010001

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040521-5
SRR: 25943
SDG: 245101
CASE: CNWRA
VTSR: May 20, 2004
PROJECT#: 06002.01.141

FINAL REPORT

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010002
Sample ID
Anion 1A

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 05/20/04

Matrix: Water

Project No.: 06002.01.141

Task Order: 040521-5

SRR: 25943

Lab System ID: 245101

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Bromide	<0.1	0.1
Chloride	6.74	0.1
Fluoride	1.84	0.1
Nitrate-N	0.922	0.1
Nitrite-N	<0.1	0.1
Phosphate-P	0.0205	0.01
Sulfate	28.8	0.1

SOUTHWEST RESEARCH INSTITUTE

DUPLICATE SUMMARY

010003
Sample ID
Anion 1A

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 05/20/04

Matrix: Water

Project No.: 06002.01.141

Task Order: 040521-5

SRR: 25943

Lab System ID: 245101

Analysis	Sample Result (mg/L)	Duplicate Result (mg/L)	RPD
Bromide	<0.1	<0.1	0.00%
Chloride	6.74	6.72	0.30%
Fluoride	1.84	1.83	0.54%
Nitrate-N	0.922	0.916	0.65%
Nitrite-N	<0.1	<0.1	0.00%
Phosphate-P	0.0205	0.0306	39.5%
Sulfate	28.8	28.7	0.35%

SOUTHWEST RESEARCH INSTITUTE

MATRIX SPIKE SUMMARY

010004

Sample ID
Anion 1A

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 05/20/04

Matrix: Water

Project No.: 06002.01.141

Task Order: 040521-5

SRR: 25943

Lab System ID: 245101

Analysis	Sample Result (mg/L)	Spike Result (mg/L)	Spike Added (mg/L)	Recovery
Bromide	<0.1	4.11	4.00	103%
Chloride	6.74	8.66	2.00	96.0%
Fluoride	1.84	2.83	1.00	99.0%
Nitrate-N	0.922	1.72	0.904	88.3%
Nitrite-N	<0.1	0.933	1.00	93.3%
Phosphate-P	0.0205	0.273	0.250	101%
Sulfate	28.8	32.4	4.00	90.0%

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010005

Sample ID
Anion 2A

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 05/20/04

Matrix: Water

Project No.: 06002.01.141

Task Order: 040521-5

SRR: 25943

Lab System ID: 245102

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Bromide	<0.1	0.1
Chloride	5.85	0.1
Fluoride	1.73	0.1
Nitrate-N	0.735	0.1
Nitrite-N	<0.1	0.1
Phosphate-P	0.0679	0.01
Sulfate	22.1	0.1

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010006

Sample ID
Anion 3A

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 05/20/04

Matrix: Water

Project No.: 06002.01.141

Task Order: 040521-5

SRR: 25943

Lab System ID: 245103

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Bromide	7.98	0.1
Chloride	3.91	0.1
Fluoride	1.99	0.1
Nitrate-N	1.59	0.1
Nitrite-N	<0.1	0.1
Phosphate-P	4.44	0.01
Sulfate	7.67	0.1

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010007

Sample ID
Anion 4A

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 05/20/04

Matrix: Water

Project No.: 06002.01.141

Task Order: 040521-5

SRR: 25943

Lab System ID: 245104

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Bromide	<0.1	0.1
Chloride	10.2	0.1
Fluoride	<0.1	0.1
Nitrate-N	0.374	0.1
Nitrite-N	<0.1	0.1
Phosphate-P	<0.01	0.01
Sulfate	<0.1	0.1

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010008

Sample ID
Anion 5A

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 05/20/04

Matrix: Water

Project No.: 06002.01.141

Task Order: 040521-5

SRR: 25943

Lab System ID: 245105

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Bromide	<0.1	0.1
Chloride	<0.1	0.1
Fluoride	<0.1	0.1
Nitrate-N	<0.1	0.1
Nitrite-N	<0.1	0.1
Phosphate-P	<0.01	0.01
Sulfate	<0.1	0.1

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010009

Sample ID
Anion 6A

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 05/20/04

Matrix: Water

Project No.: 06002.01.141

Task Order: 040521-5

SRR: 25943

Lab System ID: 245106

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Bromide	<0.1	0.1
Chloride	6.70	0.1
Fluoride	1.79	0.1
Nitrate-N	0.902	0.1
Nitrite-N	<0.1	0.1
Phosphate-P	0.027	0.01
Sulfate	28.8	0.1

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010010

Sample ID
Anion 7A

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 05/20/04

Matrix: Water

Project No.: 06002.01.141

Task Order: 040521-5

SRR: 25943

Lab System ID: 245107

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Bromide	<0.1	0.1
Chloride	5.98	0.1
Fluoride	1.69	0.1
Nitrate-N	0.733	0.1
Nitrite-N	<0.1	0.1
Phosphate-P	0.0673	0.01
Sulfate	22.2	0.1

SOUTHWEST RESEARCH INSTITUTE

LABORATORY CONTROL SAMPLE 010011

Sample ID
LCSW

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: NA

Matrix: Water

Project No.: 06002.01.141

Task Order: 040521-5

SRR: 25943

Lab System ID: NA

Analysis	Sample Result (mg/L)	True Value (mg/L)	Recovery
Bromide	408	400	102%
Chloride	206	200	103%
Fluoride	102	100	102%
Nitrate-N	84.3	90.4	93.3%
Nitrite-N	97.0	100	97.0%
Phosphate-P	2.50	2.31	108%
Sulfate	398	400	99.5%

NA- Not Applicable.

SOUTHWEST RESEARCH INSTITUTE

BLANK SUMMARY

010012

Sample ID
PBW

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: NA

Matrix: Water

Project No.: 06002.01.141

Task Order: 040521-5

SRR: 25943

Lab System ID: NA

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Bromide	<0.1	0.1
Chloride	<0.1	0.1
Fluoride	<0.1	0.1
Nitrate-N	<0.1	0.1
Nitrite-N	<0.1	0.1
Phosphate-P	<0.01	0.01
Sulfate	<0.1	0.1

NA- Not Applicable.

010013

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040521-5
SRR: 25943
SDG: 245101
CASE: CNWRA
VTSR: May 20, 2004
PROJECT#: 06002.01.141

Task Orders/01-QPP-015

Southwest Research Institute

Laboratory Task Order

TO #: 040521-5 Revision: 1

SDG: 245101
VTSR: 05/20/04
CASE: CNWRA

SRR #'s: 25943
Client(s): DIV 20

Project(s): 06002.01.141
Manager(s): DAMMANN, MIKE
To PM: 06/16/04
To QA: 07/26/04
To Client: 07/27/04 010014

Instructions

DIVISION 20 - CNWRA. 30-day TAT. Using 27-day TAT for report/PM, QAU, 28-day TAT for hardcopy (subject to change). Point of Contact is Brad Werling (x6565). Analysis for Anions by IC except Phosphate. Phosphate required by Method 365.3. Work is 10 CFR 50, Part 21, Appendix B. CONTACT Charlie Butcher (ext. 5928, pager 271-5172) BEFORE STARTING ANY WORK ON THIS TASK ORDER. CONTACT PM WITH ANY QUESTIONS.
revision 1: updated task order. (dr072304)

Documents Related to this task order: 10688[COC 25943]

Test: IC-SWRI
Section: WETCHEM

Holding: 28 days from CED

Ion Chromatography by SwRI Method (EXCEPT PHOSPHATE)

Cnt: 7

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
245101		1	Water	Anion 1A	20 May 04	17 Jun 04
245102		1	Water	Anion 2A	20 May 04	17 Jun 04
245103		1	Water	Anion 3A	20 May 04	17 Jun 04
245104		1	Water	Anion 4A	20 May 04	17 Jun 04
245105		1	Water	Anion 5A	20 May 04	17 Jun 04
245106		1	Water	Anion 6A	20 May 04	17 Jun 04
245107		1	Water	Anion 7A	20 May 04	17 Jun 04

Test: PO4_365.3
Section: WETCHEM

Holding: 2 days from CED

Phosphate by Method 365.3

Cnt: 7

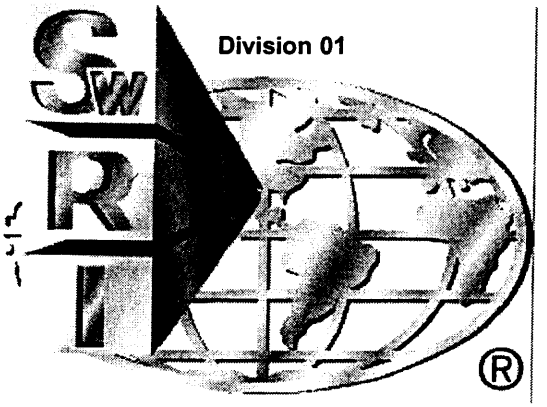
System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
245101		1	Water	Anion 1A	20 May 04	22 May 04
245102		1	Water	Anion 2A	20 May 04	22 May 04
245103		1	Water	Anion 3A	20 May 04	22 May 04
245104		1	Water	Anion 4A	20 May 04	22 May 04
245105		1	Water	Anion 5A	20 May 04	22 May 04
245106		1	Water	Anion 6A	20 May 04	22 May 04
245107		1	Water	Anion 7A	20 May 04	22 May 04

010015

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

01-QPP-015
Division 01
Revision 4
November 2002

Document No. 3



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

DIV. 20
SRR #25943
PROJECT #06002.01.141
CASE: CNWRA
VTSR: 05/20/04 1500

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

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

SwRI AUTHORIZATION SIGNATORIES

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

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

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

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

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

TABLE OF CONTENTS

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

1.0 INTRODUCTION

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

2.0 SCOPE

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

3.0 REFERENCES

3.1 *SwRI Quality System Manual – 2000*

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

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

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

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

4.1 Indoctrination and Training

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

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

4.2 Qualification of Personnel

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

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

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

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

4.3 Design Control

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

4.4 Right of Access

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

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

4.5 Control of Supplier-Generated Documents

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

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

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

4.6 Acceptance of Services Only

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

4.7 Commercial Grade Items

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

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

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

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

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

(a) Damage was not sustained during shipment;

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

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

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

(a) Chemical name;

(b) Chemical grade;

(c) Lot code;

(d) Date received; and

(e) Shelf life, when applicable.

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

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

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

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

(a) Sample control number;

(b) Purchase order number;

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

(d) Work order number;

(e) Nuclear QA label; and

(f) Sample retention date, when applicable.

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

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

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

4.8 Inspection

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

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

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

(b) Testing processes;

(c) Calibration and major equipment;

(d) Sample and record retention; and

(e) Test records.

4.9 Inspection and Testing

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

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

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

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

4.10 Handling, Storage, Packaging, Preservation, and Delivery

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

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

4.11 Quality Assurance Records

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

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

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

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

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

4.12 10 CFR, Part 21

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

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

4.13 Certified Test Report

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

4.14 Valid Documents List

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

5.0 HISTORY OF REVISIONS

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

010024

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040521-5
SRR: 25943
SDG: 245101
CASE: CNWRA
VTSR: May 20, 2004
PROJECT#: 06002.01.141

Chain of Custody/Login Paperwork

10688

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 Herling
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 Damman

Analyses Requested

Sample ID	Sample Collection Date (mm/dd/yy)	Sample Collection Time	Matrix Type	Sample Type	# of Containers	Anions by IC except Phosphate	Phosphate by 365.3	Samples Intact
Anion 1A1	05/20/04		W		1	X	X	
Anion 2A1						X	X	
Anion 3A1						X	X	
Anion 4A1						X	X	
Anion 5A1						X	X	
Anion 6A1						X	X	
~~Anion 7B~~								
Anion 7A1	✓		✓		✓	X	X	

Exact Copy
Original Located T.D. 040521-6
gmf 7/27/04

DIV. 20
SRR #25943
PROJECT #06002.01.141
CASE: CNWRA
VTSR: 05/20/04 1500

REMARKS
Preservation
- **a** = HCl to pH <2
- **b** = HNO_3 to pH <2
- **c** = H_2SO_4 to pH <2
- **d** = NaOH to pH >12
- **e** = Cool (4°C±2°C)
- **f** = Other (specify) none

Nuclear Safety Related - use appropriate QA procedures

POC: Brad Herling
phone 6565
Fax 5184

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

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

Temp: 22.0°C

Therm #: 027

Comments:
628/134.136
return excess samples to B. Herling (Div. 20) x6565

	Date	Time
Relinquished by (Print/Signature): X Miriam Juckett / Miriam Juckett	5/20/04	
Received by (Print/Signature):		
Relinquished by (Print/Signature):		
Received by (Print/Signature):		
Relinquished by (Print/Signature):		

SwRI Project#: 20.06002.01.141

Received by SwRI Lab: (Signature)

Date: 5/20/04 Time: 1500

Samples Disposed: Date / Time

Samples Disposed by:

010025

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

10688

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 Herling CNWRA - DIV 20 BLD - 57

Client:

Client Purchase Order/Other ID:

Site/Zone ID:

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

SwRI Contact: Mike Damman

Analyses Requested

Exact Copy
Original Located T.O. 040524-6
smf 7-27-04

Sample ID	Sample Collection Date (mm/dd/yy)	Sample Collection Time	Matrix Type	Sample Type	# of Containers	Analysis of major + minor elements ICP	Samples Intact
Cation 1A1	05/20/04		W		1	X	
Cation 2A1						X	
Cation 3A1						X	
Cation 4A1						X	
Cation 5A1						X	
Cation 6A1						X	
Cation 7A1						X	
Cation 8A1						X	
Cation 9A1						X	

DIV. 20
SRR #25943
PROJECT #06002.01.141
CASE: CNWRA
VTSR: 05/20/04 1500

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

Nuclear Safety related - use appropriate QA procedures

POC - Brad Herling 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:
628/134-136

	Date	Time
Relinquished by (Print/Signature): Miriam Juckett / Miriam Juckett		
Received by (Print/Signature):		
Relinquished by (Print/Signature):		
Received by (Print/Signature):		
Relinquished by (Print/Signature):		

SwRI Project#: 20.06002.01.141

Received by SwRI Lab: (Signature)

Date: 5/20/04 Time: 1500

Samples Disposed: Date / Time

Samples Disposed by:

010026

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

SAMPLE LOG-IN SHEET

010027

Lab Name: Southwest Research Institute	Page 1 of 1
Received By (Print Name): DINO ROMAN	Log-in Date: 05/21/2004
Received By (Signature): DR	
Case Number: CNWRA	Sample Delivery Group No.
Remarks: 06002.01.141	SAS Number: N/A

1. Custody Seal(s)	Present/(Absent*) Intact/Broken	
2. Custody Seal Nos.	N/A	
3. Chain-of Custody Records	(Present)/Absent*	
4. Traffic Reports or Packing Lists	Present/(Absent)	
5. Airbill	Airbill/Sticker (Present)/Absent*	
6. Airbill No.	HAND DELIVERED	
7. Sample Tags	Present/(Absent)	
Sample Tag Numbers	Listed/(Not listed on Chain of Custody	
8. Sample Condition	(Intact)/Broken*/ Leaking	
9. Cooler Temperature	22.0C	
10. Does Information on custody records, traffic reports, and sample tags agree?	(Yes)/No*	
11. Date Received at Lab	05/20/2004	
12. Time Received	15:00:00	

EPA Sample #	Corresponding Sample Tag #	Corresponding Assigned Lab #	Remarks: Condition of Sample Shipment, etc
Anion 1A	None	245101	Intact
Anion 2A	None	245102	Intact
Anion 3A	None	245103	Intact
Anion 4A	None	245104	Intact
Anion 5A	None	245105	Intact
Anion 6A	None	245106	Intact
Anion 7A	None	245107	Intact
Cation 1A	None	245108	Intact
Cation 2A	None	245109	Intact
Cation 3A	None	245110	Intact
Cation 4A	None	245111	Intact
Cation 5A	None	245112	Intact
Cation 6A	None	245113	Intact
Cation 7A	None	245114	Intact
Cation 8A	None	245115	Intact
Cation 9A	None	245116	Intact

Exact Copy

Original Located T.O. 040521-6 gmf 7-27-04

Sample Transfer		
Fraction	Jnors	Fraction
Area #	R13	Area #
By	DINO ROMAN	By
On	05/20/2004	On

* Contact SMO and attach record of resolution

Reviewed By	Cynthia A. Sallegos	Logbook No.	Sample Receipt (25943)
Date	05.25.2004	Logbook Page No.	5078 (SECTION 1 OF 3)

FORM DC-1

4 05.25.2004

OLMO4.2

010028

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040521-5
SRR: 25943
SDG: 245101
CASE: CNWRA
VTSR: May 20, 2004
PROJECT#: 06002.01.141

Copies of Login Book

Sample Login Book

May 21, 2004

010029

SwRI Login Area
Division 1

Sample Receipt: 25942	Project: 06355.24.00X	Client: INEEL
VTSR Date: May 21, 2004	VTSR Time: 08:15:00	Manager: DAMMANN, MIKE

System ID	Customer Sample ID	Matrix
245099	TRA764052004CA1	Water
245100	TRA764052004CA2	Water

Sample Receipt: 25943	Project: 06002.01.141	Client: DIV 20
VTSR Date: May 20, 2004	VTSR Time: 15:00:00	Manager: DAMMANN, MIKE

System ID	Customer Sample ID	Matrix
245101	Anion 1A	Water
245102	Anion 2A	Water
245103	Anion 3A	Water
245104	Anion 4A	Water
245105	Anion 5A	Water
245106	Anion 6A	Water
245107	Anion 7A	Water
245108	Cation 1A	Water
245109	Cation 2A	Water
245110	Cation 3A	Water
245111	Cation 4A	Water
245112	Cation 5A	Water
245113	Cation 6A	Water
245114	Cation 7A	Water
245115	Cation 8A	Water
245116	Cation 9A	Water

Sample Receipt: 25944	Project: 06002.01.141	Client: DIV 20
VTSR Date: May 20, 2004	VTSR Time: 15:00:00	Manager: DAMMANN, MIKE

System ID	Customer Sample ID	Matrix
245117	UFUA-CE-D	Water
245118	UFUA-CE-S	Water
245119	UFUA-GCMS-D	Water

010030

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040521-5
SRR: 25943
SDG: 245101
CASE: CNWRA
VTSR: May 20, 2004
PROJECT#: 06002.01.141

RAW DATA

010031

Southwest Research Institute

Electronic Bench Sheet

Phosphate - WATERS

D Spies 6/21/04

Project #: 06002.01.141
Client: Div. 20
Method: 365.3
WO#: 040521-5

Date: 06/11/04
Analyst: Michael Hardy
MDL: 0.010 mg/L
Sig Figs: 3

Standardization:

Standard mg/L	Calc mg/L	Absorbance @650
0.000	-0.0	0.000
0.01	0.0	0.019
0.05	0.0	0.097
0.10	0.1	0.193
0.50	0.5	0.901
1.00	1.0	1.680

Regression Output:

Constant	-0.00849
Std Err of Y Est	0.015597
R Squared	0.9988
No. of Observations	6
Degrees of Freedom	4
X Coefficient(s)	0.59203
Std Err of Coef.	0.01031

NOTES: Phosphate std. = SPEX 7-145VY TV = 1000mg/L PO_4-P
ICV/CCV = ERA 99114(Nutrients) TV = 2.31 mg/L PO_4-P

Final Volume Colored: 10 ml

Seq #	Sample ID	Aliquot Vol ml	Abs @650	PO4P mg/L	Comments
1	ICV	2	0.860	2.50	108% R, TV = 2.31 mg/L
2	ICB	10	0.002	<0.01	
3	LLC	10	0.040	0.0152	76.0% R, TV = 0.020 mg/L
4	245101	10	0.049	0.0205	
5	245101D	10	0.066	0.0306	39.5% RPD
6	245101S	10	0.475	0.273	101% R, TV = 0.250 mg/L
7	245102	10	0.129	0.0679	
8	245103	1	0.764	4.44	
9	245104	10	0.021	<0.01	
10	245105	10	0.003	<0.01	
11	245106	10	0.060	0.027	
12	245107	10	0.128	0.0673	
13	CCV	2	0.814	2.37	103% R, TV = 2.31 mg/L
14	CCB	10	-0.003	<0.01	VOID--Cell Dirty
15	CCB	10	-0.001	<0.01	

Sample Calc: (mg/L read from curve * Final Vol. Colored) / Aliquot Vol = mg/L PO4P

Southwest Research Institute 010032
Logbook: Phosphate

Analysis / Method: Phosphate 365.3 Project# 06002.01.141
Client: Div. 20 WO# 040521-5

space provided for spectrophotometer printouts

— Ammonium Molybdate / Antimony Potassium Tartrate
Dissolved 0.1003 g Antimony Potassium Tartrate
(Aldrich Lot #: 03929CV)
and 3.9972 g Ammonium Molybdate
(Fisher Lot # 975140)
in 400 mL DI and diluted to 500 mL with DI

— Sulfuric Acid (11 N)
Added 62 mL concentrated H_2SO_4 (Fisher Lot # 036110) to 120 mL DI
and diluted to 200 mL with DI.

— Ascorbic Acid
Dissolved 2.9977 g ascorbic acid in 40 mL DI and diluted
(Fisher Lot # 035244)
to 50 mL with DI water. Then added 0.1 mL acetone (Fisher Lot # 038638)

Balance # 16
Pipettes: 5000 J
1000 H
200 H

(continued on 03 070)

Analyst Signature: [signature] Date: 6/11/04
Reviewed by: RSper Date: 6/21/04
Logbook #/ Page # 03 069

Southwest Research Institute
Logbook: Phosphate

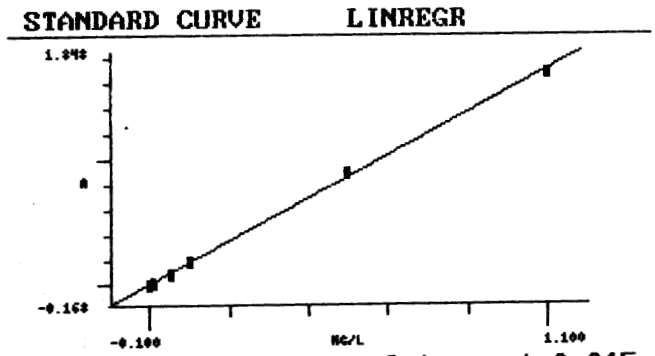
010033

Analysis / Method: Phosphate 365.3 Project# 06002.01.141

Client: Div. 20 WO# 040521-5

space provided for spectrophotometer printouts

(Continued from 03 069)



6/11/04

11 JUN 2004 10:26:20
Application: STANDARD CURVE
Model: LINREGR
Test name: PO4
ABS Correction: NONE
Wavelength: 650.0
Units: mg/L
Slope=1.687 Intercept=0.015
StdDev=0.026329 Corr.Coef.=0.999

Std	CONC	ABS
1	0.00000	0.000
2	0.010000	0.019
3	0.050000	0.097
4	0.10000	0.193
5	0.50000	0.901
6	1.0000	1.680

(continued on 03 071)

Analyst Signature: _____ Date: 6/11/04

Reviewed by: _____ Date: 6/24/04

Logbook #/ Page # 03 070

Southwest Research Institute
Logbook: Phosphate

010034

Analysis / Method: Phosphate 3653 Project# 06002.01.141

Client: Div. 20 WO# 040521-5

space provided for spectrophotometer printouts

(Continued from 03 070)

ID	ABS	CONC
ICV 1:5	0.860	0.50092
ID	ABS	CONC
ICB	0.002	-0.00765
ID	ABS	CONC
LLC	0.040	0.014870
ID	ABS	CONC
245101	0.049	0.020205
ID	ABS	CONC
245101D	0.066	0.030282
ID	ABS	CONC
245101S	0.475	0.27272
ID	ABS	CONC
245102	0.129	0.067625
ID	ABS	CONC
245103 1:10	0.764	0.44402
ID	ABS	CONC
245104	0.021	0.003608
ID	ABS	CONC
245105	0.003	-0.00706
ID	ABS	CONC
245106	0.060	0.026725
ID	ABS	CONC
245107	0.128	0.067032
ID	ABS	CONC
CCV 1:5	0.814	0.47366
ID	ABS	CONC
~~CCB~~ VOID	~~-0.003~~	~~-0.01062~~
ID CELL DIRTY	ABS	CONC
CCB	-0.001	-0.00943

6/11/04

6/11/04

Analyst Signature: _____ Date: 6/11/04

Reviewed by: _____ Date: 6/21/04

Logbook #/ Page # 03 071

Book/Page: 12 003

010035

Southwest Research Institute

Dionex DX500 Ion Chromatography Daily Log

Analyst: RSpus

Date: 6/23/04

Conductivity: 17.9

Client	Project #	TO #	Analytical Method
	04-0616-1	↔ 06002.01.081	300
DIV20	040521-5	↔ 06002.01.141	↓
↓	040615-8	↔ 06002.01.141	
	040617-9	↔ 10542.02.002	
LaCantera	040611-1	↔ 05827.04006	

Loop: 40ul

Column: AS14#015-02-087

Method: anion 040622

Calibration: 6/22/04

Comments:

ICV/CCV/MS:

1st Source: SPEX (Inorg #4578)

Lot #: 25-145AS

CCV Conc: 1:20

MS Conc: 1:100

2nd Source: Nitrite N

Lot #: 178-01-1C4

CCV Conc: 1:20

MS Conc: 1:100

✓ 1.0 mM Sodium Bicarbonate & 3.5 mM Sodium Carbonate — FV = 2.0L DI H20

Weight: 0.1689g $NaHCO_3$

Source: Aldrich

Lot: 15308EI

Weight: 0.7419g Na_2HCO_3

Source: alfa Aesar

Lot: L06M34

Balance #12

Other Eluent:

50 mA-Autoregen (ASRS)

Other Regen:

✓ 7/2/04

Eppendorf: 5000L 1000J 200J

DIV 20
06002.01.141
TO#040521-5

7/1/04 7/23/04

Analyst: RSS
Method: EPA 300

6/30/04

010036

	System ID	Analyte	Conc mg/L	RESULT mg/L	Qual	DL	TV	% Rec or RPD
06/23/04	245101	Fluoride	1.837	1.84		0.1		
06/23/04	245101	Chloride	6.743	6.74		0.1		
06/23/04	245101	Nitrite-N	0.026	0.1	U	0.1		
06/23/04	245101	Bromide	0.036	0.1	U	0.1		
06/23/04	245101	Nitrate-N	0.922	0.922		0.1		
06/23/04	245101	Sulfate	28.792	28.8		0.1		
06/23/04	245101D	Fluoride	1.828	1.83		0.1		0.49%
06/23/04	245101D	Chloride	6.721	6.72		0.1		0.33%
06/23/04	245101D	Nitrite-N	0.024	0.1	U	0.1		0.00%
06/23/04	245101D	Bromide	0.029	0.1	U	0.1		0.00%
06/23/04	245101D	Nitrate-N	0.916	0.916		0.1		0.65%
06/23/04	245101D	Sulfate	28.673	28.7		0.1		0.41%
06/23/04	245101S	Fluoride	2.828	2.83		0.1	1	99.1%
06/23/04	245101S	Chloride	8.662	8.66		0.1	2	96.0%
06/23/04	245101S	Nitrite-N	0.933	0.933		0.1	1	93.3%
06/23/04	245101S	Bromide	4.111	4.11		0.1	4	103%
06/23/04	245101S	Nitrate-N	1.722	1.72		0.1	0.904	88.5%
06/23/04	245101S	Sulfate	32.376	32.4		0.1	4	89.6%
06/23/04	245102	Fluoride	1.728	1.73		0.1		
06/23/04	245102	Chloride	5.853	5.85		0.1		
06/23/04	245102	Nitrite-N	0.000	0.1	U	0.1		
06/23/04	245102	Bromide	0.039	0.1	U	0.1		
06/23/04	245102	Nitrate-N	0.735	0.735		0.1		
06/23/04	245102	Sulfate	22.118	22.1		0.1		
06/23/04	245103	Fluoride	1.992	1.99		0.1		
06/23/04	245103	Chloride	3.911	3.91		0.1		
06/23/04	245103	Nitrite-N	0.000	0.1	U	0.1		
06/23/04	245103	Bromide	7.983	7.98		0.1		
06/23/04	245103	Nitrate-N	1.588	1.59		0.1		
06/23/04	245103	Sulfate	7.674	7.67		0.1		
06/23/04	245104	Fluoride	0.000	0.1	U	0.1		
06/23/04	245104	Chloride	10.233	10.2		0.1		
06/23/04	245104	Nitrite-N	0.000	0.1	U	0.1		
06/23/04	245104	Bromide	0.000	0.1	U	0.1		
06/23/04	245104	Nitrate-N	0.374	0.374		0.1		
06/23/04	245104	Sulfate	0.000	0.1	U	0.1		
06/23/04	245105	Fluoride	0.000	0.1	U	0.1		
06/23/04	245105	Chloride	0.057	0.1	U	0.1		
06/23/04	245105	Nitrite-N	0.000	0.1	U	0.1		
06/23/04	245105	Bromide	0.000	0.1	U	0.1		
06/23/04	245105	Nitrate-N	0.000	0.1	U	0.1		
06/23/04	245105	Sulfate	0.087	0.1	U	0.1		
06/23/04	245106	Fluoride	1.791	1.79		0.1		
06/23/04	245106	Chloride	6.704	6.70		0.1		
06/23/04	245106	Nitrite-N	0.027	0.1	U	0.1		
06/23/04	245106	Bromide	0.040	0.1	U	0.1		
06/23/04	245106	Nitrate-N	0.902	0.902		0.1		
06/23/04	245106	Sulfate	28.785	28.8		0.1		
06/23/04	245107	Fluoride	1.687	1.69		0.1		
06/23/04	245107	Chloride	5.980	5.98		0.1		
06/23/04	245107	Nitrite-N	0.000	0.1	U	0.1		
06/23/04	245107	Bromide	0.031	0.1	U	0.1		
06/23/04	245107	Nitrate-N	0.733	0.733		0.1		
06/23/04	245107	Sulfate	22.230	22.2		0.1		

U = UNDETECTED

DIV 20
06002.01.141
TO#040521.5

Analyst: RSS
Method: EPA 300

010038

	System ID	Analyte	Conc mg/L	RESULT mg/L	Qual	DL	TV	% Rec or RPD
06/23/04	ICV	Fluoride	101.959	102		0.1	100	102%
06/23/04	ICV	Chloride	206.149	206		0.1	200	103%
06/23/04	ICV	Nitrite-N	96.954	97.0		0.1	100	97.0%
06/23/04	ICV	Bromide	408.169	408		0.1	400	102%
06/23/04	ICV	Nitrate-N	84.273	84.3		0.1	90.4	93.2%
06/23/04	ICV	Sulfate	397.780	398		0.1	400	99.4%
06/23/04	CCV-1	Fluoride	102.699	103		0.1	100	103%
06/23/04	CCV-1	Chloride	207.722	208		0.1	200	104%
06/23/04	CCV-1	Nitrite-N	98.498	98.5		0.1	100	98.5%
06/23/04	CCV-1	Bromide	413.437	413		0.1	400	103%
06/23/04	CCV-1	Nitrate-N	85.785	85.8		0.1	90.4	94.9%
06/23/04	CCV-1	Sulfate	401.578	402		0.1	400	100%
06/23/04	CCV-2	Fluoride	101.420	101		0.1	100	101%
06/23/04	CCV-2	Chloride	205.650	206		0.1	200	103%
06/23/04	CCV-2	Nitrite-N	97.671	97.7		0.1	100	97.7%
06/23/04	CCV-2	Bromide	409.123	409		0.1	400	102%
06/23/04	CCV-2	Nitrate-N	84.619	84.6		0.1	90.4	93.6%
06/23/04	CCV-2	Sulfate	400.359	400		0.1	400	100%
06/23/04	ICB	Fluoride	0.000	0.1	U	0.1		
06/23/04	ICB	Chloride	0.005	0.1	U	0.1		
06/23/04	ICB	Nitrite-N	0.000	0.1	U	0.1		
06/23/04	ICB	Bromide	0.000	0.1	U	0.1		
06/23/04	ICB	Nitrate-N	0.000	0.1	U	0.1		
06/23/04	ICB	Sulfate	0.004	0.1	U	0.1		
06/23/04	CCB-1	Fluoride	0.000	0.1	U	0.1		
06/23/04	CCB-1	Chloride	0.002	0.1	U	0.1		
06/23/04	CCB-1	Nitrite-N	0.000	0.1	U	0.1		
06/23/04	CCB-1	Bromide	0.000	0.1	U	0.1		
06/23/04	CCB-1	Nitrate-N	0.000	0.1	U	0.1		
06/23/04	CCB-1	Sulfate	0.015	0.1	U	0.1		
06/23/04	CCB-2	Fluoride	0.000	0.1	U	0.1		
06/23/04	CCB-2	Chloride	0.005	0.1	U	0.1		
06/23/04	CCB-2	Nitrite-N	0.000	0.1	U	0.1		
06/23/04	CCB-2	Bromide	0.000	0.1	U	0.1		
06/23/04	CCB-2	Nitrate-N	0.000	0.1	U	0.1		
06/23/04	CCB-2	Sulfate	0.021	0.1	U	0.1		

U = UNDETECTED

Schedule File: C:\PeakNet\schedule\23jun04.SCH

Line	Sample	Sample Type	Level	Method	Data File	Dilution
1	ICV	Sample		anions040622.met	040623_001.dxd	20
2	ICB	Sample		anions040622.met	040623_002.dxd	1
3	245101	Sample		anions040622.met	040623_003.dxd	1
4	245101D	Sample		anions040622.met	040623_004.dxd	1
5	245101S	Sample		anions040622.met	040623_005.dxd	1
6	245102	Sample		anions040622.met	040623_006.dxd	1
7	245103	Sample		anions040622.met	040623_007.dxd	1
8	245104	Sample		anions040622.met	040623_008.dxd	1
9	245105	Sample		anions040622.met	040623_009.dxd	1
10	245106	Sample		anions040622.met	040623_010.dxd	1
11	245107	Sample		anions040622.met	040623_011.dxd	1
12	CCV	Sample		anions040622.met	040623_012.dxd	20
13	CCB	Sample		anions040622.met	040623_013.dxd	1
14	245101	Sample		anions040622.met	040623_014.dxd	10
15	245101D	Sample		anions040622.met	040623_015.dxd	10
16	245101S	Sample		anions040622.met	040623_016.dxd	10
17	245102	Sample		anions040622.met	040623_017.dxd	10
18	245103	Sample		anions040622.met	040623_018.dxd	10
19	245104	Sample		anions040622.met	040623_019.dxd	10
20	245105	Sample		anions040622.met	040623_020.dxd	10
21	245106	Sample		anions040622.met	040623_021.dxd	10
22	245107	Sample		anions040622.met	040623_022.dxd	10
23	CCV	Sample		anions040622.met	040623_023.dxd	20
24	CCB	Sample		anions040622.met	040623_024.dxd	1
25	246040	Sample		anions040622.met	040623_025.dxd	1
26	246040D	Sample		anions040622.met	040623_026.dxd	1
27	246040S	Sample		anions040622.met	040623_027.dxd	1
28	246041	Sample		anions040622.met	040623_028.dxd	1
29	246042	Sample		anions040622.met	040623_029.dxd	1
30	246043	Sample		anions040622.met	040623_030.dxd	1
31	246044	Sample		anions040622.met	040623_031.dxd	1
32	246045	Sample		anions040622.met	040623_032.dxd	1
33	246040D-R	Sample		anions040622.met	040623_033.dxd	1
34	CCV	Sample		anions040622.met	040623_034.dxd	20
35	CCB	Sample		anions040622.met	040623_035.dxd	1
36	246146	Sample		anions040622.met	040623_036.dxd	20
37	246146D	Sample		anions040622.met	040623_037.dxd	20
38	246146S	Sample		anions040622.met	040623_038.dxd	20
39	246147	Sample		anions040622.met	040623_039.dxd	20
40	246148	Sample		anions040622.met	040623_040.dxd	20
41	246149	Sample		anions040622.met	040623_041.dxd	20
42	246150	Sample		anions040622.met	040623_042.dxd	20
43	246151	Sample		anions040622.met	040623_043.dxd	20
44	246152	Sample		anions040622.met	040623_044.dxd	20
45	246153	Sample		anions040622.met	040623_045.dxd	20
46	CCV	Sample		anions040622.met	040623_046.dxd	20
47	CCB	Sample		anions040622.met	040623_047.dxd	1
48	246046	Sample		anions040622.met	040623_048.dxd	50
49	246046D	Sample		anions040622.met	040623_049.dxd	50
50	246046S	Sample		anions040622.met	040623_050.dxd	50
51	246047	Sample		anions040622.met	040623_051.dxd	50
52	246048	Sample		anions040622.met	040623_052.dxd	50
53	246049	Sample		anions040622.met	040623_053.dxd	50
54	246050	Sample		anions040622.met	040623_054.dxd	50
55	246051	Sample		anions040622.met	040623_055.dxd	50
56	246052	Sample		anions040622.met	040623_056.dxd	50
57	246053	Sample		anions040622.met	040623_057.dxd	50
58	CCV	Sample		anions040622.met	040623_058.dxd	20
59	CCB	Sample		anions040622.met	040623_059.dxd	1
60	246054	Sample		anions040622.met	040623_060.dxd	50
61	246055	Sample		anions040622.met	040623_061.dxd	50
62	246056	Sample		anions040622.met	040623_062.dxd	50
63	246057	Sample		anions040622.met	040623_063.dxd	50

1010039

Schedule File: C:\PeakNet\schedule\23jun04.SCH

Line	Sample	Sample Type	Level	Method	Data File	Dilution
64	246058	Sample		anions040622.met	040623_064.dxd	50
65	246059	Sample		anions040622.met	040623_065.dxd	50
66	246060	Sample		anions040622.met	040623_066.dxd	50
67	CCV	Sample		anions040622.met	040623_067.dxd	20
68	CCB	Sample		anions040622.met	040623_068.dxd	1
69	245860	Sample		anions040622.met	040623_069.dxd	100
70	245861	Sample		anions040622.met	040623_070.dxd	100
71	CCV	Sample		anions040622.met	040623_071.dxd	20
72	CCB	Sample		anions040622.met	040623_072.dxd	1
73	CCB	Sample		astop.met	040610	1

010040

Default Method Path: C:\PEAKNET\METHOD
Default Data Path: C:\PEAKNET\DATA\040623
Comment:
DIV 20 06002.01.141 TO#040521-5
DIV 20 06002.01.141 TO#040615-8
DIV 20 10542.02.002 TO#040617-9
DIV 20 06002.01.081 TO#040616-1
LACANTERA 05827.04.006 040611-1

RSpris
6/23/04

ICV/CCV Spex 25-145AS (Inorg # 4578)
NO_2N 178-01-1C4

Spikes: 50µl of Spex + NO_2N into
5ml sample/sample dilution

Sample Name : ICV
Dilution Factor : 20.00
Injection Number : 1
Data File Name : c:\peaknet\data\040623\040623_001.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\23jun04.sch

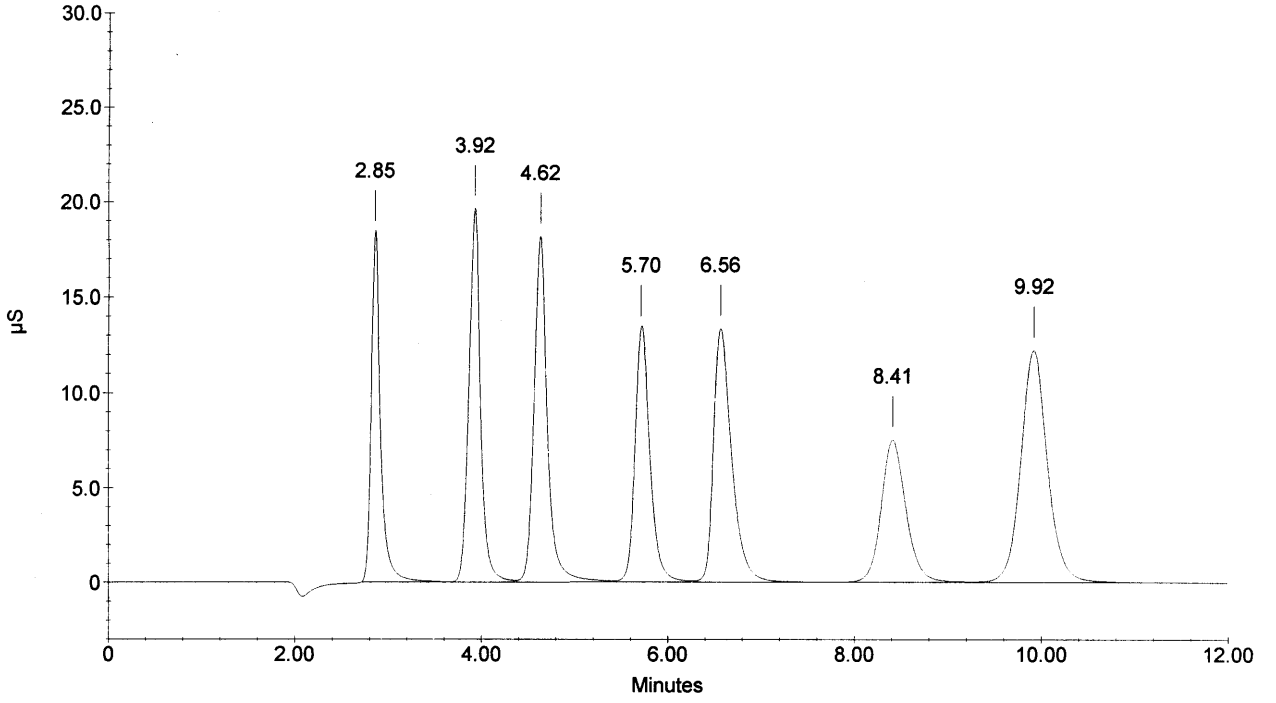
Date Time Collected : 6/23/04 11:03:53 AM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010041

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.85	FLUORIDE	101.959	182716	1274348	2	-1.38
2	3.92	CHLORIDE	206.149	195883	1711245	2	-3.29
3	4.62	NITRITE-N	96.954	181453	1817169	2	-2.05
4	5.70	BROMIDE	408.169	133054	1506297	2	-1.67
5	6.56	NITRATE-N	84.273	133182	1816876	2	0.25
6	8.41	PHOSPHATE-P	195.422	75328	1395263	2	-0.47
7	9.92	SULFATE	397.780	122306	2440518	2	-0.93
	0.00		---total(s)--- 1490.707		11961716		

ICV



Sample Name : ICB
Dilution Factor : 1.00
Injection Number : 2
Data File Name : c:\peaknet\data\040623\040623_002.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\23jun04.sch

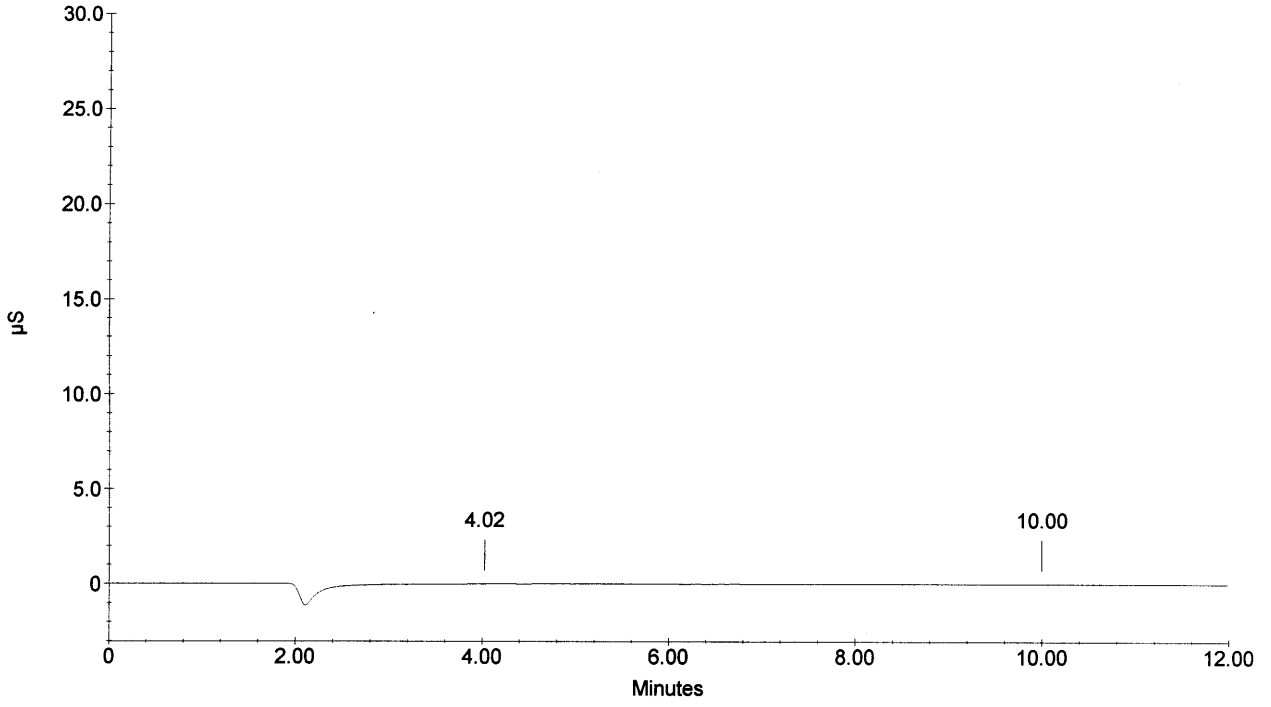
Date Time Collected : 6/23/04 11:18:30 AM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010042

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	4.02	CHLORIDE	0.005	94	781	1	-0.66
1	4.02	CHLORIDE NITRITE-N BROMIDE NITRATE-N PHOSPHATE-P	0.005	94	781	1	-0.66
2	10.00	SULFATE	0.004	59	500	1	-0.13
	0.00	---total(s)---	0.014		2061		

ICB



Sample Name : 245101
Dilution Factor : 1.00
Injection Number : 3
Data File Name : ...\040623_003.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\23jun04.sch

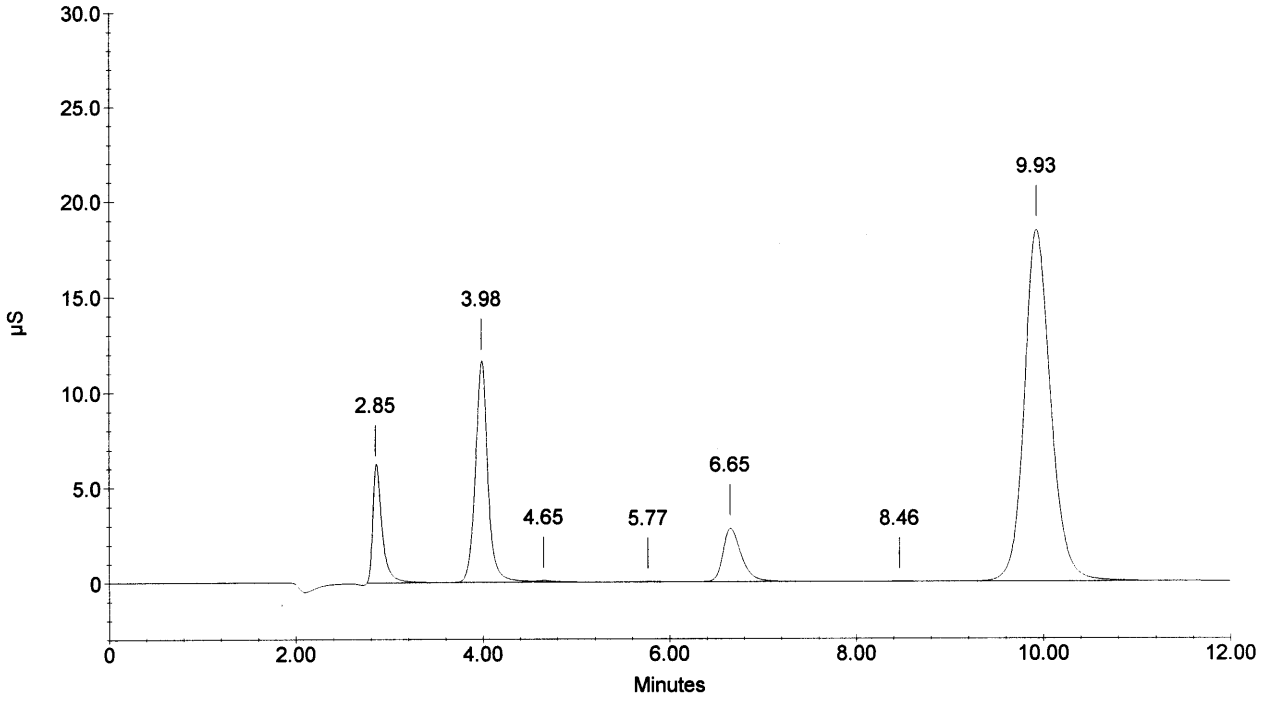
Date Time Collected : 6/23/04 11:33:12 AM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010043

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.85	FLUORIDE	1.837 ✓	59792	437576	1	-1.38
2	3.98	CHLORIDE	6.743 ✓	115202	1087679	3	-1.65
3	4.65	NITRITE-N	0.026 ✓	848	9757	4	-1.48
4	5.77	BROMIDE	0.036 ✓	238	2364	1	-0.52
5	6.65	NITRATE-N	0.922 ✓	28151	387402	1	1.68
6	8.46	PHOSPHATE-P	0.007	88	988	1	0.16
7	9.93	SULFATE	28.792 ✓	184222	3620937	1	-0.80
	0.00		---total(s)--- 38.362		5546702		

245101



Sample Name : 245101D
Dilution Factor : 1.00
Injection Number : 4
Data File Name : ...\040623_004.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\23jun04.sch

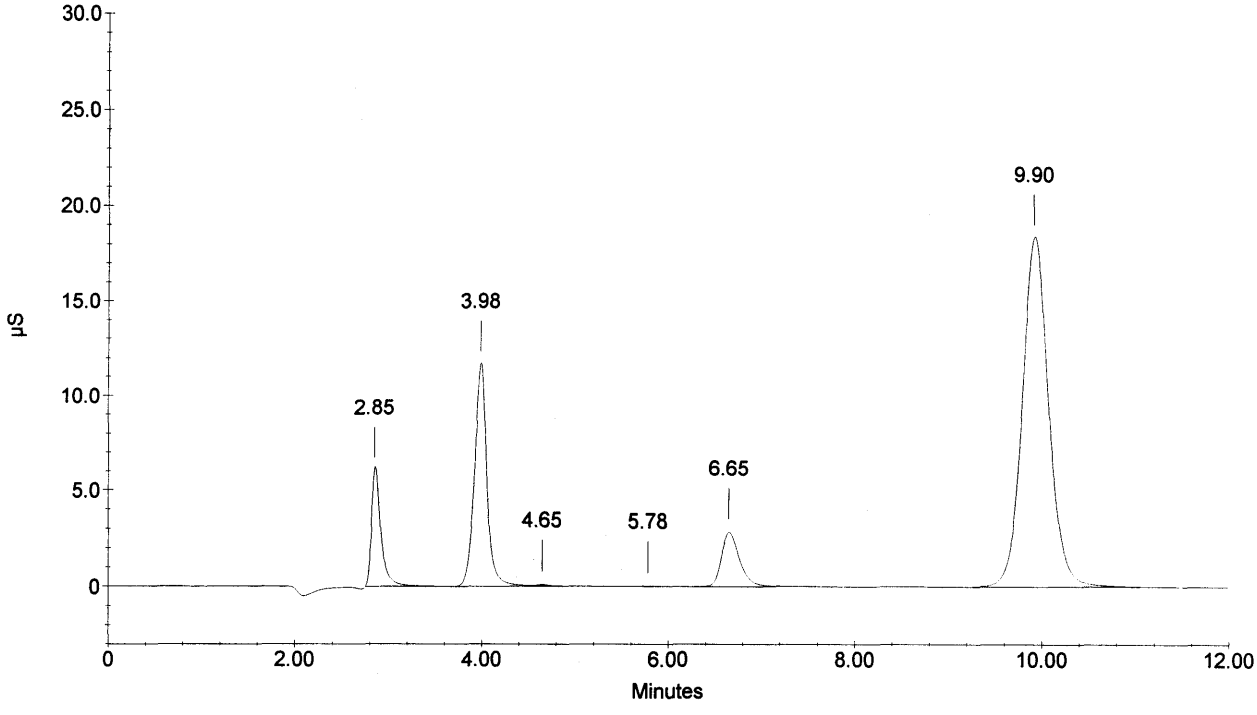
Date Time Collected : 6/23/04 11:47:54 AM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010044

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.85	FLUORIDE	1.828 ✓	60231	435582	2	-1.38
2	3.98	CHLORIDE	6.721 ✓	116219	1083982	3	-1.65
3	4.65	NITRITE-N	0.024 ✓	819	9106	4	-1.48
4	5.78	BROMIDE	0.029 ✓	207	1876	1	-0.29
5	6.65	NITRATE-N PHOSPHATE-P	0.916 ✓	28088	384908	1	1.68
6	9.90	SULFATE	28.673 ✓	182977	3604749	1	-1.07
	0.00		---total(s)--- 38.191		5520204		

245101D



Sample Name : 245101S
Dilution Factor : 1.00
Injection Number : 5
Data File Name : ...\040623_005.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\23jun04.sch

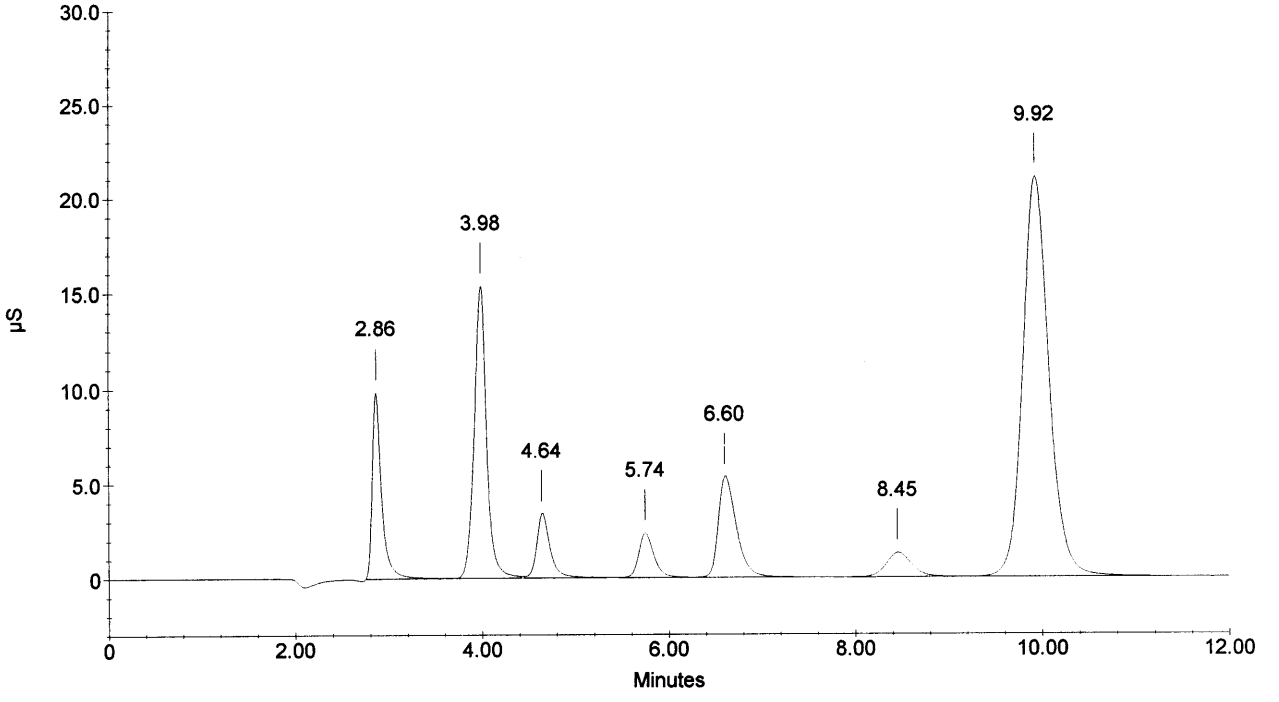
Date Time Collected : 6/23/04 12:02:36 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010045

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.86	FLUORIDE	2.828	98116	683926	1	-0.92
2	3.98	CHLORIDE	8.662	153002	1418623	2	-1.65
3	4.64	NITRITE-N	0.933	33884	349815	2	-1.77
4	5.74	BROMIDE	4.111	23732	273094	2	-0.98
5	6.60	NITRATE-N	1.722	53064	728030	2	0.87
6	8.45	PHOSPHATE-P	1.878	13009	252198	2	0.00
7	9.92	SULFATE	32.376	210165	4114637	2	-0.93
	0.00		---total(s)--- 52.510		7820323		

245101S



Sample Name : 245102
Dilution Factor : 1.00
Injection Number : 6
Data File Name : ...\040623_006.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\23jun04.sch

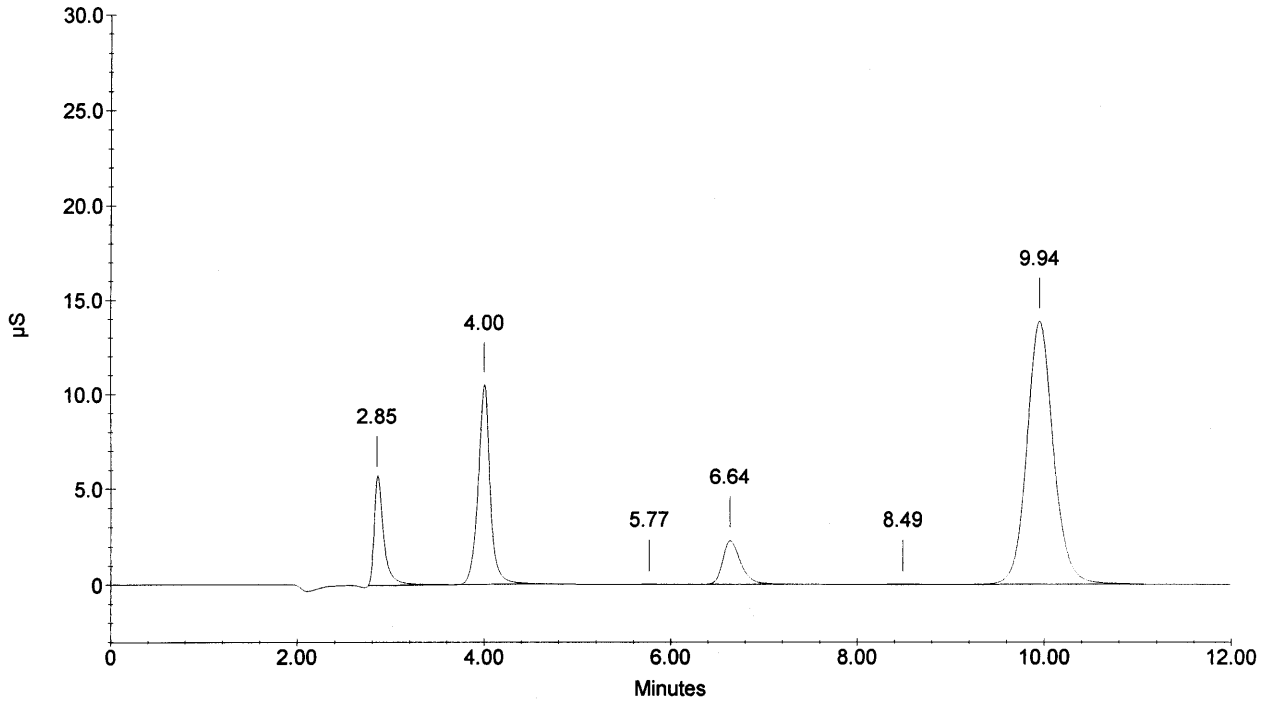
Date Time Collected : 6/23/04 12:17:19 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010046

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.85	FLUORIDE	1.728	55196	411069	2	-1.38
2	4.00	CHLORIDE	5.853	104080	937766	2	-1.32
		NITRITE-N					
3	5.77	BROMIDE	0.039	241	2558	1	-0.52
4	6.64	NITRATE-N	0.735	22744	308475	1	1.48
5	8.49	PHOSPHATE-P	0.016	130	2090	1	0.47
6	9.94	SULFATE	22.118	138347	2730316	1	-0.67
		---total(s)---					
	0.00		30.489		4392275		

245102



Sample Name : 245103
Dilution Factor : 1.00
Injection Number : 7
Data File Name : ...\040623_007.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\23jun04.sch

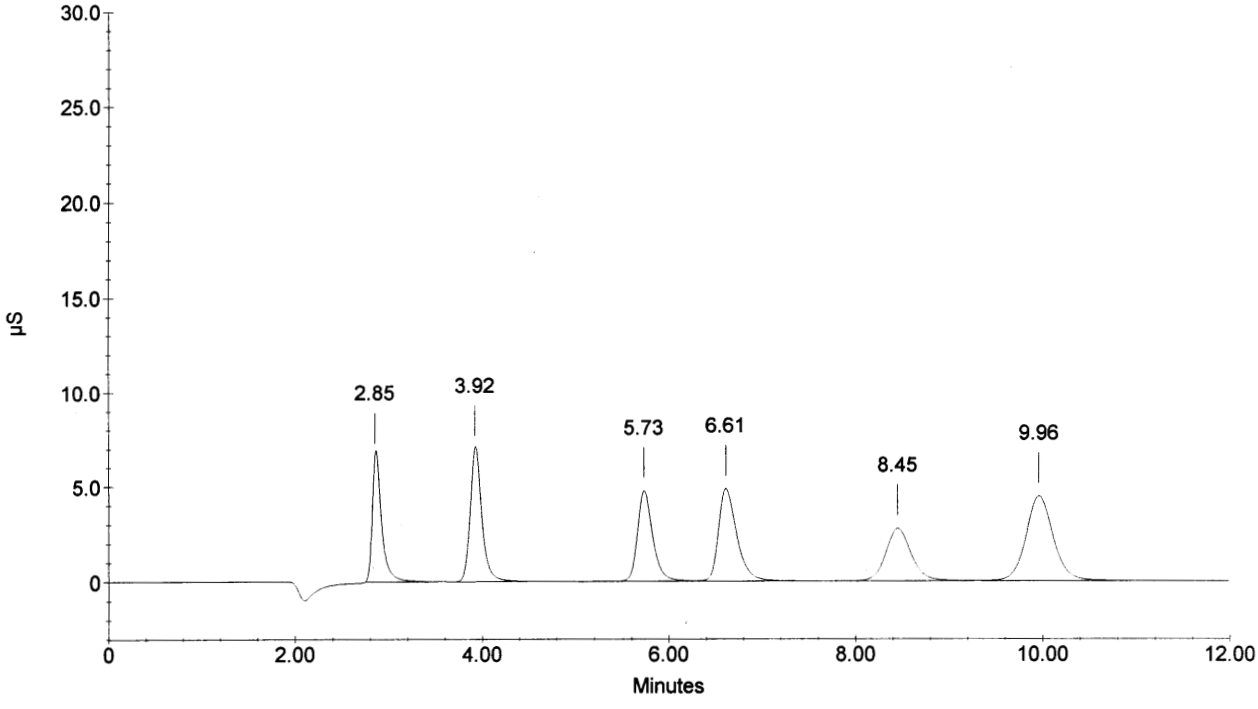
Date Time Collected : 6/23/04 12:32:01 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010047

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.85	FLUORIDE	1.992 ✓	66068	475686	1	-1.38
2	3.92	CHLORIDE	3.911 ✓	69953	617670	1	-3.29
		NITRITE-N	✓				
3	5.73	BROMIDE	7.983 ✓	47578	542155	2	-1.21
4	6.61	NITRATE-N	1.588 ✓	48690	670847	2	1.07
5	8.45	PHOSPHATE-P	3.874	27623	527681	2	0.00
6	9.96	SULFATE	7.674 ✓	44582	912904	2	-0.53
	0.00		---total(s)--- 27.020		3746942		

245103



Sample Name : 245104
Dilution Factor : 1.00
Injection Number : 8
Data File Name : ...\040623_008.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\23jun04.sch

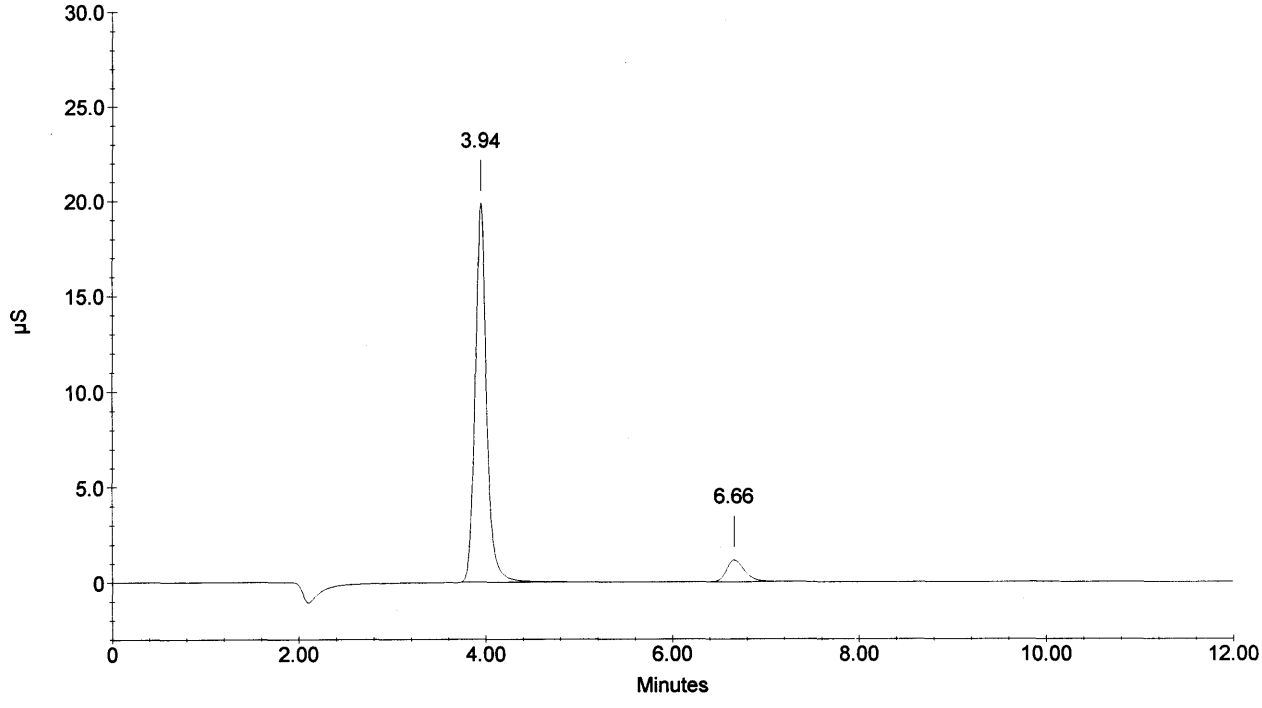
Date Time Collected : 6/23/04 12:46:42 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010048

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	3.94	CHLORIDE	10.233 ✓	198047	1697858	1	-2.63
1	3.94	CHLORIDE	10.233	198047	1697858	1	-2.63
		NITRITE-N ✓					
		BROMIDE ✓					
2	6.66	NITRATE-N	0.374 ✓	11453	156491	1	1.89
		PHOSPHATE-P					
		SULFATE ✓					
		---total(s)---					
	0.00		20.840		3552207		

245104



Sample Name : 245105
Dilution Factor : 1.00
Injection Number : 9
Data File Name : ...\040623_009.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\23jun04.sch

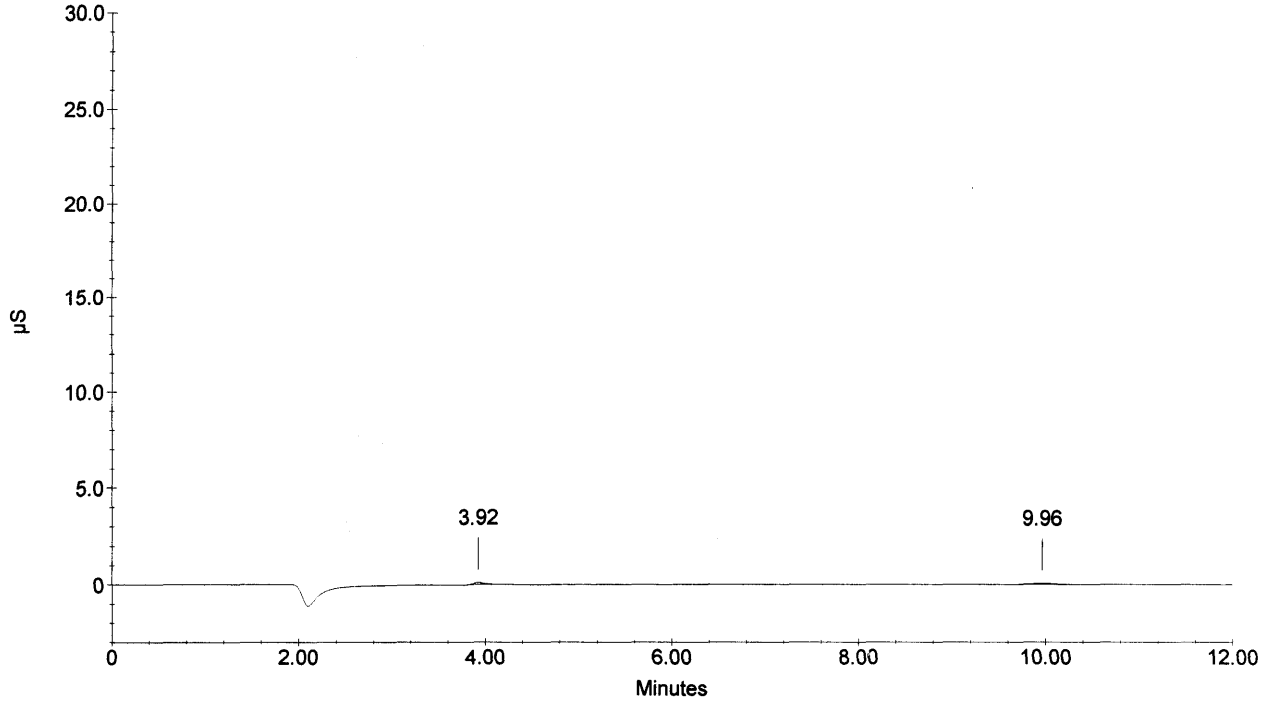
Date Time Collected : 6/23/04 1:01:24 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010049

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	3.92	CHLORIDE	0.057	1072	8751	1	-3.29
1	3.92	CHLORIDE NITRITE-N BROMIDE NITRATE-N PHOSPHATE-P	0.057	1072	8751	1	-3.29
2	9.96	SULFATE	0.087	537	10208	1	-0.53
	0.00	---total(s)---	0.201		27710		

245105



Sample Name : 245106
Dilution Factor : 1.00
Injection Number : 10
Data File Name : ...\040623_010.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\23jun04.sch

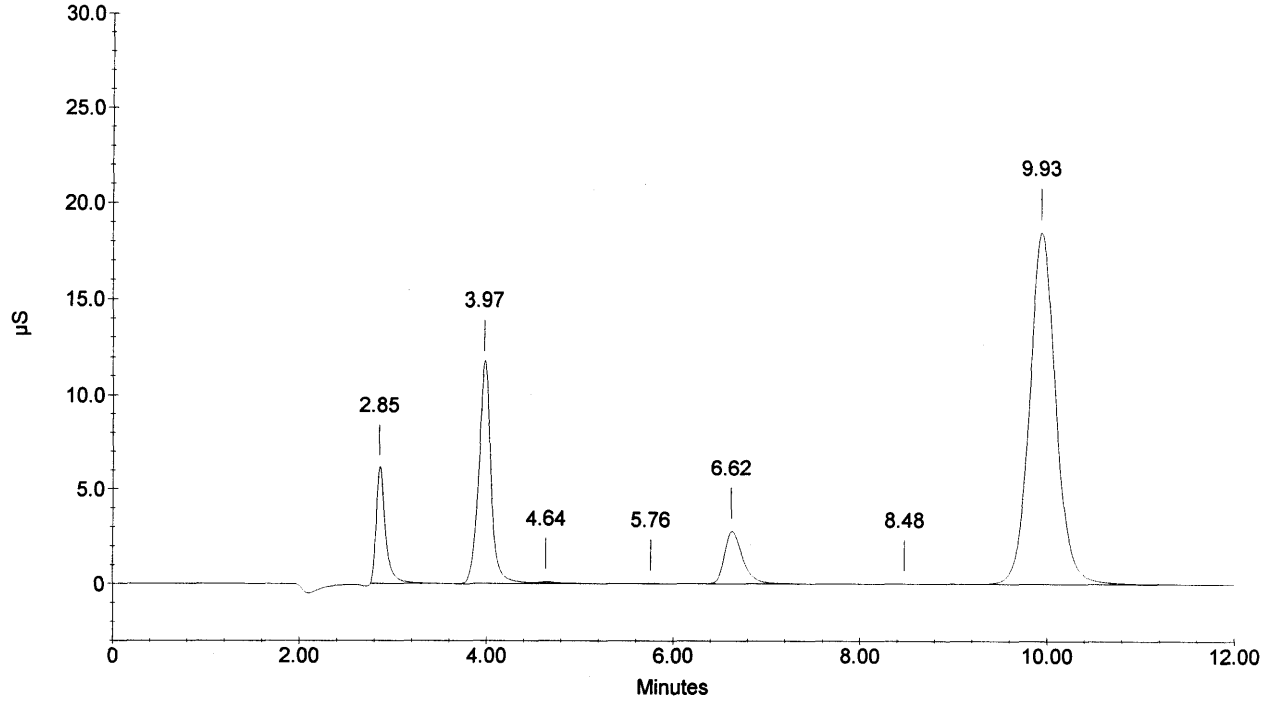
Date Time Collected : 6/23/04 1:16:05 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010050

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.85	FLUORIDE	1.791	61062	426518	1	-1.38
2	3.97	CHLORIDE	6.704	115913	1081133	3	-1.98
3	4.64	NITRITE-N	0.027	853	10143	4	-1.77
4	5.76	BROMIDE	0.040	248	2625	1	-0.75
5	6.62	NITRATE-N	0.902	27681	379059	1	1.27
6	8.48	PHOSPHATE-P	0.012	110	1531	1	0.32
7	9.93	SULFATE	28.785	184517	3619962	1	-0.80
	0.00		---total(s)--- 38.261		5520971		

245106



Sample Name : 245107
Dilution Factor : 1.00
Injection Number : 11
Data File Name : ...\040623_011.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\23jun04.sch

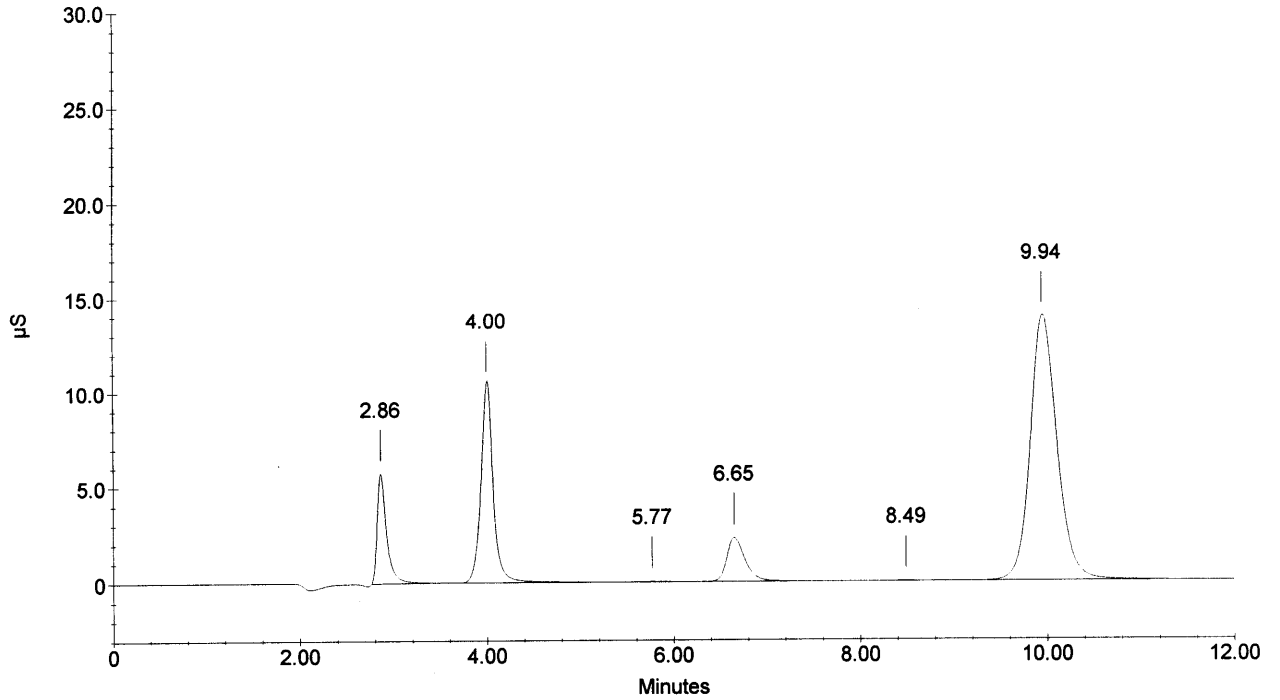
Date Time Collected : 6/23/04 1:30:46 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010051

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.86	FLUORIDE	1.687	57144	400940	1	-0.92
2	4.00	CHLORIDE	5.980	103634	958977	1	-1.32
		NITRITE-N					
3	5.77	BROMIDE	0.031	202	2003	1	-0.52
4	6.65	NITRATE-N	0.733	22670	307747	1	1.68
5	8.49	PHOSPHATE-P	0.018	125	2353	1	0.47
6	9.94	SULFATE	22.230	138743	2745016	1	-0.67
	0.00		---total(s)--- 30.678		4417036		

245107



Sample Name : CCV
Dilution Factor : 20.00
Injection Number : 12
Data File Name : c:\peaknet\data\040623\040623_012.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\23jun04.sch

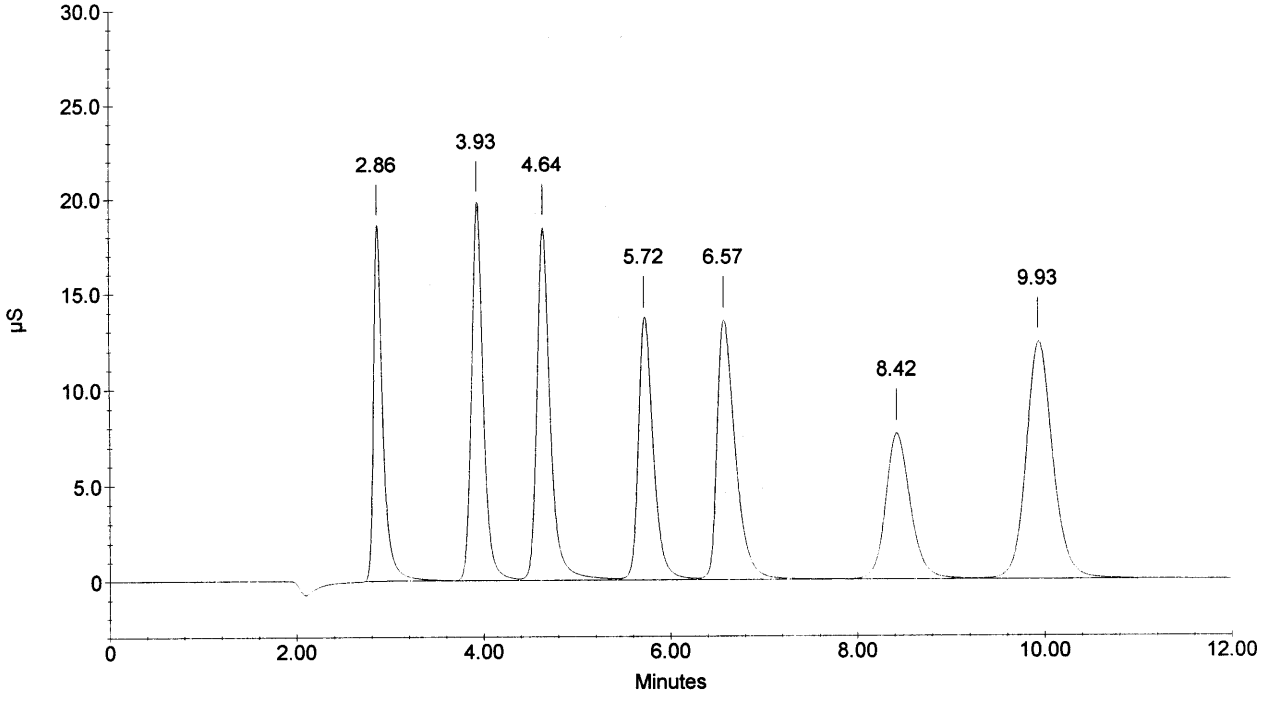
Date Time Collected : 6/23/04 1:45:28 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010052

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.86	FLUORIDE	102.699	184273	1284260	2	-0.92
2	3.93	CHLORIDE	207.722	196596	1725450	2	-2.96
3	4.64	NITRITE-N	98.498	184204	1846103	2	-1.77
4	5.72	BROMIDE	413.437	135093	1528838	2	-1.44
5	6.57	NITRATE-N	85.785	134902	1850593	2	0.46
6	8.42	PHOSPHATE-P	197.601	76121	1412141	2	-0.32
7	9.93	SULFATE	401.578	123341	2465068	2	-0.80
	0.00		---total(s)--- 1507.320		12112452		

CCV



Sample Name : CCB
Dilution Factor : 1.00
Injection Number : 13
Data File Name : c:\peaknet\data\040623\040623_013.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\23jun04.sch

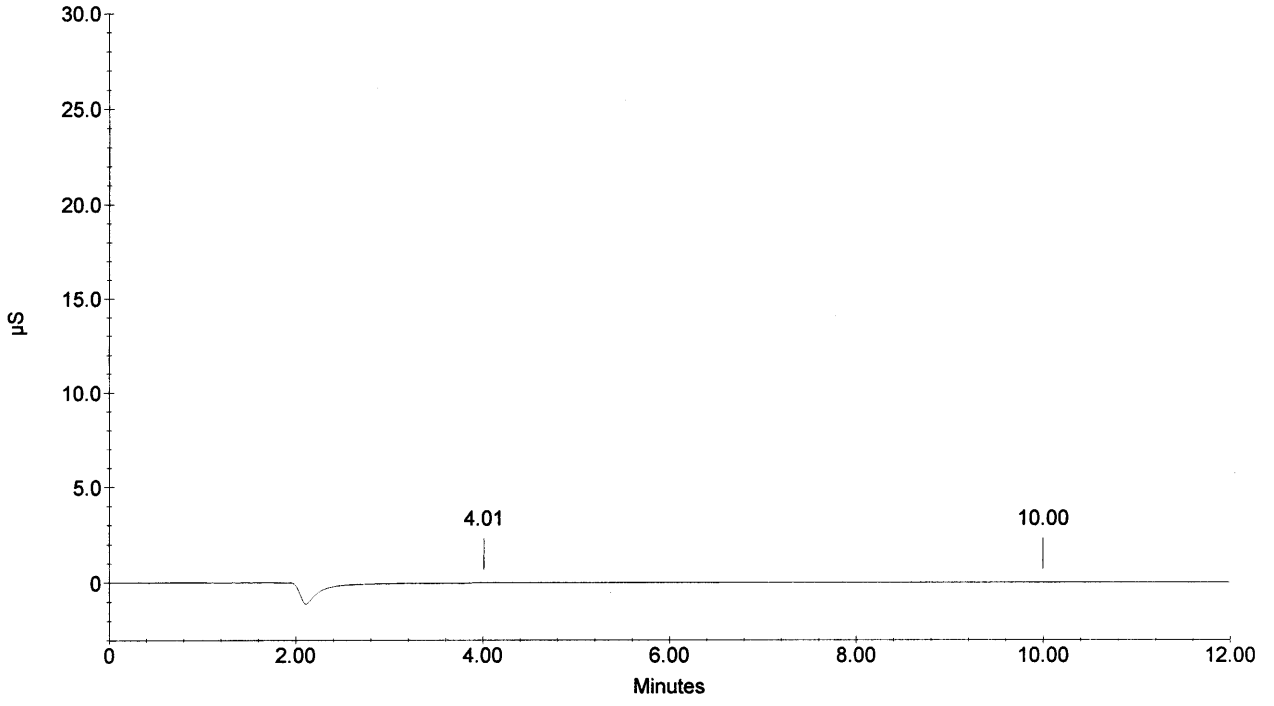
Date Time Collected : 6/23/04 2:00:09 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010053

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	4.01	CHLORIDE	0.002	46	329	1	-0.99
1	4.01	CHLORIDE NITRITE-N BROMIDE NITRATE-N PHOSPHATE-P	0.002	46	329	1	-0.99
2	10.00	SULFATE	0.015	96	1748	1	-0.13
		---total(s)---					
	0.00		0.019		2406		

CCB



Sample Name : 245101
Dilution Factor : 10.00
Injection Number : 14
Data File Name : ...\040623_014.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\23jun04.sch

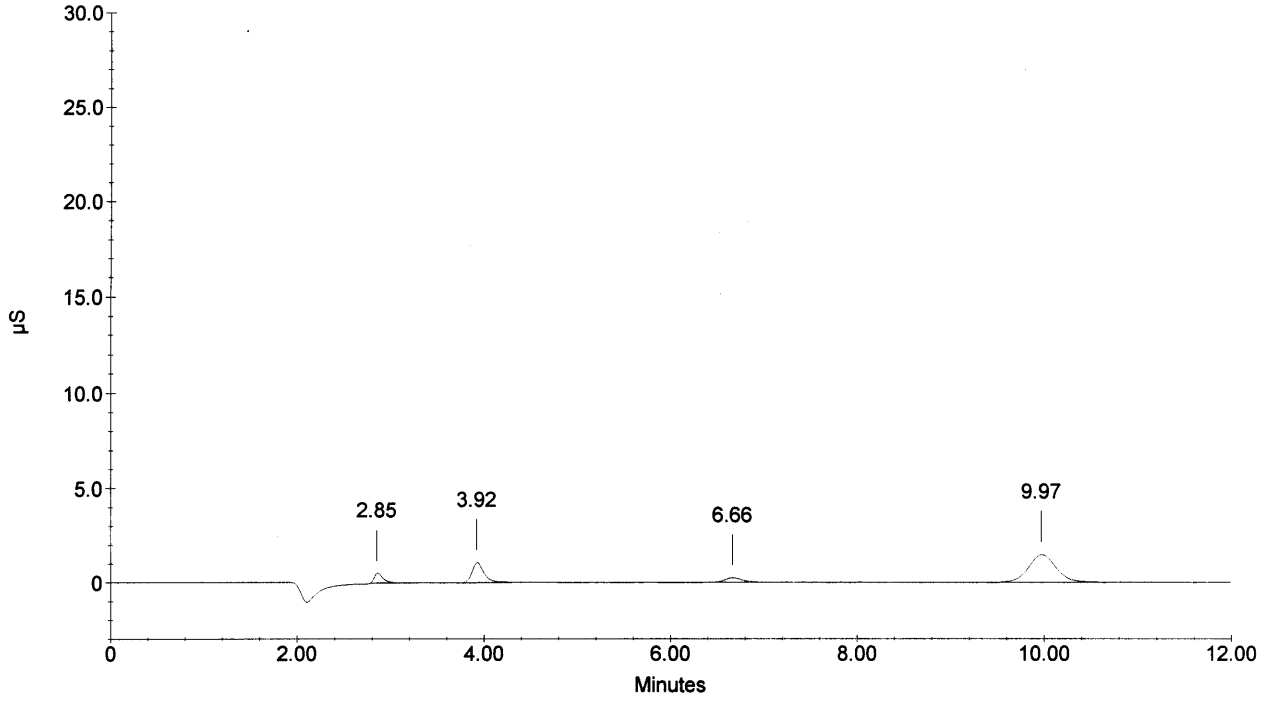
Date Time Collected : 6/23/04 2:14:51 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010054

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.85	FLUORIDE	1.500	5123	34837	1	-1.38
2	3.92	CHLORIDE NITRITE-N BROMIDE	6.390	10612	98641	1	-3.29
3	6.66	NITRATE-N PHOSPHATE-P	0.778	2403	32497	1	1.89
4	9.97	SULFATE	26.105	14817	306850	1	-0.40
	0.00		---total(s)--- 34.773		472825		

245101



Sample Name : 245101D
Dilution Factor : 10.00
Injection Number : 15
Data File Name : c:\peaknet\data\040623\040623_015.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\23jun04.sch

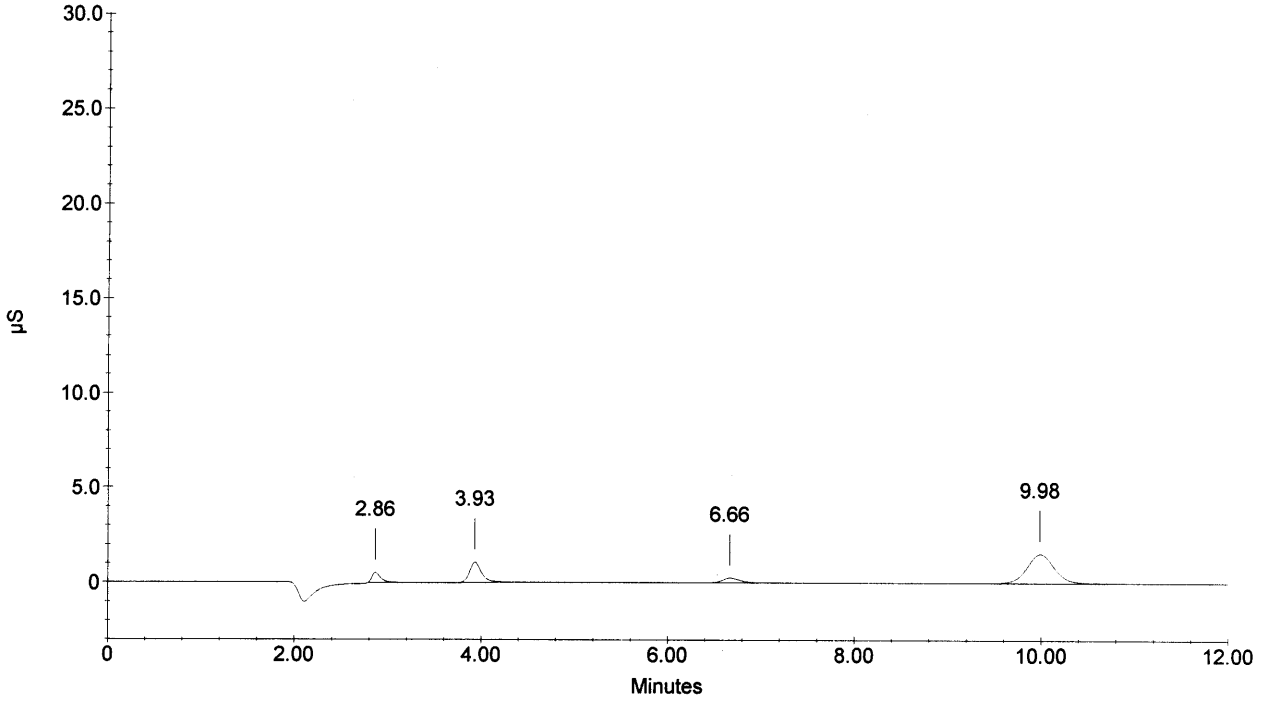
Date Time Collected : 6/23/04 2:29:32 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010055

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.86	FLUORIDE	1.454	5241	33766	1	-0.92
2	3.93	CHLORIDE NITRITE-N BROMIDE	6.301	10761	97258	1	-2.96
3	6.66	NITRATE-N PHOSPHATE-P	0.797	2515	33272	1	1.89
4	9.98	SULFATE	27.018	15431	317651	1	-0.27
	0.00		---total(s)--- 35.570		481947		

245101D



Sample Name : 245101S
Dilution Factor : 10.00
Injection Number : 16
Data File Name : c:\peaknet\data\040623\040623_016.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\23jun04.sch

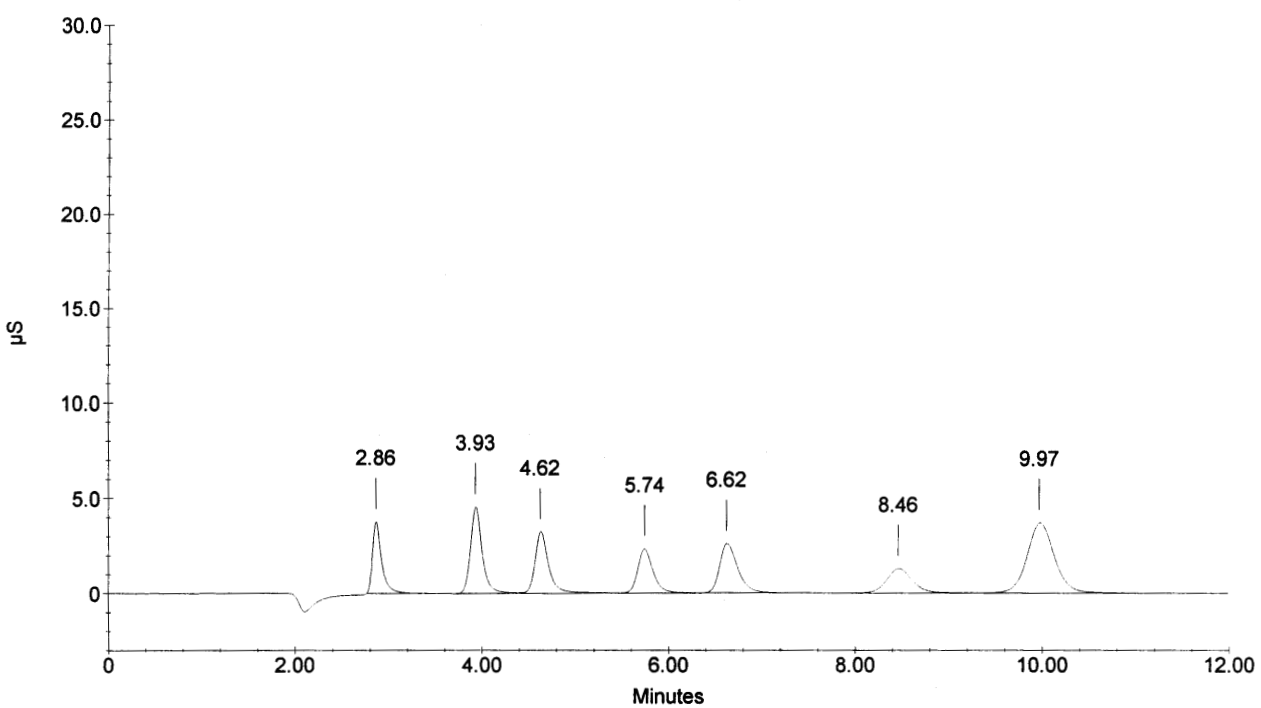
Date Time Collected : 6/23/04 2:44:13 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010056

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.86	FLUORIDE	11.034	37758	259978	1	-0.92
2	3.93	CHLORIDE	25.692	45497	401923	2	-2.96
3	4.62	NITRITE-N	8.873	32261	332591	2	-2.05
4	5.74	BROMIDE	40.305	23287	267658	2	-0.98
5	6.62	NITRATE-N	8.402	25958	352910	2	1.27
6	8.46	PHOSPHATE-P	18.684	12944	250854	2	0.16
7	9.97	SULFATE	63.603	36989	754266	2	-0.40
	0.00		---total(s)--- 176.593		2620180		

245101S



Sample Name : 245102
Dilution Factor : 10.00
Injection Number : 17
Data File Name : c:\peaknet\data\040623\040623_017.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\23jun04.sch

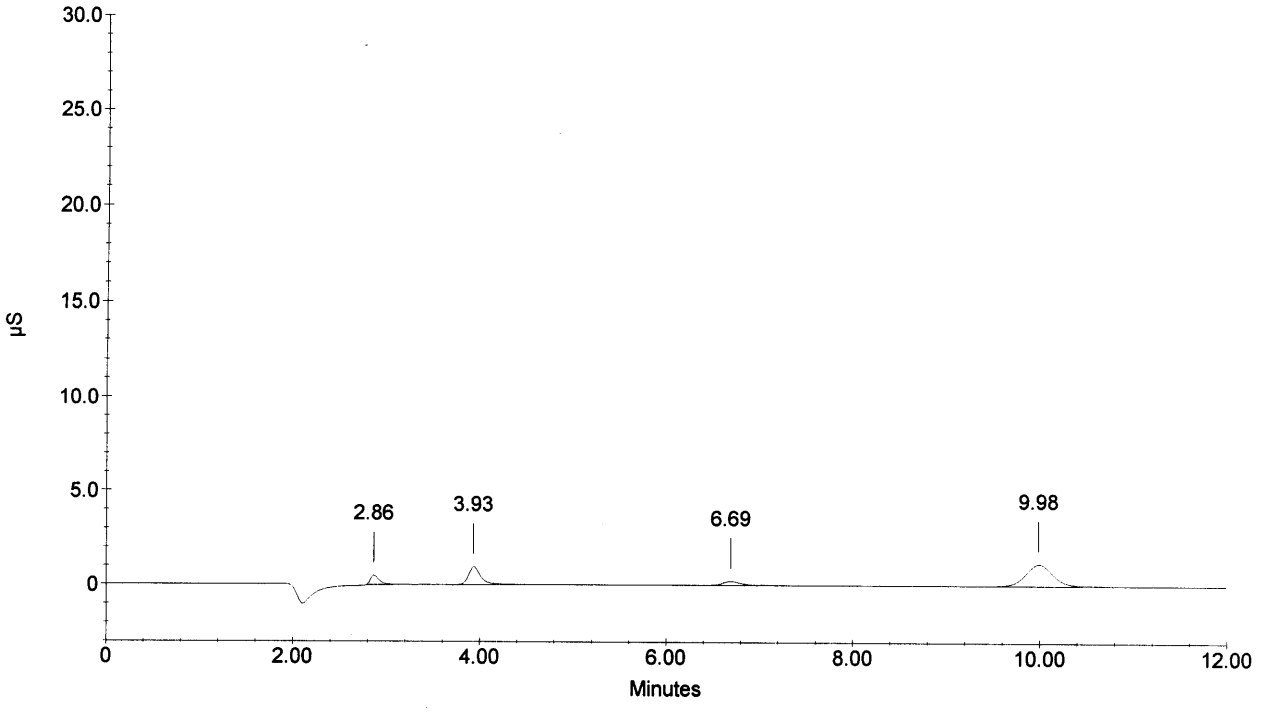
Date Time Collected : 6/23/04 2:58:55 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010057

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.86	FLUORIDE	1.373	4926	31875	1	-0.92
2	3.93	CHLORIDE NITRITE-N BROMIDE	5.745	9498	88646	1	-2.96
3	6.69	NITRATE-N PHOSPHATE-P	0.657	2059	27420	1	2.29
4	9.98	SULFATE	20.076	11600	235644	1	-0.27
	0.00		---total(s)--- 27.850		383585		

245102



Sample Name : 245103
Dilution Factor : 10.00
Injection Number : 18
Data File Name : c:\peaknet\data\040623\040623_018.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\23jun04.sch

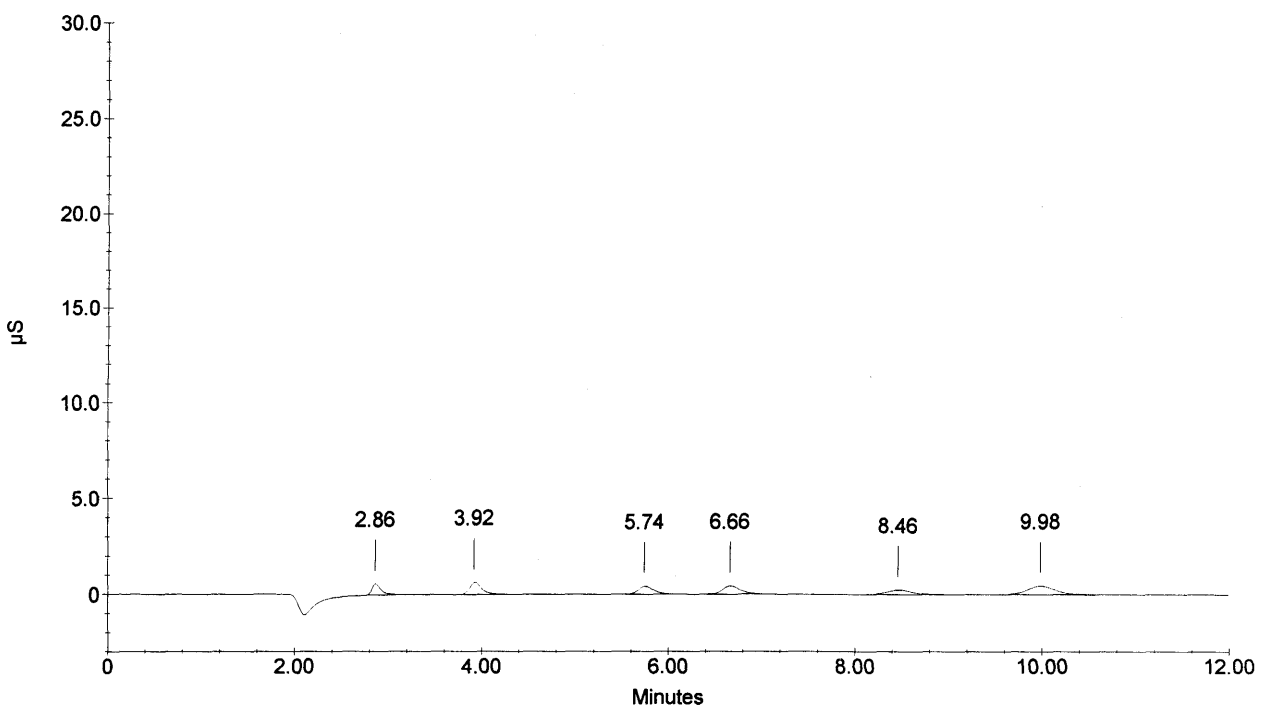
Date Time Collected : 6/23/04 3:13:36 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010058

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.86	FLUORIDE	1.671	5815	38807	1	-0.92
2	3.92	CHLORIDE	3.893	6410	59996	1	-3.29
		NITRITE-N					
3	5.74	BROMIDE	7.292	4171	47577	1	-0.98
4	6.66	NITRATE-N	1.400	4335	58515	1	1.89
5	8.46	PHOSPHATE-P	3.586	2413	47639	1	0.16
6	9.98	SULFATE	7.968	4543	93261	1	-0.27
	0.00		---total(s)--- 25.810		345796		

245103



Sample Name : 245104
Dilution Factor : 10.00
Injection Number : 19
Data File Name : c:\peaknet\data\040623\040623_019.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\23jun04.sch

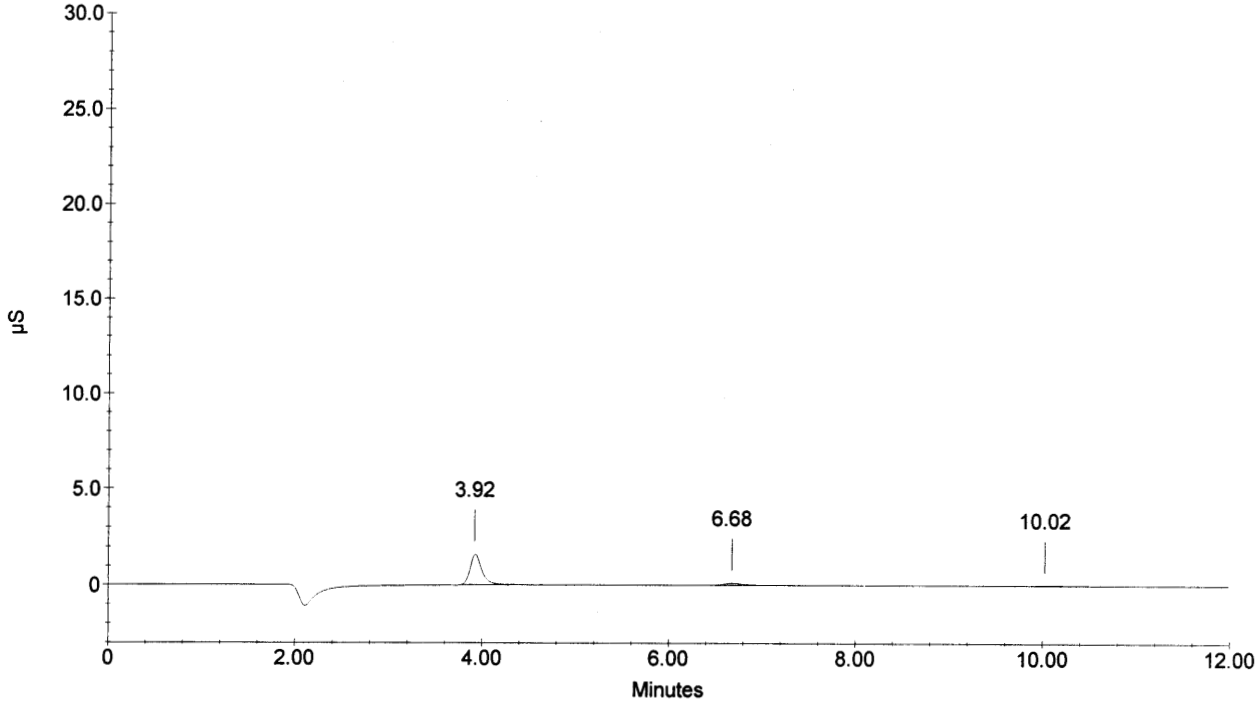
Date Time Collected : 6/23/04 3:28:18 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010059

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	3.92	CHLORIDE	8.902	15671	137656	1	-3.29
1	3.92	CHLORIDE NITRITE-N BROMIDE	8.902	15671	137656	1	-3.29
2	6.68	NITRATE-N PHOSPHATE-P	0.335	1060	14006	1	2.09
3	10.02	SULFATE	0.133	90	1549	1	0.13
	0.00		---total(s)--- 18.272		290867		

245104



Sample Name : 245105
Dilution Factor : 10.00
Injection Number : 20
Data File Name : c:\peaknet\data\040623\040623_020.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\23jun04.sch

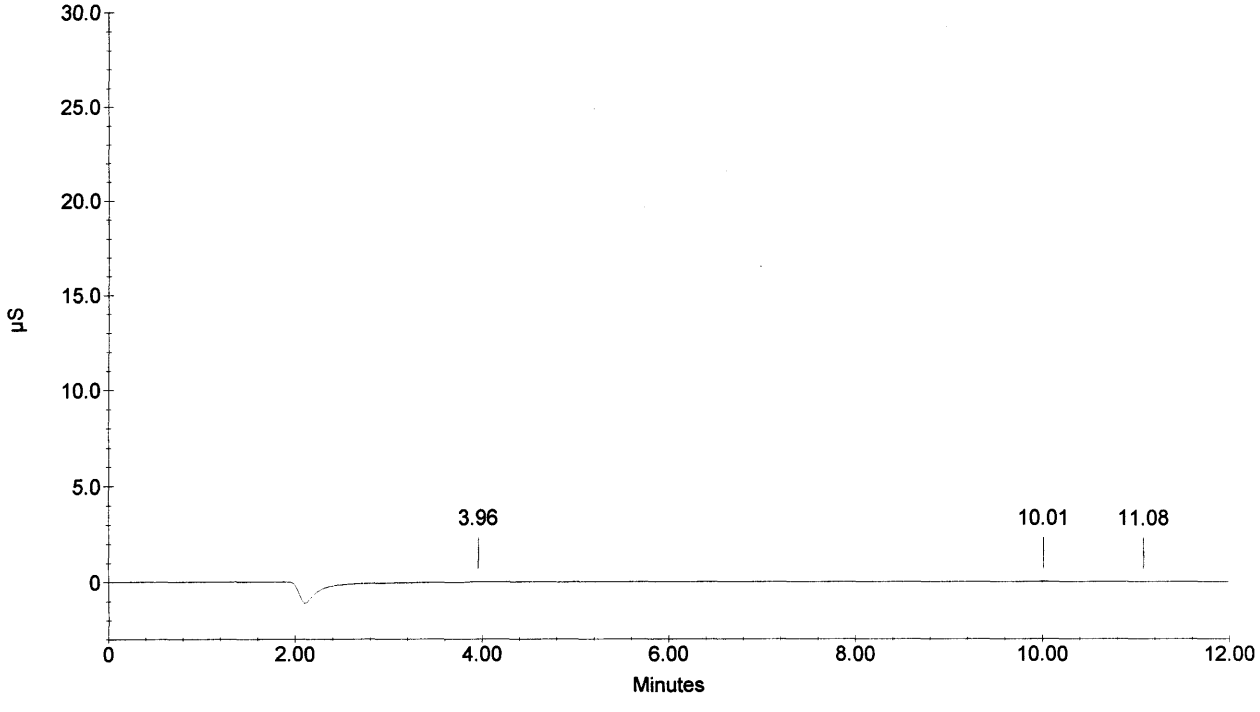
Date Time Collected : 6/23/04 3:43:02 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010060

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	3.96	CHLORIDE	0.046	107	712	1	-2.30
1	3.96	CHLORIDE NITRITE-N BROMIDE NITRATE-N PHOSPHATE-P	0.046	107	712	1	-2.30
2	10.01	SULFATE	0.100	95	1172	1	0.00
	0.00	---total(s)---	0.193		2596		

245105



Sample Name : 245106
Dilution Factor : 10.00
Injection Number : 21
Data File Name : ...\040623_021.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\23jun04.sch

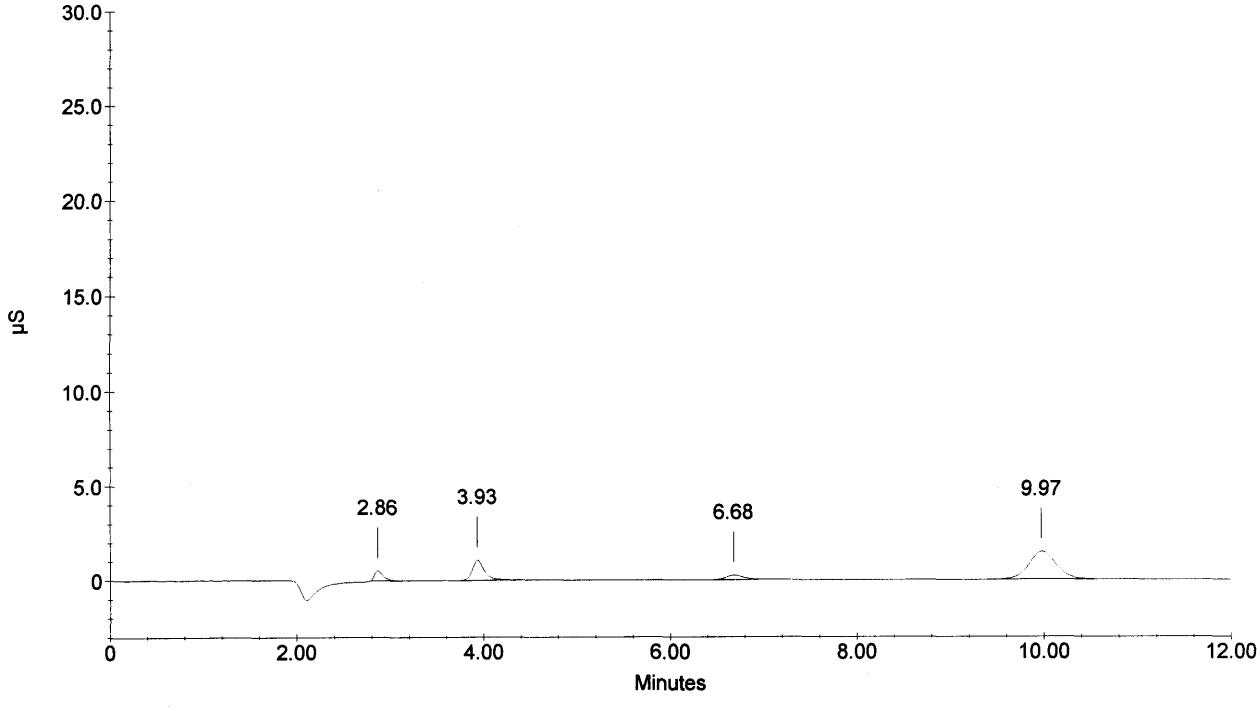
Date Time Collected : 6/23/04 3:57:43 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010061

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.86	FLUORIDE	1.486	5275	34509	1	-0.92
2	3.93	CHLORIDE NITRITE-N BROMIDE	6.336	10682	97803	1	-2.96
3	6.68	NITRATE-N PHOSPHATE-P	0.762	2378	31836	1	2.09
4	9.97	SULFATE	25.598	14697	300854	1	-0.40
	0.00		---total(s)--- 34.182		465003		

245106



Sample Name : 245107
Dilution Factor : 10.00
Injection Number : 22
Data File Name : c:\peaknet\data\040623\040623_022.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\23jun04.sch

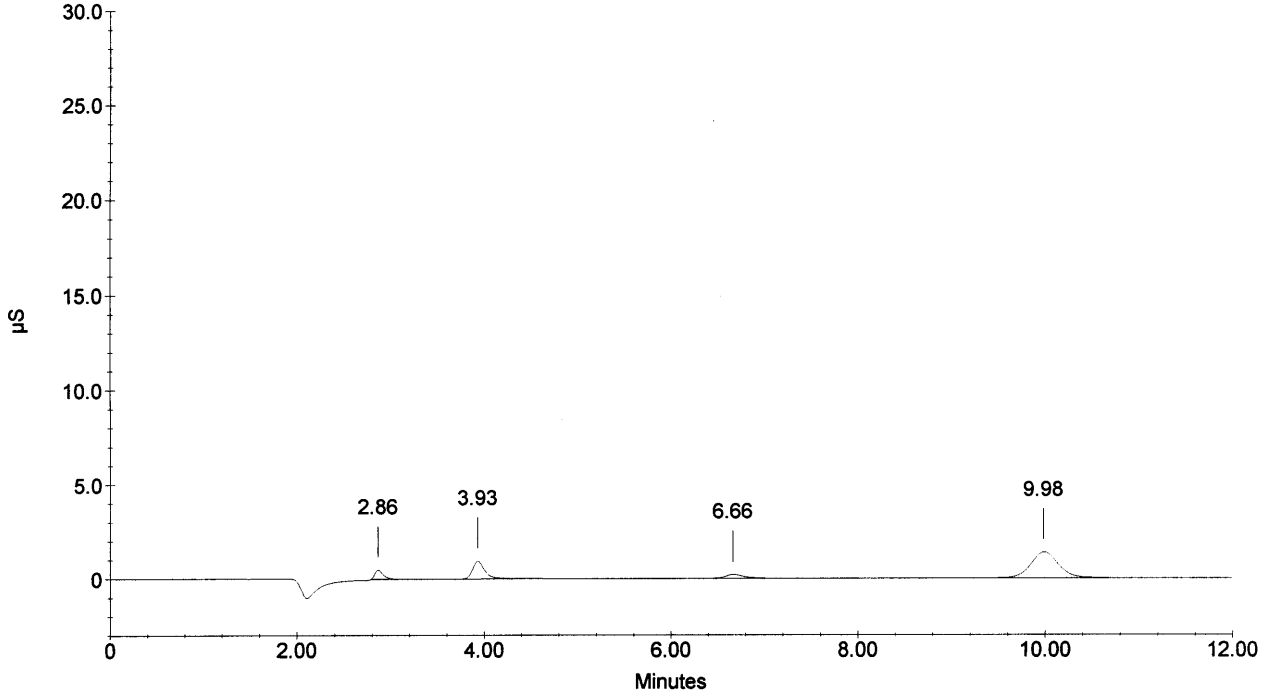
Date Time Collected : 6/23/04 4:12:36 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010062

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.86	FLUORIDE	1.364	4875	31673	1	-0.92
2	3.93	CHLORIDE NITRITE-N BROMIDE	5.617	9497	86667	1	-2.96
3	6.66	NITRATE-N PHOSPHATE-P	0.664	2042	27731	1	1.89
4	9.98	SULFATE	23.726	13633	278732	1	-0.27
	0.00	---total(s)---	31.372		424803		

245107



Sample Name : CCV
Dilution Factor : 20.00
Injection Number : 23
Data File Name : c:\peaknet\data\040623\040623_023.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\23jun04.sch

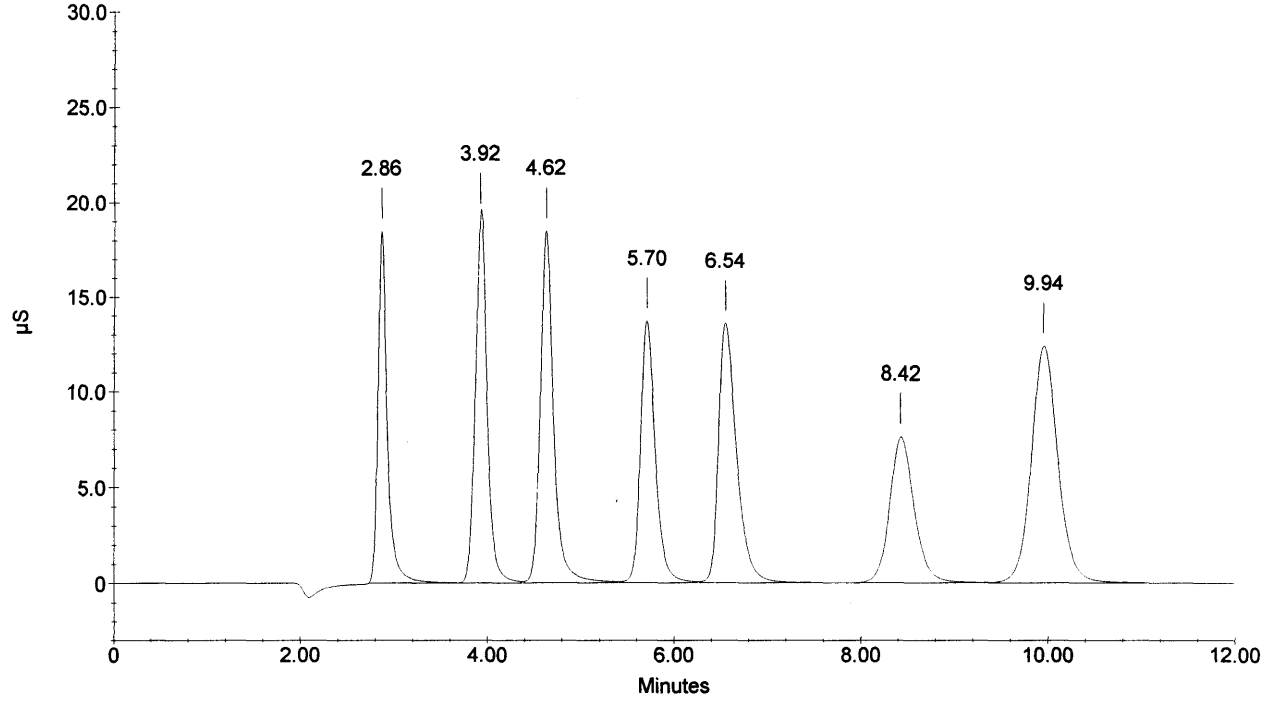
Date Time Collected : 6/23/04 4:27:19 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010063

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.86	FLUORIDE	101.420	184248	1267129	2	-0.92
2	3.92	CHLORIDE	205.650	191942	1706746	2	-3.29
3	4.62	NITRITE-N	97.671	184376	1830598	2	-2.05
4	5.70	BROMIDE	409.123	136649	1510372	2	-1.67
5	6.54	NITRATE-N	84.619	135387	1824589	2	0.05
6	8.42	PHOSPHATE-P	195.984	75844	1399610	2	-0.32
7	9.94	SULFATE	400.359	123461	2457185	2	-0.67
	0.00		---total(s)--- 1494.826		11996229		

CCV



Sample Name : CCB
Dilution Factor : 1.00
Injection Number : 24
Data File Name : c:\peaknet\data\040623\040623_024.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\23jun04.sch

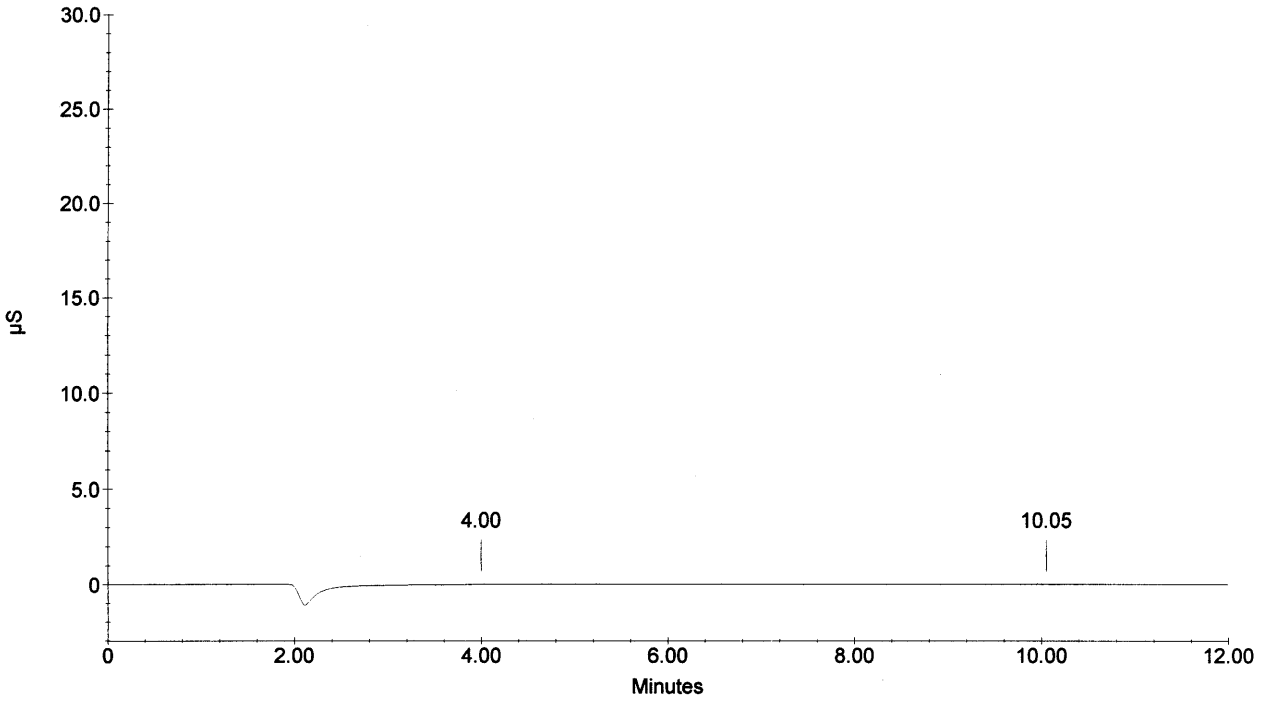
Date Time Collected : 6/23/04 4:42:09 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010064

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	4.00	CHLORIDE	0.005	88	707	1	-1.32
1	4.00	CHLORIDE NITRITE-N BROMIDE NITRATE-N PHOSPHATE-P	0.005	88	707	1	-1.32
2	10.05	SULFATE	0.021	138	2423	1	0.40
		---total(s)---					
	0.00		0.030		3837		

CCB



Work continued from Page

010065 SwRI®

177-01-1C4 Anions - 20ppm Mix + 60ppm SO_4 (STD 1)

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

* 1000 mg/L SO_4.

177-02-1C4 15ppm / 45ppm SO_4 (STD 2)
3ml 177-01-1C4 + 1ml DI H_2O.

177-03-1C4 10ppm Anions + 30ppm SO_4 (STD 3)
2ml 177-01-1C4 + 2ml DI H_2O.

177-04-1C4 5ppm Anions + 15ppm SO_4 (STD 4)
2ml 177-03-1C4 + 2ml DI H_2O.

177-05-1C4 1ppm Anions + 3ppm SO_4 (STD 5)
1ml 177-04-1C4 + 4ml DI H_2O

177-06-1C4 0.5ppm Anions + 1.5ppm SO_4 (STD 6)
2ml 177-05-1C4 + 2ml DI H_2O.

177-07-1C4 0.1ppm Anions RSS 6/22/04 0.3ppm SO_4 (STD 7)
1.8ml 177-06-1C4 + 1.2ml DI H_2O.
RSS 6/22/04

177-08-1C4 0ppm (STD 8)
DI H_2O.

177-09-1C4 0ppm - DI H_2O (STD 9)

Work continued to Page

SIGNATURE [signature] DATE 6/22/04

Eppendorf 5000L 1000J 200J

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

TITLE Nitrite-N

Work continued from Page

010066

SwRI®

178-01-IC4 Nitrite N, 100 mg/L

0.0493g Sodium nitrite (Fisher, Lot # 944033 Inorg # 0277) diluted to 100 mL DI H_2O.

Balance #12.

Work continued to Page

SIGNATURE [signature] DATE 6/22/04

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

Book/Page: 11 201

Southwest Research Institute

Dionex DX500 Ion Chromatography Daily Log

010067

Analyst: RSpier

Date: 6/22/04

Conductivity: 17.9

Client	Project #	TO #	Analytical Method
Calibration Curve EPA 300 SW846 9056	—	—	EPA 300 9056

Loop: 40 ul

Method: anions 040622

Column: AS14 # 015-02-087

Calibration: 6/22/04

Comments:

ICV/CCV/MS:

1st Source: SPEX (nom #4518)

2nd Source: Nitrite N

Lot #: 25-145AS

Lot #: 178-01-104

CCV Conc: 1:20

CCV Conc: 1:20

MS Conc: 1:100

MS Conc: 1:100

✓ ELUENT SOLUTION PREP:

FV = 2.0L DI H20

1.0 mM Sodium Bicarbonate & 3.5 mM Sodium Carbonate

Weight: 0.168g $NaHCO_3$

Weight: 0.7419g Na_2CO_3

Source: Aldrich

Source: Aja Aesar

Lot: 15308 EI

Lot: L06M34

Balance #12

✓ Other Eluent:

50 mA-Autoregen (ASRS)

Other Regen:

Eppendorfs: 5000 ✓

1000 J

200 J

✓ 7/2/04

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

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

010068

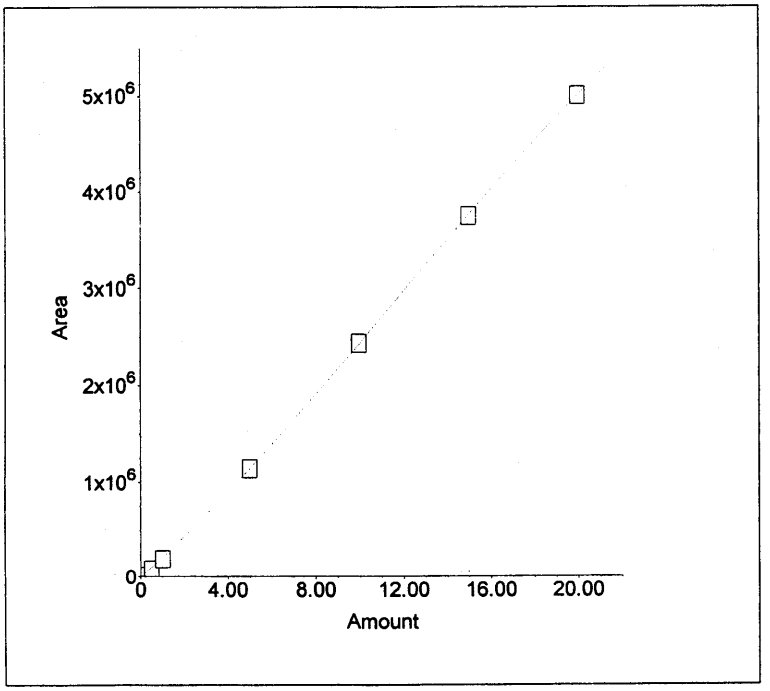
Default Method Path: C:\PEAKNET\METHOD
Default Data Path: C:\PEAKNET\DATA\040622
Comment:
EPA300 & SW 846 9056

ICV = Spex 25-145AS (Inorg # 4518)
NO_2N 178-01-IC4

RSpres
6/30/04

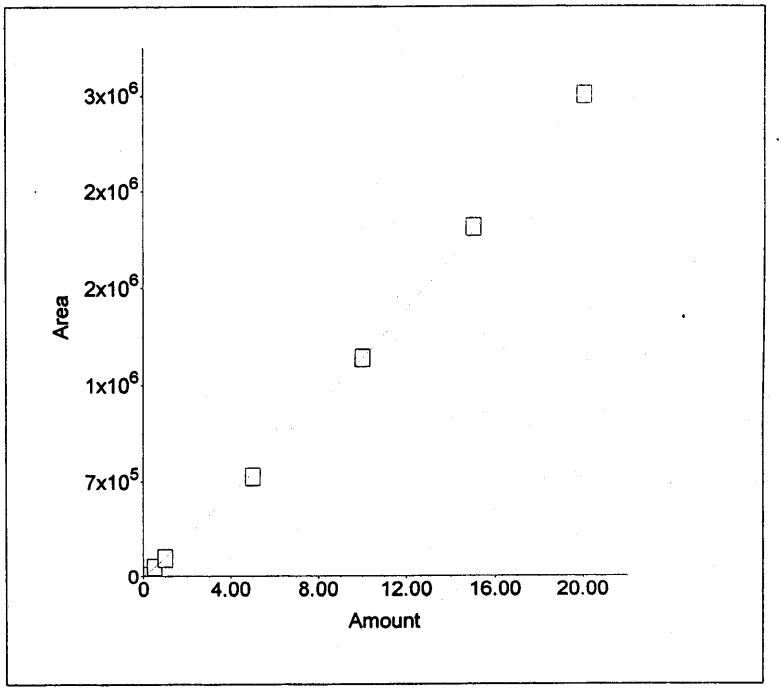
SwRI 54 QA 23Jun04

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

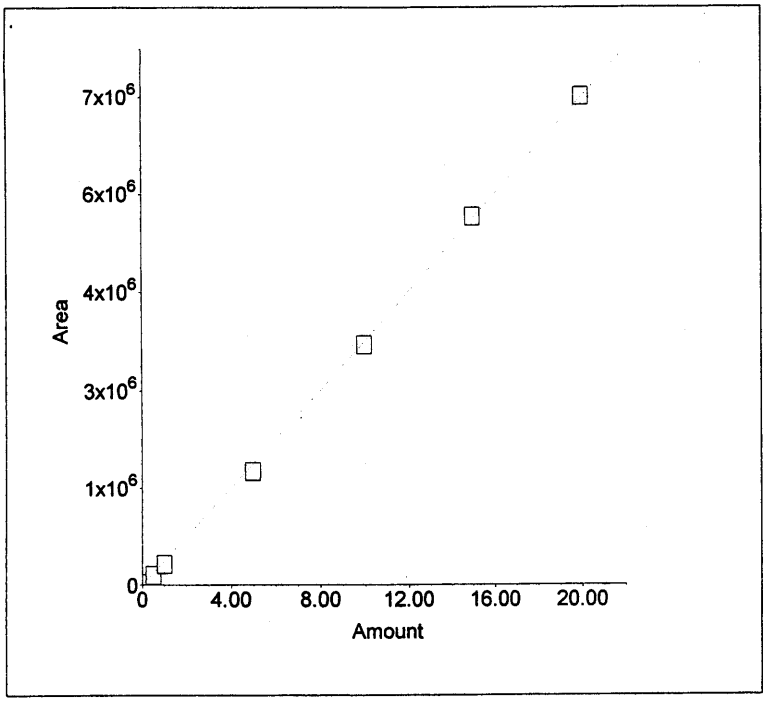


2. Component:CHLORIDE
Standard:External Fit Type:Quadratic
Origin:Force Calibration:Area
r^2=0.999821
Amt=-2.817856e-013*Resp^2+
6.505570e-006*Resp+0

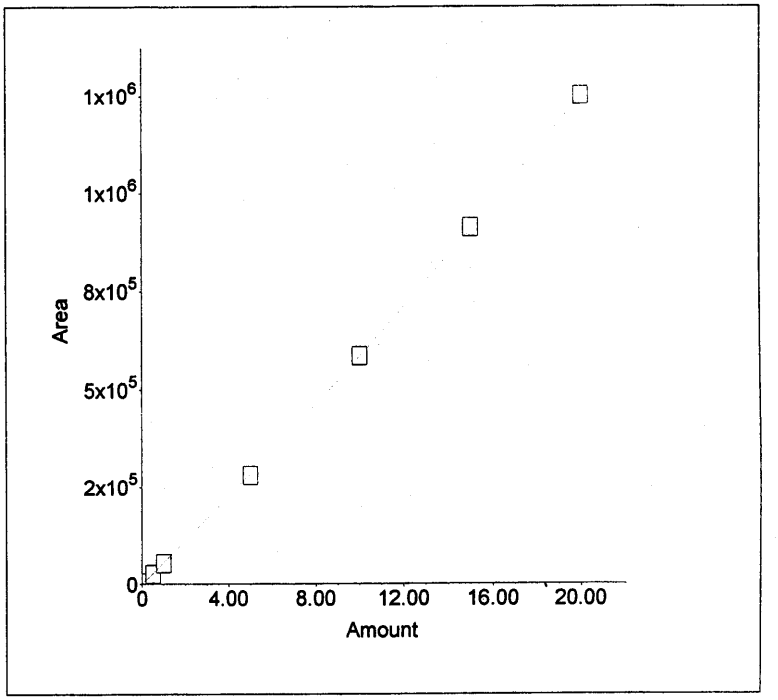
010069



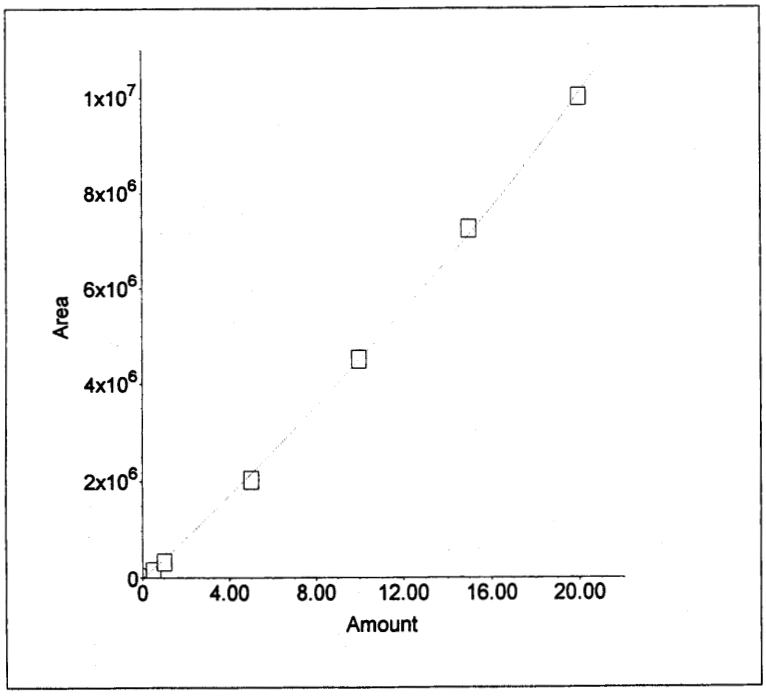
3. Component:NITRITE-N
Standard:External Fit Type:Linear
Origin:Force Calibration:Area
r^2=0.999621
Amt=2.668e-006*Resp+0



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

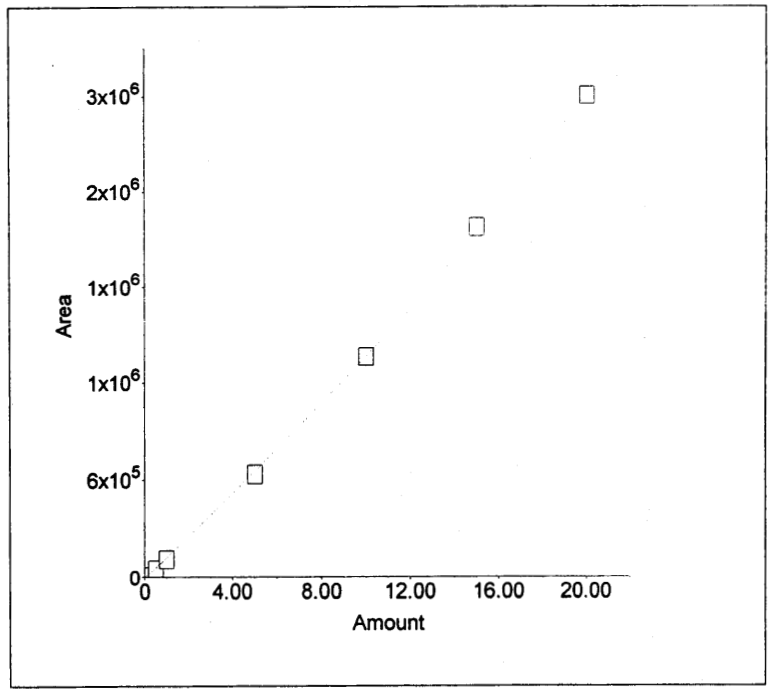


5. Component:NITRATE-N
Standard:External Fit Type:Quadratic
Origin:Force Calibration:Area
r^2=0.999492
Amt=-4.209966e-014*Resp^2+
2.395673e-006*Resp+0

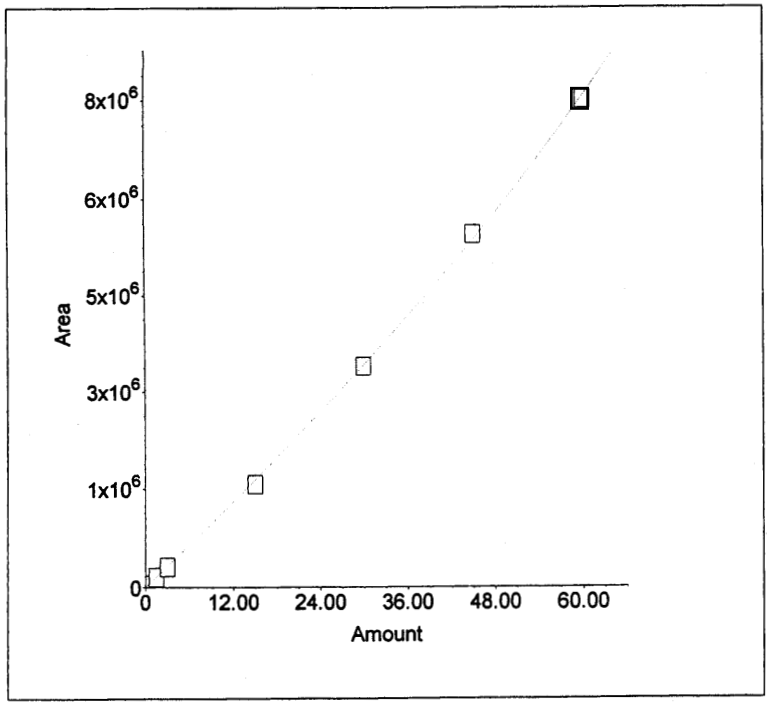


6. Component:PHOSPHATE-P
Standard:External Fit Type:Quadratic
Origin:Force Calibration:Area
r^2=0.999784
Amt=-3.890673e-013*Resp^2+
7.545921e-006*Resp+0

010070



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



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

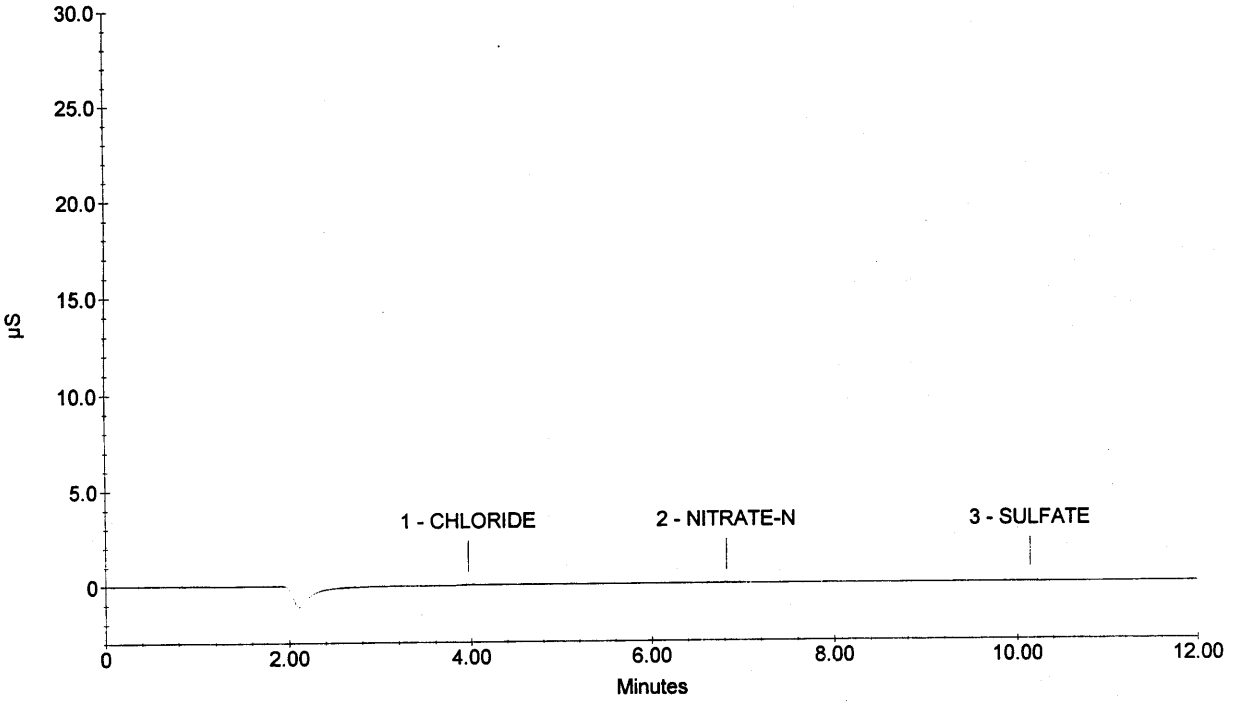
Date Time Collected : 6/22/04 11:40:54 AM
Date Time Updated : 6/22/04 3:48:55 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010071

Peak Information : All Components

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

STD 8 177-08-IC4



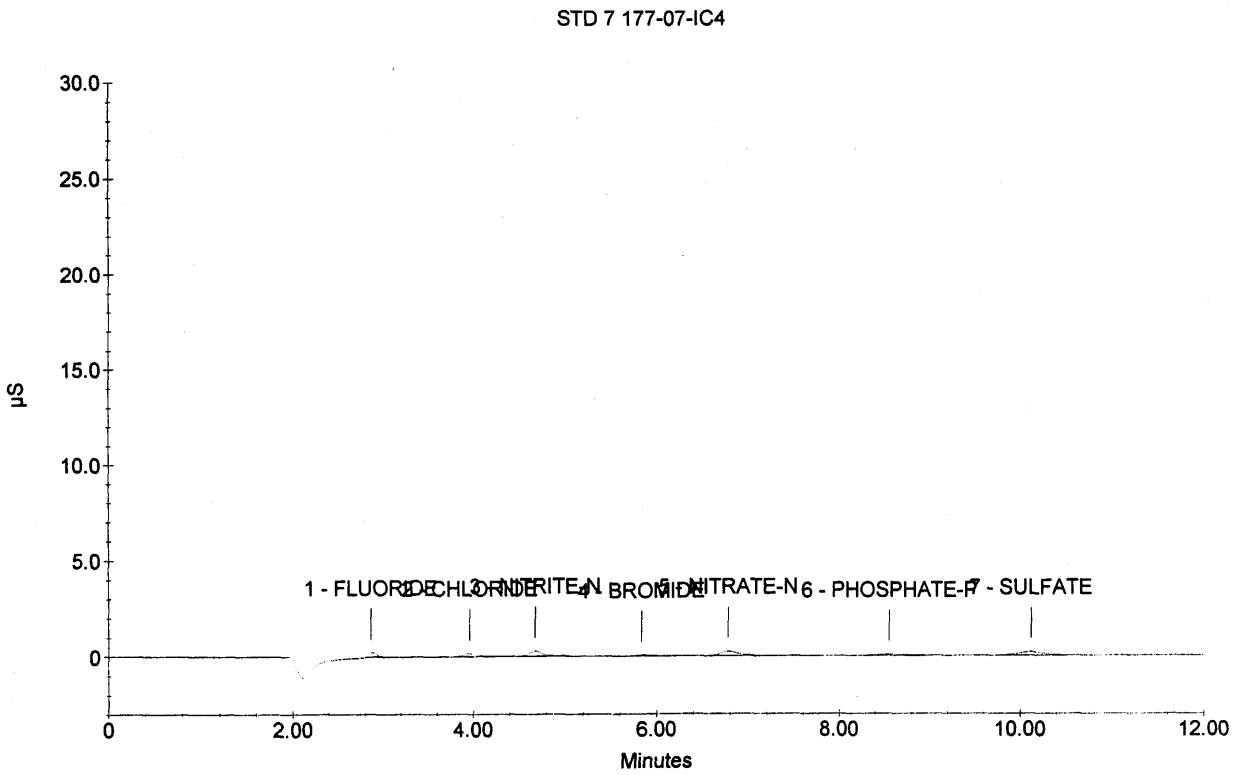
Sample Name : STD 7 177-07-IC4
Dilution Factor : 1.00
Injection Number : 2
Data File Name : c:\peaknet\data\040622\040622_002.DXD
Method File Name : ...\ANIONS040622.met
Schedule File Name : c:\peaknet\schedule\040622.sch

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

010072

Peak Information : All Components

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



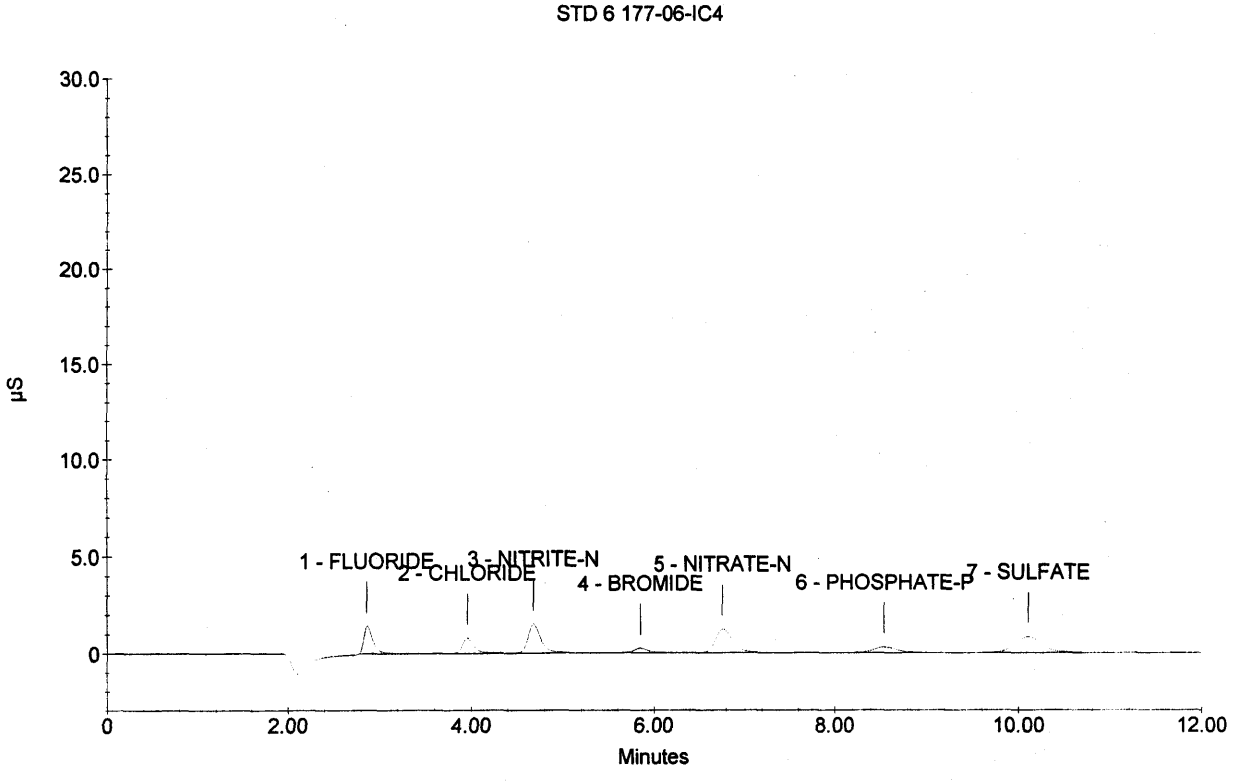
Sample Name : STD 6 177-06-IC4
Dilution Factor : 1.00
Injection Number : 3
Data File Name : c:\peaknet\data\040622\040622_003.DXD
Method File Name : ...\ANIONS040622.met
Schedule File Name : c:\peaknet\schedule\040622.sch

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

010073

Peak Information : All Components

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



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

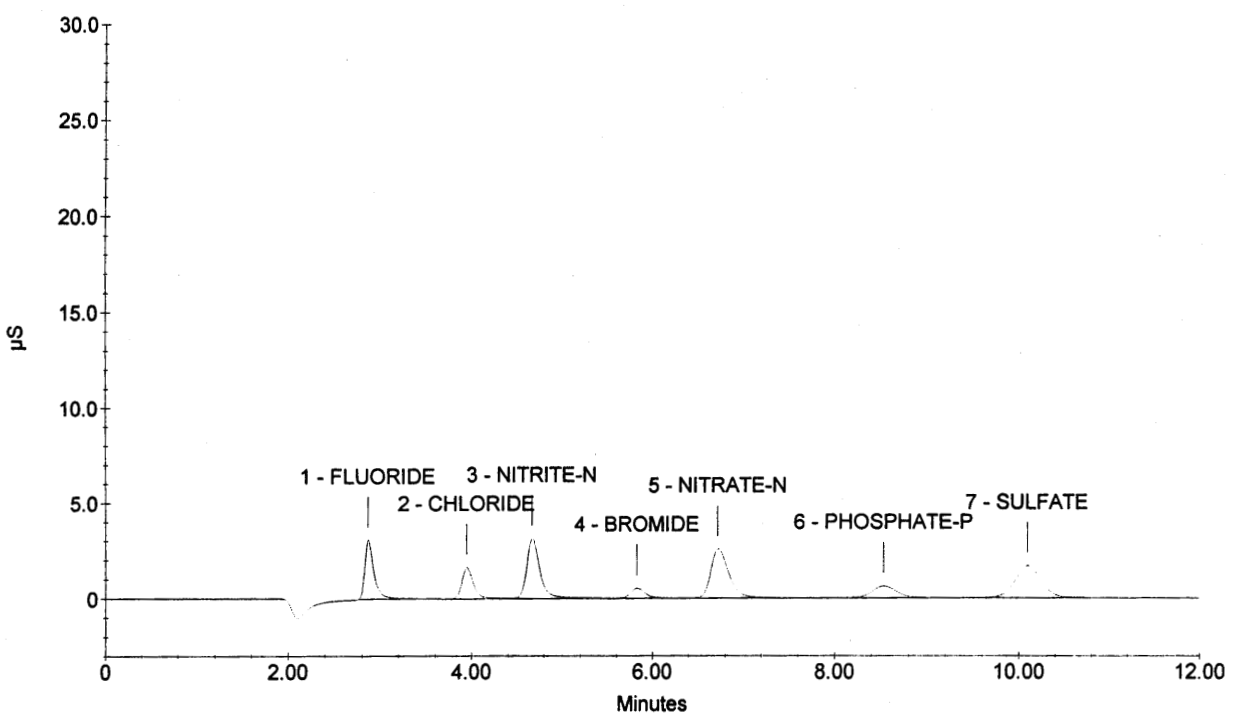
Date Time Collected : 6/22/04 12:24:55 PM
Date Time Updated : 6/22/04 3:49:08 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010074

Peak Information : All Components

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

STD 5 177-05-IC4



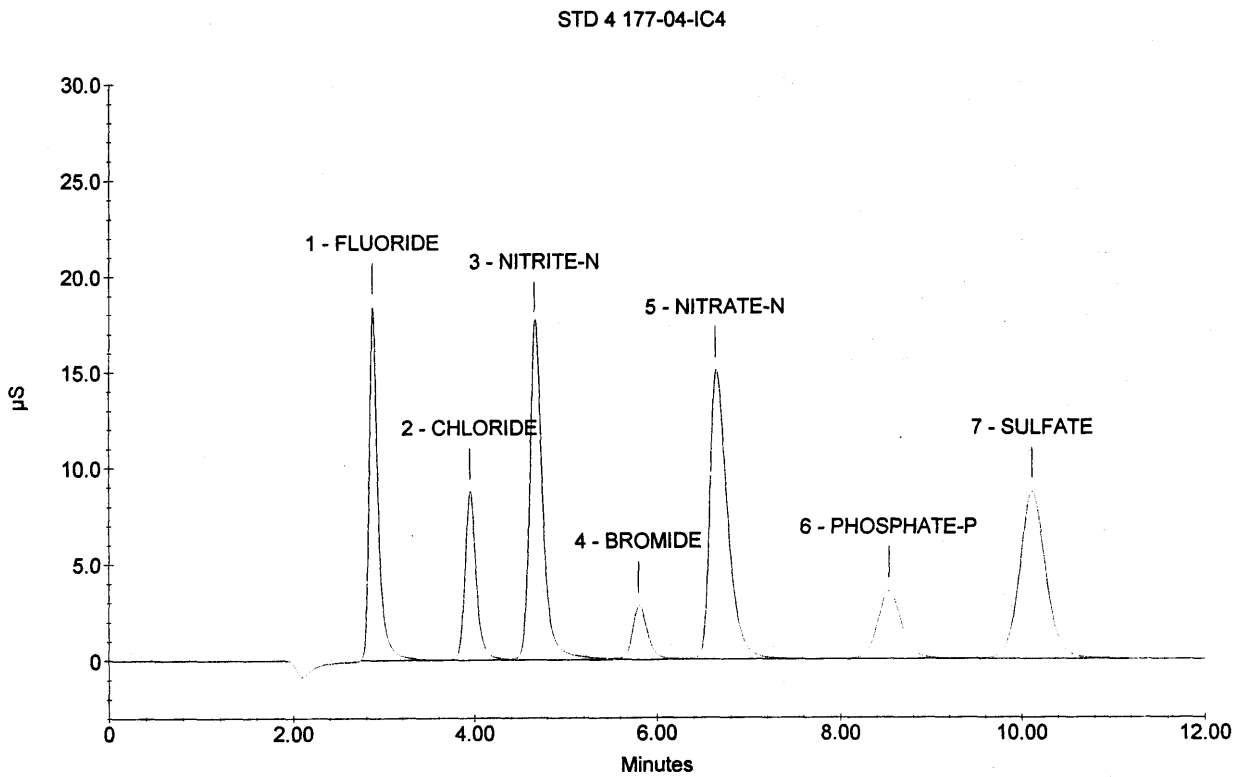
Sample Name : STD 4 177-04-IC4
Dilution Factor : 1.00
Injection Number : 5
Data File Name : c:\peaknet\data\040622\040622_005.DXD
Method File Name : ...\ANIONS040622.met
Schedule File Name : c:\peaknet\schedule\040622.sch

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

010075

Peak Information : All Components

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



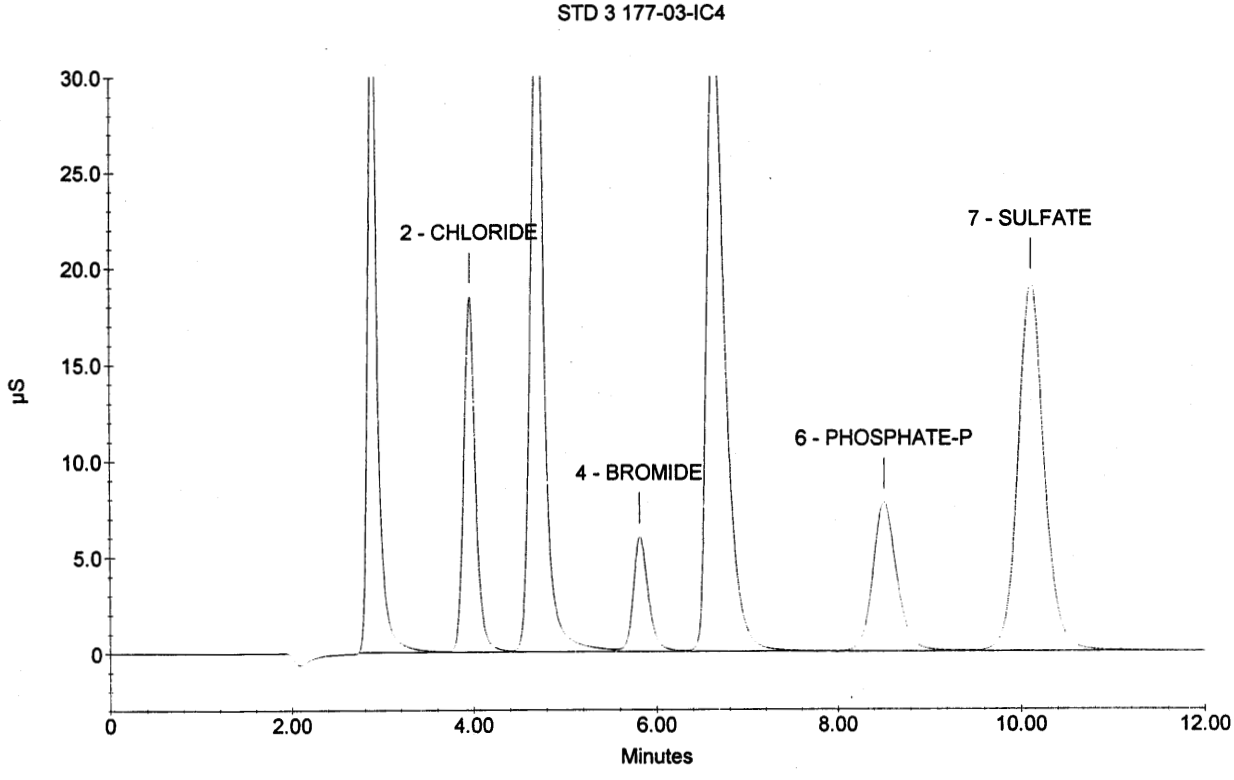
Sample Name : STD 3 177-03-IC4
Dilution Factor : 1.00
Injection Number : 6
Data File Name : c:\peaknet\data\040622\040622_006.DXD
Method File Name : ...\ANIONS040622.met
Schedule File Name : c:\peaknet\schedule\040622.sch

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

010076

Peak Information : All Components

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



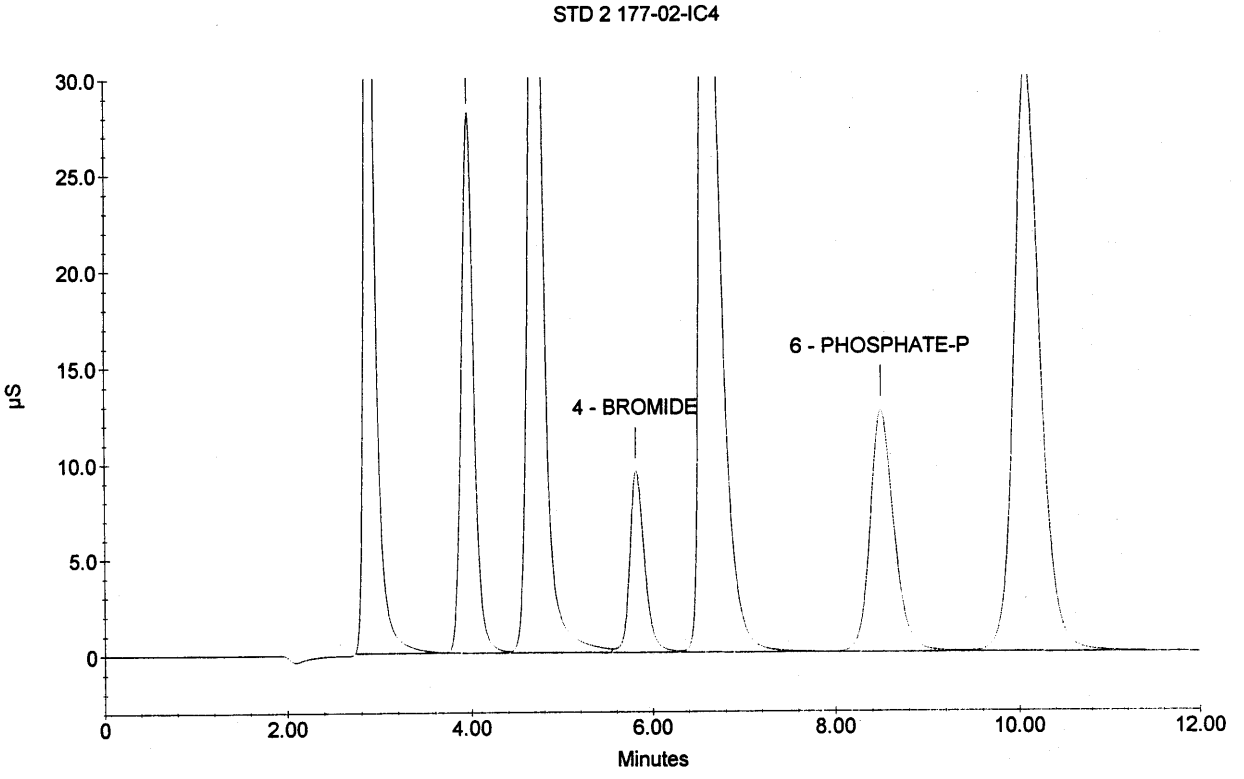
Sample Name : STD 2 177-02-IC4
Dilution Factor : 1.00
Injection Number : 7
Data File Name : c:\peaknet\data\040622\040622_007.DXD
Method File Name : ...\ANIONS040622.met
Schedule File Name : c:\peaknet\schedule\040622.sch

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

010077

Peak Information : All Components

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



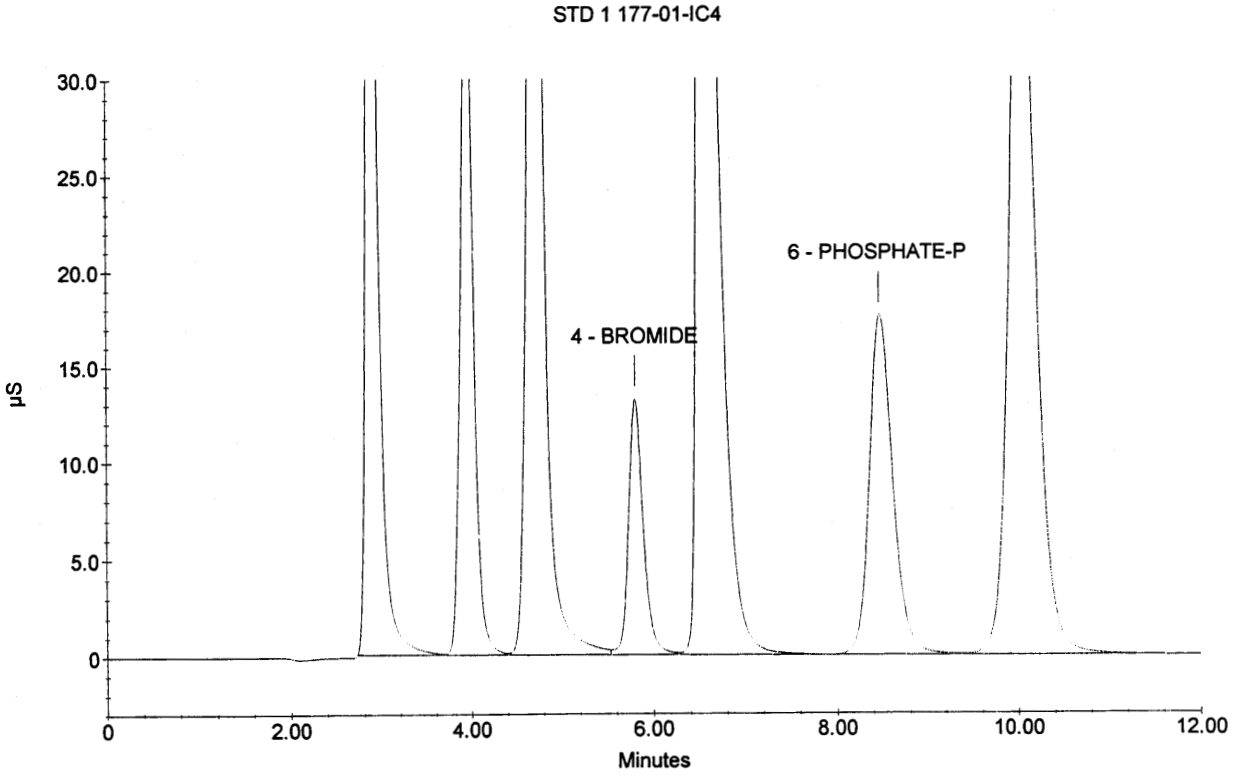
Sample Name : STD 1 177-01-IC4
Dilution Factor : 1.00
Injection Number : 8
Data File Name : c:\peaknet\data\040622\040622_008.DXD
Method File Name : ...\ANIONS040622.met
Schedule File Name : c:\peaknet\schedule\040622.sch

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

C10078

Peak Information : All Components

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



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

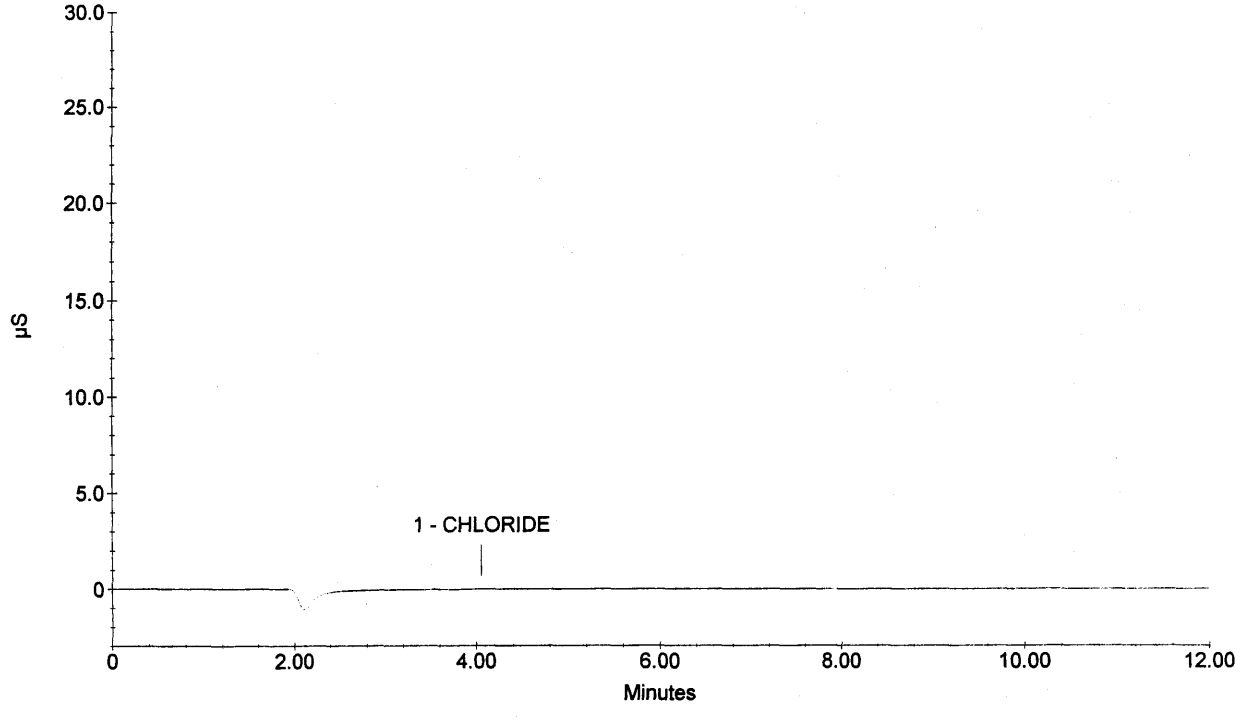
Date Time Collected : 6/22/04 1:46:11 PM
Date Time Updated : 6/22/04 3:49:26 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010079

Peak Information : All Components

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

STD 9 177-09-IC4



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

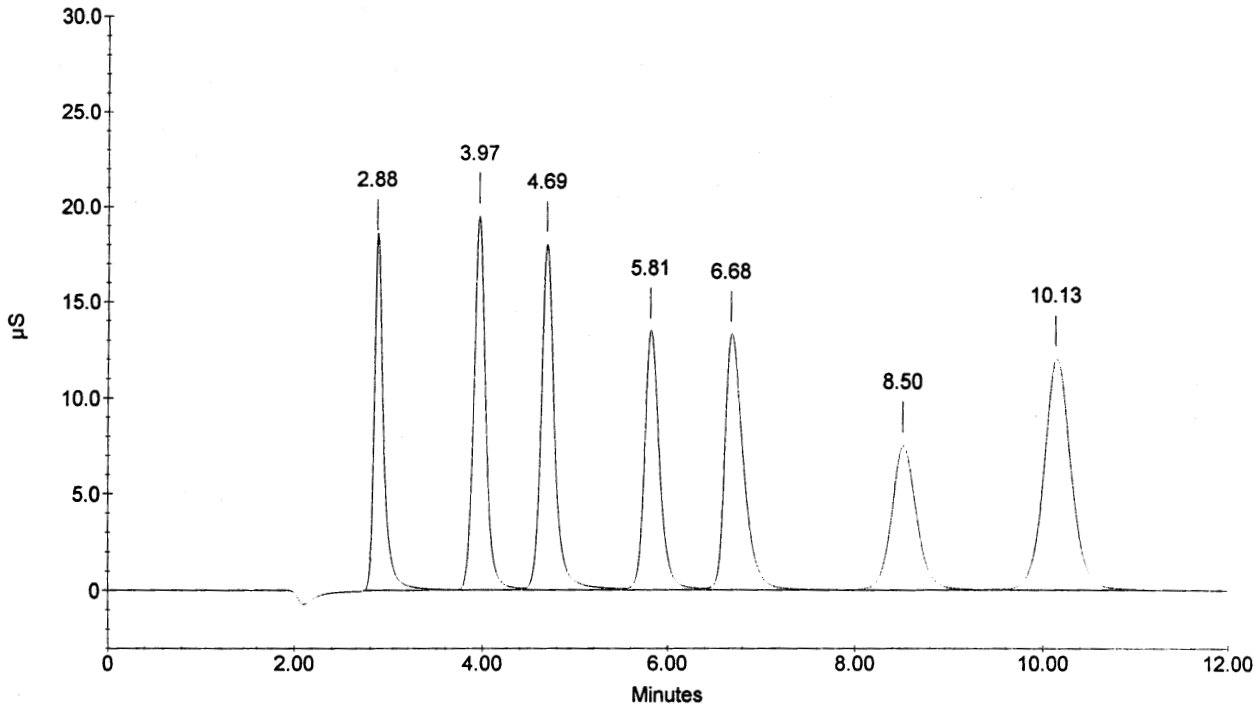
Date Time Collected : 6/22/04 3:20:43 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010080

Peak Information : All Components

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

ICV



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

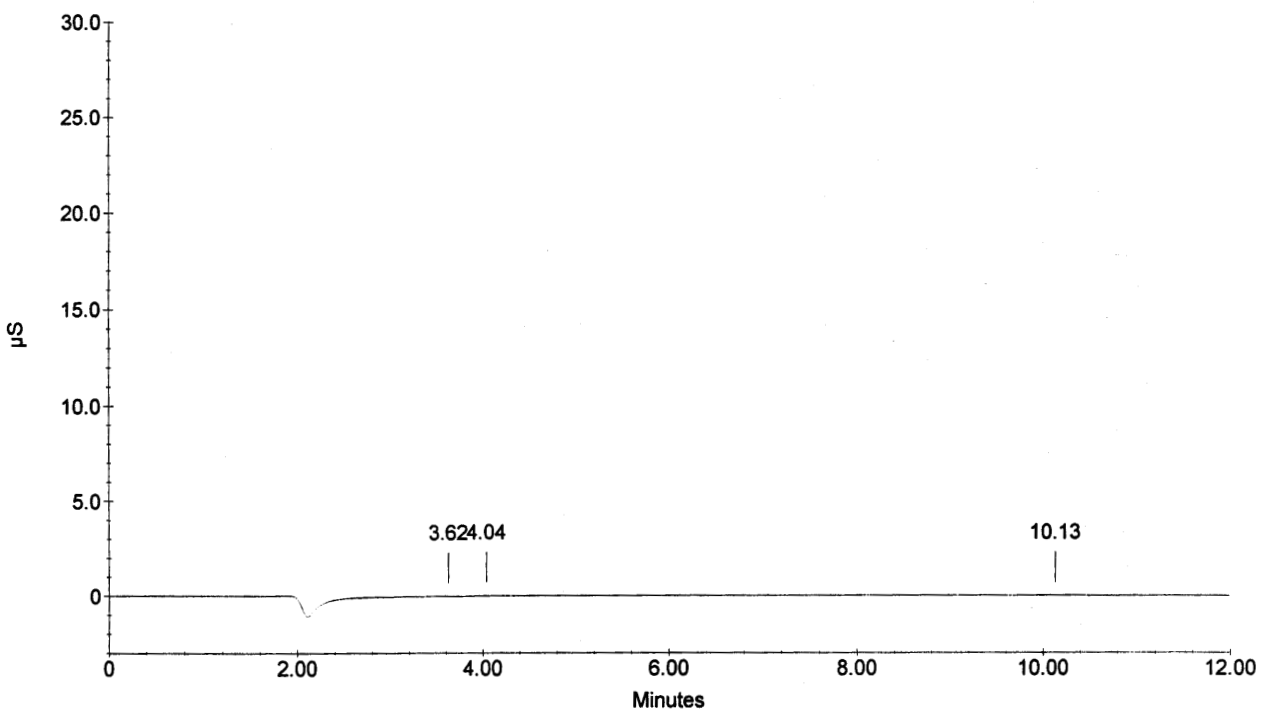
Date Time Collected : 6/22/04 3:35:42 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010081

Peak Information : All Components

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

ICB



SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040521-5
SRR: 25943
SDG: 245101
CASE: CNWRA
VTSR: May 20, 2004
PROJECT#: 06002.01.141

010082

Certificates of Analysis

SIGMA-ALDRICH

010083
3050 Spruce Street
Saint Louis, Missouri 63105 USA
Telephone (800) 521-8956 • (314) 771-5765
Fax (800) 325-5052 • (314) 77-5757
Visit Us At www.sigma-aldrich.com

ATTN: MICHAEL HARDY
FAX: 210 522 3649
LLM

PO NBR:

Certificate of Analysis

PRODUCT NUMBER: 24479-1 LOT NUMBER: 03929CV

PRODUCT NAME: POTASSIUMANTIMONYLL-TARTRATEHYDRATE, 99+%

FORMULA: C4H4KO7SB.XH2O FORMULA WEIGHT: 324.92

APPEARANCE	WHITE POWDER AND CHUNKS
INFRARED SPECTRUM	CONFORMS TO STRUCTURE.
OPTICAL ROTATION	+141.21 DEGREES (C=2%, H2O)
TITRATION	36.9% SB (WITH IODINE)

ALDRICH CHEMICAL COMPANY
RONNIE MARTIN
JUNE 18, 2004

Fisher Scientific Company

Chemical Manufacturing Division

Certificate of Analysis

1 Reagent Lane
Fair Lawn, NJ 07410
Phone: (201) 796-7100 Fax: (201) 796-1329

010084

Catalog Number	A674	**Report Date**	7/21/97	**Mfg. Date**	7/14/97
Lot Number	975140	**Sample ID**	A674..975140.B1.		
Description	AMMONIUM MOLYBDATE, A.C.S.				

This is to certify that units of the above mentioned lot number were tested and found to comply with the specifications of the grade listed. The following are the actual analytical results obtained:

Result Name	Units	Test Value
APPEARANCE	PASS/FAIL	PASS WHITE CRYSTALS
ARS/PHOS/SILICATE %	%	0.0010
ASSAY	%	82.0000
CHLORIDE	%	0.0007
HEAVY METALS	%	0.0003
IDENTIFICATION		PASS
INSOLUBLE MATTER	%	0.0020
MAGNESIUM &CATIONS-%	%	0.016
NITRATE	PASS/FAIL	PASS
PHOSPHATE (PO4)	PPM	2.500
SULFATE (SO4)	%	0.0070

CERTIFIED BY

Robert Dowd
Lab Manager Fair Lawn

Edgar E. Hess
Lab Manager BPF

Note: The data listed is valid for all package sizes of this lot of product, expressed as a extension of the catalog number listed above. If there are any questions with this certificate, please call Chemical Services at (800) 227-6701

Fisher Scientific Company

Chemical Manufacturing Division

1 Reagent Lane
Fairlawn, NJ 07410
Phone: (201) 796-7100 Fax: (201) 796-1329

Certificate of Analysis

Fisher Scientific's Quality System is Certified to ISO9002 (1994) standard by DNV Cert. # 96-HOU-AQ-8052

010085

Catalog Number	A300	**Report Date**	9/26/03	**Mfg. Date**	9/10/03
Lot Number	036110	**Sample ID**	A300..036110.B1.		
Description	SULFURIC ACID, CERTIFIED ACS				

This is to certify that units of the above mentioned lot number were tested and found to comply with the specifications of the grade listed. Certain data have been supplied by third parties. Fisher Scientific expressly disclaims all warranties, expressed or implied, including the implied warranties of merchantability and fitness for a particular purpose. Unless otherwise stated, these products are not intended for dialysis, parenteral or injectable use without further processing. The following are the actual analytical results obtained:

Result Name	Specifications	Units	Test Value
ALUMINUM (Al)	0.2 Maximum	PPM	0.001
AMMONIUM (NH4)	1 Maximum	PPM	0.750
APPEARANCE	Colorless and free from suspended or insoluble matter	REPORT	CLEAR COLORLESS LIQUID
ARSENIC (As)	0.004 Maximum	PPM	<0.001
ASSAY	95.0 to 98.0	w/w %	95.8000
BORON (B)	0.01 Maximum	PPM	<0.0010
CALCIUM (Ca)	0.3 Maximum	PPM	0.007
CHLORIDE	0.1 Maximum	PPM	<0.100
CHROMIUM (Cr)	0.2 Maximum	PPM	0.001
COLOR	10 Maximum	APHA	5
COPPER (Cu)	0.1 Maximum	PPM	<0.001
GOLD (Au)	0.3 Maximum	PPM	<0.001
HEAVY METALS(AS Pb)	0.8 Maximum	PPM	0.16
IDENTIFICATION	Pass test	PASS/FAIL	PASS
IRON (Fe)	0.2 Maximum	PPM	0.006
SUBS. REDUCING KMNO4	2 Maximum	PPM(AS SO2)	<2
LEAD (Pb)	0.3 Maximum	PPM	<0.001
MAGNESIUM (Mg)	0.3 Maximum	PPM	0.002

CERTIFIED BY

Edgar E. Hess — **Lab Manager Fair Lawn**

Joel Ballard — **Lab Manager BPF**

Note: The data listed is valid for all package sizes of this lot of product, expressed as a extension of the catalog number listed above. If there are any questions with this certificate, please call Chemical Services at (800) 227-6701

Fisher Scientific Company
Chemical Manufacturing Division

1 Reagent Lane
Fairlawn, NJ 07410
Phone: (201) 796-7100 Fax: (201) 796-1329

Certificate of Analysis

Fisher Scientific's Quality System is Certified to ISO9002 (1994) standard by DNV
Cert. # 96-HOU-AQ-8052

010086

Catalog Number	A300	**Report Date**	9/26/03	**Mfg. Date**	9/10/03
Lot Number	036110	**Sample ID**	A300..036110.B1.		
Description	SULFURIC ACID, CERTIFIED ACS				

This is to certify that units of the above mentioned lot number were tested and found to comply with the specifications of the grade listed. Certain data have been supplied by third parties. Fisher Scientific expressly disclaims all warranties, expressed or implied, including the implied warranties of merchantability and fitness for a particular purpose. Unless otherwise stated, these products are not intended for dialysis, parenteral or injectable use without further processing. The following are the actual analytical results obtained:

Result Name	Specifications	Units	Test Value
MANGANESE (Mn)	0.2 Maximum	PPM	0.001
MERCURY (Hg)	5 Maximum	PPB	<1.000
NICKEL (Ni)	0.1 Maximum	PPM	0.001
NITRATE (NO3)	0.2 Maximum	PPM	0.050
PHOSPHATE (PO4)	0.5 Maximum	PPM	0.100
POTASSIUM (K)	0.3 Maximum	PPM	0.001
RESIDUE AFTER IGNIT.	3 Maximum	PPM	<0.10
SODIUM (Na)	0.3 Maximum	PPM	0.001
TIN (Sn)	0.2 Maximum	PPM	<0.001
TITANIUM (Ti)	0.3 Maximum	PPM	<0.001
ZINC (Zn)	0.2 Maximum	PPM	<0.001

CERTIFIED BY

Edgar E. Hess
Lab Manager Fair Lawn

Joel Baland
Lab Manager BPF

Note: The data listed is valid for all package sizes of this lot of product, expressed as a extension of the catalog number listed above. If there are any questions with this certificate, please call Chemical Services at (800) 227-6701

Fisher Scientific Company
Chemical Manufacturing Division

1 Reagent Lane
Fairlawn, NJ 07410
Phone: (201) 796-7100 Fax: (201) 796-1329

Certificate of Analysis

Fisher Scientific's Quality System is Certified to ISO9002 (1994) standard by DNV Cert. # 96-HOU-AQ-8052

010087

Catalog Number	A61	**Report Date**	7/17/03	**Mfg. Date**	7/1/03
Lot Number	035244	**Sample ID**	A61...035244.B1.		
Description	L-ASCORBIC ACID, A.C.S.				

This is to certify that units of the above mentioned lot number were tested and found to comply with the specifications of the grade listed. Certain data have been supplied by third parties. Fisher Scientific expressly disclaims all warranties, expressed or implied, including the implied warranties of merchantability and fitness for a particular purpose. Unless otherwise stated, these products are not intended for dialysis, parenteral or injectable use without further processing. The following are the actual analytical results obtained:

Result Name	Specifications	Units	Test Value
APPEARANCE	White crystalline powder	REPORT	FINE WHITE CRYSTALS
ASSAY	99.0 Minimum	%	99.7000
HEAVY METALS(AS Pb)	0.002 Maximum	%	0.0006
IDENTIFICATION	Pass test	PASS/FAIL	PASS
IGNITION RESIDUE	0.1 Maximum	%	0.03000
IRON	0.001 Maximum	%	0.00040
SPECIFIC ROTATION	+20.5 - +21.5	DEGREES (+ OR -)	21.100
APPEARANCE	White crystalline powder	REPORT	FINE WHITE CRYSTALS
ASSAY	99.0 Minimum	%	99.7000
HEAVY METALS(AS Pb)	0.002 Maximum	%	0.0006
IGNITION RESIDUE	0.1 Maximum	%	0.03000
IRON	0.001 Maximum	%	0.00040
SPECIFIC ROTATION	20.5 to 21.5	DEGREES (+ OR -)	21.100

CERTIFIED BY

Edgar E. Hess
Lab Manager Fair Lawn

Joel Boland
Lab Manager BPF

Note: The data listed is valid for all package sizes of this lot of product, expressed as a extension of the catalog number listed above. If there are any questions with this certificate, please call Chemical Services at (800) 227-6701

Fisher Scientific Company
Chemical Manufacturing Division

1 Reagent Lane
Fairlawn, NJ 07410
Phone: (201) 796-7100 Fax: (201) 796-1329

Certificate of Analysis

Fisher Scientific's Quality System is Certified to ISO9002 (1994) standard by DNV Cert. # 96-HOU-AQ-8052

010088

Catalog Number	A929	**Report Date**	2/20/04	**Mfg. Date**	2/6/04
Lot Number	038638	**Sample ID**	A929..038638.B1.		
Description	ACETONE-OPTIMA				

This is to certify that units of the above mentioned lot number were tested and found to comply with the specifications of the grade listed. Certain data have been supplied by third parties. Fisher Scientific expressly disclaims all warranties, expressed or implied, including the implied warranties of merchantability and fitness for a particular purpose. Unless otherwise stated, these products are not intended for dialysis, parenteral or injectable use without further processing. The following are the actual analytical results obtained:

Result Name	Specifications	Units	Test Value
ALDEHYDE	0.002 Maximum	%	0.00050
APPEARANCE	Clear colorless liquid	REPORT	CLEAR, COLORLESS LIQUID
ASSAY	99.5 Minimum	%	99.7000
COLOR	5 Maximum	APHA	5
DENSITY @ 25 DEG C	0.7857 Maximum	GM/ML	0.7856
EVAPORATION RESIDUE	1 Maximum	PPM	0.40
FLUORESCENCE BKG-PPB	1 Maximum	PPB	<1.00
IDENTIFICATION	Pass test	PASS/FAIL	PASS
ISOPROPYL ALCOHOL	0.05 Maximum	%	0.010
SUBS. REDUCING KMNO4	Pass test	PASS/FAIL	PASS
METHANOL	0.05 Maximum	%	0.030
OPT.ABSORBANCE @ 330	1.00 Maximum	ABSORBANCE UNITS	0.5900
OPT.ABSORBANCE @ 340	0.06 Maximum	ABSORBANCE UNITS	0.0400
OPT.ABSORBANCE @ 350	0.010 Maximum	ABSORBANCE UNITS	0.0020
OPT ABS 400 - 350 NM	0.01 Maximum	ABSORBANCE UNITS	0.002
PESTICIDE RESIDUE AN	10 Maximum	NG/L	10.0000

CERTIFIED BY

Edgar E. Hess — **Lab Manager Fair Lawn**

Joel Boland — **Lab Manager BPF**

Note: The data listed is valid for all package sizes of this lot of product, expressed as a extension of the catalog number listed above. If there are any questions with this certificate, please call Chemical Services at (800) 227-6701

Fisher Scientific Company
Chemical Manufacturing Division

1 Reagent Lane
Fairlawn, NJ 07410
Phone: (201) 796-7100 Fax: (201) 796-1329

Certificate of Analysis

Fisher Scientific's Quality System is Certified to ISO9002 (1994) standard by DNV Cert. # 96-HOU-AQ-8052

010089

Catalog Number	A929	**Report Date**	2/20/04	**Mfg. Date**	2/6/04
Lot Number	038638	**Sample ID**	A929..038638.B1.		
Description	ACETONE-OPTIMA				

This is to certify that units of the above mentioned lot number were tested and found to comply with the specifications of the grade listed. Certain data have been supplied by third parties. Fisher Scientific expressly disclaims all warranties, expressed or implied, including the implied warranties of merchantability and fitness for a particular purpose. Unless otherwise stated, these products are not intended for dialysis, parenteral or injectable use without further processing. The following are the actual analytical results obtained:

Result Name	Specifications	Units	Test Value
REFRACTIVE INDEX @25	1.3555 - 1.3580		1.3561
TITRATABLE ACID	0.0003 Maximum	mEq/g	0.00030
TITRATABLE BASE	0.0006 Maximum	mEq/g	<0.00010
WATER (H2O)	0.5 Maximum	%	0.300
SOLUBILITY IN WATER	Pass test	PASS/FAIL	PASS

CERTIFIED BY

Edgar E. Hess
Lab Manager Fair Lawn

Joel Boland
Lab Manager BPF

Note: The data listed is valid for all package sizes of this lot of product, expressed as a extension of the catalog number listed above. If there are any questions with this certificate, please call Chemical Services at (800) 227-6701

SPEXertificate™

Certificate of Reference Material

010090

Catalog Number: AS-F9-2X/2Y **Lot No.** 25-5AS
Description: 1000 mg/L Fluoride
Matrix: H2O

This **ASSURANCE®** certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevent to the certified properties listed below.

Certified Value: 998 mg/L
Uncertainty Associated with Measurement: +/- 3.0 mg/
Certified Value is Traceable to: NIST SRM 3183

The CRM is prepared gravimetrically using high purity Sodium Fluoride Lot# M44142 . The certified value listed is the average of values obtained by classical wet assay and Ion Chromatography analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 997 mg/L
Method: Potentiometric using Fluoride combination electrode

Instrumentation Analysis By Ion Chromatography: 999 mg/L

Uncertified Properties:

Trace Ionic Impurities in the Actual Solution via IC Analysis:

Ion	mg/L	Ion	mg/L
Br	<0.2	NO3	<0.2
Cl	<10	PO4	<1
NO2	<0.2	SO4	<0.5

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

Date of Certification: JAN -- 2004 Certifying Officer: N. Kocherlakota

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:

010091

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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010092

Certificate of Reference Material

Catalog Number: AS-CL9-2X/2Y **Lot No.** 7-147VY
Description: 1000 mg/L Chloride
Matrix: H2O

This **ASSURANCE®** certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevent to the certified properties listed below.

Certified Value: 997 mg/L
Uncertainty Associated with Measurement: +/- 3 mg/L
Certified Value is Traceable to: NIST SRM 3182

The CRM is prepared gravimetrically using high puritySodium Chloride Lot# 004723 . The certified value listed is the average of values obtained by classical wet assay and Ion Chromatography analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 997 mg/L

Method: Gravimetry: Precipitation using AgNO3, filtering, drying and weighing as AgCl.

Instrumentation Analysis By Ion Chromatography: 997 mg/L

Uncertified Properties:

Trace Ionic Impurities in the Actual Solution via IC Analysis:

Element	mg/L	Element	mg/L
F	<0.05	Br	<0.1
PO4	<0.05	NO3	<0.1
SO4	<0.05	NO2	<0.2

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

Date of Certification: JAN -- 2004 Certifying Officer: N. Kocherlakota

Report of Certification

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 010093
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

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

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

Statistical estimator and Confidence limits:

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

Certification Traveler Report:

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

Legal Notice:

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

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Certificate of Reference Material

010094

Catalog Number: AS-NO2N9-2X/2Y **Lot No.** 7-158VY

Description: 1000 mg/L Nitrite-N

Matrix: H2O

This ASSURANCE® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 1001.5 mg/L

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

Certified Value is Traceable to: SPEX CRM 0902

The CRM is prepared gravimetrically using high purity Sodium Nitrite Lot# 0791R . The certified value listed is the average of values obtained by classical wet assay and Ion Chromatography analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1000mg/L

Method: Titration with KMNO4 that was standardized against Sodium Oxalate NIST SRM 40h.

Instrumentation Analysis By Ion Chromatography: 1003 mg/L

Uncertified Properties:

Trace Ionic Impurities in the Actual Solution via IC Analysis:

Ion	mg/L	Ion	mg/L
Br	<20	NO3	<40
Cl	<20	PO4	<0.8
F	<0.4	SO4	<0.4

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

Date of Certification: MAR -- 2004 Certifying Officer: N. 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

010095

Material Source:

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

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

Statistical estimator and Confidence limits:

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

Certification Traveler Report:

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

Legal Notice:

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Certificate of Reference Material

010096

Catalog Number: AS-BR9-2X/2Y **Lot No.** 27-128AS

Description: 1000 mg/L Bromide

Matrix: H2O

This ASSURANCE ®certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 1003.5 mg/L

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

Certified Value is Traceable to: NIST SRM 3184

The CRM is prepared gravimetrically using high purity Sodium Bromide Lot# 017400 . The certified value listed is the average of values obtained by classical wet assay and Ion Chromatography analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1003 mg/L:

Method: Precipitation using Silver Nitrate, filter, dry and weigh as AgBr.

Instrumentation Analysis By Ion Chromatography: 1004 mg/L:

Uncertified Properties:

Trace Ionic Impurities in the Actual Solution via IC Analysis:

Ion	mg/L	Ion	mg/L
Cl	<1.50	NO3	<0.05
F	<0.02	PO4	<0.20
NO2	<0.05	SO4	<0.05

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

Date of Certification: JUN - - 2004 Certifying Officer: N. Kocherlakota

INORGANIC LABS/RADIOCHEM LABS
DATE RECEIVED: 06/15/04
DATE EXPIRED: 06/15/2005 WS
DATE OPENED: 06/15/04
INORG: 4603 PO: F5392

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

010097

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

SPEXertificate™

Certificate of Reference Material

010098

Catalog Number: AS-NO3N9-2X/2Y **Lot No.** 25-65AS

Description: 1000 mg/L Nitrate Nitrogen

Matrix: H2O

This ASSURANCE ® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevent to the certified properties listed below.

Certified Value: 1003.5 mg/L

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

Certified Value is Traceable to: NIST SRM 3185

The CRM is prepared gravimetrically using high purity Sodium Nitrate Lot# M14156 . The certified value listed is the average of values obtained by classical wet assay and Ion Chromatography analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1004 mg/L

Method: Precipitate using Nitron Acetate, filter, dry and weigh as C20H16N4HNO3

Instrumentation Analysis By Ion Chromatography: 1003 mg/L

Uncertified Properties:

Trace Ionic Impurities in the Actual Solution via IC Analysis:

Ion	mg/L	Ion	mg/L
Br	<0.5	NO2	<0.2
Cl	<0.2	PO4	<2.0
F	<0.05	SO4	<0.5

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

Date of Certification: JAN -- 2004 Certifying Officer: N. Kocherlakota

Report of Certification 010099

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

Material Source:

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

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

Statistical estimator and Confidence limits:

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

Certification Traveler Report:

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

Legal Notice:

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

ISO 9001
CERTIFIED

010100

SPEXertificate™

Certificate of Reference Material

Catalog Number: AS-PO4P9-2X/2Y **Lot No.** 7-145VY
Description: 1000 mg/L Phosphate-P
Matrix: H2O

This **ASSURANCE** ® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevent to the certified properties listed below.

Certified Value: 998 mg/L
Uncertainty Associated with Measurement: +/- 3 mg/L
Certified Value is Traceable to: NIST SRM #318b

The CRM is prepared gravimetrically using high purityKH2PO4 Lot# V35142 . The certified value listed is the average of values obtained by classical wet assay and Ion Chromatography analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 998 mg/L

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

Instrumentation Analysis By Ion Chromatography: 998 mg/L

Uncertified Properties:

Trace Ionic Impurities in the Actual Solution via IC Analysis:

Element	mg/L	Element	mg/L
Cl	<3.0	Br	<0.3
F	<0.2	NO3	<0.5
NO2	<0.3	SO4	<0.5

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

Date of Certification: JAN - - 2004 Certifying Officer: N. Kocherlakota

Report of Certification

010101

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

Material Source:

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

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

Statistical estimator and Confidence limits:

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

Certification Traveler Report:

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

Legal Notice:

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ISO 9001
CERTIFIED

SPEXertificate™

Certificate of Reference Material

Catalog Number: AS-SO4S9-2X/2Y **Lot No.** 27-98AS
Description: 1000 mg/L Sulfate-S
Matrix: H2O

This ASSURANCE ®certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 1000.5 mg/L
Uncertainty Associated with Measurement: +/- 3.0 mg/L
Certified Value is Traceable to: NIST SRM 3181

The CRM is prepared gravimetrically using high purity Potassium Sulfate Lot# X34146 . The certified value listed is the average of values obtained by classical wet assay and Ion Chromatography analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 998 mg/L:
Method: Precipitated using Barium Chloride, filtered, ignited and weighed as BaSO4.

Instrumentation Analysis By Ion Chromatography: 1003 mg/L:

Uncertified Properties:

Trace Ionic Impurities in the Actual Solution via IC Analysis:

Ion	mg/L	Ion	mg/L
Br	<0.03	NO3	<0.03
Cl	<0.03	PO4	<0.30
F	<0.02		
NO2	<0.03		

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

Date of Certification: JUN - - 2004 Certifying Officer: N. Kocherlakota

Report of Certification 010103

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.
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s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
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$U=ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c=\sqrt{\Sigma u_i^2}$

Certification Traveler Report:

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

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ISO 9001
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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

010104

ALDRICH®

1001 West Saint Paul Avenue
Milwaukee, WI 53233 USA
Tel.: 800-558-9160 • (414) 273-3850
Fax: 800-962-9591 • (414) 273-4979
e-mail: aldrich@sial.com

Certificate of Analysis

SOUTHWEST RESEARCH INST
DANNY RAMIREZ
6220 CULEBRA RD
SAN ANTONIO TX 78238

PO NBR: 130686E

INORGANICS LAB 27/28/29/30/34
DATE RECEIVED: 1/9/2001
DATE EXPIRED: 1/9/2012 OR
DATE OPENED: 1/9/2001
INORG: 26036 PO: 130686E

PRODUCT NUMBER: 236527-500G

LOT NUMBER: 15308EI

PRODUCT NAME: SODIUM HYDROGENCARBONATE, 99.7+%, A.C.S. REAGENT

FORMULA: NAHCO3

FORMULA WEIGHT: 84.01

APPEARANCE	WHITE POWDER
TITRATION	100.3 % (WITH HCL)
ICP ASSAY	CONFIRMS SODIUM COMPONENT
INSOLUBLE MATTER	0.001% *
CALCIUM	0.0050%
CHLORIDE	0.0014% *
IRON	< 0.0001% *
HEAVY METALS	<5PPM (AS PB) *
POTASSIUM	<0.0020 % *
MAGNESIUM	0.00025%
AMMONIUM	<5PPM *
PHOSPHATE	<0.001% *
CALCIUM, MAGNESIUM & R2O3 PRECIPITATE	0.016% *

CONTINUED ON NEXT PAGE

ALDRICH CHEMICAL COMPANY
DAVID SWESSEL
JANUARY 5, 2001

Certificate of Analysis

THE RIGHT CHEMICALS
THE RIGHT CHEMISTRY

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 02/27/03
DATE EXPIRED: 02/27/2013 VGS
DATE OPENED: 04/10/03
INORG: 4033 PO: 330176E

Sodium carbonate, ACS primary standard, 99.95-100.05% (dried basis)

Stock Number: 33377
Lot Number: L06M34

Analysis

Test	Limits	Results
Assay (dried basis)	99.95 – 100.05 %	100.0 %
Insoluble	0.01 % max	< 0.01 %
Loss on heating (285°C)	1.0 % max	< 0.05 %
Chloride	0.001 % max	< 0.001 %
Nitrogen compounds	0.001 % max	< 0.001 %
Phosphate	0.001 % max	< 0.001 %
Silica	0.005 % max	< 0.005 %
Sulfur compounds	0.003 % max	< 0.003 %
NH_4OH precipitate	0.01 % max	< 0.01 %
Potassium	0.005 % max	< 0.001 %
Calcium	0.02 % max	< 0.01 %
Magnesium	0.004 % max	< 0.004 %
Heavy metals (as Pb)	0.0005 % max	< 0.0005 %
Iron	0.0005 % max	< 0.0005 %

Traceable to NIST? Yes

Certified by:

Quality Control:

Alfa Aesar
A Johnson Matthey Company

TUV CERT ISO 9002

30 Bond Street • Ward Hill, MA 01835-8099 USA • Telephone: (978) 521-6300 • Fax: (978) 521-6350
Toll-free Catalog Sales: (800) 343-0660 • Technical Services: (800) 343-7276 • Specialty/Bulk Sales: (888) 343-8025
www.alfa.com • email: info@alfa.com

SPEXertificate™

Certificate of Reference Material

Catalog Number: ICMIX2-100 **Lot No.:** 25-145AS
Description: **IC Instrument Check Standard 2**
Matrix: H_2O

This **ASSURANCE** ®certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

The CRM is prepared from high purity single ion concentrates of individual elements using Class A laboratory ware to give precise concentration.
Refer to side 2 for details of measurement uncertainties.

Instrumental Analysis by ION Chromatography:

Analyte	Labeled (mg/L)	Measured (mg/L)	NIST SRM
F^-	100	100	3183
Cl^-	200	200	3182
Br^-	400	399	3184
NO_3^-	400	402	3185
HPO_4^{-2}	600	600	3186
SO_4^{-2}	400	399	3181

Spex Reference Multi: Lot #IC6-77VY

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

Date of Certification: APR - - 2004 Certifying Officer: N. Kocherlakota

Report of Certification

010107

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
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ISO 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

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$U=ku_c$ where k=2 is the coverage factor at the 95% confidence level
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ISO 9001
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TITLE Nitrite-N

010108

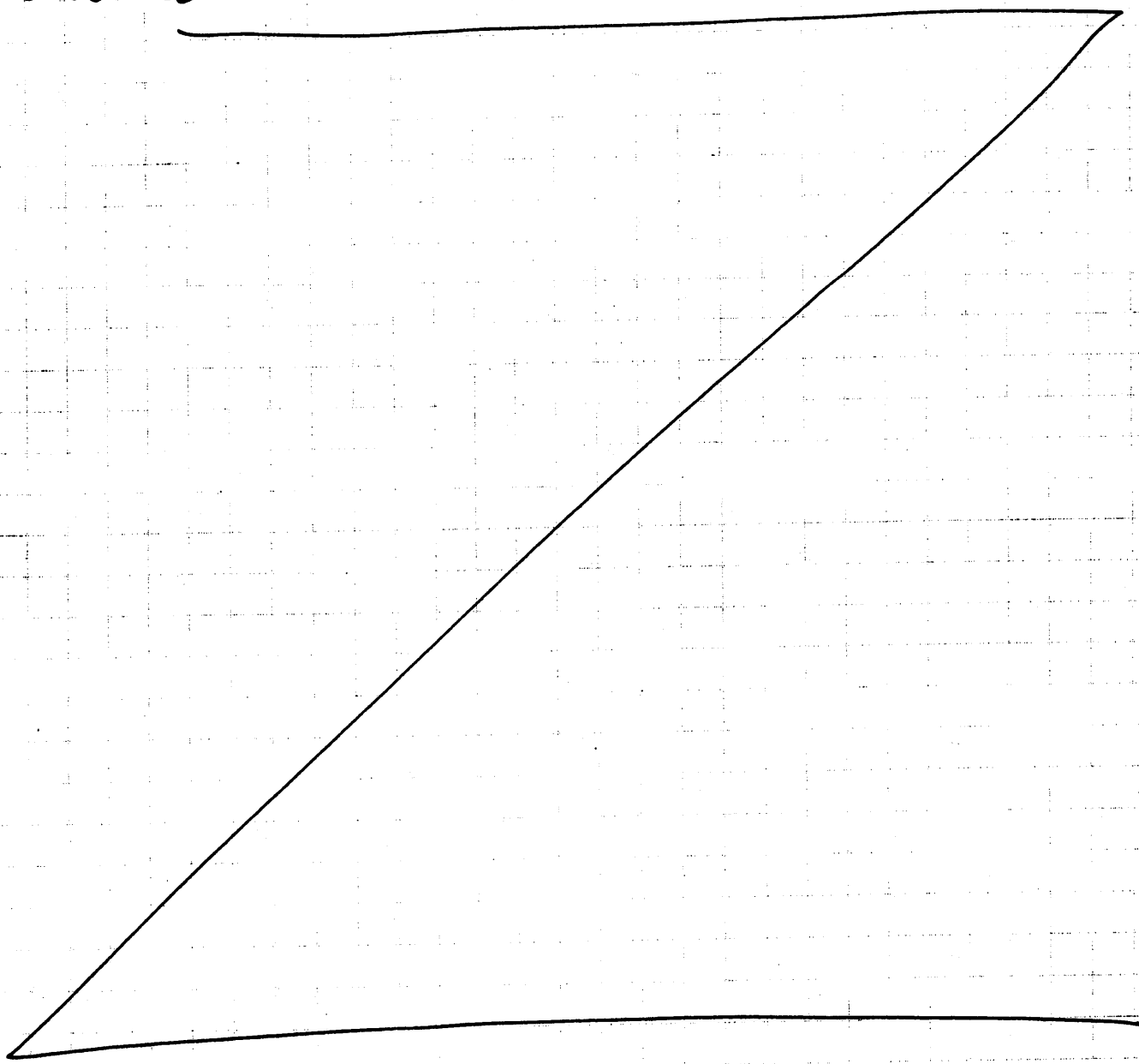
Work continued from Page

SwRI®

178-01-IC4 Nitrite N, 100 mg/L

0.0493g Sodium nitrite (Fisher, Lot # 944033 Inorg # 0277) diluted to 100 mL DI H_2O.

Balance #12.



Work continued to Page

SIGNATURE [signature] DATE 6/22/04

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

FROM: Fisher Scientific TO: Extension PAGES: 2

FISHER SCIENTIFIC CHEMICAL DIVISION
One Reagent Lane, Fair Lawn, NJ 07410

010109

ANALYTICAL CONTROL LABORATORY ANALYSIS

Name & Grade:
SODIUM NITRITE, A.C.S.
Catalog Number: S347
Lot Number: 944033
P.O./ Other Customer ID:

Date of Testing/Mfg: 07/14/94

This is to certify that units of the above mentioned lot number were tested and found to comply with the specifications of the grade listed. The following are the actual analytical results obtained:

Test	Unit	Result
APPEARANCE	PASS/FAIL	PASS-WHITE CRYSTS W/YEL TINT
ASSAY	%	99.5000
CALCIUM IN %	%	0.0030
CHLORIDE	%	0.0020
FLUORIDE (F)	PPM	0.400
HEAVY METALS	%	0.0003
IDENTIFICATION		PASS
INSOLUBLE MATTER	%	0.0020
IRON	%	0.00030
POTASSIUM	%	0.00100
SULFATE (SO4)	%	0.0020

Approved by: Frederick H. Turk, FL Analytical QA Supv. or Edgar E. Hess, BPF Analytical QA Supv.

Date: 07/18/94 (Signed and dated original is on file)

NOTE: The data listed is valid for all package sizes of this lot of product, expressed as a extension of the catalog number listed above. If there are any questions with this certificate, please call Steven P. Davis, Analytical QA Manager, at (201) 703-3149.

Ref. No. S347..944033.B1.

Location: FL

010110

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040521-5
SRR: 25943
SDG: 245101
CASE: CNWRA
VTSR: May 20, 2004
PROJECT#: 06002.01.141

Pipette Calibrations

Book/page: 06 093

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010111

Jordan A. Naegeli 06/11/04

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	100					
ADJ1000-C	500					
	1000					
	100					
ADJ1000-D	500					
	1000					
	100					
ADJ1000-E	500					
	1000					
	100					
ADJ1000-F	500					
	1000					
	100	0.1019	0.1011	0.1020	0.102	101.67
ADJ1000-G	500	0.4943	0.4978	0.5000	0.497	99.47
	1000	1.0098	1.0072	1.0066	1.008	100.79
	100	0.0998	0.1000	0.0992	0.100	99.67
ADJ1000-H	500	0.4918	0.4936	0.4959	0.494	98.75
	1000	0.9820	0.9863	0.9876	0.985	98.53
	100	0.0991	0.1001	0.1003	0.100	99.83
ADJ1000-J	500	0.4967	0.4955	0.4965	0.496	99.25
	1000	0.9927	0.9936	0.9923	0.993	99.29
	100					
ADJ1000	500					
	1000					
	100					
ADJ1000-K	500					
	1000					

FRM-247b (Rev 2/Oct 03)

Book/page: 06 094

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log 010112

Balance #: _____ Thermometer #: _____ diH20 Temperature (° C)_____

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	0.1019	0.1011	0.1020
ADJ1000-G	500	0.4943	0.4978	0.5000
	1000	1.0098	1.0072	1.0066
	100	0.0998	0.1000	0.0992
ADJ1000-H	500	0.4918	0.4936	0.4959
	1000	0.9820	0.9863	0.9876
	100	0.0991	0.1001	0.1003
ADJ1000-J	500	0.4967	0.4955	0.4965
	1000	0.9927	0.9936	0.9923
	100			
ADJ1000-K	500			
	1000			
	100			
ADJ1000	500			
	1000			

WAN 06/11/04

WAN 06/11/04

Analyst: Roberto A. Maggelli Date: 06/11/04

Reviewed by: [signature] Date: 6/21/04

Book/page: 06 093

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010113

Written A. Naegeli 06/11/04

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	100					
ADJ1000-C	500					
	1000					
	100					
ADJ1000-D	500					
	1000					
	100					
ADJ1000-E	500					
	1000					
	100					
ADJ1000-F	500					
	1000					
	100	0.1019	0.1011	0.1020	0.102	101.67
ADJ1000-G	500	0.4943	0.4978	0.5000	0.497	99.47
	1000	1.0098	1.0072	1.0066	1.008	100.79
	100	0.0998	0.1000	0.0992	0.100	99.67
ADJ1000-H	500	0.4918	0.4936	0.4959	0.494	98.75
	1000	0.9820	0.9863	0.9876	0.985	98.53
	100	0.0991	0.1001	0.1003	0.100	99.83
ADJ1000-J	500	0.4967	0.4955	0.4965	0.496	99.25
	1000	0.9927	0.9936	0.9923	0.993	99.29
	100					
ADJ1000	500					
	1000					
	100					
ADJ1000-K	500					
	1000					

FRM-247b (Rev 2/Oct 03)

Book/page: 06 094

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

010114

Balance #: _____ Thermometer #: _____ diH20 Temperature (° C)_____

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	0.1019	0.1011	0.1020
ADJ1000-G	500	0.4943	0.4978	0.5000
	1000	1.0098	1.0072	1.0066
	100	0.0998	0.1000	0.0992
ADJ1000-H	500	0.4918	0.4936	0.4959
	1000	0.9820	0.9863	0.9876
	100	0.0991	0.1001	0.1003
ADJ1000-J	500	0.4967	0.4955	0.4965
	1000	0.9927	0.9936	0.9923
	100			
ADJ1000-K	500			
	1000			
	100			
ADJ1000	500			
	1000			

WAN 06/11/04

WAN 06/11/04

Analyst: Victoria A. Maggi Date: 06/11/04

Reviewed by: [signature] Date: 6/21/04

Book/page: 06 153

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010115

Warren A. Naegeli 06/11/04

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	500					
ADJ5000-C	2500					
	5000					
	500					
ADJ5000-G	2500					
	5000					
	500					
ADJ5000-H	2500					
	5000					
	500					
ADJ5000-I	2500					
	5000					
	500	0.5006	0.5040	0.5058	0.503	100.69
ADJ5000-J	2500	2.4968	2.4974	2.4999	2.498	99.92
	5000	4.9870	4.9977	4.9976	4.994	99.88
	500	0.4948	0.4954	0.4962	0.495	99.09
ADJ5000-K	2500	2.4969	2.4949	2.4960	2.496	99.84
	5000	5.0356	5.0067	5.0094	5.017	100.34
	500	0.5017	0.5005	0.5019	0.501	100.27
ADJ5000-L	2500	2.4897	2.4897	2.4894	2.490	99.58
	5000	4.9800	4.9833	4.9877	4.984	99.67
	500					
ADJ5000	2500					
	5000					
	500					
ADJ5000	2500					
	5000					
	500					
ADJ5000	2500					
	5000					
	500					
ADJ5000-M	2500					
	5000					

FRM-247c (Rev 2/Mar 03)

Book/page: 06 154

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log 010116

Balance #: _____ Thermometer #: _____ diH20 Temperature (° C) _____

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	0.5006	0.5040	0.5058
ADJ5000-J	2500	2.4968	2.4974	2.4999
	5000	4.9870	4.9977	4.9976
	500	0.4948	0.4954	0.4962
ADJ5000-K	2500	2.4969	2.4949	2.4960
	5000	5.0356	5.0067	5.0094
	500	0.5017	0.5005	0.5019
ADJ5000-L	2500	2.4897	2.4897	2.4894
	5000	4.9800	4.9833	4.9877
	500			
ADJ5000-M	2500			
	5000			
	500			
ADJ5000-N	2500			
	5000			
	500			
ADJ5000	2500			
	5000			
	500			
ADJ5000	2500			
	5000			

Analyst: _____ Date: 06/11/04

Reviewed by: _____ Date: 6/21/04

Book/page: 06 098

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log 010117

Balance #: 16 Thermometer #: G011 diH20 Temperature (° C) 21

	Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
100 µL – 1000 µL		100			
	ADJ1000-C	500			
		1000			
		100			
	ADJ1000-D	500			
		1000			
		100			
	ADJ1000-E	500			
		1000			
		100			
	ADJ1000-F	500			
		1000			
		100	0.0987	0.0989	0.0984
	ADJ1000-G	500	0.5034	0.5047	0.5009
		1000	0.9925	0.9884	0.9907
		100	0.0990	0.0985	0.0983
	ADJ1000-H	500	0.4938	0.4960	0.4941
		1000	1.0006	1.0019	0.9991
		100	0.0986	0.0997	0.0994
	ADJ1000-J	500	0.5005	0.5021	0.5013
		1000	1.0041	1.0031	1.0026
		100			
	ADJ1000-K	500			
		1000			
		100			
	ADJ1000	500			
		1000			

(Rows C–F and K–ADJ1000 crossed out, initialed and dated 6/21/04)

Analyst: [signature] Date: 6/21/04

Reviewed by: [signature] Date: 7/7/04

Book/page: 06 097

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010118

6/21/04

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	100				0.000	0.00
ADJ1000-C	500				0.000	0.00
	1000				0.000	0.00
	100				0.000	0.00
ADJ1000-D	500				0.000	0.00
	1000				0.000	0.00
	100				0.000	0.00
ADJ1000-E	500				0.000	0.00
	1000				0.000	0.00
	100				0.000	0.00
ADJ1000-F	500				0.000	0.00
	1000				0.000	0.00
	100	0.0987	0.0989	0.0984	0.099	98.67
ADJ1000-G	500	0.5034	0.5047	0.5009	0.503	100.60
	1000	0.9925	0.9884	0.9907	0.991	99.05
	100	0.0990	0.0985	0.0983	0.099	98.60
ADJ1000-H	500	0.4938	0.4960	0.4941	0.495	98.93
	1000	1.0006	1.0019	0.9991	1.001	100.05
	100	0.0986	0.0997	0.0994	0.099	99.23
ADJ1000-J	500	0.5005	0.5021	0.5013	0.501	100.26
	1000	1.0041	1.0031	1.0026	1.003	100.33
	100				0.000	0.00
ADJ1000	500				0.000	0.00
	1000				0.000	0.00
	100				0.000	0.00
ADJ1000	500				0.000	0.00
	1000				0.000	0.00

FRM-247b (Rev 2/Oct 03)

010120 Book/page: 06 158

SW 4-19-04

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 16 Thermometer #: G011 diH20 Temperature (° C) 21

	Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
500 µL – 5000 µL		500			
	ADJ5000-C	2500			
		5000			
		500			
	ADJ5000-G	2500			
		5000			
		500			
	ADJ5000-H	2500			
		5000			
		500			
	ADJ5000-I	2500			
		5000			
		500	0.5044	0.5020	0.5036
	ADJ5000-J	2500	2.5087	2.5021	2.5104
		5000	5.0316	5.0183	5.0327
		500	0.4917	0.4959	0.4967
	ADJ5000-K	2500	2.5066	2.5013	2.5039
		5000	5.0327	5.0391	5.0283
		500	0.5047	0.5011	0.5032
	ADJ5000-L	2500	2.4905	2.4889	2.4922
		5000	5.0511	5.0481	5.0496
		500			
	ADJ5000-M	2500			
		5000			
		500			
	ADJ5000-N	2500			
		5000			
		500			
	ADJ5000	2500			
		5000			
		500			
	ADJ5000	2500			
		5000			

6/21/04

6/21/04

Analyst: [signature] Date: 6/21/04

Reviewed by: [signature] Date: 7/7/04

Book/page: 06 157

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

[signature] 6/21/04

010122

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	500				0.000	0.00
ADJ5000-C	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000-G	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000-H	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000-I	2500				0.000	0.00
	5000				0.000	0.00
	500	0.5044	0.5020	0.5036	0.503	100.67
ADJ5000-J	2500	2.5087	2.5021	2.5104	2.507	100.28
	5000	5.0216	5.0183	5.0227	5.021	100.42
	500	0.4917	0.4959	0.4967	0.495	98.95
ADJ5000-K	2500	2.5066	2.5013	2.5039	2.504	100.16
	5000	5.0327	5.0391	5.0283	5.033	100.67
	500	0.5047	0.5011	0.5032	0.503	100.60
ADJ5000-L	2500	2.4905	2.4889	2.4922	2.491	99.62
	5000	5.0511	5.0481	5.0496	5.050	100.99
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00

FRM-247c (Rev 2/Mar 03)

010124 Book/page: 06 038

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 16 Thermometer #: G011 diH20 Temperature (° C) 21

20 µL – 200 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	20			
ADJ200-A	100			
	200			
	20			
ADJ200-C	100			
	200			
	20			
ADJ200-D	100			
	200			
	20	0.0205	0.0203	0.0204
ADJ200-G	100	0.0996	0.1011	0.1021
	200	0.1986	0.1974	0.2003
	20			
ADJ200-H	100	COULD NOT FIND		
	200			
	20	0.0202	0.0203	0.0202
ADJ200-J	100	0.0991	0.1005	0.0989
	200	0.2013	0.2041	0.2027
	20			
ADJ200-K	100			
	200			
	20			
ADJ200	100			
	200			

6/21/04

6/21/04

Analyst: _____ Date: 6/21/04

Reviewed by: _____ Date: 7/7/04

Book/page: 06 037

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010125

6/21/04

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	20				0.000	0.00
ADJ200-A	100				0.000	0.00
	200				0.000	0.00
	20				0.000	0.00
ADJ200-C	100				0.000	0.00
	200				0.000	0.00
	20				0.000	0.00
ADJ200-D	100				0.000	0.00
	200				0.000	0.00
	20	0.0205	0.0203	0.0204	0.020	102.00
ADJ200-G	100	0.0996	0.1011	0.1021	0.101	100.93
	200	0.1986	0.1974	0.2003	0.199	99.38
	20				0.000	0.00
ADJ200-H	100				0.000	0.00
	200				0.000	0.00
	20	0.0202	0.0203	0.0202	0.020	101.17
ADJ200-J	100	0.0991	0.1005	0.0989	0.100	99.50
	200	0.2013	0.2041	0.2027	0.203	101.35
	20				0.000	0.00
ADJ200	100				0.000	0.00
	200				0.000	0.00
	20				0.000	0.00
ADJ200	100				0.000	0.00
	200				0.000	0.00
	20				0.000	0.00
ADJ200	100				0.000	0.00
	200				0.000	0.00

FRM-247a (Rev 3/Oct 03)

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040521-5
SRR: 25943
SDG: 245101
CASE: CNWRA
VTSR: May 20, 2004
PROJECT#: 06002.01.141

010126

Balance Calibrations

Southwest Research Institute®
Division 01

BALANCE VERIFICATION LOG

BALANCE #:	LOCATION:	SERIAL #:	TOLERANCE:	COMMENTS:
16	Bldg. 70 Lab 27	P37987	±0.0005	
Date	**Std Wt (g)**	**Recorded Wt (g)**	**Operator**	SN: 99-J50526-15
6-3-04	2.0000	1.9999	KE	"
6-4-04	2.0000	2.0000	KE	"
6-7-04	2.0000	2.0000	KE	"
6-8-04	2.0000	2.0000	KE	"
6-9-04	2.0000	2.0000	KE	"
6-10-04	2.0000	2.0000	KE	"
6-11-04	2.0000	2.0000	KE	"
6/11				

clw 6/11/04

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.

clw 6/11/04

Southwest Research Institute
Division 01

BALANCE VERIFICATION LOG

BALANCE #:	LOCATION:	SERIAL #:	TOLERANCE:	COMMENTS:
12	Bldg. 70 Lab 27	1122510787	±0.0005	
Date	**Std Wt (g)**	**Recorded Wt (g)**	**Operator**	
6-17-04	2.00000	2.0000	KE	SN: 99-J50526-15
6-18-04	2.0000	2.0000	KE	"
6-21-04	2.0000	2.0000	KE	"
6-22-04	2.0000	2.0001	KE	"
6-23-04	2.0000	2.0000	KE	"
6-24-04	2.0000	2.0000	KE	"
6-25-04	2.0000	1.9999	[illegible]	"
6-26-04	2.0000	2.0000	KE	"
6-28-04	2.0000	2.0000	[illegible]	"
6-29-04	2.0000	2.0000	KE	"

If balance is out of limits, clean the balance and re-calibrate using Class "S" weights.
If balance is still out of limits, place a "DO NOT USE" sign on it and call (DQA) for service.

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040521-5
SRR: 25943
SDG: 245101
CASE: CNWRA
VTSR: May 20, 2004
PROJECT#: 06002.01.141

010129

DI Water Verification

D.I. WATER SYSTEM NOTEBOOK
SOUTHWEST RESEARCH INSTITUTE
BUILDING 70

40006

Contact U.S. Filter (1-800-466-7873) for repairs/exchanges. (Make sure to have a P.O.)

HIGH PURITY SYSTEM (HP) 010130

DATE / TIME	INITIALS	RESISTIVITY MONITOR (M OHMS)	RESISTIVITY MONITOR QC LT.	QC LIGHTS QC 1	QC LIGHTS QC 2	USAGE (GALS)	COMMENTS
5/24/04 6:00pm	DR	18.04	✓	✓	✓	1903.8	ALL OK ✓
5/25/04 6:49pm	DR	18.04	✓	✓	✓	1946.3	✓
5/26/04 6:41pm	DR	18.04	✓	✓	✓	1974.6	✓
5/27/04 8:56pm	DR	18.04	✓	✓	✓	1992.2	✓
6/1/04 6:49pm	DR	18.04	✓	✓	✓	2012.0	✓
6/2/04 6:16pm	DR	18.04	✓	✓	✓	2029.5	✓
6/3/04 6:20pm	DR	18.04	✓	✓	✓	2044.4	✓
6/4/04 5:43pm	DR	18.04	✓	✓	✓	2054.7	✓
6/7/04 5:53pm	DR	18.05	✓	✓	✓	2072.0	✓
6/8/04 7:34pm	DR	18.05	✓	✓	✓	2086.5	✓
6/9/04 7:10pm	DR	18.04	✓	✓	✓	2123.7	✓
6/10/04 7:30pm	DR	18.05	✓	✓	✓	2136.8	✓
6/11/04 6:18pm	DR	18.04	✓	✓	✓	2145.4	✓
6/14/04 6:20pm	DR	18.05	✓	✓	✓	2156.2	✓
6/15/04 5:18pm	DR	18.04	✓	✓	✓	2170.2	✓
6/16/04 7pm	DR	18.05	✓	✓	✓	2187.0	✓

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
5/24/04 6:00pm	DR	✓ (14.5)	✓	910.2	ALL OK ✓
5/25/04 6:49pm	DR	✓ (15.0)	✓	911.6	✓
5/26/04 6:41pm	DR	✓ (15.0)	✓	912.1	✓
5/27/04 8:56pm	DR	✓ (15.0)	✓	912.3	✓
6/1/04 6:49pm	DR	✓ (15.0)	✓	912.9	✓
6/2/04 6:16pm	DR	✓ (16.0)	✓	913.7	✓
6/3/04 6:20pm	DR	✓ (16.5)	✓	913.9	✓
6/4/04 5:43pm	DR	✓ (16.5)	✓	914.0	✓
6/7/04 5:53pm	DR	✓ (18.0)	✓	914.0	✓
6/8/04 7:34pm	DR	X (18.0)	✓	914.5	need to call USFilter for P.O
6/9/04 7:10pm	DR	X	(17.5) ✓	915.0	need P.O.
6/10/04 7:30pm	DR	X	(17.5) ✓	915.1	P.O. received. USFilter called need P.O
6/11/04 6:18pm	DR	X	(17.5) ✓	917.3	need P.O
6/14/04 6:20pm	DR	✓	(14.0) ✓	920.5	tank, Filter exchange. ALL OK.
6/15/04 5:18pm	DR	✓	(15.0) ✓	921.7	✓
6/16/04 7pm	DR	✓	(15.5) ✓	923.2	✓

Legend: Check = Green (OK); X = Red (call for service)

D.I. WATER SYSTEM NOTEBOOK
SOUTHWEST RESEARCH INSTITUTE
BUILDING 70

(A0007)

Contact U.S. Filter (1-800-466-7873) for repairs/exchanges. (Make sure to have a P.O.)

010131

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
6/17/04 5:38pm	DR	18.04	✓	✓	✓	2190.5	✓
6/18/04 6:30pm	DR	18.06	✓	✓	✓	2199.8	✓
6/21/04 5:21pm	DR	18.05	✓	✓	✓	2239.7	✓
6/22/04 5:31pm	DR	18.05	✓	✓	✓	2263.3	✓
6/23/04 5:56pm	DR	18.05	✓	✓	✓	2307.8	✓
6/24/04 2:45pm	JW	18.04	✓	✓	✓	2320.8	✓
6/25/04 4:39pm	JW	18.07	✓	✓	✓	2380.5	✓
6/28/04 3pm	DR	18.05	✓	✓	✓	2522.7	✓
6/29/04 6:12pm	DR	18.04	✓	✓	✓	2607.8	✓
6/30/04 8pm	DR	18.03	✓	✓	✓	2666.7	✓
7/1/04 4:52pm	DR	18.03	✓	✓	✓	2696.6	✓
7/2/04 7:22pm	DR	16.04	✓	✓	✓	2745.6	✓
		RSS					

Legend: Check = Green (OK); X = Red (call for service)

LOW PURITY SYSTEM (LP)

DATE / TIME	INITIALS	QC LIGHTS QC 1	QC LIGHTS QC 2	USAGE (GALS)	COMMENTS
6/17/04 5:38pm	DR	✓	(15) ✓	923.3	✓
6/18/04 6:30pm	DR	✓	(15.5) ✓	923.4	✓
6/21/04 5:21pm	DR	✓	(16) ✓	923.6	✓
6/22/04 5:31pm	DR	✓	(16.5) ✓	923.8	✓
6/23/04 5:56pm	DR	X	(17) ✓	929.5	need P.O. call U.S. Filter
6/24/04 2:47pm	JW	X	(17.5) ✓	930.2	✓ 4" filter called (Rec'd PO)
6/25/04 4:41pm	JW	X	(18) ✓	930.4	waiting on U.S. Filter
6/28/04 3pm	DR	✓	(15.5) ✓	935.6	tank exchanged. All ok. ✓
6/29/04 6:13pm	DR	✓	(15.5) ✓	935.8	✓
6/30/04 8pm	DR	✓	(16) ✓	936.1	✓
7/1/04 4:50pm	DR	✓	(16) ✓	936.3	✓
7/2/04 7:22pm	DR	✓	(16.5) ✓	955.4	✓
		RSS			

Legend: Check = Green (OK); X = Red (call for service)

R Sparks 7/6/04

010001

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040521-6
SRR: 25943
SDG: 245108
CASE: CNWRA
VTSR: May 20, 2004
PROJECT#: 06002.01.141

FINAL REPORT

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010002

Sample ID
Cation 1A

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 05/20/04

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 245108

SRR: 25943

TO: 040521-6

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.05	0.05
Antimony	<0.02	0.02
Arsenic	0.006	0.005
Barium	0.011	0.005
Beryllium	<0.005	0.005
Bismuth	<0.01	0.01
Boron	0.145	0.05
Cadmium	<0.005	0.005
Calcium	13.6	0.05
Chromium	<0.015	0.015
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	<0.1	0.1
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	0.042	0.01
Magnesium	1.34	0.05
Manganese	<0.005	0.005
Molybdenum	<0.01	0.01
Nickel	<0.01	0.01
Palladium	<0.005	0.005
Phosphorus	<0.02	0.02
Potassium	3.59	0.2
Selenium	<0.015	0.015
Silicon	19.7	0.05
Silver	<0.005	0.005
Sodium	51.7	0.2
Strontium	0.075	0.005
Sulfur	9.43	0.05
Thallium	<0.02	0.02
Thorium	<0.015	0.015
Tin	<0.01	0.01
Titanium	<0.005	0.005
Tungsten	<0.01	0.01
Uranium	<0.1	0.1
Vanadium	0.013	0.005
Yttrium	<0.005	0.005
Zinc	<0.005	0.005
Zirconium	<0.005	0.005

SOUTHWEST RESEARCH INSTITUTE

DUPLICATE SUMMARY

010003

Sample ID
Cation 1A

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 05/20/04

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 245108

SRR: 25943

TO: 040521-6

Analysis	Sample Result (mg/L)	Duplicate Result (mg/L)	RPD
Aluminum	<0.05	<0.05	0.00%
Antimony	<0.02	<0.02	0.00%
Arsenic	0.006	0.009	32.9%
Barium	0.011	0.010	2.39%
Beryllium	<0.005	<0.005	0.00%
Bismuth	<0.01	<0.01	0.00%
Boron	0.145	0.140	3.57%
Cadmium	<0.005	<0.005	0.00%
Calcium	13.6	13.2	2.87%
Chromium	<0.015	<0.015	0.00%
Cobalt	<0.005	<0.005	0.00%
Copper	<0.005	<0.005	0.00%
Iron	<0.1	<0.1	0.00%
Lanthanum	<0.005	<0.005	0.00%
Lead	<0.005	<0.005	0.00%
Lithium	0.042	0.043	1.90%
Magnesium	1.34	1.31	2.74%
Manganese	<0.005	<0.005	0.00%
Molybdenum	<0.01	<0.01	0.00%
Nickel	<0.01	<0.01	0.00%
Palladium	<0.005	<0.005	0.00%
Phosphorus	<0.02	<0.02	0.00%
Potassium	3.59	3.58	0.31%
Selenium	<0.015	<0.015	0.00%
Silicon	19.7	19.1	2.96%
Silver	<0.005	<0.005	0.00%
Sodium	51.7	51.8	0.15%
Strontium	0.075	0.073	2.71%
Sulfur	9.43	9.20	2.41%
Thallium	<0.02	<0.02	0.00%
Thorium	<0.015	<0.015	0.00%
Tin	<0.01	<0.01	0.00%
Titanium	<0.005	<0.005	0.00%
Tungsten	<0.01	<0.01	0.00%
Uranium	<0.1	<0.1	0.00%
Vanadium	0.013	0.013	1.51%
Yttrium	<0.005	<0.005	0.00%
Zinc	<0.005	<0.005	0.00%
Zirconium	<0.005	<0.005	0.00%

SOUTHWEST RESEARCH INSTITUTE

MATRIX SPIKE SUMMARY

010004

Sample ID
Cation 1A

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 05/20/04

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 245108

SRR: 25943

TO: 040521-6

Analysis	Sample Result (mg/L)	Spike Result (mg/L)	Spike Added (mg/L)	Recovery
Aluminum	<0.05	1.94	2	97.0%
Antimony	<0.02	0.501	0.5	100.3%
Arsenic	0.006	2.03	2	101.1%
Barium	0.011	2.01	2	99.9%
Beryllium	<0.005	0.049	0.05	97.8%
Bismuth	NA	NA	NA	NA
Boron	NA	NA	NA	NA
Cadmium	<0.005	0.049	0.05	98.4%
Calcium	13.6	33.8	20	100.9%
Chromium	<0.015	0.195	0.2	97.6%
Cobalt	<0.005	0.498	0.5	99.6%
Copper	<0.005	0.251	0.25	100.5%
Iron	<0.1	1.06	1	106.0%
Lanthanum	NA	NA	NA	NA
Lead	<0.005	0.494	0.5	98.8%
Lithium	NA	NA	NA	NA
Magnesium	1.34	21.8	20	102.1%
Manganese	<0.005	0.501	0.5	100.1%
Molybdenum	NA	NA	NA	NA
Nickel	<0.01	0.482	0.5	96.5%
Palladium	NA	NA	NA	NA
Phosphorus	NA	NA	NA	NA
Potassium	3.59	24.1	20	102.8%
Selenium	<0.015	2.17	2	108.6%
Silicon	NA	NA	NA	NA
Silver	<0.005	0.050	0.05	100.9%
Sodium	51.7	72.1	20	102.0%
Strontium	NA	NA	NA	NA
Sulfur	NA	NA	NA	NA
Thallium	<0.02	2.08	2	104.0%
Thorium	NA	NA	NA	NA
Tin	NA	NA	NA	NA
Titanium	NA	NA	NA	NA
Tungsten	NA	NA	NA	NA
Uranium	NA	NA	NA	NA
Vanadium	0.013	0.507	0.5	98.8%
Yttrium	NA	NA	NA	NA
Zinc	<0.005	0.508	0.5	101.7%
Zirconium	NA	NA	NA	NA

NA- Not Applicable.

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010005

Sample ID
Cation 2A

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 05/20/04

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 245109

SRR: 25943

TO: 040521-6

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	0.084	0.05
Antimony	<0.02	0.02
Arsenic	0.017	0.005
Barium	0.007	0.005
Beryllium	<0.005	0.005
Bismuth	<0.01	0.01
Boron	0.167	0.05
Cadmium	<0.005	0.005
Calcium	6.69	0.05
Chromium	<0.015	0.015
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	<0.1	0.1
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	0.089	0.01
Magnesium	0.550	0.05
Manganese	<0.005	0.005
Molybdenum	<0.01	0.01
Nickel	<0.01	0.01
Palladium	<0.005	0.005
Phosphorus	0.033	0.02
Potassium	2.76	0.2
Selenium	<0.015	0.015
Silicon	25.6	0.05
Silver	<0.005	0.005
Sodium	77.2	0.2
Strontium	0.031	0.005
Sulfur	7.36	0.05
Thallium	<0.02	0.02
Thorium	<0.015	0.015
Tin	<0.01	0.01
Titanium	<0.005	0.005
Tungsten	<0.01	0.01
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	<0.005	0.005
Zirconium	<0.005	0.005

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010006

Sample ID
Cation 3A

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 05/20/04

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 245110

SRR: 25943

TO: 040521-6

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.05	0.05
Antimony	<0.02	0.02
Arsenic	0.007	0.005
Barium	0.011	0.005
Beryllium	<0.005	0.005
Bismuth	<0.01	0.01
Boron	0.141	0.05
Cadmium	<0.005	0.005
Calcium	13.6	0.05
Chromium	<0.015	0.015
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	<0.1	0.1
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	0.044	0.01
Magnesium	1.34	0.05
Manganese	<0.005	0.005
Molybdenum	<0.01	0.01
Nickel	<0.01	0.01
Palladium	<0.005	0.005
Phosphorus	0.027	0.02
Potassium	3.71	0.2
Selenium	<0.015	0.015
Silicon	19.6	0.05
Silver	<0.005	0.005
Sodium	52.8	0.2
Strontium	0.075	0.005
Sulfur	9.46	0.05
Thallium	<0.02	0.02
Thorium	<0.015	0.015
Tin	0.017	0.01
Titanium	<0.005	0.005
Tungsten	<0.01	0.01
Uranium	<0.1	0.1
Vanadium	0.013	0.005
Yttrium	<0.005	0.005
Zinc	<0.005	0.005
Zirconium	<0.005	0.005

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010007

Sample ID
Cation 4A

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 05/20/04

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 245111

SRR: 25943

TO: 040521-6

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	0.396	0.05
Antimony	<0.02	0.02
Arsenic	0.010	0.005
Barium	0.008	0.005
Beryllium	<0.005	0.005
Bismuth	<0.01	0.01
Boron	0.171	0.05
Cadmium	<0.005	0.005
Calcium	6.97	0.05
Chromium	<0.015	0.015
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	0.138	0.1
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	0.093	0.01
Magnesium	0.604	0.05
Manganese	<0.005	0.005
Molybdenum	<0.01	0.01
Nickel	<0.01	0.01
Palladium	<0.005	0.005
Phosphorus	0.039	0.02
Potassium	2.89	0.2
Selenium	<0.015	0.015
Silicon	27.0	0.05
Silver	<0.005	0.005
Sodium	80.3	0.2
Strontium	0.033	0.005
Sulfur	7.42	0.05
Thallium	<0.02	0.02
Thorium	<0.015	0.015
Tin	0.023	0.01
Titanium	<0.005	0.005
Tungsten	<0.01	0.01
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	<0.005	0.005
Zirconium	<0.005	0.005

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

Sample ID 010008

Cation 5A

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 05/20/04

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 245112

SRR: 25943

TO: 040521-6

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.05	0.05
Antimony	<0.02	0.02
Arsenic	<0.005	0.005
Barium	<0.005	0.005
Beryllium	<0.005	0.005
Bismuth	<0.01	0.01
Boron	<0.05	0.05
Cadmium	<0.005	0.005
Calcium	10.0	0.05
Chromium	<0.015	0.015
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	10.1	0.1
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	<0.01	0.01
Magnesium	9.84	0.05
Manganese	<0.005	0.005
Molybdenum	<0.01	0.01
Nickel	<0.01	0.01
Palladium	<0.005	0.005
Phosphorus	<0.02	0.02
Potassium	9.08	0.2
Selenium	<0.015	0.015
Silicon	<0.05	0.05
Silver	<0.005	0.005
Sodium	8.94	0.2
Strontium	<0.005	0.005
Sulfur	<0.05	0.05
Thallium	<0.02	0.02
Thorium	<0.015	0.015
Tin	<0.01	0.01
Titanium	<0.005	0.005
Tungsten	<0.01	0.01
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	<0.005	0.005
Zirconium	<0.005	0.005

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010009

Sample ID

Cation 6A

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 05/20/04

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 245113

SRR: 25943

TO: 040521-6

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	0.075	0.05
Antimony	0.096	0.02
Arsenic	0.092	0.005
Barium	0.101	0.005
Beryllium	0.097	0.005
Bismuth	<0.01	0.01
Boron	<0.05	0.05
Cadmium	0.100	0.005
Calcium	9.96	0.05
Chromium	0.097	0.015
Cobalt	0.099	0.005
Copper	0.096	0.005
Iron	10.1	0.1
Lanthanum	<0.005	0.005
Lead	0.099	0.005
Lithium	<0.01	0.01
Magnesium	9.77	0.05
Manganese	0.101	0.005
Molybdenum	0.092	0.01
Nickel	0.098	0.01
Palladium	<0.005	0.005
Phosphorus	<0.02	0.02
Potassium	8.99	0.2
Selenium	0.094	0.015
Silicon	<0.05	0.05
Silver	0.100	0.005
Sodium	8.91	0.2
Strontium	9.91	0.005
Sulfur	<0.05	0.05
Thallium	0.103	0.02
Thorium	0.091	0.015
Tin	<0.01	0.01
Titanium	<0.005	0.005
Tungsten	<0.01	0.01
Uranium	<0.1	0.1
Vanadium	0.098	0.005
Yttrium	<0.005	0.005
Zinc	0.099	0.005
Zirconium	<0.005	0.005

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010010

Sample ID

Cation 7A

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 05/20/04

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 245114

SRR: 25943

TO: 040521-6

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.05	0.05
Antimony	<0.02	0.02
Arsenic	<0.005	0.005
Barium	<0.005	0.005
Beryllium	<0.005	0.005
Bismuth	<0.01	0.01
Boron	<0.05	0.05
Cadmium	<0.005	0.005
Calcium	<0.05	0.05
Chromium	<0.015	0.015
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	<0.1	0.1
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	<0.01	0.01
Magnesium	<0.05	0.05
Manganese	<0.005	0.005
Molybdenum	<0.01	0.01
Nickel	<0.01	0.01
Palladium	<0.005	0.005
Phosphorus	<0.02	0.02
Potassium	<0.2	0.2
Selenium	<0.015	0.015
Silicon	<0.05	0.05
Silver	<0.005	0.005
Sodium	<0.2	0.2
Strontium	<0.005	0.005
Sulfur	<0.05	0.05
Thallium	<0.02	0.02
Thorium	<0.015	0.015
Tin	<0.01	0.01
Titanium	<0.005	0.005
Tungsten	<0.01	0.01
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	<0.005	0.005
Zirconium	<0.005	0.005

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010011

Sample ID
Cation 8A

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 05/20/04

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 245115

SRR: 25943

TO: 040521-6

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	0.336	0.05
Antimony	<0.02	0.02
Arsenic	0.005	0.005
Barium	0.012	0.005
Beryllium	<0.005	0.005
Bismuth	<0.01	0.01
Boron	0.142	0.05
Cadmium	<0.005	0.005
Calcium	14.0	0.05
Chromium	<0.015	0.015
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	0.182	0.1
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	0.043	0.01
Magnesium	1.42	0.05
Manganese	<0.005	0.005
Molybdenum	<0.01	0.01
Nickel	<0.01	0.01
Palladium	<0.005	0.005
Phosphorus	0.037	0.02
Potassium	3.69	0.2
Selenium	<0.015	0.015
Silicon	20.7	0.05
Silver	<0.005	0.005
Sodium	52.3	0.2
Strontium	0.077	0.005
Sulfur	9.50	0.05
Thallium	<0.02	0.02
Thorium	<0.015	0.015
Tin	<0.01	0.01
Titanium	<0.005	0.005
Tungsten	<0.01	0.01
Uranium	<0.1	0.1
Vanadium	0.014	0.005
Yttrium	<0.005	0.005
Zinc	<0.005	0.005
Zirconium	<0.005	0.005

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010012

Sample ID
Cation 9A

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 05/20/04

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 245116

SRR: 25943

TO: 040521-6

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	0.498	0.05
Antimony	<0.02	0.02
Arsenic	<0.005	0.005
Barium	0.008	0.005
Beryllium	<0.005	0.005
Bismuth	<0.01	0.01
Boron	0.172	0.05
Cadmium	<0.005	0.005
Calcium	7.31	0.05
Chromium	<0.015	0.015
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	0.167	0.1
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	0.100	0.01
Magnesium	0.640	0.05
Manganese	<0.005	0.005
Molybdenum	<0.01	0.01
Nickel	<0.01	0.01
Palladium	<0.005	0.005
Phosphorus	0.039	0.02
Potassium	2.96	0.2
Selenium	<0.015	0.015
Silicon	27.8	0.05
Silver	<0.005	0.005
Sodium	85.3	0.2
Strontium	0.036	0.005
Sulfur	7.57	0.05
Thallium	<0.02	0.02
Thorium	<0.015	0.015
Tin	0.027	0.01
Titanium	<0.005	0.005
Tungsten	<0.01	0.01
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	<0.005	0.005
Zirconium	<0.005	0.005

SOUTHWEST RESEARCH INSTITUTE

LABORATORY CONTROL SAMPLE 010013

Sample ID
LCSW - F15W1 / F15E2

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: NA

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: NA

SRR: 25943

TO: 040521-6

Analysis	Sample Result (mg/L)	True Value (mg/L)	Recovery
Aluminum	1.91	2	95.4%
Antimony	0.490	0.5	97.9%
Arsenic	1.99	2	99.7%
Barium	2.01	2	100.6%
Beryllium	0.049	0.05	98.8%
Bismuth	NA	NA	NA
Boron	NA	NA	NA
Cadmium	0.050	0.05	99.3%
Calcium	21.0	20	104.8%
Chromium	0.208	0.2	104.2%
Cobalt	0.499	0.5	99.8%
Copper	0.252	0.25	100.8%
Iron	1.14	1	114.1%
Lanthanum	NA	NA	NA
Lead	0.497	0.5	99.4%
Lithium	NA	NA	NA
Magnesium	20.7	20	103.4%
Manganese	0.504	0.5	100.7%
Molybdenum	NA	NA	NA
Nickel	0.498	0.5	99.6%
Palladium	NA	NA	NA
Phosphorus	NA	NA	NA
Potassium	19.2	20	95.8%
Selenium	2.04	2	101.8%
Silicon	NA	NA	NA
Silver	0.050	0.05	101.0%
Sodium	19.1	20	95.3%
Strontium	NA	NA	NA
Sulfur	NA	NA	NA
Thallium	2.06	2	102.9%
Thorium	NA	NA	NA
Tin	NA	NA	NA
Titanium	NA	NA	NA
Tungsten	NA	NA	NA
Uranium	NA	NA	NA
Vanadium	0.498	0.5	99.6%
Yttrium	NA	NA	NA
Zinc	0.497	0.5	99.4%
Zirconium	NA	NA	NA

NA- Not Applicable.

SOUTHWEST RESEARCH INSTITUTE

BLANK SUMMARY

010014

Sample ID

PBW - F15E1 / F15E2

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: NA

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: NA

SRR: 25943

TO: 040521-6

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.05	0.05
Antimony	<0.02	0.02
Arsenic	<0.005	0.005
Barium	<0.005	0.005
Beryllium	<0.005	0.005
Bismuth	<0.01	0.01
Boron	<0.05	0.05
Cadmium	<0.005	0.005
Calcium	<0.05	0.05
Chromium	<0.015	0.015
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	<0.1	0.1
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	<0.01	0.01
Magnesium	<0.05	0.05
Manganese	<0.005	0.005
Molybdenum	<0.01	0.01
Nickel	<0.01	0.01
Palladium	<0.005	0.005
Phosphorus	<0.02	0.02
Potassium	<0.2	0.2
Selenium	<0.015	0.015
Silicon	<0.05	0.05
Silver	<0.005	0.005
Sodium	<0.2	0.2
Strontium	<0.005	0.005
Sulfur	<0.05	0.05
Thallium	<0.02	0.02
Thorium	<0.015	0.015
Tin	<0.01	0.01
Titanium	<0.005	0.005
Tungsten	<0.01	0.01
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	<0.005	0.005
Zirconium	<0.005	0.005

NA- Not Applicable.

010015

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040521-6
SRR: 25943
SDG: 245108
CASE: CNWRA
VTSR: May 20, 2004
PROJECT#: 06002.01.141

Task Orders/01-QPP-015

Southwest Research Institute

Laboratory Task Order

TO #: 040521-6 Revision: 1

SDG: 245108
VTSR: 05/20/04
CASE: CNWRA

SRR #'s: 25943
Client(s): DIV 20

Project(s): 06002.01.141
Manager(s): DAMMANN, MIKE
To PM: 06/16/04
To QA: 07/26/04
To Client: 07/27/04

010016

Instructions

DIVISION 20 - CNWRA. 30-day TAT. Using 27-day TAT for report/PM, QAU, 28-day TAT for hardcopy (subject to change). Point of Contact is Brad Werling (x6565). Analysis for Major and Minor elements by ICP. Work is 10 CFR 50, Part 21, Appendix B. CONTACT Charlie Butcher (ext. 5928, pager 271-5172) BEFORE STARTING ANY WORK ON THIS TASK ORDER. CONTACT PM WITH ANY QUESTIONS.
revision 1: updated task order. (dr072304)

Documents Related to this task order: 10688[COC 25943]

Test: DIL-DILUTION
Section: METALPREP

Holding: 28 days from CED

Prep, Dilution

Cnt: 9

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
245108		1	Water	Cation 1A	20 May 04	17 Jun 04
245109		1	Water	Cation 2A	20 May 04	17 Jun 04
245110		1	Water	Cation 3A	20 May 04	17 Jun 04
245111		1	Water	Cation 4A	20 May 04	17 Jun 04
245112		1	Water	Cation 5A	20 May 04	17 Jun 04
245113		1	Water	Cation 6A	20 May 04	17 Jun 04
245114		1	Water	Cation 7A	20 May 04	17 Jun 04
245115		1	Water	Cation 8A	20 May 04	17 Jun 04
245116		1	Water	Cation 9A	20 May 04	17 Jun 04

Test: ICP-SWRI
Section: METALS

Holding: 180 days from CED

ICP Analysis by SwRI Method

Cnt: 9

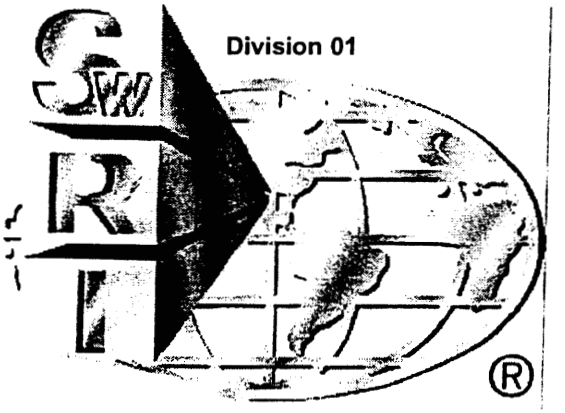
System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
245108		1	Water	Cation 1A	20 May 04	16 Nov 04
245109		1	Water	Cation 2A	20 May 04	16 Nov 04
245110		1	Water	Cation 3A	20 May 04	16 Nov 04
245111		1	Water	Cation 4A	20 May 04	16 Nov 04
245112		1	Water	Cation 5A	20 May 04	16 Nov 04
245113		1	Water	Cation 6A	20 May 04	16 Nov 04
245114		1	Water	Cation 7A	20 May 04	16 Nov 04
245115		1	Water	Cation 8A	20 May 04	16 Nov 04
245116		1	Water	Cation 9A	20 May 04	16 Nov 04

010017

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

01-QPP-015
Division 01
Revision 4
November 2002

Document No. 3



Chemistry and Chemical
Engineering Division

QUALITY PROJECT PLAN FOR

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

DIV. 20
SRR #25943
PROJECT #06002.01.141
CASE: CNWRA
VTSR: 05/20/04 1500

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

010018

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

SwRI AUTHORIZATION SIGNATORIES

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

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

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

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

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

TABLE OF CONTENTS

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

1.0 INTRODUCTION

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

2.0 SCOPE

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

3.0 REFERENCES

3.1 *SwRI Quality System Manual – 2000*

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

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

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

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

4.1 Indoctrination and Training

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

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

4.2 Qualification of Personnel

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

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

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

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

4.3 Design Control

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

4.4 Right of Access

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

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

4.5 Control of Supplier-Generated Documents

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

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

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

4.6 Acceptance of Services Only

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

4.7 Commercial Grade Items

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

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

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

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

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

(a) Damage was not sustained during shipment;

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

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

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

(a) Chemical name;

(b) Chemical grade;

(c) Lot code;

(d) Date received; and

(e) Shelf life, when applicable.

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

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

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

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

(a) Sample control number;

(b) Purchase order number;

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

(d) Work order number;

(e) Nuclear QA label; and

(f) Sample retention date, when applicable.

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

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

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

4.8 Inspection

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

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

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

(b) Testing processes;

(c) Calibration and major equipment;

(d) Sample and record retention; and

(e) Test records.

4.9 Inspection and Testing

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

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

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

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

4.10 Handling, Storage, Packaging, Preservation, and Delivery

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

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

4.11 Quality Assurance Records

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

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

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

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

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

4.12 10 CFR, Part 21

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

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

4.13 Certified Test Report

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

4.14 Valid Documents List

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

5.0 HISTORY OF REVISIONS

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

010026

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040521-6
SRR: 25943
SDG: 245108
CASE: CNWRA
VTSR: May 20, 2004
PROJECT#: 06002.01.141

Chain of Custody/Login Paperwork

10688

Shipper Name/ Address: Brad Herling
CNWRA - DIV 20
BLD - 57

Client:

SAMPLE LIST/CHAIN OF CUSTODY

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

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	Anions by IC except Phosphate	Phosphate by 365.3							Samples Intact
Anion 1A	05/20/04		W		1	X	X							
Anion 2A						X	X							
Anion 3A						X	X							
Anion 4A						X	X							
Anion 5A						X	X							
Anion 6A						X	X							
~~Anion 7B~~														
Anion 7A						X	X							

DIV. 20
SRR #25943
PROJECT #06002.01.141
CASE: CNWRA
VTSR: 05/20/04 1500

REMARKS
Preservation
a = HCl to pH <2
b = HNO_3 to pH <2
c = H_2SO_4 to pH <2
d = NaOH to pH >12
e = Cool (4°C±2°C)
f = Other (specify) none

Nuclear Safety Related - use appropriate QA procedures

POC: Brad Herling
phone 6565
Fax 5184

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

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

Temp: 22.0°C

Therm #: 027

Comments:
628/134-136
Return excess samples to B. Herling (Div. 20) x6565

	Date	Time
Relinquished by (Print/Signature): X Miriam Juckett / Miriam Juckett	5/20/04	
Received by (Print/Signature):		
Relinquished by (Print/Signature):		
Received by (Print/Signature):		
Relinquished by (Print/Signature):		

SwRI Project#: 20.06002.01.141

Received by SwRI Lab: (Signature)

Date: 5/20/04 Time: 1500

Samples Disposed: Date / Time

Samples Disposed by:

010021

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

10688

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 Herling CNWRA - DIV 20 BLD - 57

Client:

Client Purchase Order/Other ID:

Site/Zone ID:

Requested Turnaround:
- ☐ 2 Weeks
- ☐ 3 Weeks
- ☒ Other: 24hr

SwRI Contact: Mike Damman

Analyses Requested

Sample ID	Sample Collection Date (mm/dd/yy)	Sample Collection Time	Matrix Type	Sample Type	# of Containers	Analysis of Major + minor elements ICP	Samples Intact
Cation 1A1	05/20/04		W		1	X	
Cation 2A1						X	
Cation 3A1						X	
Cation 4A1						X	
Cation 5A1						X	
Cation 6A1						X	
Cation 7A1						X	
Cation 8A1						X	
Cation 9A1						X	

DIV. 20
SRR #25943
PROJECT #06002.01.141
CASE: CNWRA
VTSR: 05/20/04 1500

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

Nuclear Safety related - use appropriate QA procedures

POC - Brad Herling 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: 628/134-136

	Date	Time
Relinquished by (Print/Signature): Miriam Juckett / Miriam Juckett		
Received by (Print/Signature):		
Relinquished by (Print/Signature):		
Received by (Print/Signature):		
Relinquished by (Print/Signature):		

SwRI Project#: 20.06002.01.141

Received by SwRI Lab: (Signature)

Date: 5/20/04 Time: 1500

Samples Disposed: Date / Time

Samples Disposed by:

010028

SAMPLE LOG-IN SHEET 010029

Lab Name: Southwest Research Institute	Page 1 of 1
Received By (Print Name): DINO ROMAN	Log-in Date: 05/21/2004
Received By (Signature): DR	

Case Number: CNWRA	Sample Delivery Group No.	SAS Number: N/A

Remarks: 06002.01.141

1.	Custody Seal(s)	Present/(Absent*) Intact/Broken
2.	Custody Seal Nos.	N/A
3.	Chain-of Custody Records	(Present)/Absent*
4.	Traffic Reports or Packing Lists	Present/(Absent)
5.	Airbill	Airbill/Sticker (Present)/Absent*
6.	Airbill No.	HAND DELIVERED
7.	Sample Tags	Present/(Absent)
	Sample Tag Numbers	Listed/(Not) listed on Chain of Custody
8.	Sample Condition	(Intact)/Broken*/ Leaking
9.	Cooler Temperature	22.0C
10.	Does Information on custody records, traffic reports, and sample tags agree?	(Yes)/No*
11.	Date Received at Lab	05/20/2004
12.	Time Received	15:00:00

EPA Sample #	Corresponding: Sample Tag #	Corresponding: Assigned Lab #	Remarks: Condition of Sample Shipment, etc
Anion 1A	None	245101	Intact
Anion 2A	None	245102	Intact
Anion 3A	None	245103	Intact
Anion 4A	None	245104	Intact
Anion 5A	None	245105	Intact
Anion 6A	None	245106	Intact
Anion 7A	None	245107	Intact
Cation 1A	None	245108	Intact
Cation 2A	None	245109	Intact
Cation 3A	None	245110	Intact
Cation 4A	None	245111	Intact
Cation 5A	None	245112	Intact
Cation 6A	None	245113	Intact
Cation 7A	None	245114	Intact
Cation 8A	None	245115	Intact
Cation 9A	None	245116	Intact

Sample Transfer

Fraction: Inorg	Fraction
Area #: R13	Area #
By: DINO ROMAN	By
On: 05/20/2004	On

* Contact SMO and attach record of resolution

Reviewed By: CYNTHIA A. SANCHEZ	Logbook No.: Sample Receipt (25943)
Date: 05.25.2004	Logbook Page No.: 507 (QC SECTION 1 OF 3)

FORM DC-1 4 05.25.2004 OLMO4.2

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040521-6
SRR: 25943
SDG: 245108
CASE: CNWRA
VTSR: May 20, 2004
PROJECT#: 06002.01.141

Copies of Login Book

Sample Login Book

May 21, 2004

SwRI Login Area
Division 1

Sample Receipt: 25942	Project: 06355.24.00X	Client: INEEL
VTSR Date: May 21, 2004	VTSR Time: 08:15:00	Manager: DAMMANN, MIKE

System ID	Customer Sample ID	Matrix
245099	TRA764052004CA1	Water
245100	TRA764052004CA2	Water

Sample Receipt: 25943	Project: 06002.01.141	Client: DIV 20
VTSR Date: May 20, 2004	VTSR Time: 15:00:00	Manager: DAMMANN, MIKE

System ID	Customer Sample ID	Matrix
245101	Anion 1A	Water
245102	Anion 2A	Water
245103	Anion 3A	Water
245104	Anion 4A	Water
245105	Anion 5A	Water
245106	Anion 6A	Water
245107	Anion 7A	Water
245108	Cation 1A	Water
245109	Cation 2A	Water
245110	Cation 3A	Water
245111	Cation 4A	Water
245112	Cation 5A	Water
245113	Cation 6A	Water
245114	Cation 7A	Water
245115	Cation 8A	Water
245116	Cation 9A	Water

Sample Receipt: 25944	Project: 06002.01.141	Client: DIV 20
VTSR Date: May 20, 2004	VTSR Time: 15:00:00	Manager: DAMMANN, MIKE

System ID	Customer Sample ID	Matrix
245117	UFUA-CE-D	Water
245118	UFUA-CE-S	Water
245119	UFUA-GCMS-D	Water

010032

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040521-6
SRR: 25943
SDG: 245108
CASE: CNWRA
VTSR: May 20, 2004
PROJECT#: 06002.01.141

RAW DATA

Div 20
to#040415-2, 040521-6
06002.01.141

010033

system id	elem	result	qual	units	rl	tv	rec	ug/ml	date	time
243222"	Ag3280"	0.005	U	mg/L	0.005			-0.00032	06/15/04"	12:44"
243222"	Al3082"	0.05	U	mg/L	0.05			-0.01361	06/15/04"	12:44"
243222"	As1890"	0.005	U	mg/L	0.005			-0.00071	06/15/04"	12:44"
243222"	B_2496"	1.69		mg/L	0.05			1.68823	06/15/04"	12:44"
243222"	Ba4934"	0.297		mg/L	0.005			0.29658	06/15/04"	12:44"
243222"	Be3130"	0.005	U	mg/L	0.005			0.00005	06/15/04"	12:44"
243222"	Bi2230"	0.01	U	mg/L	0.01			0.00299	06/15/04"	12:44"
243222"	Ca3179"	29.1		mg/L	0.05			29.10540	06/15/04"	12:44"
243222"	Cd2265"	0.005	U	mg/L	0.005			0.00040	06/15/04"	12:44"
243222"	Co2286"	0.005	U	mg/L	0.005			0.00247	06/15/04"	12:44"
243222"	Cr2677"	0.015	U	mg/L	0.015			-0.00069	06/15/04"	12:44"
243222"	Cu3247"	0.005	U	mg/L	0.005			-0.00064	06/15/04"	12:44"
243222"	Fe2714"	0.1	U	mg/L	0.1			0.08023	06/15/04"	12:44"
243222"	K_766	0.414		mg/L	0.2			0.4138	06/15/04	13:18:25
243222"	La3988"	0.005	U	mg/L	0.005			-0.00017	06/15/04"	12:44"
243222"	Li670	0.01	U	mg/L	0.01			0.0020	06/15/04	13:18:25
243222"	Mg2790"	0.098		mg/L	0.05			0.09757	06/15/04"	12:44"
243222"	Mn2576"	0.005	U	mg/L	0.005			0.00408	06/15/04"	12:44"
243222"	Mo2020"	0.01	U	mg/L	0.01			0.00148	06/15/04"	12:44"
243222"	Na589	3.64		mg/L	0.2			3.6375	06/15/04	13:18:25
243222"	Ni2316"	0.059		mg/L	0.01			0.05876	06/15/04"	12:44"
243222"	P_1782"	0.02	U	mg/L	0.02			-0.00263	06/15/04"	12:44"
243222"	Pb220"	0.005	U	mg/L	0.005			0.00144	06/15/04"	12:44"
243222"	Pd3404"	0.005	U	mg/L	0.005			-0.00181	06/15/04"	12:44"
243222"	S_1820"	24.9		mg/L	0.05			24.93973	06/15/04"	12:44"
243222"	Sb2068"	0.02	U	mg/L	0.02			0.00192	06/15/04"	12:44"
243222"	Se196"	0.015	U	mg/L	0.015			0.00261	06/15/04"	12:44"
243222"	Si2881"	0.274		mg/L	0.05			0.27400	06/15/04"	12:44"
243222"	Sn1899"	0.01	U	mg/L	0.01			-0.00092	06/15/04"	12:44"
243222"	Sr4215"	0.212		mg/L	0.005			0.21215	06/15/04"	12:44"
243222"	Th2837"	0.015	U	mg/L	0.015			-0.00138	06/15/04"	12:44"
243222"	Ti3349"	0.005	U	mg/L	0.005			0.00007	06/15/04"	12:44"
243222"	Tl1908"	0.02	U	mg/L	0.02			0.00223	06/15/04"	12:44"
243222"	U_4090"	0.1	U	mg/L	0.1			0.00820	06/15/04"	12:44"
243222"	V_2924"	0.005	U	mg/L	0.005			0.00016	06/15/04"	12:44"
243222"	W_2079"	0.01	U	mg/L	0.01			-0.00129	06/15/04"	12:44"
243222"	Y_3710"	0.005	U	mg/L	0.005			-0.00015	06/15/04"	12:44"
243222"	Zn2062"	0.112		mg/L	0.005			0.11164	06/15/04"	12:44"
243222"	Zr3496"	0.005	U	mg/L	0.005			0.00013	06/15/04"	12:44"
243223"	Ag3280"	0.005	U	mg/L	0.005			-0.00038	06/15/04"	12:48"
243223"	Al3082"	0.05	U	mg/L	0.05			-0.01765	06/15/04"	12:48"
243223"	As1890"	0.005	U	mg/L	0.005			0.00189	06/15/04"	12:48"
243223"	B_2496"	0.138		mg/L	0.05			0.13826	06/15/04"	12:48"
243223"	Ba4934"	0.007		mg/L	0.005			0.00717	06/15/04"	12:48"
243223"	Be3130"	0.005	U	mg/L	0.005			0.00005	06/15/04"	12:48"
243223"	Bi2230"	0.01	U	mg/L	0.01			-0.00022	06/15/04"	12:48"
243223"	Ca3179"	17.8		mg/L	0.05			17.75094	06/15/04"	12:48"
243223"	Cd2265"	0.005	U	mg/L	0.005			0.00016	06/15/04"	12:48"
243223"	Co2286"	0.005	U	mg/L	0.005			0.00098	06/15/04"	12:48"
243223"	Cr2677"	0.015	U	mg/L	0.015			-0.00085	06/15/04"	12:48"
243223"	Cu3247"	0.005	U	mg/L	0.005			-0.00097	06/15/04"	12:48"
243223"	Fe2714"	0.1	U	mg/L	0.1			0.00866	06/15/04"	12:48"
243223"	K_766	5.08		mg/L	0.2			5.0838	06/15/04	13:22:00
243223"	La3988"	0.005	U	mg/L	0.005			-0.00020	06/15/04"	12:48"

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system id	elem	result	qual	units	rl	tv	rec	ug/ml	date	time
243223"	Li670	0.035		mg/L	0.01			0.0353	06/15/04	13:22:00
243223"	Mg2790"	2.78		mg/L	0.05			2.78323	06/15/04"	12:48"
243223"	Mn2576"	0.025		mg/L	0.005			0.02539	06/15/04"	12:48"
243223"	Mo2020"	0.01	U	mg/L	0.01			0.00309	06/15/04"	12:48"
243223"	Na589	34.9		mg/L	0.2			34.8656	06/15/04	13:22:00
243223"	Ni2316"	0.01	U	mg/L	0.01			0.00083	06/15/04"	12:48"
243223"	P_1782"	0.020		mg/L	0.02			0.02024	06/15/04"	12:48"
243223"	Pb220"	0.005	U	mg/L	0.005			0.00131	06/15/04"	12:48"
243223"	Pd3404"	0.005	U	mg/L	0.005			-0.00121	06/15/04"	12:48"
243223"	S_1820"	6.81		mg/L	0.05			6.80944	06/15/04"	12:48"
243223"	Sb2068"	0.02	U	mg/L	0.02			0.00168	06/15/04"	12:48"
243223"	Se196"	0.015	U	mg/L	0.015			0.00645	06/15/04"	12:48"
243223"	Si2881"	19.5		mg/L	0.05			19.50259	06/15/04"	12:48"
243223"	Sn1899"	0.015		mg/L	0.01			0.01464	06/15/04"	12:48"
243223"	Sr4215"	0.079		mg/L	0.005			0.07866	06/15/04"	12:48"
243223"	Th2837"	0.015	U	mg/L	0.015			-0.00249	06/15/04"	12:48"
243223"	Ti3349"	0.005	U	mg/L	0.005			-0.00034	06/15/04"	12:48"
243223"	Tl1908"	0.02	U	mg/L	0.02			-0.01242	06/15/04"	12:48"
243223"	U_4090"	0.1	U	mg/L	0.1			0.01111	06/15/04"	12:48"
243223"	V_2924"	0.005	U	mg/L	0.005			0.00168	06/15/04"	12:48"
243223"	W_2079"	0.01	U	mg/L	0.01			-0.00276	06/15/04"	12:48"
243223"	Y_3710"	0.005	U	mg/L	0.005			-0.00006	06/15/04"	12:48"
243223"	Zn2062"	0.005	U	mg/L	0.005			0.00027	06/15/04"	12:48"
243223"	Zr3496"	0.005	U	mg/L	0.005			-0.00010	06/15/04"	12:48"
243224"	Ag3280"	0.005	U	mg/L	0.005			-0.00011	06/15/04"	12:53"
243224"	Al3082"	0.05	U	mg/L	0.05			-0.01335	06/15/04"	12:53"
243224"	As1890"	0.005	U	mg/L	0.005			0.00055	06/15/04"	12:53"
243224"	B_2496"	0.05	U	mg/L	0.05			-0.00189	06/15/04"	12:53"
243224"	Ba4934"	0.005	U	mg/L	0.005			0.00020	06/15/04"	12:53"
243224"	Be3130"	0.005	U	mg/L	0.005			0.00002	06/15/04"	12:53"
243224"	Bi2230"	0.01	U	mg/L	0.01			0.00227	06/15/04"	12:53"
243224"	Ca3179"	5.00		mg/L	0.05			4.99723	06/15/04"	12:53"
243224"	Cd2265"	0.005	U	mg/L	0.005			0.00045	06/15/04"	12:53"
243224"	Co2286"	0.005	U	mg/L	0.005			0.00012	06/15/04"	12:53"
243224"	Cr2677"	0.015	U	mg/L	0.015			-0.00022	06/15/04"	12:53"
243224"	Cu3247"	0.005	U	mg/L	0.005			-0.00044	06/15/04"	12:53"
243224"	Fe2714"	0.1	U	mg/L	0.1			-0.00309	06/15/04"	12:53"
243224"	K_766	0.2	U	mg/L	0.2			0.0033	06/15/04	13:25:03
243224"	La3988"	0.005	U	mg/L	0.005			0.00000	06/15/04"	12:53"
243224"	Li670	0.01	U	mg/L	0.01			0.0007	06/15/04	13:25:03
243224"	Mg2790"	0.05	U	mg/L	0.05			0.00021	06/15/04"	12:53"
243224"	Mn2576"	0.005	U	mg/L	0.005			-0.00001	06/15/04"	12:53"
243224"	Mo2020"	0.01	U	mg/L	0.01			0.00020	06/15/04"	12:53"
243224"	Na589	8.86		mg/L	0.2			8.8576	06/15/04	13:25:03
243224"	Ni2316"	0.01	U	mg/L	0.01			0.00076	06/15/04"	12:53"
243224"	P_1782"	0.02	U	mg/L	0.02			0.00764	06/15/04"	12:53"
243224"	Pb220"	0.005	U	mg/L	0.005			-0.00136	06/15/04"	12:53"
243224"	Pd3404"	0.005	U	mg/L	0.005			-0.00047	06/15/04"	12:53"
243224"	S_1820"	0.05	U	mg/L	0.05			-0.03086	06/15/04"	12:53"
243224"	Sb2068"	0.02	U	mg/L	0.02			-0.00051	06/15/04"	12:53"
243224"	Se196"	0.015	U	mg/L	0.015			-0.00264	06/15/04"	12:53"
243224"	Si2881"	0.05	U	mg/L	0.05			0.03229	06/15/04"	12:53"
243224"	Sn1899"	0.01	U	mg/L	0.01			-0.00062	06/15/04"	12:53"
243224"	Sr4215"	0.005	U	mg/L	0.005			0.00013	06/15/04"	12:53"

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system id	elem	result	qual	units	rl	tv	rec	ug/ml	date	time
243224"	Th2837"	0.015	U	mg/L	0.015			0.00156	06/15/04"	12:53"
243224"	Ti3349"	0.005	U	mg/L	0.005			0.00005	06/15/04"	12:53"
243224"	Tl1908"	0.02	U	mg/L	0.02			-0.00021	06/15/04"	12:53"
243224"	U_4090"	0.1	U	mg/L	0.1			-0.00951	06/15/04"	12:53"
243224"	V_2924"	0.005	U	mg/L	0.005			0.00051	06/15/04"	12:53"
243224"	W_2079"	0.01	U	mg/L	0.01			-0.00089	06/15/04"	12:53"
243224"	Y_3710"	0.005	U	mg/L	0.005			-0.00002	06/15/04"	12:53"
243224"	Zn2062"	0.005	U	mg/L	0.005			0.00031	06/15/04"	12:53"
243224"	Zr3496"	0.005	U	mg/L	0.005			0.00030	06/15/04"	12:53"
243225"	Ag3280"	0.005	U	mg/L	0.005			0.00010	06/15/04"	12:58"
243225"	Al3082"	0.05	U	mg/L	0.05			-0.00267	06/15/04"	12:58"
243225"	As1890"	0.005	U	mg/L	0.005			-0.00013	06/15/04"	12:58"
243225"	B_2496"	1.23		mg/L	0.05			1.23179	06/15/04"	12:58"
243225"	Ba4934"	0.183		mg/L	0.005			0.18317	06/15/04"	12:58"
243225"	Be3130"	0.005	U	mg/L	0.005			0.00004	06/15/04"	12:58"
243225"	Bi2230"	0.01	U	mg/L	0.01			0.00648	06/15/04"	12:58"
243225"	Ca3179"	0.248		mg/L	0.05			0.24774	06/15/04"	12:58"
243225"	Cd2265"	0.005	U	mg/L	0.005			0.00046	06/15/04"	12:58"
243225"	Co2286"	0.005	U	mg/L	0.005			0.00073	06/15/04"	12:58"
243225"	Cr2677"	0.015	U	mg/L	0.015			-0.00068	06/15/04"	12:58"
243225"	Cu3247"	0.005	U	mg/L	0.005			-0.00057	06/15/04"	12:58"
243225"	Fe2714"	0.1	U	mg/L	0.1			-0.00081	06/15/04"	12:58"
243225"	K_766	0.2	U	mg/L	0.2			0.1353	06/15/04	13:28:07
243225"	La3988"	0.005	U	mg/L	0.005			0.00015	06/15/04"	12:58"
243225"	Li670	0.01	U	mg/L	0.01			0.0015	06/15/04	13:28:07
243225"	Mg2790"	0.05	U	mg/L	0.05			0.03015	06/15/04"	12:58"
243225"	Mn2576"	0.005	U	mg/L	0.005			0.00111	06/15/04"	12:58"
243225"	Mo2020"	0.01	U	mg/L	0.01			0.00059	06/15/04"	12:58"
243225"	Na589	2.89		mg/L	0.2			2.8862	06/15/04	13:28:07
243225"	Ni2316"	0.016		mg/L	0.01			0.01570	06/15/04"	12:58"
243225"	P_1782"	0.02	U	mg/L	0.02			0.00390	06/15/04"	12:58"
243225"	Pb220"	0.005	U	mg/L	0.005			0.00026	06/15/04"	12:58"
243225"	Pd3404"	0.005	U	mg/L	0.005			-0.00138	06/15/04"	12:58"
243225"	S_1820"	0.432		mg/L	0.05			0.43194	06/15/04"	12:58"
243225"	Sb2068"	0.02	U	mg/L	0.02			-0.00289	06/15/04"	12:58"
243225"	Se196"	0.015	U	mg/L	0.015			-0.00026	06/15/04"	12:58"
243225"	Si2881"	0.465		mg/L	0.05			0.46477	06/15/04"	12:58"
243225"	Sn1899"	0.01	U	mg/L	0.01			0.00157	06/15/04"	12:58"
243225"	Sr4215"	0.005	U	mg/L	0.005			0.00141	06/15/04"	12:58"
243225"	Th2837"	0.015	U	mg/L	0.015			-0.00143	06/15/04"	12:58"
243225"	Ti3349"	0.005	U	mg/L	0.005			0.00019	06/15/04"	12:58"
243225"	Tl1908"	0.02	U	mg/L	0.02			0.00190	06/15/04"	12:58"
243225"	U_4090"	0.1	U	mg/L	0.1			0.02786	06/15/04"	12:58"
243225"	V_2924"	0.005	U	mg/L	0.005			0.00002	06/15/04"	12:58"
243225"	W_2079"	0.01	U	mg/L	0.01			0.00147	06/15/04"	12:58"
243225"	Y_3710"	0.005	U	mg/L	0.005			-0.00003	06/15/04"	12:58"
243225"	Zn2062"	0.032		mg/L	0.005			0.03244	06/15/04"	12:58"
243225"	Zr3496"	0.005	U	mg/L	0.005			0.00043	06/15/04"	12:58"
243225d"	Ag3280"	0.005	U	mg/L	0.005			-0.00014	06/15/04"	13:03"
243225d"	Al3082"	0.05	U	mg/L	0.05			-0.00843	06/15/04"	13:03"
243225d"	As1890"	0.005	U	mg/L	0.005			0.00085	06/15/04"	13:03"
243225d"	B_2496"	1.22		mg/L	0.05			1.21835	06/15/04"	13:03"
243225d"	Ba4934"	0.182		mg/L	0.005			0.18163	06/15/04"	13:03"
243225d"	Be3130"	0.005	U	mg/L	0.005			0.00003	06/15/04"	13:03"

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system id	elem	result	qual	units	rl	tv	rec	ug/ml	date	time
243225d"	Bi2230"	0.01	U	mg/L	0.01			0.00118	06/15/04"	13:03"
243225d"	Ca3179"	0.242		mg/L	0.05			0.24219	06/15/04"	13:03"
243225d"	Cd2265"	0.005	U	mg/L	0.005			0.00047	06/15/04"	13:03"
243225d"	Co2286"	0.005	U	mg/L	0.005			0.00105	06/15/04"	13:03"
243225d"	Cr2677"	0.015	U	mg/L	0.015			0.00036	06/15/04"	13:03"
243225d"	Cu3247"	0.005	U	mg/L	0.005			-0.00053	06/15/04"	13:03"
243225d"	Fe2714"	0.1	U	mg/L	0.1			0.00182	06/15/04"	13:03"
243225d"	K_766	NA								
243225d"	La3988"	0.005	U	mg/L	0.005			0.00020	06/15/04"	13:03"
243225d"	Li670	NA								
243225d"	Mg2790"	0.05	U	mg/L	0.05			0.02957	06/15/04"	13:03"
243225d"	Mn2576"	0.005	U	mg/L	0.005			0.00102	06/15/04"	13:03"
243225d"	Mo2020"	0.01	U	mg/L	0.01			0.00030	06/15/04"	13:03"
243225d"	Na589	NA								
243225d"	Ni2316"	0.015		mg/L	0.01			0.01478	06/15/04"	13:03"
243225d"	P_1782"	0.02	U	mg/L	0.02			0.00196	06/15/04"	13:03"
243225d"	Pb220"	0.005	U	mg/L	0.005			-0.00177	06/15/04"	13:03"
243225d"	Pd3404"	0.005	U	mg/L	0.005			-0.00187	06/15/04"	13:03"
243225d"	S_1820"	0.419		mg/L	0.05			0.41930	06/15/04"	13:03"
243225d"	Sb2068"	0.02	U	mg/L	0.02			0.00243	06/15/04"	13:03"
243225d"	Se196"	0.015	U	mg/L	0.015			-0.00019	06/15/04"	13:03"
243225d"	Si2881"	0.456		mg/L	0.05			0.45600	06/15/04"	13:03"
243225d"	Sn1899"	0.01	U	mg/L	0.01			0.00194	06/15/04"	13:03"
243225d"	Sr4215"	0.005	U	mg/L	0.005			0.00137	06/15/04"	13:03"
243225d"	Th2837"	0.015	U	mg/L	0.015			-0.00183	06/15/04"	13:03"
243225d"	Ti3349"	0.005	U	mg/L	0.005			0.00022	06/15/04"	13:03"
243225d"	Tl1908"	0.02	U	mg/L	0.02			0.00119	06/15/04"	13:03"
243225d"	U_4090"	0.1	U	mg/L	0.1			0.00385	06/15/04"	13:03"
243225d"	V_2924"	0.005	U	mg/L	0.005			0.00058	06/15/04"	13:03"
243225d"	W_2079"	0.01	U	mg/L	0.01			-0.00072	06/15/04"	13:03"
243225d"	Y_3710"	0.005	U	mg/L	0.005			-0.00004	06/15/04"	13:03"
243225d"	Zn2062"	0.032		mg/L	0.005			0.03180	06/15/04"	13:03"
243225d"	Zr3496"	0.005	U	mg/L	0.005			0.00006	06/15/04"	13:03"
243226"	Ag3280"	0.005	U	mg/L	0.005			-0.00034	06/15/04"	13:07"
243226"	Al3082"	0.05	U	mg/L	0.05			0.00284	06/15/04"	13:07"
243226"	As1890"	0.005	U	mg/L	0.005			-0.00922	06/15/04"	13:07"
243226"	B_2496"	2.09		mg/L	0.05			2.09115	06/15/04"	13:07"
243226"	Ba4934"	0.273		mg/L	0.005			0.27330	06/15/04"	13:07"
243226"	Be3130"	0.005	U	mg/L	0.005			0.00007	06/15/04"	13:07"
243226"	Bi2230"	0.01	U	mg/L	0.01			-0.00344	06/15/04"	13:07"
243226"	Ca3179"	0.202		mg/L	0.05			0.20178	06/15/04"	13:07"
243226"	Cd2265"	0.005	U	mg/L	0.005			0.00016	06/15/04"	13:07"
243226"	Co2286"	0.005	U	mg/L	0.005			0.00078	06/15/04"	13:07"
243226"	Cr2677"	0.015	U	mg/L	0.015			-0.00023	06/15/04"	13:07"
243226"	Cu3247"	0.005	U	mg/L	0.005			-0.00033	06/15/04"	13:07"
243226"	Fe2714"	0.1	U	mg/L	0.1			-0.00830	06/15/04"	13:07"
243226"	K_766	0.316		mg/L	0.2			0.3161	06/15/04	13:31:11
243226"	La3988"	0.005	U	mg/L	0.005			-0.00032	06/15/04"	13:07"
243226"	Li670	0.01	U	mg/L	0.01			0.0033	06/15/04	13:31:11
243226"	Mg2790"	0.05	U	mg/L	0.05			0.02926	06/15/04"	13:07"
243226"	Mn2576"	0.005	U	mg/L	0.005			0.00111	06/15/04"	13:07"
243226"	Mo2020"	0.01	U	mg/L	0.01			-0.00119	06/15/04"	13:07"
243226"	Na589	4.49		mg/L	0.2			4.4891	06/15/04	13:31:11
243226"	Ni2316"	0.036		mg/L	0.01			0.03557	06/15/04"	13:07"

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system id	elem	result	qual	units	rl	tv	rec	ug/ml	date	time
243226"	P_1782"	0.059		mg/L	0.02			0.05896	06/15/04"	13:07"
243226"	Pb220"	0.005	U	mg/L	0.005			0.00438	06/15/04"	13:07"
243226"	Pd3404"	0.005	U	mg/L	0.005			-0.00188	06/15/04"	13:07"
243226"	S_1820"	0.395		mg/L	0.05			0.39494	06/15/04"	13:07"
243226"	Sb2068"	0.02	U	mg/L	0.02			0.01296	06/15/04"	13:07"
243226"	Se196"	0.05	U	mg/L	0.05			0.03007	06/15/04"	13:07"
243226"	Si2881"	1.57		mg/L	0.05			1.57164	06/15/04"	13:07"
243226"	Sn1899"	0.079		mg/L	0.01			0.07918	06/15/04"	13:07"
243226"	Sr4215"	0.005	U	mg/L	0.005			0.00157	06/15/04"	13:07"
243226"	Th2837"	0.015	U	mg/L	0.015			-0.00050	06/15/04"	13:07"
243226"	Ti3349"	0.005	U	mg/L	0.005			0.00124	06/15/04"	13:07"
243226"	Tl1908"	0.075	U	mg/L	0.075			-0.07278	06/15/04"	13:07"
243226"	U_4090"	0.1	U	mg/L	0.1			-0.00010	06/15/04"	13:07"
243226"	V_2924"	0.005	U	mg/L	0.005			0.00034	06/15/04"	13:07"
243226"	W_2079"	0.01	U	mg/L	0.01			-0.00817	06/15/04"	13:07"
243226"	Y_3710"	0.005	U	mg/L	0.005			-0.00001	06/15/04"	13:07"
243226"	Zn2062"	0.077		mg/L	0.005			0.07729	06/15/04"	13:07"
243226"	Zr3496"	0.005	U	mg/L	0.005			0.00058	06/15/04"	13:07"
243227"	Ag3280"	0.005	U	mg/L	0.005			-0.00038	06/15/04"	13:12"
243227"	Al3082"	0.05	U	mg/L	0.05			0.04515	06/15/04"	13:12"
243227"	As1890"	0.005	U	mg/L	0.005			-0.00135	06/15/04"	13:12"
243227"	B_2496"	2.01		mg/L	0.05			2.01249	06/15/04"	13:12"
243227"	Ba4934"	0.765		mg/L	0.005			0.76532	06/15/04"	13:12"
243227"	Be3130"	0.005	U	mg/L	0.005			0.00005	06/15/04"	13:12"
243227"	Bi2230"	0.01	U	mg/L	0.01			0.00714	06/15/04"	13:12"
243227"	Ca3179"	2.62		mg/L	0.05			2.62002	06/15/04"	13:12"
243227"	Cd2265"	0.005	U	mg/L	0.005			0.00034	06/15/04"	13:12"
243227"	Co2286"	0.005	U	mg/L	0.005			0.00194	06/15/04"	13:12"
243227"	Cr2677"	0.015	U	mg/L	0.015			0.00184	06/15/04"	13:12"
243227"	Cu3247"	0.008		mg/L	0.005			0.00836	06/15/04"	13:12"
243227"	Fe2714"	0.1	U	mg/L	0.1			0.03388	06/15/04"	13:12"
243227"	K_766	9.80		mg/L	0.2			9.8033	06/15/04	13:34:15
243227"	La3988"	0.005	U	mg/L	0.005			0.00002	06/15/04"	13:12"
243227"	Li670	0.01	U	mg/L	0.01			0.0020	06/15/04	13:34:15
243227"	Mg2790"	0.537		mg/L	0.05			0.53739	06/15/04"	13:12"
243227"	Mn2576"	0.049		mg/L	0.005			0.04853	06/15/04"	13:12"
243227"	Mo2020"	0.01	U	mg/L	0.01			0.00114	06/15/04"	13:12"
243227"	Na589	20.1		mg/L	0.2			20.1192	06/15/04	13:34:15
243227"	Ni2316"	0.024		mg/L	0.01			0.02380	06/15/04"	13:12"
243227"	P_1782"	0.02	U	mg/L	0.02			0.00776	06/15/04"	13:12"
243227"	Pb220"	0.005	U	mg/L	0.005			0.00103	06/15/04"	13:12"
243227"	Pd3404"	0.005	U	mg/L	0.005			-0.00160	06/15/04"	13:12"
243227"	S_1820"	1.04		mg/L	0.05			1.03629	06/15/04"	13:12"
243227"	Sb2068"	0.02	U	mg/L	0.02			0.00148	06/15/04"	13:12"
243227"	Se196"	0.015	U	mg/L	0.015			0.00317	06/15/04"	13:12"
243227"	Si2881"	1.54		mg/L	0.05			1.53548	06/15/04"	13:12"
243227"	Sn1899"	0.01	U	mg/L	0.01			0.00687	06/15/04"	13:12"
243227"	Sr4215"	0.014		mg/L	0.005			0.01441	06/15/04"	13:12"
243227"	Th2837"	0.015	U	mg/L	0.015			-0.00089	06/15/04"	13:12"
243227"	Ti3349"	0.005	U	mg/L	0.005			0.00158	06/15/04"	13:12"
243227"	Tl1908"	0.02	U	mg/L	0.02			-0.00424	06/15/04"	13:12"
243227"	U_4090"	0.1	U	mg/L	0.1			0.01053	06/15/04"	13:12"
243227"	V_2924"	0.005	U	mg/L	0.005			0.00091	06/15/04"	13:12"
243227"	W_2079"	0.01	U	mg/L	0.01			-0.00258	06/15/04"	13:12"

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243227"	Y_3710"	0.005	U	mg/L	0.005			0.00000	06/15/04"	13:12"
243227"	Zn2062"	0.268		mg/L	0.005			0.26835	06/15/04"	13:12"
243227"	Zr3496"	0.005	U	mg/L	0.005			0.00054	06/15/04"	13:12"
243228"	Ag3280"	0.005	U	mg/L	0.005			-0.00017	06/15/04"	13:17"
243228"	Al3082"	0.194		mg/L	0.05			0.19406	06/15/04"	13:17"
243228"	As1890"	0.005	U	mg/L	0.005			0.00020	06/15/04"	13:17"
243228"	B_2496"	2.47		mg/L	0.05			2.46841	06/15/04"	13:17"
243228"	Ba4934"	0.464		mg/L	0.005			0.46418	06/15/04"	13:17"
243228"	Be3130"	0.005	U	mg/L	0.005			0.00002	06/15/04"	13:17"
243228"	Bi2230"	0.01	U	mg/L	0.01			0.00398	06/15/04"	13:17"
243228"	Ca3179"	1.31		mg/L	0.05			1.30829	06/15/04"	13:17"
243228"	Cd2265"	0.005	U	mg/L	0.005			0.00029	06/15/04"	13:17"
243228"	Co2286"	0.005	U	mg/L	0.005			0.00091	06/15/04"	13:17"
243228"	Cr2677"	0.015	U	mg/L	0.015			0.00050	06/15/04"	13:17"
243228"	Cu3247"	0.005	U	mg/L	0.005			0.00096	06/15/04"	13:17"
243228"	Fe2714"	0.1	U	mg/L	0.1			0.06261	06/15/04"	13:17"
243228"	K_766	1.26		mg/L	0.2			1.2577	06/15/04	13:37:20
243228"	La3988"	0.005	U	mg/L	0.005			-0.00035	06/15/04"	13:17"
243228"	Li670	0.01	U	mg/L	0.01			0.0029	06/15/04	13:37:20
243228"	Mg2790"	0.364		mg/L	0.05			0.36424	06/15/04"	13:17"
243228"	Mn2576"	0.005	U	mg/L	0.005			0.00037	06/15/04"	13:17"
243228"	Mo2020"	0.01	U	mg/L	0.01			-0.00015	06/15/04"	13:17"
243228"	Na589	7.47		mg/L	0.2			7.4679	06/15/04	13:37:20
243228"	Ni2316"	0.01	U	mg/L	0.01			0.00023	06/15/04"	13:17"
243228"	P_1782"	0.037		mg/L	0.02			0.03730	06/15/04"	13:17"
243228"	Pb220"	0.005	U	mg/L	0.005			0.00135	06/15/04"	13:17"
243228"	Pd3404"	0.005	U	mg/L	0.005			-0.00217	06/15/04"	13:17"
243228"	S_1820"	0.987		mg/L	0.05			0.98693	06/15/04"	13:17"
243228"	Sb2068"	0.02	U	mg/L	0.02			-0.00365	06/15/04"	13:17"
243228"	Se196"	0.015	U	mg/L	0.015			0.00387	06/15/04"	13:17"
243228"	Si2881"	2.97		mg/L	0.05			2.97323	06/15/04"	13:17"
243228"	Sn1899"	0.01	U	mg/L	0.01			0.00405	06/15/04"	13:17"
243228"	Sr4215"	0.008		mg/L	0.005			0.00811	06/15/04"	13:17"
243228"	Th2837"	0.015	U	mg/L	0.015			-0.00379	06/15/04"	13:17"
243228"	Ti3349"	0.007		mg/L	0.005			0.00745	06/15/04"	13:17"
243228"	Tl1908"	0.02	U	mg/L	0.02			0.00098	06/15/04"	13:17"
243228"	U_4090"	0.1	U	mg/L	0.1			0.00440	06/15/04"	13:17"
243228"	V_2924"	0.005	U	mg/L	0.005			0.00107	06/15/04"	13:17"
243228"	W_2079"	0.01	U	mg/L	0.01			-0.00154	06/15/04"	13:17"
243228"	Y_3710"	0.005	U	mg/L	0.005			0.00001	06/15/04"	13:17"
243228"	Zn2062"	0.119		mg/L	0.005			0.11888	06/15/04"	13:17"
243228"	Zr3496"	0.005	U	mg/L	0.005			0.00051	06/15/04"	13:17"
243229"	Ag3280"	0.005	U	mg/L	0.005			-0.00011	06/15/04"	13:37"
243229"	Al3082"	0.05	U	mg/L	0.05			-0.02060	06/15/04"	13:37"
243229"	As1890"	0.005	U	mg/L	0.005			0.00370	06/15/04"	13:37"
243229"	B_2496"	0.142		mg/L	0.05			0.14166	06/15/04"	13:37"
243229"	Ba4934"	0.012		mg/L	0.005			0.01211	06/15/04"	13:37"
243229"	Be3130"	0.005	U	mg/L	0.005			0.00008	06/15/04"	13:37"
243229"	Bi2230"	0.01	U	mg/L	0.01			0.00280	06/15/04"	13:37"
243229"	Ca3179"	24.7		mg/L	0.05			24.72039	06/15/04"	13:37"
243229"	Cd2265"	0.005	U	mg/L	0.005			0.00036	06/15/04"	13:37"
243229"	Co2286"	0.005	U	mg/L	0.005			0.00076	06/15/04"	13:37"
243229"	Cr2677"	0.015	U	mg/L	0.015			0.00000	06/15/04"	13:37"
243229"	Cu3247"	0.005	U	mg/L	0.005			-0.00012	06/15/04"	13:37"

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243229"	Fe2714"	0.1	U	mg/L	0.1			-0.00319	06/15/04"	13:37"
243229"	K_766	5.53		mg/L	0.2			5.5317	06/15/04	13:40:24
243229"	La3988"	0.005	U	mg/L	0.005			-0.00012	06/15/04"	13:37"
243229"	Li670	0.035		mg/L	0.01			0.0352	06/15/04	13:40:24
243229"	Mg2790"	3.29		mg/L	0.05			3.28619	06/15/04"	13:37"
243229"	Mn2576"	0.005	U	mg/L	0.005			0.00000	06/15/04"	13:37"
243229"	Mo2020"	0.01	U	mg/L	0.01			0.00588	06/15/04"	13:37"
243229"	Na589	37.3		mg/L	0.2			37.2965	06/15/04	13:40:24
243229"	Ni2316"	0.01	U	mg/L	0.01			-0.00131	06/15/04"	13:37"
243229"	P_1782"	0.025		mg/L	0.02			0.02484	06/15/04"	13:37"
243229"	Pb220"	0.005	U	mg/L	0.005			-0.00043	06/15/04"	13:37"
243229"	Pd3404"	0.005	U	mg/L	0.005			-0.00257	06/15/04"	13:37"
243229"	S_1820"	8.52		mg/L	0.05			8.52205	06/15/04"	13:37"
243229"	Sb2068"	0.02	U	mg/L	0.02			-0.00008	06/15/04"	13:37"
243229"	Se196"	0.015	U	mg/L	0.015			0.00546	06/15/04"	13:37"
243229"	Si2881"	24.3		mg/L	0.05			24.29212	06/15/04"	13:37"
243229"	Sn1899"	0.016		mg/L	0.01			0.01595	06/15/04"	13:37"
243229"	Sr4215"	0.100		mg/L	0.005			0.10041	06/15/04"	13:37"
243229"	Th2837"	0.015	U	mg/L	0.015			-0.00517	06/15/04"	13:37"
243229"	Ti3349"	0.005	U	mg/L	0.005			-0.00031	06/15/04"	13:37"
243229"	Tl1908"	0.02	U	mg/L	0.02			0.00521	06/15/04"	13:37"
243229"	U_4090"	0.1	U	mg/L	0.1			0.00043	06/15/04"	13:37"
243229"	V_2924"	0.005	U	mg/L	0.005			0.00326	06/15/04"	13:37"
243229"	W_2079"	0.01	U	mg/L	0.01			-0.00160	06/15/04"	13:37"
243229"	Y_3710"	0.005	U	mg/L	0.005			-0.00009	06/15/04"	13:37"
243229"	Zn2062"	0.005	U	mg/L	0.005			0.00221	06/15/04"	13:37"
243229"	Zr3496"	0.005	U	mg/L	0.005			-0.00001	06/15/04"	13:37"
243230"	Ag3280"	0.005	U	mg/L	0.005			0.00013	06/15/04"	13:41"
243230"	Al3082"	0.05	U	mg/L	0.05			0.01895	06/15/04"	13:41"
243230"	As1890"	0.005	U	mg/L	0.005			-0.00265	06/15/04"	13:41"
243230"	B_2496"	0.258		mg/L	0.05			0.25843	06/15/04"	13:41"
243230"	Ba4934"	0.005	U	mg/L	0.005			0.00279	06/15/04"	13:41"
243230"	Be3130"	0.005	U	mg/L	0.005			0.00002	06/15/04"	13:41"
243230"	Bi2230"	0.01	U	mg/L	0.01			-0.00302	06/15/04"	13:41"
243230"	Ca3179"	2.49		mg/L	0.05			2.49218	06/15/04"	13:41"
243230"	Cd2265"	0.005	U	mg/L	0.005			0.00034	06/15/04"	13:41"
243230"	Co2286"	0.005	U	mg/L	0.005			0.00005	06/15/04"	13:41"
243230"	Cr2677"	0.015	U	mg/L	0.015			-0.00056	06/15/04"	13:41"
243230"	Cu3247"	0.005	U	mg/L	0.005			0.00153	06/15/04"	13:41"
243230"	Fe2714"	0.136		mg/L	0.1			0.13575	06/15/04"	13:41"
243230"	K_766	3.81		mg/L	0.2			3.8069	06/15/04	13:53:15
243230"	La3988"	0.005	U	mg/L	0.005			0.00030	06/15/04"	13:41"
243230"	Li670	0.270		mg/L	0.01			0.2696	06/15/04	13:53:15
243230"	Mg2790"	0.112		mg/L	0.05			0.11207	06/15/04"	13:41"
243230"	Mn2576"	0.005	U	mg/L	0.005			0.00367	06/15/04"	13:41"
243230"	Mo2020"	0.046		mg/L	0.01			0.04588	06/15/04"	13:41"
243230"	Na589	206		mg/L	0.2			205.8112	06/15/04	13:53:15
243230"	Ni2316"	0.01	U	mg/L	0.01			-0.00082	06/15/04"	13:41"
243230"	P_1782"	0.057		mg/L	0.02			0.05706	06/15/04"	13:41"
243230"	Pb220"	0.005	U	mg/L	0.005			0.00388	06/15/04"	13:41"
243230"	Pd3404"	0.005	U	mg/L	0.005			-0.00002	06/15/04"	13:41"
243230"	S_1820"	10.4		mg/L	0.05			10.40335	06/15/04"	13:41"
243230"	Sb2068"	0.02	U	mg/L	0.02			0.01376	06/15/04"	13:41"
243230"	Se196"	0.05	U	mg/L	0.05			0.02561	06/15/04"	13:41"

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system id	elem	result	qual	units	rl	tv	rec	ug/ml	date	time
243230"	Si2881"	7.88		mg/L	0.05			7.88349	06/15/04"	13:41"
243230"	Sn1899"	0.062		mg/L	0.01			0.06231	06/15/04"	13:41"
243230"	Sr4215"	0.007		mg/L	0.005			0.00696	06/15/04"	13:41"
243230"	Th2837"	0.015	U	mg/L	0.015			-0.00020	06/15/04"	13:41"
243230"	Ti3349"	0.005	U	mg/L	0.005			-0.00013	06/15/04"	13:41"
243230"	Tl1908"	0.075	U	mg/L	0.075			-0.07505	06/15/04"	13:41"
243230"	U_4090"	0.1	U	mg/L	0.1			-0.00299	06/15/04"	13:41"
243230"	V_2924"	0.005	U	mg/L	0.005			-0.00034	06/15/04"	13:41"
243230"	W_2079"	0.01	U	mg/L	0.01			0.00136	06/15/04"	13:41"
243230"	Y_3710"	0.005	U	mg/L	0.005			-0.00001	06/15/04"	13:41"
243230"	Zn2062"	0.005	U	mg/L	0.005			0.00008	06/15/04"	13:41"
243230"	Zr3496"	0.005	U	mg/L	0.005			0.00010	06/15/04"	13:41"
243230d	K_766	3.82		mg/L	0.2			3.8217	06/15/04	13:56:19
243230d	Li670	0.265		mg/L	0.01			0.2654	06/15/04	13:56:19
243230d	Na589	203		mg/L	0.2			202.7277	06/15/04	13:56:19
243231"	Ag3280"	0.005	U	mg/L	0.005			-0.00044	06/15/04"	13:46"
243231"	Al3082"	0.05	U	mg/L	0.05			-0.01994	06/15/04"	13:46"
243231"	As1890"	0.010		mg/L	0.005			0.00960	06/15/04"	13:46"
243231"	B_2496"	0.136		mg/L	0.05			0.13600	06/15/04"	13:46"
243231"	Ba4934"	0.008		mg/L	0.005			0.00813	06/15/04"	13:46"
243231"	Be3130"	0.005	U	mg/L	0.005			0.00011	06/15/04"	13:46"
243231"	Bi2230"	0.01	U	mg/L	0.01			0.00182	06/15/04"	13:46"
243231"	Ca3179"	13.3		mg/L	0.05			13.29359	06/15/04"	13:46"
243231"	Cd2265"	0.005	U	mg/L	0.005			0.00015	06/15/04"	13:46"
243231"	Co2286"	0.005	U	mg/L	0.005			0.00094	06/15/04"	13:46"
243231"	Cr2677"	0.015	U	mg/L	0.015			-0.00012	06/15/04"	13:46"
243231"	Cu3247"	0.005	U	mg/L	0.005			-0.00056	06/15/04"	13:46"
243231"	Fe2714"	0.1	U	mg/L	0.1			0.01436	06/15/04"	13:46"
243231"	K_766	5.68		mg/L	0.2			5.6802	06/15/04	13:59:23
243231"	La3988"	0.005	U	mg/L	0.005			0.00002	06/15/04"	13:46"
243231"	Li670	0.038		mg/L	0.01			0.0381	06/15/04	13:59:23
243231"	Mg2790"	2.05		mg/L	0.05			2.05341	06/15/04"	13:46"
243231"	Mn2576"	0.006		mg/L	0.005			0.00565	06/15/04"	13:46"
243231"	Mo2020"	0.01	U	mg/L	0.01			0.00976	06/15/04"	13:46"
243231"	Na589	41.9		mg/L	0.2			41.9194	06/15/04	13:59:23
243231"	Ni2316"	0.01	U	mg/L	0.01			0.00021	06/15/04"	13:46"
243231"	P_1782"	0.02	U	mg/L	0.02			0.01870	06/15/04"	13:46"
243231"	Pb220"	0.005	U	mg/L	0.005			-0.00014	06/15/04"	13:46"
243231"	Pd3404"	0.005	U	mg/L	0.005			0.00176	06/15/04"	13:46"
243231"	S_1820"	6.96		mg/L	0.05			6.95732	06/15/04"	13:46"
243231"	Sb2068"	0.02	U	mg/L	0.02			0.00281	06/15/04"	13:46"
243231"	Se196"	0.015	U	mg/L	0.015			0.00352	06/15/04"	13:46"
243231"	Si2881"	25.7		mg/L	0.05			25.68427	06/15/04"	13:46"
243231"	Sn1899"	0.013		mg/L	0.01			0.01292	06/15/04"	13:46"
243231"	Sr4215"	0.067		mg/L	0.005			0.06656	06/15/04"	13:46"
243231"	Th2837"	0.015	U	mg/L	0.015			-0.00306	06/15/04"	13:46"
243231"	Ti3349"	0.005	U	mg/L	0.005			-0.00031	06/15/04"	13:46"
243231"	Tl1908"	0.02	U	mg/L	0.02			-0.00893	06/15/04"	13:46"
243231"	U_4090"	0.1	U	mg/L	0.1			0.01220	06/15/04"	13:46"
243231"	V_2924"	0.006		mg/L	0.005			0.00562	06/15/04"	13:46"
243231"	W_2079"	0.01	U	mg/L	0.01			0.00058	06/15/04"	13:46"
243231"	Y_3710"	0.005	U	mg/L	0.005			-0.00007	06/15/04"	13:46"
243231"	Zn2062"	0.005	U	mg/L	0.005			0.00162	06/15/04"	13:46"
243231"	Zr3496"	0.005	U	mg/L	0.005			0.00023	06/15/04"	13:46"

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243231s"	Ag3280"	0.051		mg/L	0.005	0.05	102.5%	0.05126	06/15/04"	13:51"
243231s"	Al3082"	1.95		mg/L	0.05	2	97.3%	1.94636	06/15/04"	13:51"
243231s"	As1890"	2.04		mg/L	0.005	2	101.7%	2.04387	06/15/04"	13:51"
243231s"	B_2496"	0.141		mg/L	0.05			0.14074	06/15/04"	13:51"
243231s"	Ba4934"	2.03		mg/L	0.005	2	100.9%	2.02688	06/15/04"	13:51"
243231s"	Be3130"	0.049		mg/L	0.005	0.05	98.7%	0.04937	06/15/04"	13:51"
243231s"	Bi2230"	0.01	U	mg/L	0.01			0.00819	06/15/04"	13:51"
243231s"	Ca3179"	33.7		mg/L	0.05	20	101.9%	33.68361	06/15/04"	13:51"
243231s"	Cd2265"	0.050		mg/L	0.005	0.05	99.5%	0.04974	06/15/04"	13:51"
243231s"	Co2286"	0.501		mg/L	0.005	0.5	100.2%	0.50096	06/15/04"	13:51"
243231s"	Cr2677"	0.197		mg/L	0.015	0.2	98.5%	0.19705	06/15/04"	13:51"
243231s"	Cu3247"	0.252		mg/L	0.005	0.25	100.8%	0.25190	06/15/04"	13:51"
243231s"	Fe2714"	1.08		mg/L	0.1	1	108.4%	1.08374	06/15/04"	13:51"
243231s"	K_766	NA								
243231s"	La3988"	0.005	U	mg/L	0.005			0.00010	06/15/04"	13:51"
243231s"	Li670	NA								
243231s"	Mg2790"	22.4		mg/L	0.05	20	101.5%	22.35152	06/15/04"	13:51"
243231s"	Mn2576"	0.509		mg/L	0.005	0.5	100.6%	0.50902	06/15/04"	13:51"
243231s"	Mo2020"	0.011		mg/L	0.01			0.01103	06/15/04"	13:51"
243231s"	Na589	NA								
243231s"	Ni2316"	0.490		mg/L	0.01	0.5	98.0%	0.48997	06/15/04"	13:51"
243231s"	P_1782"	0.029		mg/L	0.02			0.02887	06/15/04"	13:51"
243231s"	Pb220"	0.497		mg/L	0.005	0.5	99.3%	0.49663	06/15/04"	13:51"
243231s"	Pd3404"	0.005	U	mg/L	0.005			0.00004	06/15/04"	13:51"
243231s"	S_1820"	7.04		mg/L	0.05			7.03781	06/15/04"	13:51"
243231s"	Sb2068"	0.505		mg/L	0.02	0.5	101.1%	0.50545	06/15/04"	13:51"
243231s"	Se196"	2.23		mg/L	0.015	2	111.6%	2.23159	06/15/04"	13:51"
243231s"	Si2881"	25.9		mg/L	0.05			25.88962	06/15/04"	13:51"
243231s"	Sn1899"	0.013		mg/L	0.01			0.01266	06/15/04"	13:51"
243231s"	Sr4215"	0.067		mg/L	0.005			0.06747	06/15/04"	13:51"
243231s"	Th2837"	0.015	U	mg/L	0.015			-0.01570	06/15/04"	13:51"
243231s"	Ti3349"	0.005	U	mg/L	0.005			-0.00019	06/15/04"	13:51"
243231s"	Tl1908"	2.08		mg/L	0.02	2	103.8%	2.07547	06/15/04"	13:51"
243231s"	U_4090"	0.1	U	mg/L	0.1			0.00811	06/15/04"	13:51"
243231s"	V_2924"	0.505		mg/L	0.005	0.5	99.8%	0.50501	06/15/04"	13:51"
243231s"	W_2079"	0.01	U	mg/L	0.01			0.00070	06/15/04"	13:51"
243231s"	Y_3710"	0.005	U	mg/L	0.005			-0.00008	06/15/04"	13:51"
243231s"	Zn2062"	0.509		mg/L	0.005	0.5	101.8%	0.50897	06/15/04"	13:51"
243231s"	Zr3496"	0.005	U	mg/L	0.005			0.00014	06/15/04"	13:51"
243232"	Ag3280"	0.005	U	mg/L	0.005			-0.00015	06/15/04"	13:56"
243232"	Al3082"	0.05	U	mg/L	0.05			0.00710	06/15/04"	13:56"
243232"	As1890"	0.008		mg/L	0.005			0.00778	06/15/04"	13:56"
243232"	B_2496"	0.142		mg/L	0.05			0.14230	06/15/04"	13:56"
243232"	Ba4934"	0.014		mg/L	0.005			0.01383	06/15/04"	13:56"
243232"	Be3130"	0.005	U	mg/L	0.005			0.00014	06/15/04"	13:56"
243232"	Bi2230"	0.01	U	mg/L	0.01			0.00387	06/15/04"	13:56"
243232"	Ca3179"	12.8		mg/L	0.05			12.79881	06/15/04"	13:56"
243232"	Cd2265"	0.005	U	mg/L	0.005			0.00023	06/15/04"	13:56"
243232"	Co2286"	0.005	U	mg/L	0.005			0.00000	06/15/04"	13:56"
243232"	Cr2677"	0.015	U	mg/L	0.015			0.00032	06/15/04"	13:56"
243232"	Cu3247"	0.005	U	mg/L	0.005			-0.00028	06/15/04"	13:56"
243232"	Fe2714"	0.1	U	mg/L	0.1			0.00607	06/15/04"	13:56"
243232"	K_766	3.82		mg/L	0.2			3.8210	06/15/04	14:02:28
243232"	La3988"	0.005	U	mg/L	0.005			-0.00007	06/15/04"	13:56"

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243232"	Li670	0.045		mg/L	0.01			0.0448	06/15/04	14:02:28
243232"	Mg2790"	1.07		mg/L	0.05			1.06501	06/15/04"	13:56"
243232"	Mn2576"	0.005	U	mg/L	0.005			0.00023	06/15/04"	13:56"
243232"	Mo2020"	0.01	U	mg/L	0.01			0.00428	06/15/04"	13:56"
243232"	Na589	48.6		mg/L	0.2			48.5507	06/15/04	14:02:28
243232"	Ni2316"	0.01	U	mg/L	0.01			-0.00068	06/15/04"	13:56"
243232"	P_1782"	0.02	U	mg/L	0.02			0.00877	06/15/04"	13:56"
243232"	Pb220"	0.005	U	mg/L	0.005			-0.00057	06/15/04"	13:56"
243232"	Pd3404"	0.005	U	mg/L	0.005			-0.00137	06/15/04"	13:56"
243232"	S_1820"	8.09		mg/L	0.05			8.09277	06/15/04"	13:56"
243232"	Sb2068"	0.02	U	mg/L	0.02			0.00151	06/15/04"	13:56"
243232"	Se196"	0.015	U	mg/L	0.015			0.00391	06/15/04"	13:56"
243232"	Si2881"	26.2		mg/L	0.05			26.22082	06/15/04"	13:56"
243232"	Sn1899"	0.012		mg/L	0.01			0.01230	06/15/04"	13:56"
243232"	Sr4215"	0.071		mg/L	0.005			0.07071	06/15/04"	13:56"
243232"	Th2837"	0.015	U	mg/L	0.015			-0.00233	06/15/04"	13:56"
243232"	Ti3349"	0.005	U	mg/L	0.005			-0.00012	06/15/04"	13:56"
243232"	Tl1908"	0.02	U	mg/L	0.02			-0.00938	06/15/04"	13:56"
243232"	U_4090"	0.1	U	mg/L	0.1			0.02237	06/15/04"	13:56"
243232"	V_2924"	0.007		mg/L	0.005			0.00667	06/15/04"	13:56"
243232"	W_2079"	0.01	U	mg/L	0.01			0.00052	06/15/04"	13:56"
243232"	Y_3710"	0.005	U	mg/L	0.005			-0.00009	06/15/04"	13:56"
243232"	Zn2062"	0.005	U	mg/L	0.005			-0.00096	06/15/04"	13:56"
243232"	Zr3496"	0.005	U	mg/L	0.005			-0.00014	06/15/04"	13:56"
243232s	K_766	24.1		mg/L	0.2	20	101.3%	24.0845	06/15/04	14:06:02
243232s	Li670	0.046		mg/L	0.01			0.0462	06/15/04	14:06:02
243232s	Na589	68.6		mg/L	0.2	20	99.8%	68.5664	06/15/04	14:06:02
245108"	Ag3280"	0.005	U	mg/L	0.005			-0.00012	06/15/04"	14:00"
245108"	Al3082"	0.05	U	mg/L	0.05			-0.01246	06/15/04"	14:00"
245108"	As1890"	0.006		mg/L	0.005			0.00613	06/15/04"	14:00"
245108"	B_2496"	0.145		mg/L	0.05			0.14501	06/15/04"	14:00"
245108"	Ba4934"	0.011		mg/L	0.005			0.01058	06/15/04"	14:00"
245108"	Be3130"	0.005	U	mg/L	0.005			0.00017	06/15/04"	14:00"
245108"	Bi2230"	0.01	U	mg/L	0.01			0.00215	06/15/04"	14:00"
245108"	Ca3179"	13.6		mg/L	0.05			13.58609	06/15/04"	14:00"
245108"	Cd2265"	0.005	U	mg/L	0.005			0.00004	06/15/04"	14:00"
245108"	Co2286"	0.005	U	mg/L	0.005			0.00120	06/15/04"	14:00"
245108"	Cr2677"	0.015	U	mg/L	0.015			0.00032	06/15/04"	14:00"
245108"	Cu3247"	0.005	U	mg/L	0.005			0.00053	06/15/04"	14:00"
245108"	Fe2714"	0.1	U	mg/L	0.1			0.01202	06/15/04"	14:00"
245108"	K_766	3.59		mg/L	0.2			3.5922	06/15/04	14:09:07
245108"	La3988"	0.005	U	mg/L	0.005			0.00013	06/15/04"	14:00"
245108"	Li670	0.042		mg/L	0.01			0.0417	06/15/04	14:09:07
245108"	Mg2790"	1.34		mg/L	0.05			1.34495	06/15/04"	14:00"
245108"	Mn2576"	0.005	U	mg/L	0.005			0.00174	06/15/04"	14:00"
245108"	Mo2020"	0.01	U	mg/L	0.01			0.00819	06/15/04"	14:00"
245108"	Na589	51.7		mg/L	0.2			51.6882	06/15/04	14:09:07
245108"	Ni2316"	0.01	U	mg/L	0.01			0.00000	06/15/04"	14:00"
245108"	P_1782"	0.02	U	mg/L	0.02			0.01716	06/15/04"	14:00"
245108"	Pb220"	0.005	U	mg/L	0.005			-0.00151	06/15/04"	14:00"
245108"	Pd3404"	0.005	U	mg/L	0.005			0.00060	06/15/04"	14:00"
245108"	S_1820"	9.43		mg/L	0.05			9.42693	06/15/04"	14:00"
245108"	Sb2068"	0.02	U	mg/L	0.02			-0.00049	06/15/04"	14:00"
245108"	Se196"	0.015	U	mg/L	0.015			0.00025	06/15/04"	14:00"

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245108"	Si2881"	19.7		mg/L	0.05			19.70862	06/15/04"	14:00"
245108"	Sn1899"	0.01	U	mg/L	0.01			0.00415	06/15/04"	14:00"
245108"	Sr4215"	0.075		mg/L	0.005			0.07474	06/15/04"	14:00"
245108"	Th2837"	0.015	U	mg/L	0.015			-0.00297	06/15/04"	14:00"
245108"	Ti3349"	0.005	U	mg/L	0.005			-0.00026	06/15/04"	14:00"
245108"	Tl1908"	0.02	U	mg/L	0.02			-0.00225	06/15/04"	14:00"
245108"	U_4090"	0.1	U	mg/L	0.1			0.01539	06/15/04"	14:00"
245108"	V_2924"	0.013		mg/L	0.005			0.01334	06/15/04"	14:00"
245108"	W_2079"	0.01	U	mg/L	0.01			0.00567	06/15/04"	14:00"
245108"	Y_3710"	0.005	U	mg/L	0.005			-0.00013	06/15/04"	14:00"
245108"	Zn2062"	0.005	U	mg/L	0.005			0.00154	06/15/04"	14:00"
245108"	Zr3496"	0.005	U	mg/L	0.005			0.00061	06/15/04"	14:00"
245108d"	Ag3280"	0.005	U	mg/L	0.005			-0.00002	06/15/04"	14:05"
245108d"	Al3082"	0.05	U	mg/L	0.05			-0.02038	06/15/04"	14:05"
245108d"	As1890"	0.009		mg/L	0.005			0.00854	06/15/04"	14:05"
245108d"	B_2496"	0.140		mg/L	0.05			0.13992	06/15/04"	14:05"
245108d"	Ba4934"	0.010		mg/L	0.005			0.01033	06/15/04"	14:05"
245108d"	Be3130"	0.005	U	mg/L	0.005			0.00020	06/15/04"	14:05"
245108d"	Bi2230"	0.01	U	mg/L	0.01			0.00460	06/15/04"	14:05"
245108d"	Ca3179"	13.2		mg/L	0.05			13.20116	06/15/04"	14:05"
245108d"	Cd2265"	0.005	U	mg/L	0.005			0.00044	06/15/04"	14:05"
245108d"	Co2286"	0.005	U	mg/L	0.005			0.00004	06/15/04"	14:05"
245108d"	Cr2677"	0.015	U	mg/L	0.015			-0.00036	06/15/04"	14:05"
245108d"	Cu3247"	0.005	U	mg/L	0.005			0.00058	06/15/04"	14:05"
245108d"	Fe2714"	0.1	U	mg/L	0.1			0.00315	06/15/04"	14:05"
245108d"	K_766	3.58		mg/L	0.2			3.5812	06/15/04	14:12:11
245108d"	La3988"	0.005	U	mg/L	0.005			0.00000	06/15/04"	14:05"
245108d"	Li670	0.043		mg/L	0.01			0.0425	06/15/04	14:12:11
245108d"	Mg2790"	1.31		mg/L	0.05			1.30866	06/15/04"	14:05"
245108d"	Mn2576"	0.005	U	mg/L	0.005			0.00158	06/15/04"	14:05"
245108d"	Mo2020"	0.01	U	mg/L	0.01			0.00826	06/15/04"	14:05"
245108d"	Na589	51.8		mg/L	0.2			51.7678	06/15/04	14:12:11
245108d"	Ni2316"	0.01	U	mg/L	0.01			0.00068	06/15/04"	14:05"
245108d"	P_1782"	0.02	U	mg/L	0.02			0.01283	06/15/04"	14:05"
245108d"	Pb220"	0.005	U	mg/L	0.005			-0.00035	06/15/04"	14:05"
245108d"	Pd3404"	0.005	U	mg/L	0.005			-0.00075	06/15/04"	14:05"
245108d"	S_1820"	9.20		mg/L	0.05			9.20236	06/15/04"	14:05"
245108d"	Sb2068"	0.02	U	mg/L	0.02			0.00174	06/15/04"	14:05"
245108d"	Se196"	0.015	U	mg/L	0.015			0.00108	06/15/04"	14:05"
245108d"	Si2881"	19.1		mg/L	0.05			19.13470	06/15/04"	14:05"
245108d"	Sn1899"	0.01	U	mg/L	0.01			0.00501	06/15/04"	14:05"
245108d"	Sr4215"	0.073		mg/L	0.005			0.07274	06/15/04"	14:05"
245108d"	Th2837"	0.015	U	mg/L	0.015			-0.00187	06/15/04"	14:05"
245108d"	Ti3349"	0.005	U	mg/L	0.005			-0.00013	06/15/04"	14:05"
245108d"	Tl1908"	0.02	U	mg/L	0.02			-0.00342	06/15/04"	14:05"
245108d"	U_4090"	0.1	U	mg/L	0.1			0.01616	06/15/04"	14:05"
245108d"	V_2924"	0.013		mg/L	0.005			0.01314	06/15/04"	14:05"
245108d"	W_2079"	0.01	U	mg/L	0.01			0.00355	06/15/04"	14:05"
245108d"	Y_3710"	0.005	U	mg/L	0.005			-0.00004	06/15/04"	14:05"
245108d"	Zn2062"	0.005	U	mg/L	0.005			0.00277	06/15/04"	14:05"
245108d"	Zr3496"	0.005	U	mg/L	0.005			0.00043	06/15/04"	14:05"
245108s"	Ag3280"	0.050		mg/L	0.005	0.05	100.9%	0.05043	06/15/04"	14:10"
245108s"	Al3082"	1.94		mg/L	0.05	2	97.0%	1.93996	06/15/04"	14:10"
245108s"	As1890"	2.03		mg/L	0.005	2	101.1%	2.02830	06/15/04"	14:10"

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245108s"	B_2496"	0.142		mg/L	0.05			0.14203	06/15/04"	14:10"
245108s"	Ba4934"	2.01		mg/L	0.005	2	99.8%	2.00761	06/15/04"	14:10"
245108s"	Be3130"	0.049		mg/L	0.005	0.05	97.8%	0.04892	06/15/04"	14:10"
245108s"	Bi2230"	0.01	U	mg/L	0.01			0.00733	06/15/04"	14:10"
245108s"	Ca3179"	33.8		mg/L	0.05	20	100.9%	33.77074	06/15/04"	14:10"
245108s"	Cd2265"	0.049		mg/L	0.005	0.05	98.4%	0.04920	06/15/04"	14:10"
245108s"	Co2286"	0.498		mg/L	0.005	0.5	99.6%	0.49792	06/15/04"	14:10"
245108s"	Cr2677"	0.195		mg/L	0.015	0.2	97.6%	0.19523	06/15/04"	14:10"
245108s"	Cu3247"	0.251		mg/L	0.005	0.25	100.5%	0.25133	06/15/04"	14:10"
245108s"	Fe2714"	1.06		mg/L	0.1	1	106.0%	1.06004	06/15/04"	14:10"
245108s"	K_766	24.1		mg/L	0.2	20	102.8%	24.1459	06/15/04	14:15:15
245108s"	La3988"	0.005	U	mg/L	0.005			-0.00017	06/15/04"	14:10"
245108s"	Li670	0.042		mg/L	0.01			0.0422	06/15/04	14:15:15
245108s"	Mg2790"	21.8		mg/L	0.05	20	102.1%	21.75639	06/15/04"	14:10"
245108s"	Mn2576"	0.501		mg/L	0.005	0.5	100.1%	0.50070	06/15/04"	14:10"
245108s"	Mo2020"	0.01	U	mg/L	0.01			0.00901	06/15/04"	14:10"
245108s"	Na589	72.1		mg/L	0.2	20	101.9%	72.0863	06/15/04	14:15:15
245108s"	Ni2316"	0.482		mg/L	0.01	0.5	96.5%	0.48245	06/15/04"	14:10"
245108s"	P_1782"	0.023		mg/L	0.02			0.02298	06/15/04"	14:10"
245108s"	Pb220"	0.494		mg/L	0.005	0.5	98.8%	0.49408	06/15/04"	14:10"
245108s"	Pd3404"	0.005	U	mg/L	0.005			-0.00092	06/15/04"	14:10"
245108s"	S_1820"	9.31		mg/L	0.05			9.31152	06/15/04"	14:10"
245108s"	Sb2068"	0.501		mg/L	0.02	0.5	100.3%	0.50131	06/15/04"	14:10"
245108s"	Se196"	2.17		mg/L	0.015	2	108.6%	2.17253	06/15/04"	14:10"
245108s"	Si2881"	19.4		mg/L	0.05			19.42317	06/15/04"	14:10"
245108s"	Sn1899"	0.01	U	mg/L	0.01			0.00309	06/15/04"	14:10"
245108s"	Sr4215"	0.074		mg/L	0.005			0.07378	06/15/04"	14:10"
245108s"	Th2837"	0.015	U	mg/L	0.015			-0.01507	06/15/04"	14:10"
245108s"	Ti3349"	0.005	U	mg/L	0.005			-0.00026	06/15/04"	14:10"
245108s"	Tl1908"	2.08		mg/L	0.02	2	104.0%	2.07903	06/15/04"	14:10"
245108s"	U_4090"	0.1	U	mg/L	0.1			0.00060	06/15/04"	14:10"
245108s"	V_2924"	0.507		mg/L	0.005	0.5	98.8%	0.50713	06/15/04"	14:10"
245108s"	W_2079"	0.01	U	mg/L	0.01			0.00700	06/15/04"	14:10"
245108s"	Y_3710"	0.005	U	mg/L	0.005			-0.00018	06/15/04"	14:10"
245108s"	Zn2062"	0.508		mg/L	0.005	0.5	101.7%	0.50840	06/15/04"	14:10"
245108s"	Zr3496"	0.005	U	mg/L	0.005			0.00003	06/15/04"	14:10"
245109"	Ag3280"	0.005	U	mg/L	0.005			-0.00010	06/15/04"	14:15"
245109"	Al3082"	0.084		mg/L	0.05			0.08377	06/15/04"	14:15"
245109"	As1890"	0.017		mg/L	0.005			0.01671	06/15/04"	14:15"
245109"	B_2496"	0.167		mg/L	0.05			0.16706	06/15/04"	14:15"
245109"	Ba4934"	0.007		mg/L	0.005			0.00741	06/15/04"	14:15"
245109"	Be3130"	0.005	U	mg/L	0.005			0.00024	06/15/04"	14:15"
245109"	Bi2230"	0.01	U	mg/L	0.01			0.00180	06/15/04"	14:15"
245109"	Ca3179"	6.69		mg/L	0.05			6.69064	06/15/04"	14:15"
245109"	Cd2265"	0.005	U	mg/L	0.005			0.00069	06/15/04"	14:15"
245109"	Co2286"	0.005	U	mg/L	0.005			0.00079	06/15/04"	14:15"
245109"	Cr2677"	0.015	U	mg/L	0.015			0.00088	06/15/04"	14:15"
245109"	Cu3247"	0.005	U	mg/L	0.005			0.00096	06/15/04"	14:15"
245109"	Fe2714"	0.1	U	mg/L	0.1			0.03502	06/15/04"	14:15"
245109"	K_766	2.76		mg/L	0.2			2.7615	06/15/04	14:18:19
245109"	La3988"	0.005	U	mg/L	0.005			-0.00002	06/15/04"	14:15"
245109"	Li670	0.089		mg/L	0.01			0.0889	06/15/04	14:18:19
245109"	Mg2790"	0.550		mg/L	0.05			0.54993	06/15/04"	14:15"
245109"	Mn2576"	0.005	U	mg/L	0.005			0.00061	06/15/04"	14:15"

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245109"	Mo2020"	0.01	U	mg/L	0.01			0.00646	06/15/04"	14:15"
245109"	Na589	77.2		mg/L	0.2			77.1561	06/15/04	14:18:19
245109"	Ni2316"	0.01	U	mg/L	0.01			-0.00032	06/15/04"	14:15"
245109"	P_1782"	0.033		mg/L	0.02			0.03319	06/15/04"	14:15"
245109"	Pb220"	0.005	U	mg/L	0.005			0.00076	06/15/04"	14:15"
245109"	Pd3404"	0.005	U	mg/L	0.005			0.00015	06/15/04"	14:15"
245109"	S_1820"	7.36		mg/L	0.05			7.35884	06/15/04"	14:15"
245109"	Sb2068"	0.02	U	mg/L	0.02			0.00200	06/15/04"	14:15"
245109"	Se196"	0.015	U	mg/L	0.015			0.00585	06/15/04"	14:15"
245109"	Si2881"	25.6		mg/L	0.05			25.62435	06/15/04"	14:15"
245109"	Sn1899"	0.01	U	mg/L	0.01			0.00801	06/15/04"	14:15"
245109"	Sr4215"	0.031		mg/L	0.005			0.03147	06/15/04"	14:15"
245109"	Th2837"	0.015	U	mg/L	0.015			-0.00032	06/15/04"	14:15"
245109"	Ti3349"	0.005	U	mg/L	0.005			0.00056	06/15/04"	14:15"
245109"	Tl1908"	0.02	U	mg/L	0.02			-0.00642	06/15/04"	14:15"
245109"	U_4090"	0.1	U	mg/L	0.1			0.00299	06/15/04"	14:15"
245109"	V_2924"	0.005	U	mg/L	0.005			0.00473	06/15/04"	14:15"
245109"	W_2079"	0.01	U	mg/L	0.01			0.00064	06/15/04"	14:15"
245109"	Y_3710"	0.005	U	mg/L	0.005			0.00006	06/15/04"	14:15"
245109"	Zn2062"	0.005	U	mg/L	0.005			0.00279	06/15/04"	14:15"
245109"	Zr3496"	0.005	U	mg/L	0.005			0.00085	06/15/04"	14:15"
245110"	Ag3280"	0.005	U	mg/L	0.005			-0.00048	06/15/04"	14:20"
245110"	Al3082"	0.05	U	mg/L	0.05			-0.02370	06/15/04"	14:20"
245110"	As1890"	0.007		mg/L	0.005			0.00737	06/15/04"	14:20"
245110"	B_2496"	0.141		mg/L	0.05			0.14082	06/15/04"	14:20"
245110"	Ba4934"	0.011		mg/L	0.005			0.01066	06/15/04"	14:20"
245110"	Be3130"	0.005	U	mg/L	0.005			0.00022	06/15/04"	14:20"
245110"	Bi2230"	0.01	U	mg/L	0.01			0.00246	06/15/04"	14:20"
245110"	Ca3179"	13.6		mg/L	0.05			13.63298	06/15/04"	14:20"
245110"	Cd2265"	0.005	U	mg/L	0.005			0.00000	06/15/04"	14:20"
245110"	Co2286"	0.005	U	mg/L	0.005			0.00091	06/15/04"	14:20"
245110"	Cr2677"	0.015	U	mg/L	0.015			-0.00106	06/15/04"	14:20"
245110"	Cu3247"	0.005	U	mg/L	0.005			-0.00037	06/15/04"	14:20"
245110"	Fe2714"	0.1	U	mg/L	0.1			0.00296	06/15/04"	14:20"
245110"	K_766	3.71		mg/L	0.2			3.7062	06/15/04	14:21:23
245110"	La3988"	0.005	U	mg/L	0.005			-0.00042	06/15/04"	14:20"
245110"	Li670	0.044		mg/L	0.01			0.0436	06/15/04	14:21:23
245110"	Mg2790"	1.34		mg/L	0.05			1.34392	06/15/04"	14:20"
245110"	Mn2576"	0.005	U	mg/L	0.005			0.00163	06/15/04"	14:20"
245110"	Mo2020"	0.01	U	mg/L	0.01			0.00798	06/15/04"	14:20"
245110"	Na589	52.8		mg/L	0.2			52.7663	06/15/04	14:21:23
245110"	Ni2316"	0.01	U	mg/L	0.01			0.00093	06/15/04"	14:20"
245110"	P_1782"	0.027		mg/L	0.02			0.02714	06/15/04"	14:20"
245110"	Pb220"	0.005	U	mg/L	0.005			-0.00082	06/15/04"	14:20"
245110"	Pd3404"	0.005	U	mg/L	0.005			-0.00164	06/15/04"	14:20"
245110"	S_1820"	9.46		mg/L	0.05			9.45732	06/15/04"	14:20"
245110"	Sb2068"	0.02	U	mg/L	0.02			0.00397	06/15/04"	14:20"
245110"	Se196"	0.015	U	mg/L	0.015			0.00383	06/15/04"	14:20"
245110"	Si2881"	19.6		mg/L	0.05			19.64123	06/15/04"	14:20"
245110"	Sn1899"	0.017		mg/L	0.01			0.01658	06/15/04"	14:20"
245110"	Sr4215"	0.075		mg/L	0.005			0.07517	06/15/04"	14:20"
245110"	Th2837"	0.015	U	mg/L	0.015			-0.00175	06/15/04"	14:20"
245110"	Ti3349"	0.005	U	mg/L	0.005			-0.00029	06/15/04"	14:20"
245110"	Tl1908"	0.02	U	mg/L	0.02			-0.01743	06/15/04"	14:20"

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245110"	U_4090"	0.1	U	mg/L	0.1			0.00769	06/15/04"	14:20"
245110"	V_2924"	0.013		mg/L	0.005			0.01326	06/15/04"	14:20"
245110"	W_2079"	0.01	U	mg/L	0.01			-0.00068	06/15/04"	14:20"
245110"	Y_3710"	0.005	U	mg/L	0.005			-0.00014	06/15/04"	14:20"
245110"	Zn2062"	0.005	U	mg/L	0.005			-0.00016	06/15/04"	14:20"
245110"	Zr3496"	0.005	U	mg/L	0.005			0.00020	06/15/04"	14:20"
245111"	Ag3280"	0.005	U	mg/L	0.005			0.00000	06/15/04"	14:39"
245111"	Al3082"	0.396		mg/L	0.05			0.39623	06/15/04"	14:39"
245111"	As1890"	0.010		mg/L	0.005			0.00993	06/15/04"	14:39"
245111"	B_2496"	0.171		mg/L	0.05			0.17053	06/15/04"	14:39"
245111"	Ba4934"	0.008		mg/L	0.005			0.00812	06/15/04"	14:39"
245111"	Be3130"	0.005	U	mg/L	0.005			0.00029	06/15/04"	14:39"
245111"	Bi2230"	0.01	U	mg/L	0.01			0.00311	06/15/04"	14:39"
245111"	Ca3179"	6.97		mg/L	0.05			6.96974	06/15/04"	14:39"
245111"	Cd2265"	0.005	U	mg/L	0.005			0.00009	06/15/04"	14:39"
245111"	Co2286"	0.005	U	mg/L	0.005			0.00077	06/15/04"	14:39"
245111"	Cr2677"	0.015	U	mg/L	0.015			0.00064	06/15/04"	14:39"
245111"	Cu3247"	0.005	U	mg/L	0.005			0.00052	06/15/04"	14:39"
245111"	Fe2714"	0.138		mg/L	0.1			0.13786	06/15/04"	14:39"
245111"	K_766	2.89		mg/L	0.2			2.8883	06/15/04	14:34:14
245111"	La3988"	0.005	U	mg/L	0.005			0.00075	06/15/04"	14:39"
245111"	Li670	0.093		mg/L	0.01			0.0932	06/15/04	14:34:14
245111"	Mg2790"	0.604		mg/L	0.05			0.60413	06/15/04"	14:39"
245111"	Mn2576"	0.005	U	mg/L	0.005			0.00083	06/15/04"	14:39"
245111"	Mo2020"	0.01	U	mg/L	0.01			0.00923	06/15/04"	14:39"
245111"	Na589	80.3		mg/L	0.2			80.2902	06/15/04	14:34:14
245111"	Ni2316"	0.01	U	mg/L	0.01			0.00093	06/15/04"	14:39"
245111"	P_1782"	0.039		mg/L	0.02			0.03884	06/15/04"	14:39"
245111"	Pb220"	0.005	U	mg/L	0.005			0.00260	06/15/04"	14:39"
245111"	Pd3404"	0.005	U	mg/L	0.005			0.00034	06/15/04"	14:39"
245111"	S_1820"	7.42		mg/L	0.05			7.42317	06/15/04"	14:39"
245111"	Sb2068"	0.02	U	mg/L	0.02			0.00097	06/15/04"	14:39"
245111"	Se196"	0.015	U	mg/L	0.015			0.00800	06/15/04"	14:39"
245111"	Si2881"	27.0		mg/L	0.05			26.99124	06/15/04"	14:39"
245111"	Sn1899"	0.023		mg/L	0.01			0.02337	06/15/04"	14:39"
245111"	Sr4215"	0.033		mg/L	0.005			0.03319	06/15/04"	14:39"
245111"	Th2837"	0.015	U	mg/L	0.015			-0.00114	06/15/04"	14:39"
245111"	Ti3349"	0.005	U	mg/L	0.005			0.00363	06/15/04"	14:39"
245111"	Tl1908"	0.02	U	mg/L	0.02			-0.00486	06/15/04"	14:39"
245111"	U_4090"	0.1	U	mg/L	0.1			0.02911	06/15/04"	14:39"
245111"	V_2924"	0.005	U	mg/L	0.005			0.00495	06/15/04"	14:39"
245111"	W_2079"	0.01	U	mg/L	0.01			0.00000	06/15/04"	14:39"
245111"	Y_3710"	0.005	U	mg/L	0.005			0.00017	06/15/04"	14:39"
245111"	Zn2062"	0.005	U	mg/L	0.005			0.00171	06/15/04"	14:39"
245111"	Zr3496"	0.005	U	mg/L	0.005			0.00129	06/15/04"	14:39"
245112"	Ag3280"	0.005	U	mg/L	0.005			-0.00030	06/15/04"	14:44"
245112"	Al3082"	0.05	U	mg/L	0.05			-0.01757	06/15/04"	14:44"
245112"	As1890"	0.005	U	mg/L	0.005			-0.00103	06/15/04"	14:44"
245112"	B_2496"	0.05	U	mg/L	0.05			-0.00168	06/15/04"	14:44"
245112"	Ba4934"	0.005	U	mg/L	0.005			0.00014	06/15/04"	14:44"
245112"	Be3130"	0.005	U	mg/L	0.005			0.00029	06/15/04"	14:44"
245112"	Bi2230"	0.01	U	mg/L	0.01			0.00554	06/15/04"	14:44"
245112"	Ca3179"	10.0		mg/L	0.05			10.01406	06/15/04"	14:44"
245112"	Cd2265"	0.005	U	mg/L	0.005			0.00102	06/15/04"	14:44"

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245112"	Co2286"	0.005	U	mg/L	0.005			0.00085	06/15/04"	14:44"
245112"	Cr2677"	0.015	U	mg/L	0.015			-0.00022	06/15/04"	14:44"
245112"	Cu3247"	0.005	U	mg/L	0.005			0.00006	06/15/04"	14:44"
245112"	Fe2714"	10.1		mg/L	0.1			10.13740	06/15/04"	14:44"
245112"	K_766	9.08		mg/L	0.2			9.0834	06/15/04	14:37:18
245112"	La3988"	0.005	U	mg/L	0.005			-0.00030	06/15/04"	14:44"
245112"	Li670	0.01	U	mg/L	0.01			0.0015	06/15/04	14:37:18
245112"	Mg2790"	9.84		mg/L	0.05			9.83796	06/15/04"	14:44"
245112"	Mn2576"	0.005	U	mg/L	0.005			-0.00003	06/15/04"	14:44"
245112"	Mo2020"	0.01	U	mg/L	0.01			0.00182	06/15/04"	14:44"
245112"	Na589	8.94		mg/L	0.2			8.9422	06/15/04	14:37:18
245112"	Ni2316"	0.01	U	mg/L	0.01			-0.00030	06/15/04"	14:44"
245112"	P_1782"	0.02	U	mg/L	0.02			0.00779	06/15/04"	14:44"
245112"	Pb220"	0.005	U	mg/L	0.005			0.00174	06/15/04"	14:44"
245112"	Pd3404"	0.005	U	mg/L	0.005			-0.00138	06/15/04"	14:44"
245112"	S_1820"	0.05	U	mg/L	0.05			-0.02917	06/15/04"	14:44"
245112"	Sb2068"	0.02	U	mg/L	0.02			-0.00127	06/15/04"	14:44"
245112"	Se196"	0.015	U	mg/L	0.015			-0.00280	06/15/04"	14:44"
245112"	Si2881"	0.05	U	mg/L	0.05			0.00677	06/15/04"	14:44"
245112"	Sn1899"	0.01	U	mg/L	0.01			0.00041	06/15/04"	14:44"
245112"	Sr4215"	0.005	U	mg/L	0.005			0.00021	06/15/04"	14:44"
245112"	Th2837"	0.015	U	mg/L	0.015			-0.00970	06/15/04"	14:44"
245112"	Ti3349"	0.005	U	mg/L	0.005			0.00029	06/15/04"	14:44"
245112"	Tl1908"	0.02	U	mg/L	0.02			0.00765	06/15/04"	14:44"
245112"	U_4090"	0.1	U	mg/L	0.1			0.01455	06/15/04"	14:44"
245112"	V_2924"	0.005	U	mg/L	0.005			-0.00039	06/15/04"	14:44"
245112"	W_2079"	0.01	U	mg/L	0.01			-0.00232	06/15/04"	14:44"
245112"	Y_3710"	0.005	U	mg/L	0.005			-0.00012	06/15/04"	14:44"
245112"	Zn2062"	0.005	U	mg/L	0.005			0.00039	06/15/04"	14:44"
245112"	Zr3496"	0.005	U	mg/L	0.005			0.00011	06/15/04"	14:44"
245113"	Ag3280"	0.100		mg/L	0.005			0.10009	06/15/04"	14:49"
245113"	Al3082"	0.075		mg/L	0.05			0.07520	06/15/04"	14:49"
245113"	As1890"	0.092		mg/L	0.005			0.09205	06/15/04"	14:49"
245113"	B_2496"	0.05	U	mg/L	0.05			-0.00325	06/15/04"	14:49"
245113"	Ba4934"	0.101		mg/L	0.005			0.10052	06/15/04"	14:49"
245113"	Be3130"	0.097		mg/L	0.005			0.09660	06/15/04"	14:49"
245113"	Bi2230"	0.01	U	mg/L	0.01			-0.00116	06/15/04"	14:49"
245113"	Ca3179"	9.96		mg/L	0.05			9.95879	06/15/04"	14:49"
245113"	Cd2265"	0.100		mg/L	0.005			0.09956	06/15/04"	14:49"
245113"	Co2286"	0.099		mg/L	0.005			0.09875	06/15/04"	14:49"
245113"	Cr2677"	0.097		mg/L	0.015			0.09681	06/15/04"	14:49"
245113"	Cu3247"	0.096		mg/L	0.005			0.09593	06/15/04"	14:49"
245113"	Fe2714"	10.1		mg/L	0.1			10.11630	06/15/04"	14:49"
245113"	K_766	8.99		mg/L	0.2			8.9893	06/15/04	14:40:22
245113"	La3988"	0.005	U	mg/L	0.005			-0.00027	06/15/04"	14:49"
245113"	Li670	0.01	U	mg/L	0.01			0.0020	06/15/04	14:40:22
245113"	Mg2790"	9.77		mg/L	0.05			9.77278	06/15/04"	14:49"
245113"	Mn2576"	0.101		mg/L	0.005			0.10069	06/15/04"	14:49"
245113"	Mo2020"	0.092		mg/L	0.01			0.09239	06/15/04"	14:49"
245113"	Na589	8.91		mg/L	0.2			8.9059	06/15/04	14:40:22
245113"	Ni2316"	0.098		mg/L	0.01			0.09824	06/15/04"	14:49"
245113"	P_1782"	0.02	U	mg/L	0.02			0.00441	06/15/04"	14:49"
245113"	Pb220"	0.099		mg/L	0.005			0.09874	06/15/04"	14:49"
245113"	Pd3404"	0.005	U	mg/L	0.005			-0.00129	06/15/04"	14:49"

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245113"	S_1820"	0.05	U	mg/L	0.05			-0.04056	06/15/04"	14:49"
245113"	Sb2068"	0.096		mg/L	0.02			0.09574	06/15/04"	14:49"
245113"	Se196"	0.094		mg/L	0.015			0.09388	06/15/04"	14:49"
245113"	Si2881"	0.05	U	mg/L	0.05			0.00695	06/15/04"	14:49"
245113"	Sn1899"	0.01	U	mg/L	0.01			-0.00094	06/15/04"	14:49"
245113"	Sr4215"	9.91		mg/L	0.005			9.91195	06/15/04"	14:49"
245113"	Th2837"	0.091		mg/L	0.015			0.09090	06/15/04"	14:49"
245113"	Ti3349"	0.005	U	mg/L	0.005			0.00005	06/15/04"	14:49"
245113"	Tl1908"	0.103		mg/L	0.02			0.10306	06/15/04"	14:49"
245113"	U_4090"	0.1	U	mg/L	0.1			0.03286	06/15/04"	14:49"
245113"	V_2924"	0.098		mg/L	0.005			0.09802	06/15/04"	14:49"
245113"	W_2079"	0.01	U	mg/L	0.01			-0.00022	06/15/04"	14:49"
245113"	Y_3710"	0.005	U	mg/L	0.005			-0.00009	06/15/04"	14:49"
245113"	Zn2062"	0.099		mg/L	0.005			0.09861	06/15/04"	14:49"
245113"	Zr3496"	0.005	U	mg/L	0.005			-0.00027	06/15/04"	14:49"
245114"	Ag3280"	0.005	U	mg/L	0.005			-0.00012	06/15/04"	14:54"
245114"	Al3082"	0.05	U	mg/L	0.05			-0.02662	06/15/04"	14:54"
245114"	As1890"	0.005	U	mg/L	0.005			-0.00248	06/15/04"	14:54"
245114"	B_2496"	0.05	U	mg/L	0.05			-0.00238	06/15/04"	14:54"
245114"	Ba4934"	0.005	U	mg/L	0.005			0.00007	06/15/04"	14:54"
245114"	Be3130"	0.005	U	mg/L	0.005			0.00028	06/15/04"	14:54"
245114"	Bi2230"	0.01	U	mg/L	0.01			0.00532	06/15/04"	14:54"
245114"	Ca3179"	0.05	U	mg/L	0.05			-0.00018	06/15/04"	14:54"
245114"	Cd2265"	0.005	U	mg/L	0.005			0.00031	06/15/04"	14:54"
245114"	Co2286"	0.005	U	mg/L	0.005			0.00056	06/15/04"	14:54"
245114"	Cr2677"	0.015	U	mg/L	0.015			-0.00043	06/15/04"	14:54"
245114"	Cu3247"	0.005	U	mg/L	0.005			-0.00027	06/15/04"	14:54"
245114"	Fe2714"	0.1	U	mg/L	0.1			-0.00667	06/15/04"	14:54"
245114"	K_766	0.2	U	mg/L	0.2			0.0893	06/15/04	14:43:26
245114"	La3988"	0.005	U	mg/L	0.005			0.00042	06/15/04"	14:54"
245114"	Li670	0.01	U	mg/L	0.01			0.0016	06/15/04	14:43:26
245114"	Mg2790"	0.05	U	mg/L	0.05			0.00030	06/15/04"	14:54"
245114"	Mn2576"	0.005	U	mg/L	0.005			0.00000	06/15/04"	14:54"
245114"	Mo2020"	0.01	U	mg/L	0.01			0.00091	06/15/04"	14:54"
245114"	Na589	0.2	U	mg/L	0.2			-0.0468	06/15/04	14:43:26
245114"	Ni2316"	0.01	U	mg/L	0.01			0.00030	06/15/04"	14:54"
245114"	P_1782"	0.02	U	mg/L	0.02			0.00610	06/15/04"	14:54"
245114"	Pb220"	0.005	U	mg/L	0.005			-0.00056	06/15/04"	14:54"
245114"	Pd3404"	0.005	U	mg/L	0.005			0.00044	06/15/04"	14:54"
245114"	S_1820"	0.05	U	mg/L	0.05			-0.03566	06/15/04"	14:54"
245114"	Sb2068"	0.02	U	mg/L	0.02			-0.00493	06/15/04"	14:54"
245114"	Se196"	0.015	U	mg/L	0.015			-0.00115	06/15/04"	14:54"
245114"	Si2881"	0.05	U	mg/L	0.05			0.00611	06/15/04"	14:54"
245114"	Sn1899"	0.01	U	mg/L	0.01			-0.00165	06/15/04"	14:54"
245114"	Sr4215"	0.005	U	mg/L	0.005			0.00011	06/15/04"	14:54"
245114"	Th2837"	0.015	U	mg/L	0.015			-0.00182	06/15/04"	14:54"
245114"	Ti3349"	0.005	U	mg/L	0.005			0.00001	06/15/04"	14:54"
245114"	Tl1908"	0.02	U	mg/L	0.02			0.00043	06/15/04"	14:54"
245114"	U_4090"	0.1	U	mg/L	0.1			0.00701	06/15/04"	14:54"
245114"	V_2924"	0.005	U	mg/L	0.005			-0.00010	06/15/04"	14:54"
245114"	W_2079"	0.01	U	mg/L	0.01			-0.00148	06/15/04"	14:54"
245114"	Y_3710"	0.005	U	mg/L	0.005			-0.00003	06/15/04"	14:54"
245114"	Zn2062"	0.005	U	mg/L	0.005			-0.00144	06/15/04"	14:54"
245114"	Zr3496"	0.005	U	mg/L	0.005			0.00005	06/15/04"	14:54"

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245115"	Ag3280"	0.005	U	mg/L	0.005			0.00025	06/15/04"	14:58"
245115"	Al3082"	0.336		mg/L	0.05			0.33616	06/15/04"	14:58"
245115"	As1890"	0.005		mg/L	0.005			0.00522	06/15/04"	14:58"
245115"	B_2496"	0.142		mg/L	0.05			0.14155	06/15/04"	14:58"
245115"	Ba4934"	0.012		mg/L	0.005			0.01175	06/15/04"	14:58"
245115"	Be3130"	0.005	U	mg/L	0.005			0.00029	06/15/04"	14:58"
245115"	Bi2230"	0.01	U	mg/L	0.01			-0.00036	06/15/04"	14:58"
245115"	Ca3179"	14.0		mg/L	0.05			13.97375	06/15/04"	14:58"
245115"	Cd2265"	0.005	U	mg/L	0.005			0.00048	06/15/04"	14:58"
245115"	Co2286"	0.005	U	mg/L	0.005			0.00067	06/15/04"	14:58"
245115"	Cr2677"	0.015	U	mg/L	0.015			-0.00023	06/15/04"	14:58"
245115"	Cu3247"	0.005	U	mg/L	0.005			0.00074	06/15/04"	14:58"
245115"	Fe2714"	0.182		mg/L	0.1			0.18186	06/15/04"	14:58"
245115"	K_766	3.69		mg/L	0.2			3.6892	06/15/04	14:47:00
245115"	La3988"	0.005	U	mg/L	0.005			0.00027	06/15/04"	14:58"
245115"	Li670	0.043		mg/L	0.01			0.0434	06/15/04	14:47:00
245115"	Mg2790"	1.42		mg/L	0.05			1.41956	06/15/04"	14:58"
245115"	Mn2576"	0.005	U	mg/L	0.005			0.00452	06/15/04"	14:58"
245115"	Mo2020"	0.01	U	mg/L	0.01			0.00790	06/15/04"	14:58"
245115"	Na589	52.3		mg/L	0.2			52.2764	06/15/04	14:47:00
245115"	Ni2316"	0.01	U	mg/L	0.01			0.00012	06/15/04"	14:58"
245115"	P_1782"	0.037		mg/L	0.02			0.03718	06/15/04"	14:58"
245115"	Pb220"	0.005	U	mg/L	0.005			-0.00030	06/15/04"	14:58"
245115"	Pd3404"	0.005	U	mg/L	0.005			-0.00215	06/15/04"	14:58"
245115"	S_1820"	9.50		mg/L	0.05			9.50225	06/15/04"	14:58"
245115"	Sb2068"	0.02	U	mg/L	0.02			0.00236	06/15/04"	14:58"
245115"	Se196"	0.015	U	mg/L	0.015			0.00503	06/15/04"	14:58"
245115"	Si2881"	20.7		mg/L	0.05			20.73791	06/15/04"	14:58"
245115"	Sn1899"	0.01	U	mg/L	0.01			0.00891	06/15/04"	14:58"
245115"	Sr4215"	0.077		mg/L	0.005			0.07695	06/15/04"	14:58"
245115"	Th2837"	0.015	U	mg/L	0.015			-0.00073	06/15/04"	14:58"
245115"	Ti3349"	0.005	U	mg/L	0.005			0.00379	06/15/04"	14:58"
245115"	Tl1908"	0.02	U	mg/L	0.02			-0.00902	06/15/04"	14:58"
245115"	U_4090"	0.1	U	mg/L	0.1			0.00985	06/15/04"	14:58"
245115"	V_2924"	0.014		mg/L	0.005			0.01362	06/15/04"	14:58"
245115"	W_2079"	0.01	U	mg/L	0.01			-0.00187	06/15/04"	14:58"
245115"	Y_3710"	0.005	U	mg/L	0.005			0.00009	06/15/04"	14:58"
245115"	Zn2062"	0.005	U	mg/L	0.005			0.00114	06/15/04"	14:58"
245115"	Zr3496"	0.005	U	mg/L	0.005			0.00113	06/15/04"	14:58"
245116"	Ag3280"	0.005	U	mg/L	0.005			-0.00031	06/15/04"	15:03"
245116"	Al3082"	0.498		mg/L	0.05			0.49776	06/15/04"	15:03"
245116"	As1890"	0.005	U	mg/L	0.005			0.00188	06/15/04"	15:03"
245116"	B_2496"	0.172		mg/L	0.05			0.17214	06/15/04"	15:03"
245116"	Ba4934"	0.008		mg/L	0.005			0.00835	06/15/04"	15:03"
245116"	Be3130"	0.005	U	mg/L	0.005			0.00035	06/15/04"	15:03"
245116"	Bi2230"	0.01	U	mg/L	0.01			0.00210	06/15/04"	15:03"
245116"	Ca3179"	7.31		mg/L	0.05			7.31458	06/15/04"	15:03"
245116"	Cd2265"	0.005	U	mg/L	0.005			0.00019	06/15/04"	15:03"
245116"	Co2286"	0.005	U	mg/L	0.005			0.00125	06/15/04"	15:03"
245116"	Cr2677"	0.015	U	mg/L	0.015			0.00020	06/15/04"	15:03"
245116"	Cu3247"	0.005	U	mg/L	0.005			0.00049	06/15/04"	15:03"
245116"	Fe2714"	0.167		mg/L	0.1			0.16654	06/15/04"	15:03"
245116"	K_766	2.96		mg/L	0.2			2.9600	06/15/04	14:50:04
245116"	La3988"	0.005	U	mg/L	0.005			0.00050	06/15/04"	15:03"

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010050

system id	elem	result	qual	units	rl	tv	rec	ug/ml	date	time
245116"	Li670	0.100		mg/L	0.01			0.0995	06/15/04	14:50:04
245116"	Mg2790"	0.640		mg/L	0.05			0.64045	06/15/04"	15:03"
245116"	Mn2576"	0.005	U	mg/L	0.005			0.00119	06/15/04"	15:03"
245116"	Mo2020"	0.01	U	mg/L	0.01			0.00519	06/15/04"	15:03"
245116"	Na589	85.3		mg/L	0.2			85.3419	06/15/04	14:50:04
245116"	Ni2316"	0.01	U	mg/L	0.01			0.00020	06/15/04"	15:03"
245116"	P_1782"	0.039		mg/L	0.02			0.03913	06/15/04"	15:03"
245116"	Pb220"	0.005	U	mg/L	0.005			0.00125	06/15/04"	15:03"
245116"	Pd3404"	0.005	U	mg/L	0.005			0.00003	06/15/04"	15:03"
245116"	S_1820"	7.57		mg/L	0.05			7.56595	06/15/04"	15:03"
245116"	Sb2068"	0.02	U	mg/L	0.02			0.00438	06/15/04"	15:03"
245116"	Se196"	0.015	U	mg/L	0.015			0.00833	06/15/04"	15:03"
245116"	Si2881"	27.8		mg/L	0.05			27.83803	06/15/04"	15:03"
245116"	Sn1899"	0.027		mg/L	0.01			0.02658	06/15/04"	15:03"
245116"	Sr4215"	0.036		mg/L	0.005			0.03553	06/15/04"	15:03"
245116"	Th2837"	0.015	U	mg/L	0.015			0.00044	06/15/04"	15:03"
245116"	Ti3349"	0.005	U	mg/L	0.005			0.00430	06/15/04"	15:03"
245116"	Tl1908"	0.02	U	mg/L	0.02			-0.02628	06/15/04"	15:03"
245116"	U_4090"	0.1	U	mg/L	0.1			0.01155	06/15/04"	15:03"
245116"	V_2924"	0.005	U	mg/L	0.005			0.00360	06/15/04"	15:03"
245116"	W_2079"	0.01	U	mg/L	0.01			-0.00520	06/15/04"	15:03"
245116"	Y_3710"	0.005	U	mg/L	0.005			0.00011	06/15/04"	15:03"
245116"	Zn2062"	0.005	U	mg/L	0.005			0.00210	06/15/04"	15:03"
245116"	Zr3496"	0.005	U	mg/L	0.005			0.00120	06/15/04"	15:03"
lcsw-F15W1"	Ag3280"	0.050		mg/L	0.005	0.05	101.0%	0.05048	06/15/04"	12:39"
lcsw-F15W1"	Al3082"	1.91		mg/L	0.05	2	95.4%	1.90805	06/15/04"	12:39"
lcsw-F15W1"	As1890"	1.99		mg/L	0.005	2	99.7%	1.99471	06/15/04"	12:39"
lcsw-F15W1"	B_2496"	0.05	U	mg/L	0.05			0.00225	06/15/04"	12:39"
lcsw-F15W1"	Ba4934"	2.01		mg/L	0.005	2	100.6%	2.01247	06/15/04"	12:39"
lcsw-F15W1"	Be3130"	0.049		mg/L	0.005	0.05	98.8%	0.04939	06/15/04"	12:39"
lcsw-F15W1"	Bi2230"	0.01	U	mg/L	0.01			0.00485	06/15/04"	12:39"
lcsw-F15W1"	Ca3179"	21.0		mg/L	0.05	20	104.8%	20.95761	06/15/04"	12:39"
lcsw-F15W1"	Cd2265"	0.050		mg/L	0.005	0.05	99.3%	0.04966	06/15/04"	12:39"
lcsw-F15W1"	Co2286"	0.499		mg/L	0.005	0.5	99.8%	0.49923	06/15/04"	12:39"
lcsw-F15W1"	Cr2677"	0.208		mg/L	0.015	0.2	104.2%	0.20842	06/15/04"	12:39"
lcsw-F15W1"	Cu3247"	0.252		mg/L	0.005	0.25	100.8%	0.25189	06/15/04"	12:39"
lcsw-F15W1"	Fe2714"	1.14		mg/L	0.1	1	114.1%	1.14084	06/15/04"	12:39"
lcsw-F15E2	K_766	19.2		mg/L	0.2	20	95.8%	19.1528	06/15/04	13:15:21
lcsw-F15W1"	La3988"	0.005	U	mg/L	0.005			0.00026	06/15/04"	12:39"
lcsw-F15E2	Li670	0.01	U	mg/L	0.01			-0.0006	06/15/04	13:15:21
lcsw-F15W1"	Mg2790"	20.7		mg/L	0.05	20	103.4%	20.68613	06/15/04"	12:39"
lcsw-F15W1"	Mn2576"	0.504		mg/L	0.005	0.5	100.7%	0.50362	06/15/04"	12:39"
lcsw-F15W1"	Mo2020"	0.01	U	mg/L	0.01			0.00089	06/15/04"	12:39"
lcsw-F15E2	Na589	19.1		mg/L	0.2	20	95.3%	19.0508	06/15/04	13:15:21
lcsw-F15W1"	Ni2316"	0.498		mg/L	0.01	0.5	99.6%	0.49792	06/15/04"	12:39"
lcsw-F15W1"	P_1782"	0.02	U	mg/L	0.02			-0.00113	06/15/04"	12:39"
lcsw-F15W1"	Pb220"	0.497		mg/L	0.005	0.5	99.4%	0.49702	06/15/04"	12:39"
lcsw-F15W1"	Pd3404"	0.005	U	mg/L	0.005			0.00077	06/15/04"	12:39"
lcsw-F15W1"	S_1820"	0.05	U	mg/L	0.05			0.00167	06/15/04"	12:39"
lcsw-F15W1"	Sb2068"	0.490		mg/L	0.02	0.5	97.9%	0.48964	06/15/04"	12:39"
lcsw-F15W1"	Se196"	2.04		mg/L	0.015	2	101.8%	2.03529	06/15/04"	12:39"
lcsw-F15W1"	Si2881"	0.050	U	mg/L	0.05			0.02767	06/15/04"	12:39"
lcsw-F15W1"	Sn1899"	0.01	U	mg/L	0.01			-0.00142	06/15/04"	12:39"
lcsw-F15W1"	Sr4215"	0.005	U	mg/L	0.005			0.00074	06/15/04"	12:39"

Div 20
to#040415-2, 040521-6
06002.01.141

010051

system id	elem	result	qual	units	rl	tv	rec	ug/ml	date	time
lcsw-F15W1"	Th2837"	0.015	U	mg/L	0.015			-0.01280	06/15/04"	12:39"
lcsw-F15W1"	Ti3349"	0.005	U	mg/L	0.005			0.00015	06/15/04"	12:39"
lcsw-F15W1"	Tl1908"	2.06		mg/L	0.02	2	102.9%	2.05851	06/15/04"	12:39"
lcsw-F15W1"	U_4090"	0.1	U	mg/L	0.1			-0.00082	06/15/04"	12:39"
lcsw-F15W1"	V_2924"	0.498		mg/L	0.005	0.5	99.6%	0.49807	06/15/04"	12:39"
lcsw-F15W1"	W_2079"	0.01	U	mg/L	0.01			-0.00013	06/15/04"	12:39"
lcsw-F15W1"	Y_3710"	0.005	U	mg/L	0.005			-0.00012	06/15/04"	12:39"
lcsw-F15W1"	Zn2062"	0.497		mg/L	0.005	0.5	99.4%	0.49694	06/15/04"	12:39"
lcsw-F15W1"	Zr3496"	0.005	U	mg/L	0.005			0.00027	06/15/04"	12:39"
pbw-F15E1	Ag3280"	0.005	U	mg/L	0.005			0.00078	06/15/04"	12:34"
pbw-F15E1	Al3082"	0.05	U	mg/L	0.05			0.00668	06/15/04"	12:34"
pbw-F15E1	As1890"	0.005	U	mg/L	0.005			-0.00197	06/15/04"	12:34"
pbw-F15E1	B_2496"	0.05	U	mg/L	0.05			0.00335	06/15/04"	12:34"
pbw-F15E1	Ba4934"	0.005	U	mg/L	0.005			0.00005	06/15/04"	12:34"
pbw-F15E1	Be3130"	0.005	U	mg/L	0.005			0.00000	06/15/04"	12:34"
pbw-F15E1	Bi2230"	0.01	U	mg/L	0.01			0.00318	06/15/04"	12:34"
pbw-F15E1	Ca3179"	0.05	U	mg/L	0.05			0.01301	06/15/04"	12:34"
pbw-F15E1	Cd2265"	0.005	U	mg/L	0.005			0.00051	06/15/04"	12:34"
pbw-F15E1	Co2286"	0.005	U	mg/L	0.005			0.00090	06/15/04"	12:34"
pbw-F15E1	Cr2677"	0.015	U	mg/L	0.015			0.01298	06/15/04"	12:34"
pbw-F15E1	Cu3247"	0.005	U	mg/L	0.005			0.00011	06/15/04"	12:34"
pbw-F15E1	Fe2714"	0.1	U	mg/L	0.1			0.09873	06/15/04"	12:34"
pbw-F15E2	K_766	0.2	U	mg/L	0.2			-0.0828	06/15/04	13:12:17
pbw-F15E1	La3988"	0.005	U	mg/L	0.005			0.00112	06/15/04"	12:34"
pbw-F15E2	Li670	0.01	U	mg/L	0.01			0.0006	06/15/04	13:12:17
pbw-F15E1	Mg2790"	0.05	U	mg/L	0.05			0.00807	06/15/04"	12:34"
pbw-F15E1	Mn2576"	0.005	U	mg/L	0.005			0.00133	06/15/04"	12:34"
pbw-F15E1	Mo2020"	0.01	U	mg/L	0.01			0.00206	06/15/04"	12:34"
pbw-F15E2	Na589	0.2	U	mg/L	0.2			-0.0511	06/15/04	13:12:17
pbw-F15E1	Ni2316"	0.01	U	mg/L	0.01			0.00815	06/15/04"	12:34"
pbw-F15E1	P_1782"	0.02	U	mg/L	0.02			0.00398	06/15/04"	12:34"
pbw-F15E1	Pb220"	0.005	U	mg/L	0.005			0.00006	06/15/04"	12:34"
pbw-F15E1	Pd3404"	0.005	U	mg/L	0.005			0.00414	06/15/04"	12:34"
pbw-F15E1	S_1820"	0.05	U	mg/L	0.05			0.00535	06/15/04"	12:34"
pbw-F15E1	Sb2068"	0.02	U	mg/L	0.02			0.00509	06/15/04"	12:34"
pbw-F15E1	Se196"	0.015	U	mg/L	0.015			-0.00115	06/15/04"	12:34"
pbw-F15E1	Si2881"	0.050	U	mg/L	0.05			0.02544	06/15/04"	12:34"
pbw-F15E1	Sn1899"	0.01	U	mg/L	0.01			-0.00098	06/15/04"	12:34"
pbw-F15E1	Sr4215"	0.005	U	mg/L	0.005			0.00005	06/15/04"	12:34"
pbw-F15E1	Th2837"	0.015	U	mg/L	0.015			-0.00158	06/15/04"	12:34"
pbw-F15E1	Ti3349"	0.005	U	mg/L	0.005			-0.00003	06/15/04"	12:34"
pbw-F15E1	Tl1908"	0.02	U	mg/L	0.02			0.00076	06/15/04"	12:34"
pbw-F15E1	U_4090"	0.1	U	mg/L	0.1			0.04867	06/15/04"	12:34"
pbw-F15E1	V_2924"	0.005	U	mg/L	0.005			0.00034	06/15/04"	12:34"
pbw-F15E1	W_2079"	0.01	U	mg/L	0.01			0.00027	06/15/04"	12:34"
pbw-F15E1	Y_3710"	0.005	U	mg/L	0.005			0.00000	06/15/04"	12:34"
pbw-F15E1	Zn2062"	0.005	U	mg/L	0.005			0.00047	06/15/04"	12:34"
pbw-F15E1	Zr3496"	0.005	U	mg/L	0.005			0.00077	06/15/04"	12:34"

TRACE METALS PREPARATORY LABORATORY DIGESTION LOG

SOUTHWEST RESEARCH INSTITUTE
SAN ANTONIO, TEXAS 78228

BOOK / PAGE: 56 214

CLIENT(S): Div. 20 010052
TASK ORDER(S): 040415-2/040521-6 SDG(S): 243222 / 245108
PROJECT NO(S): 06002-01-141
METHOD: 3005A___ 3050B___ 3050B-7.5___ 3010A___ 3020A___ 7760A___ 7740A___ $HClO_4$___ H_2SO_4 Sb___
Microwave___ Fusion___ Teflon___ Rock___ OTHER Str. Aliquot (Trace #2)
MATRIX: Water ✓ Soil___ Biota___ Solid___ Liquid___ TCLP Ext___ OTHER___
INSTRUMENT: GFAA___ ICP ✓ ICP-MS___ IC___ FLAA___ HYDRIDE___ OTHER___
ACID INORG #: HNO_3# ** HCl# ** H_2SO_4#___ $HClO_4$#___ HF#___
INTERNAL STD: Sc @ 10 PPM ✓ Be @ 10 PPM___ SOURCE: IV INORG# ISS 02-101-02 EXP: 7-15-04 AMT: 50µl
Oven/Hotplate ID: N/A Temperature (°C):___

SAMPLE IDENTIFICATION	pH	WT (g)	I.V. (mL)	F.V. (mL)	
PBW-F15E1			5	5	
LCSW-F15E1 *			↓	↓	
KE 6/15/04 ~~245~~ 243222			↓	↓	
23r			↓	↓	
~~23r~~ KE 6/15/04			—	—	
24r			5	5	
25r			↓	↓	
25dr			↓	↓	
26r			↓	↓	
27r			↓	↓	
28r			↓	↓	
29r			↓	↓	
30r			↓	↓	
31r			↓	↓	
31 Sr *			↓	↓	
32r			↓	↓	
245108r			↓	↓	
dr			↓	↓	
Sr *			↓	↓	
109r			↓	↓	
110r			↓	↓	
111r			↓	↓	
112r			↓	↓	
113r			↓	↓	
114r			↓	↓	
115r			↓	↓	
116r			↓	↓	
*50µl spike-1 (Spex, # 4306, exp 10/04)					
20µl ICAC-1 (Spex, # 4514, exp 3/05)					LOCATION:
**RLB 02-042-02 1% HNO_3, 5% HCl.			(PBW/LCSW only)		N/A

PREPARED BY: [signature] DATE: 6-15-04
REVIEWED BY: John Wilt DATE: 6-15-04
DISPOSAL INT/DATE/LOC:___

FRM-191 (Rev 2/Mar 03)

TRACE METALS PREPARATORY LABORATORY DIGESTION LOG

SOUTHWEST RESEARCH INSTITUTE
SAN ANTONIO, TEXAS 78228

BOOK / PAGE: 56 215

CLIENT(S): Div. 20 (Spectro) ~~010053~~
TASK ORDER(S): 040415-2 / 040521-6 SDG(S): 243222 / 245108
PROJECT NO(S): 06002.01.141
METHOD: 3005A ___ 3050B ___ 3050B-7.5 ___ 3010A ___ 3020A ___ 7760A ___ 7740A ___ $HClO_4$ ___ H_2SO_4 Sb ___
Microwave ___ Fusion ___ Teflon ___ Rock ___ OTHER Str. aliquot
MATRIX: Water ✓ Soil ___ Biota ___ Solid ___ Liquid ___ TCLP Ext ___ OTHER ___
INSTRUMENT: GFAA ___ ICP ✓ ICP-MS ___ IC ___ FLAA ___ HYDRIDE ___ OTHER ___
ACID INORG #: HNO_3# ** HCl# ** H_2SO_4# ___ $HClO_4$# ___ HF# ___
INTERNAL STD: Sc @ 10 PPM ✓ Be @ 10 PPM ___ SOURCE: IV INORG# ISS 02-101-02 EXP: 7/15/04 AMT: 50µl
Oven/Hotplate ID: N/A Temperature (°C): ___

SAMPLE IDENTIFICATION	pH	WT (g)	I.V. (mL)	F.V. (mL)	
PBW-FISE2			5	5	
LCSW-FISE2 *			1	1	
243222					
23					
24					
25					
26					
27					
28					
29					
30					
30d					
31					
32					
32d S * RE 6/15/04					
245108					
d					
S *					
109					
110					
111					
112					
113					
114					
115					
116					
* 50µl Spike-1 (Spex, #4306, exp. 10/04)					
20µl ICAL-1 (Spex, #4514, exp. 3/05)					LOCATION:
** RLB 02-042-02 1% HNO_3, 5% HCl (PBW/LCSW)					N/A

PREPARED BY: [signature] DATE: 6-15-04
REVIEWED BY: John Wills DATE: 6-15-04
DISPOSAL INT/DATE/LOC: ___

FRM-191 (Rev 2/Mar 03)

SwRI 02 101

010054

ISS02-101-01 CLP SPK Solu @ ILMO4.1 GFAA LVL

J Wilks 6-14-04

CLP Spiking Solution @ GFAA LVL ILMO 4.1

Elem.	Source	Inorg #	Exp. Date	Init.Conc. (ppm)	Amt.Added (uL)	✔	Final Conc. (ppm)	FV (mL)
As	IV	4433	02/0105	1000	400		4	100
Cd	IV	4467	03/01/05	1000	50		0.5	100
Pb	IV	4313	11/01/04	1000	200		2	100
Sb	IV	4464	03/01/05	1000	1000		10	100
Se	IV	4152	07/01/04	1000	100		1	100
Tl	IV	4435	02/01/05	1000	500		5	100

Prepped by:JWILKS *ISS prepped in 1%HNO3, Fisher, Inorg # ·#4580*
Date: 06/1404 Exp Date: 07/01/04

ISS-02-101-02 1000ppm Scandium Solution
IV Inorg# 4262 Exp: 10-1-04 Initial Conc 10000ppm
Amount Added 10mL / Final Conc. 1000ppm / FV 100mL
Prepped in 1% HNO3 Fisher, Inorg # 4580 DL 6-14-04

J Wilks 7/6/04

ISS-02-101-03 1ppm M&E #3 for Mentor Corp. MDL. 1% HNO3 # 4582

elem.	Source	IC#	exp.	IC	Amt-added	FC	F.V.
M&E #3	Spex	# 4346	12/30/04	10ppm	1ml	1.0ppm	10ml

prep. date 6-22-04 exp. 9-22-04. ref EC 6/22/04

ISS-02-101-04 1ppm TC prepd 6/18/04
Added 100µL of 1000ppm TC #4435 exp 2/05
to 100ml vol flask & brought up to mark
w/ 1% HNO3 #4582 Corduña 6/22/04

ISS02-101-05 10ppb TC prepd 6/18/04 exp 2/5
Added 1ml 1ppm TC (ISS02-101-04) to 100ml
vol flask & brought up to mark w/ 1% HNO3 #4582.
Corduña 6/22/04

Trace Metals Reagent Logbook 010055

SOUTHWEST RESEARCH INSTITUTE
SAN ANTONIO, TEXAS 78228

BOOK / PAGE: 02 042

Reagent I.D.:	Preparation Description:	Prep Date:	Exp Date:	Initials:
RLB02-042-01	50% HNO_3 # 4256 2	6-10-04	9-10-04	KE
↓	50% HCl # 4586	↓	↓	↓
↓	Dilute 50ml Each to 1.0L	↓	↓	↓
RLB-02-042-02	1% HNO_3 # 4580 (1ml)	6-14-04	9-14-04	KE
	5% HCl # 4586 (5ml)	↓	↓	↓
	dilute to 100 KE d14/04 ml Di-water	↓	↓	↓
RLB-02-042-03	EFB#1 TCLP ~1311			
	66.8g NaOH # 4207, exp. 8/13			
	148.2mL Acetic Acid # 0707 exp. 4/50	6-22-04	9-22-04	KE
	dilute to 26L Di-water	6-22-04	9-22-04	KE

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SOUTHWEST RESEARCH INSTITUTE®

6220 Culebra Rd
San Antonio, Texas 78228

010056

TJA_2 TRACE ICP DAILY LOG

ANALYST JL DATE 6-15-04

As 189.042 Profile Line As Intensity: 387.914

PEAK POSITION .013764
VERNIER POSITION 753

QC PREP DATE:	
CCV/ICV	04EZ1
CRI	04F02
ICSA	"
ICSAB	"

STDs PREP DATE:	
CLP_STD1_SC	04EZ5
CLP_STD2_SC	04F02
CLP_STD3_SC	04EZ5
CLP_STD4_SC	04EZ5
CLP_STD5_SC	04F02
CLP_STD6_SC	04EZ5
BLK_SC	04EZ1

COMMENTS	FILE	CLIENT	TO#	PROJECT NO.	METHOD
B4041S2	Y04JUN	DIV 20	040415-2 040521-6	06002.01.141	6010B 56 214
B4061010	"	TAEL	040610-10	06355.24.006	6010B 57 111
B4061111	"	Westin	040611-1	05827.04.006	" 57 110

JL 6-15-04

COMMENTS: _____

MAINTENANCE: _____

REVIEWED BY: Cordova DATE: 6/22/04

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SOUTHWEST RESEARCH INSTITUTE

6220 Culebra Rd
San Antonio, Texas 78228

010057

SPECTRO ICP DAILY LOG

ANALYST [signature]

DATE 6-15-04

POWER: 1200

FLOWS:
Aux 40
Coolant 60
Mass Flow Controller 1054

CURRENT	PROPOSED	
4991	4997	Na
4765	4765	Fe
4907	4909	Sr

QC PREP DATE:	
CCV/ICV	04EZ1
CRI	
ICSA	6-15-04
ICSAB	

CLP_STD1_SC	~~04fez-04~~ EZ5 04 6-15-04
CLP_STD2_SC	~~6~~ 04
CLP_STD3_SC	6-15-04
CLP_STD4_SC	
CLP_STD5_SC	
BLK_SC	04EZ1

FILE	CLIENT	TO#	PROJECT NO.	METHOD	PREP PAGE
040615	Div 20	040415-2 040521-6	06002.01.141	Li KNA	S6215

6-15-04

COMMENTS: _____

MAINTENANCE:

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

OTHER: _____

REVIEWED BY: [signature]

DATE: 7/2/04

ICP Calibration Blank/ICB/CCB Solution

ID: BLK- 04E21

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

Make up as needed in 1000ml volumetric flask.

010058

Added ✓ 10 ml HNO3 INORG #: 4561

Added ✓ 50 ml HCL INORG #: 4554

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

ICP Calibration Blank/ICB/CCB Solution

ID: BLK- 04F21

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

Make up as needed in 1000ml volumetric flask.

Added ✓ 10 ml HNO3 INORG #: 4582

Added ✓ 50 ml HCL INORG #: 4556

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

ICP Calibration Blank/ICB/CCB Solution

ID: BLK-

Date Prepared: _____ Prepared By: _____

Make up as needed in 1000ml volumetric flask.

Added _____ 10 ml HNO3 INORG #: _____

Added _____ 50 ml HCL INORG #: _____

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

ICP Calibration Blank/ICB/CCB Solution

ID: BLK-

Date Prepared: _____ Prepared By: _____

Make up as needed in 1000ml volumetric flask.

Added _____ 10 ml HNO3 INORG #: _____

Added _____ 50 ml HCL INORG #: _____

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

ICP ICV/CCV SOLUTION

010059

CCV- 04E21

Date Prepared: 5-21-04 Prepared By: D.L

HNO3 INORG #: 4561 HCl INORG #: 4554

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

Element	Std Conc (ppm)	Amt added	Check	Source	Inorg #	Stock Conc (ppm)	Exp Date
Sc	10	1ml	✓	INORGVENT	4262	10000	10-1-04
B	5	5ml	✓	SPEX	4564	1000	4-30-05
Li	5	5ml	✓	SPEX	4439	1000	1-30-05
Mo	5	5ml	✓	SPEX	4440	1000	1-30-05
P	5	5ml	✓	SPEX	4307	1000	10-30-04
Si	5	5ml	✓	SPEX	4232	1000	8-30-04
Ti	5	5ml	✓	SPEX	4234	1000	8-30-04
Sr	5	5ml	✓	SPEX	4308	1000	10-30-04
Sn	5	5ml	✓	SPEX	4565	1000	4-30-05
Bi	5	5ml	✓	SPEX	4475	1000	2-28-05
La	5	5ml	✓	SPEX	4438	1000	1-30-05
Y	5	5ml	✓	SPEX	4441	1000	1-30-05
Pd	1	1ml	✓	SPEX	4417	1000	1-15-05
S	1	1ml	✓	SPEX	4140	1000	6-30-04
Th	1	1ml	✓	SPEX	4233	1000	8-30-04
U	1	1ml	✓	SPEX	4142	1000	6-30-04
W	1	1ml	✓	SPEX	4212	1000	8-15-04
Zr	5	5ml	✓	SPEX	4566	1000	4-30-05
Na	10	1ml	✓	SPEX	4443	10000	1-30-05
ICV-2A	vary	10ml	✓	SPEX	4328	mix	11-30-04
ICV-2B	vary	1ml	✓	SPEX	4329	mix	11-30-04
ICV-2C	vary	10ml	✓	SPEX	4330	mix	11-30-04

Expiration Date: 6-30-04

ICP Calibration Standards

Date Prepared: 5-25-04 Prepared By: JL 010060

HNO3 INORG #: 4561 HCl INORG #: 4555

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

Prepared	Standard Name	Element	Std Conc (ppm)	Added ml	Check	Source	INORG #	Stock Conc (ppm)	Exp Date
04E25	STD1- 5-24-04 5-25-04	Al	50	2.50	✓	INORVENT	4220	10000	9-1-04
		Ca	50	2.50	✓	INORVENT	4436	10000	2-1-05
		Fe	50	2.50	✓	INORVENT	4470	10000	3-1-05
		K	50	2.50	✓	INORVENT	4320	10000	12-1-04
		Mg	25	1.25	✓	INORVENT	4204	10000	8-1-04
		Na	50	2.50	✓	INORVENT	4205	10000	8-1-04
		Li	10	5.00	✓	INORVENT	4149	1000	7-1-04
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
04E25	STD2- 5-24-04 5-25-04	Ba	10	5.00	✓	INORVENT	4465	1000	3-1-05
		Be	5	2.50	✓	INORVENT	4062	1000	6-1-04 5% OH
		Cr	10	5.00	✓	INORVENT	4318	1000	12-1-04
		Cu	10	5.00	✓	INORVENT	4469	1000	3-1-05
		Ni	10	5.00	✓	INORVENT	4472	1000	3-1-05
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
04E25	STD3- 5-24-04 5-25-04	Cd	10	5.00	✓	INORVENT	4467	1000	3-1-05
		Co	10	5.00	✓	INORVENT	4468	1000	3-1-05
		Mn	10	5.00	✓	INORVENT	4434	1000	2-1-05
		V	10	5.00	✓	INORVENT	4321	1000	12-1-04
		Zn	10	5.00	✓	INORVENT	4319	1000	12-1-04
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
04E25	STD4- 5-24-04 5-25-04	Ag	2	1.00	✓	INORVENT	4222	1000	9-1-04
		As	10	5.00	✓	INORVENT	4433	1000	2-1-05
		Pb	10	5.00	✓	INORVENT	4313	1000	11-1-04
		Sb	10	5.00	✓	INORVENT	4464	1000	3-1-05
		Se	10	5.00	✓	INORVENT	4152	1000	7-1-04
		TL	10	5.00	✓	INORVENT	4435	1000	2-1-05
		Sc	10	0.500	✓	INORVENT	4262	10000	~~10-10~~ 10-1-04 5-24-04
04E25	STD5- 5-24-04 5-25-04	B	10	5.00	✓	INORVENT	4201	1000	8-1-04
		Mo	10	5.00	✓	INORVENT	4471	1000	3-1-05
		P	10	5.00	✓	INORVENT	4249	1000	6-1-04 5% OH
		Si	10	5.00	✓	INORVENT	4437	1000	2-1-05
		Ti	10	5.00	✓	INORVENT	4332	1000	12-1-04
		Sr	10	5.00	✓	INORVENT	4154	1000	7-1-04
		Sn	10	5.00	✓	INORVENT	4512	1000	4-1-05
		Bi	5	2.50	✓	INORVENT	4200	1000	8-1-04
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
04E25	STD6- 5-24-04 5-25-04	La	10	5.00	✓	INORVENT	4221	1000	9-1-04
		Na	1	0.05	✓	INORVENT	4205	10000	8-1-04
		Pd	10	5.00	✓	INORVENT	9977	1000	3-1-05
		S	10	5.00	✓	INORVENT	4317	1000	12-1-04
		Th	10	5.00	✓	INORVENT	9283	1000	11-1-04
		U	10	5.00	✓	INORVENT	4473	1000	3-1-05
		W	5	2.50	✓	INORVENT	4203	1000	8-1-04
		Y	10	5.00	✓	INORVENT	4513	1000	4-1-05
		Zr	10	5.00	✓	INORVENT	9442	1000	8-1-05
		SC	10	0.500	✓	INORVENT	4262	10000	10-1-04

Expiration Dates:

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

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

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

ICP Calibration Standards

010061

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

HNO3 INORG #: 4562 HCl INORG #: 4557

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

Prepared	Standard Name	Element	Std Conc (ppm)	Added ml	Check	Source	INORG #	Stock Conc (ppm)	Exp Date
	STD1-	Al	50	2.50		INORVENT		10000	
		Ca	50	2.50		INORVENT		10000	
		Fe	50	2.50		INORVENT		10000	
		K	50	2.50		INORVENT		10000	
		Mg	25	1.25		INORVENT		10000	
		Na	50	2.50		INORVENT		10000	
		Li	10	5.00		INORVENT		1000	
		Sc	10	0.500		INORVENT		10000	
6-2-04	STD2-	Ba	10	5.00		INORVENT	4465	1000	3-1-05
	04F02	Be	5	2.50	✓	INORVENT	4552	1000	6-1-05
		Cr	10	5.00	✓	INORVENT	4318	1000	12-1-04
		Cu	10	5.00	✓	INORVENT	4469	1000	3-1-05
		Ni	10	5.00	✓	INORVENT	4472	1000	3-1-05
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
	STD3-	Cd	10	5.00		INORVENT		1000	
		Co	10	5.00		INORVENT		1000	
		Mn	10	5.00		INORVENT		1000	
		V	10	5.00		INORVENT		1000	
		Zn	10	5.00		INORVENT		1000	
		Sc	10	0.500		INORVENT		10000	
	STD4-	Ag	10	1.00		INORVENT		1000	
		As	10	5.00		INORVENT		1000	
6-2-04		Pb	10	5.00		INORVENT		1000	
		Sb	10	5.00		INORVENT		1000	
		Se	10	5.00		INORVENT		1000	
		TL	10	5.00		INORVENT		1000	
		Sc	10	0.500		INORVENT		10000	
6-2-04	STD5-	B	10	5.00	✓	INORVENT	4201	1000	8-1-04
	04F02	Mo	10	5.00	✓	INORVENT	4471	1000	3-1-05
		P	10	5.00	✓	INORVENT	4593	1000	6-1-05
		Si	10	5.00	✓	INORVENT	4437	1000	2-1-05
		Ti	10	5.00	✓	INORVENT	4332	1000	12-1-04
		Sr	10	5.00	✓	INORVENT	4154	1000	7-1-04
		Sn	10	5.00	✓	INORVENT	4512	1000	4-1-05 OH 4-1-04
		Bi	5	2.50	✓	INORVENT	4200	1000	8-1-04
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
	STD6-	La	10	5.00		INORVENT		1000	
		Na	1	0.05		INORVENT		10000	
		Pd	10	5.00		INORVENT		1000	
		S	10	5.00		INORVENT		1000	
		Th	10	5.00	2-04	INORVENT		1000	
		U	10	5.00		INORVENT		1000	
		W	5	2.50		INORVENT		1000	
		Y	10	5.00		INORVENT		1000	
		Zr	10	5.00		INORVENT		1000	
		Sc	10	0.500		INORVENT		10000	

Expiration Dates:

STD1: —

STD2: 8-1-04

STD3: —

STD4: —

STD5: 7-1-04

STD6: —

010062

ICP ANALYSIS

PROJ. NO.	PROJECT	TO#	DATE	MATRIX	LOGBK PG
060021.141	Divco	040415-2 040521-6	6-15-04	water	SG 215

INSTRUMENT: Spectro FILENAME: 040615

INSTRUMENT DL:

EVOLUTION by Micro-Active Australia Pty Ltd 12:46:20 PM June 15, 2004

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

010063

BACKGROUND CORRECTED INTENSITIES
Identity 1 : BLK_SC Identity 2 : Type : STD
Weight : 1.0000 Volume : 1.00 Printed : 12:45:32 PM June 15, 2004

	K_766	Li670	Na589	Sc361
# 1	14.0	-9.5	46.5	4298.0
# 2	1.0	-12.5	37.5	4246.0
Mean	7.5	-11.0	42.0	4272.0
SD	9.2	2.1	6.4	36.8
%RSD	122.6	19.3	15.2	0.9

INTENSITIES
Identity 1 : BLK_SC Identity 2 : Type : STD
Weight : 1.0000 Volume : 1.00 Printed : 12:45:32 PM June 15, 2004

	K_766	Li670	Na589	Sc361
# 1	0.0	-0.0	0.0	4298.0
# 2	0.0	-0.0	0.0	4246.0
Mean	0.0	-0.0	0.0	4272.0
SD	0.0	0.0	0.0	36.8
%RSD	122.3	20.1	14.3	0.9

6/24/04

6-15-04

010064

BACKGROUND CORRECTED INTENSITIES
Identity 1 : CLP_STD1_SC Identity 2 : Type : STD
Weight : 1.0000 Volume : 1.00 Printed : 12:48:40 PM June 15, 2004

	K_766	Li670	Na589
# 1	4829.5	49726.0	28336.5
# 2	4825.5	49500.0	28229.5
Mean	4827.5	49614.0	28283.0
SD	2.8	161.2	75.7
%RSD	0.1	0.3	0.3

INTENSITIES
Identity 1 : CLP_STD1_SC Identity 2 : Type : STD
Weight : 1.0000 Volume : 1.00 Printed : 12:48:40 PM June 15, 2004

	K_766	Li670	Na589
# 1	1.1	11.6	6.6
# 2	1.1	11.6	6.6
Mean	1.1	11.6	6.6
SD	0.0	0.0	0.0
%RSD	0.1	0.1	0.1

BACKGROUND CORRECTED INTENSITIES
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 12:51:48 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	1881.0	23766.0	16334.5	4316.5	4316.5
# 2	1863.0	23661.0	16333.5	4267.5	4267.5
Mean	1872.0	23713.5	16334.0	4292.0	4292.0
SD	12.7	74.2	0.7	34.6	34.6
%RSD	0.7	0.3	0.0	0.8	0.8

APPARENT CONCENTRATIONS
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 12:51:48 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	19.2673	4.7503	28.5975	4316.500 H	101.0433
# 2	19.3022	4.7836	28.9250	4267.500	99.8945
Mean	19.2847	4.7669	28.7612	4292.000 H	100.4689
SD	0.0247	0.0235	0.2315	34.648	0.8123
%RSD	0.1279	0.4940	0.8050	0.807	0.8085

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

Report name	Low limit	Value	High limit
K_766	18.000	19.285	22.000
Li670	4.500	4.767	5.500
Na589	27.000	28.761	33.000

BACKGROUND CORRECTED INTENSITIES
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 12:56:04 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	16.0	-2.0	23.5	4319.0	4319.0

lean	12.0	-1.0	22.0	4294.5	4294.5
SD	5.7	1.4	2.1	34.6	34.6
RSD	47.1	141.4	9.6	0.8	0.8

010065

APPARENT CONCENTRATIONS
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 12:56:04 PM June 15, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	0.0865	0.0018 L	-0.0333	4319.000 H	101.1019
# 2	0.0052	0.0022 L	-0.0381	4270.000	99.9531
lean	0.0459	0.0020 L	-0.0357	4294.500 H	100.5275
SD	0.0575	0.0003	0.0034	34.648	0.8123
RSD	125.2847	13.9730	9.6094	0.807	0.8080

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

Report name	CRDL	Value
K_766	0.100	0.046
Li670	0.010	0.002
Na589	0.050	-0.036
Sc361	0.000	100.527

010066

BACKGROUND CORRECTED INTENSITIES
Identity 1 : pbw-Fi5E2 Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 12:59:12 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	6.0	-21.0	20.0	4.0	4.0
# 2	4.0	-11.0	8.0	1.0	1.0
Mean	6.0	-16.0	14.0	2.5	2.5
SD	2.8	7.1	8.5	2.1	2.1
%RSD	47.1	44.2	60.6	84.9	84.9

APPARENT CONCENTRATIONS
Identity 1 : pbw-Fi5E2 Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 12:59:12 PM June 15, 2004

		K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	H	88.7086 L	-4.5252	37.8094	4.000 L	-0.0586
# 2	H	177.4352 L	-9.4838 H	60.5397	1.000 L	-0.1289
Mean	H	133.1019 L	-7.0045	49.1745	2.500 L	-0.0938
SD		62.7816	3.5063	16.0728	2.121	0.0497
%RSD		47.1681	50.0573	32.6851	84.853	53.0330

Starting run ...
Creating high priority queue entries ...
BACKGROUND CORRECTED INTENSITIES
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 1:05:44 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	1874.5	23414.5	16144.0	4287.5	4287.5
# 2	1852.5	23237.5	15993.0	4245.5	4245.5
Mean	1863.5	23326.0	16068.5	4266.5	4266.5
SD	15.6	125.2	106.8	29.7	29.7
%RSD	0.8	0.5	0.7	0.7	0.7

APPARENT CONCENTRATIONS
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 1:05:44 PM June 15, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	19.3309	4.7117	28.4548	4287.500 H	100.3634
# 2	19.2928	4.7223	28.4676	4245.500	99.3787
Mean	19.3118	4.7170	28.4612	4266.500	99.8711
SD	0.0269	0.0075	0.0090	29.696	0.6962
%RSD	0.1393	0.1585	0.0317	0.696	0.6971

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

Report name	Low limit	Value	High limit
K_766	18.000	19.312	22.000
Li670	4.500	4.717	5.500
Na589	27.000	28.461	33.000

EVOLUTION by Micro-Active Australia Pty Ltd 1:15:56 PM June 15, 2004

010067

BACKGROUND CORRECTED INTENSITIES
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 1:09:56 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	8.5	-5.0	28.5	4359.0	4359.0
# 2	18.5	-4.0	22.5	4340.0	4340.0
Mean	13.5	-4.5	25.5	4349.5	4349.5
SD	7.1	0.7	4.2	13.4	13.4
%RSD	52.4	15.7	16.6	0.3	0.3

APPARENT CONCENTRATIONS
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 1:09:56 PM June 15, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	0.0086	0.0012 L	-0.0250	4359.000 H	102.0396
# 2	0.1113	0.0014 L	-0.0352	4340.000 H	101.5642
Mean	0.0600	0.0013 L	-0.0301	4349.500 H	101.8169
SD	0.0726	0.0001	0.0073	13.435	0.3150
%RSD	121.0705	10.3455	24.1128	0.309	0.3093

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

Report name	CRDL	Value
K_766	0.100	0.060
Li670	0.010	0.001
Na589	0.050	-0.030
Sc361	0.000	101.817

BACKGROUND CORRECTED INTENSITIES
Identity 1 : pbw-F15E2 Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:12:32 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	-5.0	-11.0	8.0	4269.5	4269.5
# 2	4.0	-5.0	18.0	4197.5	4197.5
Mean	-0.5	-8.0	13.0	4233.5	4233.5
SD	6.4	4.2	7.1	50.9	50.9
%RSD	1272.8	53.0	54.4	1.2	1.2

APPARENT CONCENTRATIONS
Identity 1 : pbw-F15E2 Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:12:34 PM June 15, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1 L	-0.1299 L	-0.0000 L	-0.0603	4269.500	99.9414
# 2 L	-0.0356	0.0012 L	-0.0420	4197.500	98.2534
Mean L	-0.0828	0.0006 L	-0.0511	4233.500	99.0974
SD	0.0667	0.0008	0.0129	50.912	1.1936
%RSD	80.5456	141.7299	25.2919	1.203	1.2044

BACKGROUND CORRECTED INTENSITIES
Identity 1 : lcsw-F15E2 Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:15:42 PM June 15, 2004

# 2	1845.0	-12.0	10753.0	4247.0	4247.0
Mean	1852.5	-14.0	10794.5	4276.5	4276.5
SD	10.6	2.8	56.7	41.7	41.7
%RSD	0.6	20.2	0.5	1.0	1.0

010068

APPARENT CONCENTRATIONS
Identity 1 : lcsw-F15E2 Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:15:42 PM June 15, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	19.0980 L	-0.0010	18.9924	4306.000 H	100.7971
# 2	19.2076 L	-0.0002	19.1092	4247.000	99.4139
Mean	19.1528 L	-0.0006	19.0508	4276.500 H	100.1055
SD	0.0775	0.0005	0.0826	41.719	0.9781
%RSD	0.4046	90.4781	0.4335	0.976	0.9770

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 243222 Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:18:50 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	55.5	-0.5	2437.5	5012.5	5012.5
# 2	55.5	-2.5	2471.5	5007.5	5007.5
Mean	55.5	-1.5	2454.5	5010.0	5010.0
SD	0.0	1.4	24.0	3.5	3.5
%RSD	0.0	94.3	1.0	0.1	0.1

APPARENT CONCENTRATIONS
Identity 1 : 243222 Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:18:50 PM June 15, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	0.4136	0.0021	3.6100	5012.500 H	117.3602
# 2	0.4141	0.0018	3.6651	5007.500 H	117.2430
Mean	0.4138	0.0020	3.6375	5010.000 H	117.3016
SD	0.0003	0.0002	0.0390	3.536	0.0829
%RSD	0.0839	12.4149	1.0716	0.071	0.0707

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 243223 Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:21:58 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	572.0	186.0	22666.5	4929.5	4929.5
# 2	572.0	189.0	22705.5	4909.5	4909.5
Mean	572.0	188.5	22686.0	4919.5	4919.5
SD	0.0	0.7	27.6	14.1	14.1
%RSD	0.0	0.4	0.1	0.3	0.3

APPARENT CONCENTRATIONS
Identity 1 : 243223 Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:21:58 PM June 15, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm

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lean	5.0838	0.0363	34.8656	4919.500 H	115.1799
SD	0.0148	0.0002	0.1429	14.142	0.3615
RSD	0.2919	0.6209	0.4099	0.287	0.2879

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 243224 Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:25:04 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	13.5	-11.0	5793.5	4915.0	4915.0
# 2	4.5	-6.0	5805.5	4924.0	4924.0
lean	9.0	-8.5	5799.5	4919.5	4919.5
SD	6.4	3.5	8.5	6.4	6.4
RSD	70.7	41.6	0.1	0.1	0.1

APPARENT CONCENTRATIONS
Identity 1 : 243224 Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:25:06 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	0.0440	0.0003	8.8565	4915.000 H	115.0744
# 2 L	-0.0374	0.0012	8.8587	4924.000 H	115.2854
lean	0.0033	0.0007	8.8576	4919.500 H	115.1799
SD	0.0575	0.0006	0.0015	6.364	0.1492
RSD	1735.5152	85.1517	0.0171	0.129	0.1295

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 243225 Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:28:14 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	21.0	-5.0	1950.5	4980.0	4980.0
# 2	27.0	-3.0	1953.5	5011.0	5011.0
lean	24.0	-4.0	1952.0	4995.5	4995.5
SD	4.2	1.4	2.1	21.9	21.9
RSD	17.7	35.4	0.1	0.4	0.4

APPARENT CONCENTRATIONS
Identity 1 : 243225 Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:28:14 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	0.1093	0.0014	2.8931	4980.000 H	116.5983
# 2	0.1613	0.0017	2.8793	5011.000 H	117.3250
lean	0.1353	0.0015	2.8862	4995.500 H	116.9617
SD	0.0368	0.0002	0.0098	21.920	0.5139
RSD	27.1625	16.1604	0.3386	0.439	0.4394

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 243226 Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:31:22 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	39.0	5.0	3010.0	4977.5	4977.5
# 2	50.0	7.0	3025.0	5042.5	5042.5

SD	7.8	1.4	10.6	46.0	46.0
%RSD	17.5	23.6	0.4	0.9	0.9

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APPARENT CONCENTRATIONS
Identity 1 : 243226 Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:31:22 PM June 15, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	0.2699	0.0031	4.5073	4977.500 H	116.5337
# 2	0.3623	0.0034	4.4708	5042.500 H	118.0635
Mean	0.3161	0.0033	4.4891	5010.000 H	117.3016
SD	0.0653	0.0002	0.0258	45.962	1.0775
%RSD	20.6620	7.1939	0.5753	0.917	0.9186

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 243227 Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:34:30 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	1100.5	-4.5	13115.0	4928.0	4928.0
# 2	1099.5	1.5	13228.0	4956.0	4956.0
Mean	1100.0	-1.5	13171.5	4942.0	4942.0
SD	0.7	4.2	79.9	19.8	19.8
%RSD	0.1	282.8	0.6	0.4	0.4

APPARENT CONCENTRATIONS
Identity 1 : 243227 Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:34:30 PM June 15, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	9.8358	0.0014	20.0897	4928.000 H	115.3792
# 2	9.7708	0.0025	20.1486	4956.000 H	116.0356
Mean	9.8033	0.0020	20.1192	4942.000 H	115.7074
SD	0.0459	0.0007	0.0416	19.799	0.4642
%RSD	0.4686	37.8783	0.2068	0.401	0.4012

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 243228 Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:37:40 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	151.5	2.0	4930.5	4938.0	4938.0
# 2	146.5	6.0	4929.5	4967.0	4967.0
Mean	149.0	4.0	4930.0	4952.5	4952.5
SD	3.5	2.8	0.7	20.5	20.5
%RSD	2.4	70.7	0.0	0.4	0.4

APPARENT CONCENTRATIONS
Identity 1 : 243228 Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:37:40 PM June 15, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	1.2841	0.0026	7.4908	4938.000 H	115.6136
# 2	1.2314	0.0033	7.4451	4967.000 H	116.2935

%RSD	2.9554	16.7910	0.4327	0.414	0.4146

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BACKGROUND CORRECTED INTENSITIES
Identity 1 : 243229 Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:40:46 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	614.5	189.0	23946.5	4850.0	4850.0
# 2	615.5	183.0	24064.5	4884.0	4884.0
Mean	615.0	186.0	24005.5	4867.0	4867.0
SD	0.7	4.2	83.4	24.0	24.0
%RSD	0.1	2.3	0.3	0.5	0.5

APPARENT CONCENTRATIONS
Identity 1 : 243229 Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:40:46 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	5.5467	0.0358	37.3352	4850.000 H	113.5506
# 2	5.5167	0.0345	37.2579	4884.000 H	114.3477
Mean	5.5317	0.0352	37.2965	4867.000 H	113.9491
SD	0.0213	0.0009	0.0547	24.042	0.5636
%RSD	0.3843	2.5997	0.1467	0.494	0.4946

BACKGROUND CORRECTED INTENSITIES
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 1:46:06 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	1893.5	23696.0	16299.5	4382.0	4382.0
# 2	1898.5	23748.0	16364.5	4380.0	4380.0
Mean	1896.0	23722.0	16332.0	4381.0	4381.0
SD	3.5	36.8	46.0	1.4	1.4
%RSD	0.2	0.2	0.3	0.0	0.0

APPARENT CONCENTRATIONS
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 1:46:06 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	19.1048	4.6655	28.1084	4382.000 H	102.5788
# 2	19.1642	4.6779	28.2337	4380.000 H	102.5319
Mean	19.1345	4.6717	28.1711	4381.000 H	102.5554
SD	0.0420	0.0087	0.0886	1.414	0.0332
%RSD	0.2196	0.1872	0.3145	0.032	0.0323

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

Report name	Low limit	Value	High limit
K_766	18.000	19.134	22.000
Li670	4.500	4.672	5.500
Na589	27.000	28.171	33.000

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BACKGROUND CORRECTED INTENSITIES
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 1:50:20 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	17.0	-8.5	34.5	4450.0	4450.0
# 2	10.0	-11.5	27.5	4411.0	4411.0
Mean	13.5	-10.0	31.0	4430.5	4430.5
SD	4.9	2.1	4.9	27.6	27.6
%RSD	36.7	21.2	16.0	0.6	0.6

APPARENT CONCENTRATIONS
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 1:50:22 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	0.0917	0.0006 L	-0.0157	4450.000 H	104.1730
# 2	0.0227 L	-0.0000 L	-0.0273	4411.000 H	103.2587
Mean	0.0572	0.0003 L	-0.0215	4430.500 H	103.7159
SD	0.0488	0.0004	0.0081	27.577	0.6465
%RSD	85.2665	155.8242	37.8338	0.622	0.6234

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

Report name	CRDL	Value
K_766	0.100	0.057
Li670	0.010	0.000
Na589	0.050	-0.022
Sc361	0.000	103.716

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 243230 Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:53:30 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	351.5	1245.5	109227.0	4134.0	4134.0
# 2	352.5	1248.5	109382.0	3917.0	3917.0
Mean	352.0	1247.0	109304.5	4025.5	4025.5
SD	0.7	2.1	109.6	153.4	153.4
%RSD	0.2	0.2	0.1	3.8	3.8

APPARENT CONCENTRATIONS
Identity 1 : 243230 Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:53:30 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	3.6967	0.2620 H	200.1161	4134.000	96.7647
# 2	3.9171	0.2771 H	211.5064	3917.000	91.6774
Mean	3.8069	0.2696 H	205.8112	4025.500	94.2211
SD	0.1559	0.0106	8.0541	153.442	3.5973
%RSD	4.0946	3.9489	3.9134	3.812	3.8179

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 243230d Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:56:38 PM June 15, 2004

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# 2	353.0	1237.0	108319.0	3942.0	3942.0
Mean	354.5	1231.5	108001.0	4037.5	4037.5
SD	2.1	7.8	449.7	135.1	135.1
%RSD	0.6	0.6	0.4	3.3	3.3

APPARENT CONCENTRATIONS
Identity 1 : 243230d Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:56:38 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	3.7459	0.2580 H	197.3340	4133.000	96.7413
# 2	3.8974	0.2728 H	208.1214	3942.000	92.2635
Mean	3.8217	0.2654 H	202.7277	4037.500	94.5024
SD	0.1071	0.0105	7.6278	135.057	3.1663
%RSD	2.8030	3.9430	3.7626	3.345	3.3505

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 243231 Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:59:46 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	633.0	207.5	27212.5	4907.0	4907.0
# 2	641.0	201.5	27225.5	4915.0	4915.0
Mean	637.0	204.5	27219.0	4911.0	4911.0
SD	5.7	4.2	9.2	5.7	5.7
%RSD	0.9	2.1	0.0	0.1	0.1

APPARENT CONCENTRATIONS
Identity 1 : 243231 Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:59:46 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	5.6488	0.0387	41.9436	4907.000 H	114.8869
# 2	5.7117	0.0376	41.8953	4915.000 H	115.0744
Mean	5.6802	0.0381	41.9194	4911.000 H	114.9807
SD	0.0445	0.0008	0.0342	5.657	0.1326
%RSD	0.7835	2.0623	0.0816	0.115	0.1153

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 243232 Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:02:56 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	428.0	242.0	31305.5	4887.5	4887.5
# 2	432.0	242.0	31536.5	4904.5	4904.5
Mean	430.0	242.0	31421.0	4896.0	4896.0
SD	2.8	0.0	163.3	12.0	12.0
%RSD	0.7	0.0	0.5	0.2	0.2

APPARENT CONCENTRATIONS
Identity 1 : 243232 Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:02:56 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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ean	3.6210	0.0446	46.5507	4896.000 H	114.6230
D	0.0161	0.0001	0.1334	12.021	0.2818
RSD	0.4207	0.2334	0.2747	0.246	0.2458

ACKGROUND CORRECTED INTENSITIES
dentity 1 : 243232s Identity 2 : pg56-215 Type : SAMPLE
eight : 1.0000 Volume : 1.00 Printed : 2:06:04 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	2578.0	239.0	42935.0	4737.0	4737.0
# 2	2572.0	244.0	42785.0	4725.0	4725.0
ean	2575.0	241.5	42860.0	4731.0	4731.0
D	4.2	3.5	106.1	8.5	8.5
RSD	0.2	1.5	0.2	0.2	0.2

PPARENT CONCENTRATIONS
dentity 1 : 243232s Identity 2 : pg56-215 Type : SAMPLE
eight : 1.0000 Volume : 1.00 Printed : 2:06:04 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	24.0821	0.0457 H	68.5995	4737.000 H	110.9014
# 2	24.0870	0.0468 H	68.5334	4725.000 H	110.6201
ean	24.0845	0.0462 H	68.5664	4731.000 H	110.7608
D	0.0035	0.0007	0.0468	8.485	0.1989
RSD	0.0146	1.5644	0.0682	0.179	0.1796

BACKGROUND CORRECTED INTENSITIES 245108 CO 6/24/04
Identity 1 : ~~243108~~ Identity 2 : pg56-215 Type : SAMPLE
eight : 1.0000 Volume : 1.00 Printed : 2:09:14 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	397.0	221.0	33186.0	4871.0	4871.0
# 2	409.0	225.0	33417.0	4878.0	4878.0
ean	403.0	223.0	33301.5	4874.5	4874.5
D	8.5	2.8	163.3	4.9	4.9
RSD	2.1	1.3	0.5	0.1	0.1

APPARENT CONCENTRATIONS 245108 CO 6/24/04
Identity 1 : ~~243108~~ Identity 2 : pg56-215 Type : SAMPLE
eight : 1.0000 Volume : 1.00 Printed : 2:09:14 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	3.5402	0.0413 H	51.5459	4871.000 H	114.0429
# 2	3.6443	0.0420 H	51.8306	4878.000 H	114.2070
Mean	3.5922	0.0417 H	51.6882	4874.500 H	114.1250
SD	0.0736	0.0005	0.2013	4.950	0.1160
%RSD	2.0475	1.1046	0.3895	0.102	0.1017

BACKGROUND CORRECTED INTENSITIES 245108d CO 6/24/04
Identity 1 : ~~243108d~~ Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:12:20 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	406.0	224.0	33406.0	4890.0	4890.0
# 2	402.0	234.0	33669.0	4913.0	4913.0

SD	2.8	7.1	186.0	16.3	16.3
%RSD	0.7	5.1	0.8	0.3	0.3

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APPARENT CONCENTRATIONS 245108d CO 6/24/04
Identity 1 : ~~245108d~~ Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:12:20 PM June 15, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	3.6079	0.0417 H	51.6662	4890.000 H	114.4663
# 2	3.5545	0.0433 H	51.8494	4913.000 H	115.0275
Mean	3.5812	0.0425 H	51.7678	4901.500 H	114.7579
SD	0.0378	0.0011	0.1155	16.263	0.3813
%RSD	1.0544	2.6122	0.2230	0.332	0.3322

BACKGROUND CORRECTED INTENSITIES 245108S CO 6/24/04
Identity 1 : ~~245108s~~ Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:15:30 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	2569.0	219.5	44833.5	4724.0	4724.0
# 2	2593.0	219.5	45263.5	4736.0	4736.0
Mean	2581.0	219.5	45048.5	4730.0	4730.0
SD	17.0	0.0	304.1	8.5	8.5
%RSD	0.7	0.0	0.7	0.2	0.2

APPARENT CONCENTRATIONS 245108S CO 6/24/04
Identity 1 : ~~245108s~~ Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:15:30 PM June 15, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	24.0640	0.0423 H	71.8335	4724.000 H	110.5966
# 2	24.2278	0.0422 H	72.3392	4736.000 H	110.8780
Mean	24.1459	0.0422 H	72.0863	4730.000 H	110.7373
SD	0.1158	0.0001	0.3576	8.485	0.1989
%RSD	0.4797	0.1700	0.4961	0.179	0.1796

BACKGROUND CORRECTED INTENSITIES 245109 CO 6/24/04
Identity 1 : ~~245109~~ Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:18:38 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	316.5	484.0	50107.0	4910.5	4910.5
# 2	309.5	500.0	49653.0	4876.5	4876.5
Mean	313.0	492.0	49880.0	4893.5	4893.5
SD	4.9	11.3	321.0	24.0	24.0
%RSD	1.6	2.3	0.6	0.5	0.5

APPARENT CONCENTRATIONS 245109 CO 6/24/04
Identity 1 : ~~245109~~ Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:18:38 PM June 15, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	2.7834	0.0872 H	77.2393	4910.500 H	114.9669
# 2	2.7396	0.0906 H	77.0729	4876.500 H	114.1718
Mean	2.7615	0.0889 H	77.1561	4893.500 H	114.5694

SRSD 1.1209 2.7216 0.1524 0.491 0.4920

BACKGROUND CORRECTED INTENSITIES 245110 CO 6/24/04

Identity 1 : ~~245110~~ Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:21:46 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	412.0	232.0	34412.0	4945.0	4945.0
# 2	434.0	244.0	34799.0	4979.0	4979.0
Mean	423.0	238.0	34605.5	4962.0	4962.0
SD	15.6	8.5	273.7	24.0	24.0
%RSD	3.7	3.6	0.8	0.5	0.5

APPARENT CONCENTRATIONS 245110 CO 6/24/04

Identity 1 : ~~245110~~ Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:21:46 PM June 15, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	3.6208	0.0427 H	52.6519	4945.000 H	115.7778
# 2	3.7917	0.0445 H	52.8807	4979.000 H	116.5748
Mean	3.7062	0.0436 H	52.7663	4962.000 H	116.1763
SD	0.1208	0.0013	0.1618	24.042	0.5636
%RSD	3.2605	2.9240	0.3067	0.485	0.4852

BACKGROUND CORRECTED INTENSITIES
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 2:27:06 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	1912.5	23794.5	16328.0	4413.5	4413.5
# 2	1897.5	23756.5	16319.0	4383.5	4383.5
Mean	1905.0	23775.5	16323.5	4398.5	4398.5
SD	10.6	26.9	6.4	21.2	21.2
%RSD	0.6	0.1	0.0	0.5	0.5

APPARENT CONCENTRATIONS
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 2:27:06 PM June 15, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	19.1590	4.6515	27.9562	4413.500 H	103.3173
# 2	19.1387	4.6758	28.1325	4383.500 H	102.6140
Mean	19.1489	4.6637	28.0444	4398.500 H	102.9657
SD	0.0143	0.0172	0.1246	21.213	0.4973
%RSD	0.0748	0.3691	0.4445	0.482	0.4830

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

Report name	Low limit	Value	High limit
K_766	18.000	19.149	22.000
Li670	4.500	4.664	5.500
Na589	27.000	28.044	33.000

010076

EVOLUTION by Micro-Active Australia Pty Ltd 2:37:56 PM June 15, 2004

BACKGROUND CORRECTED INTENSITIES
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 2:31:16 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	16.0	-7.0	35.0	4428.0	4428.0
# 2	20.0	-3.0	35.0	4405.0	4405.0
Mean	18.0	-5.0	35.0	4416.5	4416.5
SD	2.8	2.8	0.0	16.3	16.3
%RSD	15.7	56.6	0.0	0.4	0.4

APPARENT CONCENTRATIONS
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 2:31:16 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	0.0825	0.0009 L	-0.0146	4428.000 H	103.6573
# 2	0.1236	0.0016 L	-0.0143	4405.000 H	103.1180
Mean	0.1030	0.0012 L	-0.0144	4416.500 H	103.3876
SD	0.0291	0.0005	0.0002	16.263	0.3813
%RSD	28.2367	44.0634	1.5306	0.368	0.3688

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

Report name	CRDL	Value	
K_766	0.100	0.103	Contaminated
Li670	0.010	0.001	
Na589	0.050	-0.014	
Sc361	0.000	103.388	

BACKGROUND CORRECTED INTENSITIES 245111 CO 6/24/04
Identity 1 : ~~245111~~ Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:34:28 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	328.0	511.0	51254.0	4885.0	4885.0
# 2	324.0	519.0	52245.0	4873.0	4873.0
Mean	326.0	515.0	51749.5	4879.0	4879.0
SD	2.8	5.7	700.7	8.5	8.5
%RSD	0.9	1.1	1.4	0.2	0.2

APPARENT CONCENTRATIONS 245111 CO 6/24/04
Identity 1 : ~~245111~~ Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:34:28 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	2.9028	0.0924 H	79.4219	4885.000 H	114.3711
# 2	2.8737	0.0941 H	81.1585	4873.000 H	114.0898
Mean	2.8883	0.0932 H	80.2902	4879.000 H	114.2305
SD	0.0206	0.0012	1.2260	8.485	0.1989
%RSD	0.7124	1.2420	1.5274	0.174	0.1741

BACKGROUND CORRECTED INTENSITIES 245112 CO 6/24/04
Identity 1 : ~~245112~~ Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:37:36 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361

# 2	1031.5	-6.5	5966.0	4993.0	4993.0
Mean	1030.5	-4.0	5942.5	4993.5	4993.5
SD	1.4	6.4	33.2	0.7	0.7
%RSD	0.1	159.1	0.6	0.0	0.0

010078

APPARENT CONCENTRATIONS 245112 CO 6/24/04
Identity 1 : ~~243112~~ Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:37:36 PM June 15, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	9.0736	0.0023	8.9057	4994.000 H	116.9265
# 2	9.0932	0.0008	8.9788	4993.000 H	116.9031
Mean	9.0834	0.0015	8.9422	4993.500 H	116.9148
SD	0.0139	0.0011	0.0517	0.707	0.0166
%RSD	0.1527	71.6559	0.5782	0.014	0.0142

BACKGROUND CORRECTED INTENSITIES 245113 CO 6/24/04
Identity 1 : ~~243113~~ Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:40:44 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	1018.5	-0.5	5908.0	4966.0	4966.0
# 2	1022.5	-2.5	5936.0	5027.0	5027.0
Mean	1020.5	-1.5	5922.0	4996.5	4996.5
SD	2.8	1.4	19.8	43.1	43.1
%RSD	0.3	94.3	0.3	0.9	0.9

APPARENT CONCENTRATIONS 245113 CO 6/24/04
Identity 1 : ~~243113~~ Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:40:44 PM June 15, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	9.0269	0.0021	8.9395	4966.000 H	116.2701
# 2	8.9517	0.0018	8.8723	5027.000 H	117.7002
Mean	8.9893	0.0020	8.9059	4996.500 H	116.9851
SD	0.0531	0.0002	0.0475	43.134	1.0112
%RSD	0.5912	12.3230	0.5334	0.863	0.8644

BACKGROUND CORRECTED INTENSITIES 245114 CO 6/24/04
Identity 1 : ~~243114~~ Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:43:50 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	25.0	-7.5	18.0	5021.0	5021.0
# 2	13.0	0.5	19.0	5085.0	5085.0
Mean	19.0	-3.5	18.5	5053.0	5053.0
SD	8.5	5.7	0.7	45.3	45.3
%RSD	44.7	161.6	3.8	0.9	0.9

APPARENT CONCENTRATIONS 245114 CO 6/24/04
Identity 1 : ~~243114~~ Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:43:52 PM June 15, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm

Mean	0.0695	0.0016 L	-0.0468	5053.000 H	116.3097
SD	0.0760	0.0010	0.0008	45.255	1.0610
%RSD	85.1303	59.3695	1.7365	0.896	0.9168

010079

BACKGROUND CORRECTED INTENSITIES 245115 CO 6/24/04
Identity 1 : ~~245115~~ Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:47:00 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	416.0	236.5	34023.5	4940.0	4940.0
# 2	426.0	237.5	34532.5	4982.0	4982.0
Mean	421.0	237.0	34278.0	4961.0	4961.0
SD	7.1	0.7	358.9	29.7	29.7
%RSD	1.7	0.3	1.0	0.6	0.6

APPARENT CONCENTRATIONS 245115 CO 6/24/04
Identity 1 : ~~245115~~ Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:47:00 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	3.6604	0.0435 H	52.1094	4940.000 H	115.6605
# 2	3.7180	0.0433 H	52.4435	4982.000 H	116.6452
Mean	3.6892	0.0434 H	52.2764	4961.000 H	116.1529
SD	0.0407	0.0001	0.2363	29.698	0.6962
%RSD	1.1038	0.2849	0.4520	0.599	0.5994

BACKGROUND CORRECTED INTENSITIES 245116 CO 6/24/04
Identity 1 : ~~245116~~ Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:50:08 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	310.0	511.5	51026.5	4556.0	4556.0
# 2	313.0	515.5	51606.5	4548.0	4548.0
Mean	311.5	513.5	51316.5	4552.0	4552.0
SD	2.1	2.8	410.1	5.7	5.7
%RSD	0.7	0.6	0.8	0.1	0.1

APPARENT CONCENTRATIONS 245116 CO 6/24/04
Identity 1 : ~~245116~~ Identity 2 : pg56-215 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:50:08 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	2.9427	0.0990 H	64.7842	4556.000 H	106.6581
# 2	2.9773	0.1000 H	85.8997	4548.000 H	106.4705
Mean	2.9600	0.0995 H	85.3419	4552.000 H	106.5643
SD	0.0245	0.0007	0.7886	5.657	0.1326
%RSD	0.8265	0.6600	0.9243	0.124	0.1244

iVOLUTION by Micro-Active Australia Pty Ltd 2:58:56 PM June 15, 2004

BACKGROUND CORRECTED INTENSITIES
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 2:58:28 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	1891.0	23773.5	16531.0	4413.0	4413.0
# 2	1924.0	23758.5	16346.0	4388.0	4388.0
Mean	1907.5	23766.0	16438.5	4400.5	4400.5
SD	23.3	10.6	12.0	17.7	17.7
%RSD	1.2	0.0	0.1	0.4	0.4

APPARENT CONCENTRATIONS
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 2:58:28 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	18.9449	4.6479	27.9645	4413.000 H	103.3086
# 2	19.3871	4.6714	28.1536	4388.000 H	102.7185
Mean	19.1660	4.6597	28.0591	4400.500 H	103.0125
SD	0.3127	0.0166	0.1337	17.678	0.4144
%RSD	1.6316	0.3569	0.4765	0.402	0.4023

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

Report name	Low limit	Value	High limit
K_766	18.000	19.166	22.000
Li670	4.500	4.660	5.500
Na589	27.000	28.059	33.000

BACKGROUND CORRECTED INTENSITIES
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 2:59:42 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	8.0	-8.5	37.0	4420.0	4420.0
# 2	20.0	-5.5	30.0	4406.0	4406.0
Mean	14.0	-7.0	33.5	4413.0	4413.0
SD	8.5	2.1	4.9	9.9	9.9
%RSD	60.6	30.3	14.8	0.2	0.2

APPARENT CONCENTRATIONS
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 2:59:42 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	0.0024	0.0006 L	-0.0111	4420.000 H	103.4697
# 2	0.1236	0.0011 L	-0.0229	4406.000 H	103.1415
Mean	0.0630	0.0009 L	-0.0170	4413.000 H	103.3056
SD	0.0857	0.0004	0.0084	9.899	0.2321
%RSD	136.0060	48.2341	49.2798	0.224	0.2247

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

Report name	CRDL	Value
K_766	0.100	0.063

Sc361 0.000 103.306

010081

010082

ICP ANALYSIS

PROJ. NO.	PROJECT	TO#	DATE	MATRIX	LOGBK PG
06002.01.141	Div 20	040415-2 040521-6	6-15-04	WATER	S6214

INSTRUMENT: TRACE 2 FILENAME: B404152

INSTRUMENT DL:_____

Method: DAILY2 Standard: blk
Run Time: 06/15/04 11:40:18

010083

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Avge	-.0000	.0005	-.0000	.0002	-.0000	-.0001	-.0000
SDev	.0000	.0000	.0000	.0000	.0000	.0000	.0000
%RSD	8.243	.3134	42.50	16.08	11.71	1.761	115.7
#1	-.0000	.0005	-.0001	.0002	-.0000	-.0001	-.0000
#2	-.0000	.0005	-.0000	.0001	-.0000	-.0001	-.0000

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Avge	.0000	-.0000	-.0000	.0000	.0004	.0000	.0003
SDev	.0000	.0000	.0000	.0000	.0000	.0000	.0000
%RSD	2.744	25.03	56.50	175.4	1.208	22.40	7.967
#1	.0000	-.0000	-.0000	-.0000	.0004	.0000	.0003
#2	.0000	-.0000	-.0000	.0000	.0004	.0000	.0003

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Avge	-.0000	.0000	.0000	.0000	-.0000	-.0002	-.0104
SDev	.0000	.0000	.0000	.0000	.0000	.0000	.0000
%RSD	424.9	16.15	47.07	141.4	75.48	6.810	.1181
#1	.0000	.0000	.0000	.0000	-.0000	-.0002	-.0104
#2	-.0000	.0001	.0000	.0000	-.0000	-.0002	-.0103

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Avge	-.0000	.0000	.0001	-.0000	.0001	.0008	-.0012
SDev	.0000	.0000	.0000	.0000	.0000	.0000	.0000
%RSD	358.6	.0758	16.39	47.21	31.82	2.561	.6705
#1	-.0000	.0000	.0001	-.0000	.0001	.0008	-.0012
#2	.0000	.0000	.0001	-.0000	.0001	.0008	-.0012

Elem	Sc3613	1960/1	1960/2	Si2881	Sn1899	Sr4215	Th2837
Avge	64.50	-.0002	.0001	.0020	.0000	.0000	.0000
SDev	.05	.0001	.0001	.0000	.0001	.0000	.0000
%RSD	.0760	32.56	77.01	.9194	321.7	7.368	34.21
#1	64.47	-.0001	.0001	.0020	-.0000	.0000	.0001
#2	64.53	-.0002	.0002	.0020	.0001	.0000	.0000

Elem	Ti3349	Tl1908	U_4090	V_2924	W_2079	Y_3710	Zn2062
Avge	-.0001	-.0002	-.0004	-.0000	.0002	.0000	.0001
SDev	.0000	.0001	.0000	.0000	.0000	.0000	.0000
%RSD	15.59	51.12	5.313	5.313	16.60	28.21	11.75
#1	-.0001	-.0001	-.0004	-.0000	.0002	.0000	.0001
#2	-.0001	-.0002	-.0003	-.0000	.0002	.0000	.0001

Elem	Zr3496
Avge	.0001
SDev	.0000
%RSD	31.47
#1	.0001
#2	.0001

6-15-04

6/24/04

010084

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	644924	10000	--	--	--	--	--
SDev	488.6108	.0000000	--	--	--	--	--
%RSD	.0757625	.0000000	--	--	--	--	--
#1	644579	10000	--	--	--	--	--
#2	645270	10000	--	--	--	--	--

Method: DAILY2 Standard: clp_std4
Run Time: 06/15/04 11:45:03

010085

Elem	Ag3280	As1890	2203/1	2203/2	Sb2068	1960/1	1960/2
Avge	.0830	.1171	.3023	.2612	.1806	.2615	.2682
SDev	.0000	.0000	.0003	.0000	.0006	.0002	.0006
%RSD	.0341	.0350	.1009	.0096	.3068	.0842	.2399
#1	.0830	.1171	.3025	.2611	.1802	.2613	.2677
#2	.0830	.1172	.3021	.2612	.1810	.2617	.2687

Elem	T11908
Avge	.2216
SDev	.0006
%RSD	.2874
#1	.2221
#2	.2212

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	648023	10000	--	--	--	--	--
SDev	630.7393	.0000000	--	--	--	--	--
%RSD	.0973328	.0000000	--	--	--	--	--
#1	647577	10000	--	--	--	--	--
#2	648469	10000	--	--	--	--	--

Method: DAILY2 Standard: clp_std1
Run Time: 06/15/04 11:49:27

010086

Elem	Al3082	Ca3179	Fe2714	K_7664	Li6707	Mg2790	Na3302
Avge	.1122	.1878	.0984	.2078	3.220	.0852	.0089
SDev	.0000	.0001	.0000	.0006	.015	.0000	.0000
%RSD	.0257	.0303	.0126	.2753	.4586	.0288	.0786
#1	.1122	.1877	.0984	.2074	3.231	.0852	.0089
#2	.1122	.1878	.0984	.2082	3.210	.0852	.0089

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	643217	10000	--	--	--	--	--
SDev	127.2792	.0000000	--	--	--	--	--
%RSD	.0197879	.0000000	--	--	--	--	--
#1	643307	10000	--	--	--	--	--
#2	643127	10000	--	--	--	--	--

Method: DAILY2 Standard: clp_std5
Run Time: 06/15/04 11:53:07

010087

Elem	B_2496	Bi2230	Mo2020	P_1782	Si2881	Sn1899	Sr4215
Avge	.1685	.0342	.3294	.0161	.1754	.1511	2.610
SDev	.0004	.0001	.0017	.0001	.0005	.0002	.004
%RSD	.2399	.3288	.5112	.9211	.2989	.1114	.1543
#1	.1682	.0343	.3282	.0162	.1758	.1513	2.607
#2	.1688	.0341	.3306	.0160	.1751	.1510	2.613

Elem	Ti3349
Avge	2.598
SDev	.002
%RSD	.0605
#1	2.597
#2	2.599

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	647130	10000	--	--	--	--	--
SDev	2438.104	.0000000	--	--	--	--	--
%RSD	.3767565	.0000000	--	--	--	--	--
#1	645406	10000	--	--	--	--	--
#2	648854	10000	--	--	--	--	--

Method: DAILY2 Standard: clp_std2
Run Time: 06/15/04 11:56:47

010088

Elem	Ba4934	Be3130	Cr2677	Cu3247	Ni2316
Avge	1.155	1.300	.3989	.3194	.3348
SDev	.001	.002	.0001	.0005	.0004
%RSD	.0538	.1635	.0372	.1563	.1122
#1	1.156	1.299	.3988	.3198	.3346
#2	1.155	1.302	.3990	.3191	.3351

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	646431	10000	--	--	--	--	--
SDev	2026.568	.0000000	--	--	--	--	--
%RSD	.3135011	.0000000	--	--	--	--	--
#1	644998	10000	--	--	--	--	--
#2	647864	10000	--	--	--	--	--

Method: DAILY2 Standard: clp_std3
Run Time: 06/15/04 12:00:06

010089

Elem	Cd2265	Co2286	Mn2576	V_2924	Zn2062
Avge	.9303	.2052	.8268	.1886	.2732
SDev	.0006	.0003	.0001	.0002	.0000
%RSD	.0669	.1358	.0137	.1138	.0139
#1	.9307	.2054	.8269	.1888	.2731
#2	.9298	.2050	.8267	.1885	.2732

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	649341	10000	--	--	--	--	--
SDev	1798.880	.0000000	--	--	--	--	--
%RSD	.2770316	.0000000	--	--	--	--	--
#1	650613	10000	--	--	--	--	--
#2	648069	10000	--	--	--	--	--

Method: DAILY2 Standard: clp_std6
Run Time: 06/15/04 12:03:46

010090

Elem	La3988	Na5889	Pd3404	S_1820	Th2837	U_4090	W_2079
Avge	.4844	.1160	.2106	.0357	.1124	.0759	.2004
SDev	.0001	.0008	.0003	.0002	.0003	.0003	.0008
%RSD	.0296	.6760	.1664	.5491	.2734	.3942	.4195
#1	.4845	.1155	.2109	.0356	.1126	.0761	.2010
#2	.4843	.1166	.2104	.0359	.1122	.0757	.1998

Elem	Y_3710	Zr3496
Avge	.7869	1.935
SDev	.0016	.002
%RSD	.2007	.0942
#1	.7881	1.936
#2	.7858	1.933

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	641001	10000	--	--	--	--	--
SDev	2815.699	.0000000	--	--	--	--	--
%RSD	.4392660	.0000000	--	--	--	--	--
#1	639010	10000	--	--	--	--	--
#2	642992	10000	--	--	--	--	--

Standardization Report 06/15/04 12:07:37 PM page 1

Method: DAILY2 Slope = Conc(SIR)/IR 010091

Element	Wavelen	High std	Low std	Slope	Y-intercept	Date Standardized
Ag3280	328.068	clp_std4	blk	24.0914	.000635	06/15/04 12:03:46
Al3082	308.215	clp_std1	blk	447.553	-.206454	06/15/04 12:03:46
As1890	189.042	clp_std4	blk	85.3400	.003970	06/15/04 12:03:46
B_2496	249.678	clp_std5	blk	59.4010	-.009764	06/15/04 12:03:46
Ba4934	493.409	clp_std2	blk	8.65696	.000161	06/15/04 12:03:46
Be3130	313.042	clp_std2	blk	3.84438	.000459	06/15/04 12:03:46
Bi2230	223.061	clp_std5	blk	144.922	.002471	06/15/04 12:03:46
Ca3179	317.933	clp_std1	blk	266.390	-.010946	06/15/04 12:03:46
Cd2265	226.502	clp_std3	blk	10.7460	.000283	06/15/04 12:03:46
Co2286	228.616	clp_std3	blk	48.7321	.000378	06/15/04 12:03:46
Cr2677	267.716	clp_std2	blk	25.0695	-.000486	06/15/04 12:03:46
Cu3247	324.753	clp_std2	blk	31.3491	-.013392	06/15/04 12:03:46
Fe2714	271.441	clp_std1	blk	508.561	-.014984	06/15/04 12:03:46
K_7664	766.491	clp_std1	blk	240.995	-.078844	06/15/04 12:03:46
La3988	398.853	clp_std6	blk	20.6605	.000080	06/15/04 12:03:46
Li6707	670.784	clp_std1	blk	3.10552	-.000147	06/15/04 12:03:46
Mg2790	279.078	clp_std1	blk	293.428	-.000682	06/15/04 12:03:46
Mn2576	257.610	clp_std3	blk	12.0959	-.000075	06/15/04 12:03:46
Mo2020	202.030	clp_std5	blk	30.3568	.000706	06/15/04 12:03:46
Na3302	330.232	clp_std1	blk	5451.53	1.24262	06/15/04 12:03:46
Na5889	588.991	clp_std6	blk	7.95428	.082377	06/15/04 12:03:46
Ni2316	231.604	clp_std2	blk	29.8645	.000301	06/15/04 12:03:46
P_1782	178.287	clp_std5	blk	623.130	-.006763	06/15/04 12:03:46
2203/1	220.351	clp_std4	blk	33.0945	-.004003	06/15/04 12:03:46
2203/2	220.352	clp_std4	blk	38.2847	.001425	06/15/04 12:03:46
Pd3404	340.458	clp_std6	blk	48.7631	-.003705	06/15/04 12:03:46
S_1820	182.040	clp_std6	blk	286.042	-.225976	06/15/04 12:03:46
Sb2068	206.838	clp_std4	blk	55.0063	.064650	06/15/04 12:03:46
Sc3613	361.384	blk	dark	1.55038	.000000	06/15/04 12:03:46
1960/1	196.021	clp_std4	blk	38.2202	.006933	06/15/04 12:03:46
1960/2	196.022	clp_std4	blk	37.3048	-.004829	06/15/04 12:03:46
Si2881	288.158	clp_std5	blk	57.4359	-.113905	06/15/04 12:03:46
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	66.2107	-.001128	06/15/04 12:03:46
Sr4215	421.552	clp_std5	blk	3.83124	-.000056	06/15/04 12:03:46
Th2837	283.730	clp_std6	blk	92.8931	-.004178	06/15/04 12:03:46
Ti3349	334.941	clp_std5	blk	3.84891	.000463	06/15/04 12:03:46
Tl1908	190.864	clp_std4	blk	45.0821	.007338	06/15/04 12:03:46
U_4090	409.014	clp_std6	blk	138.641	.049337	06/15/04 12:03:46
V_2924	292.402	clp_std3	blk	53.0046	.002219	06/15/04 12:03:46
W_2079	207.914	clp_std6	blk	24.9624	-.004432	06/15/04 12:03:46
Y_3710	371.030	clp_std6	blk	12.7050	-.000049	06/15/04 12:03:46
Zn2062	206.200	clp_std3	blk	36.6208	-.003095	06/15/04 12:03:46
Zr3496	349.621	clp_std6	blk	5.65061	-.000609	06/15/04 12:03:46

Method: DAILY2 Sample Name: icv/ccv Operator:
Run Time: 06/15/04 12:07:49
Comment:
Mode: CONC Corr. Factor: 1

010092

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.9907	9.691	4.953	4.793	10.01	.9737	5.000
SDev	.0010	.005	.003	.000	.01	.0006	.007
%RSD	.1057	.0502	.0647	.0027	.1025	.0669	.1379
#1	.9900	9.688	4.955	4.793	10.01	.9742	5.005
#2	.9914	9.694	4.950	4.793	9.999	.9733	4.995
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	1.000	10.00	5.000	5.000	10.00	1.000	5.000
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	20.20	.9977	4.968	1.947	2.018	10.17	18.20
SDev	.21	.0006	.006	.004	.002	.04	.04
%RSD	1.060	.0596	.1306	.1889	.0935	.3727	.2353
#1	20.05	.9973	4.972	1.950	2.016	10.19	18.17
#2	20.35	.9982	4.963	1.945	2.019	10.14	18.23
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	20.00	1.000	5.000	2.000	2.000	10.00	20.00
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.935	Q4.471	19.89	1.008	4.942	Q26.90	Q18.98
SDev	.000	.011	.02	.000	.017	.10	.04
%RSD	.0075	.2390	.1075	.0165	.3371	.3538	.1993
#1	4.935	Q4.479	19.90	1.009	4.930	Q26.96	Q18.95
#2	4.935	Q4.464	19.87	1.008	4.953	Q26.83	Q19.00
Errors	QC Pass	QC Fail	QC Pass	QC Pass	QC Pass	QC Fail	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	4.873	4.928	4.985	4.986	1.022	.9916	.9843
SDev	.012	.333	.000	.023	.001	.0244	.0058
%RSD	.2506	6.748	.0018	.4564	.0751	2.462	.5897
#1	4.881	4.693	4.985	5.002	1.022	.9743	.9802
#2	4.864	5.163	4.985	4.970	1.023	1.009	.9884
Errors	QC Pass	QC Pass	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass
Value	5.000	5.000			1.000	1.000	1.000
Range	10.00	10.00			10.00	10.00	10.00

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

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	100.6	5.184	5.170	4.932	4.986	5.175	4.908
SDev	.3	.003	.007	.006	.015	.005	.001
%RSD	.2747	.0597	.1295	.1158	.3049	.1062	.0232
#1	100.4	5.186	5.175	4.928	4.996	5.178	4.907
#2	100.8	5.182	5.165	4.937	4.975	5.171	4.909
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	5.048	.9715	4.870	5.167	.9821	4.941	.9934
SDev	.002	.0021	.003	.032	.0132	.002	.0021
%RSD	.0401	.2169	.0656	.6166	1.343	.0307	.2148
#1	5.050	.9730	4.872	5.145	.9728	4.940	.9919
#2	5.047	.9700	4.868	5.190	.9914	4.942	.9949
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	5.000	1.000	5.000	5.000	1.000	5.000	1.000
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	4.969	1.004	4.805
SDev	.002	.012	.019
%RSD	.0302	1.158	.4035
#1	4.970	.9961	4.792
#2	4.968	1.012	4.819
Errors	QC Pass	QC Pass	QC Pass
Value	5.000	1.000	5.000
Range	10.00	10.00	10.00

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	648851	10000	--	--	--	--	--
SDev	1808.779	.0000000	--	--	--	--	--
%RSD	.2787665	.0000000	--	--	--	--	--
#1	647572	10000	--	--	--	--	--
#2	650130	10000	--	--	--	--	--

Analysis Report Blank Sample 06/15/04 12:18:59 PM page 1

Method: DAILY2 Sample Name: ICB/CCB Operator:
Run Time: 06/15/04 12:14:25
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	-.0027	.0015	.0048	.0001	.0000	.0009
SDev	.0004	.0050	.0016	.0008	.0000	.0000	.0038
%RSD	119.3	183.1	109.8	16.52	.0925	156.8	416.5
#1	.0006	-.0063	.0026	.0054	.0001	-.0000	.0036
#2	.0001	.0008	.0003	.0043	.0001	.0000	-.0018
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	.0021	.0005	-.0003	.0004	.0002	.0121	.0013
SDev	.0009	.0003	.0003	.0002	.0001	.0036	.0043
%RSD	43.14	58.66	100.1	43.53	44.21	29.54	332.0
#1	.0028	.0007	-.0005	.0003	.0001	.0146	.0043
#2	.0015	.0003	-.0001	.0005	.0002	.0095	-.0017
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	.0001	.0012	.0001	H.0070	.0001	.0014
SDev	.0002	.0000	.0026	.0000	.0003	.0319	.0003
%RSD	49.18	14.31	216.7	69.53	4.352	23820.	24.46
#1	.0006	.0001	-.0006	.0000	H.0072	-.0224	.0012
#2	.0003	.0001	.0031	.0001	H.0068	.0227	.0016
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC High	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	-.0005	-.0000	.0004	.0014	-.0062	-.0026
SDev	.0003	.0103	.0008	.0005	.0017	.0080	.0049
%RSD	1151.	2142.	2374.	125.8	116.5	129.6	188.8
#1	-.0003	.0068	-.0006	.0008	.0003	-.0005	.0009
#2	.0002	-.0077	.0005	.0000	.0026	L-.0118	-.0061
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass
High	.0050	.0100			.0050	.0100	.0100
Low	-.0050	-.0100			-.0050	-.0100	-.0100

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

010096

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	99.78	-.0000	-.0026	.0020	.0003	-.0017	-.0001
SDev	.08	.0009	.0030	.0009	.0001	.0017	.0018
%RSD	.0795	2920.	117.2	47.52	33.16	100.2	3356.
#1	99.72	-.0007	-.0004	.0013	.0003	-.0005	.0012
#2	99.84	.0006	-.0047	.0026	.0002	-.0029	-.0013
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	.0001	H.0100	.0266	.0005	.0029
SDev	.0000	.0002	.0000	.0076	.0181	.0003	.0011
%RSD	50.25	10.87	23.35	76.26	68.04	62.16	36.81
#1	.0001	-.0015	.0001	H.0154	.0394	.0003	.0037
#2	.0000	-.0013	.0001	.0046	.0138	.0007	.0022
Errors	LC Pass	LC Pass	LC Pass	LC High	LC Pass	LC Pass	LC Pass
High	.0050	.0100	.0050	.0100	.1000	.0050	.0100
Low	-.0050	-.0100	-.0050	-.0100	-.1000	-.0050	-.0100

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	-.0002	.0006
SDev	.0000	.0001	.0003
%RSD	70.86	54.72	44.08
#1	.0001	-.0001	.0008
#2	.0000	-.0003	.0004
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

010097

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	643561	10000	--	--	--	--	--
SDev	489.3179	.0000000	--	--	--	--	--
%RSD	.0760329	.0000000	--	--	--	--	--
#1	643215	10000	--	--	--	--	--
#2	643907	10000	--	--	--	--	--

Method: DAILY2 Sample Name: pbw-F15E1 pg56-214 Operator:
Run Time: 06/15/04 12:34:34
Comment:
Mode: CONC Corr. Factor: 1

010098

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0008	.0067	-.0020	.0034	.0001	-.0000	.0032
SDev	.0006	.0005	.0002	.0007	.0001	.0000	.0016
%RSD	78.69	7.159	11.46	19.76	82.86	40.43	51.80
#1	.0012	.0070	-.0021	.0038	.0001	-.0000	.0043
#2	.0003	.0063	-.0018	.0029	.0000	-.0000	.0020
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	.0130	.0005	.0009	H.0130	.0001	H.0987	.0311
SDev	.0035	.0003	.0003	.0003	.0002	.0247	.0356
%RSD	27.06	61.56	34.83	2.158	173.5	24.97	114.4
#1	.0155	.0007	.0011	H.0128	.0003	H.1162	.0563
#2	.0105	.0003	.0007	H.0132	-.0000	H.0813	.0059
Errors	LC Pass	LC Pass	LC Pass	LC High	LC Pass	LC High	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	.0011	.0001	.0081	.0013	.0021	H.2533	.0021
SDev	.0006	.0001	.0047	.0000	.0003	.4154	.0048
%RSD	52.19	83.02	58.63	2.032	15.11	164.0	225.2
#1	.0015	.0002	.0114	.0013	.0018	H.5470	.0055
#2	.0007	.0000	.0047	.0014	.0023	-.0405	-.0013
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC High	LC Pass
High	.0050	.0050	.0500	.0050	.0050	.0500	.0500
Low	-.0050	-.0050	-.0500	-.0050	-.0050	-.0500	-.0500

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	H.0082	.0040	.0003	-.0001	.0041	.0054	.0051
SDev	.0007	.0015	.0011	.0013	.0076	.0028	.0035
%RSD	8.806	36.71	373.7	1556.	183.5	51.96	68.66
#1	H.0087	.0030	-.0005	-.0010	H.0095	.0034	.0076
#2	H.0076	.0050	.0011	.0008	-.0012	.0073	.0026
Errors	LC High	LC Pass	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass
High	.0050	.0100			.0050	.0100	.0100
Low	-.0050	-.0100			-.0050	-.0100	-.0100

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

010099

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	98.64	.0021	-.0028	H.0254	.0001	-.0012	-.0010
SDev	.51	.0056	.0013	.0022	.0013	.0010	.0018
%RSD	.5121	263.5	47.86	8.709	2025.	82.75	184.9
#1	99.00	.0060	-.0038	H.0270	-.0008	-.0005	.0003
#2	98.28	-.0018	-.0019	H.0239	.0009	-.0018	-.0023
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	-.0016	-.0000	.0008	.0487	.0003	.0003
SDev	.0000	.0007	.0000	.0003	.0390	.0004	.0023
%RSD	42.28	45.54	7.343	32.66	80.08	130.1	822.9
#1	.0001	-.0021	-.0000	.0009	.0762	.0000	.0019
#2	.0000	-.0011	-.0000	.0006	.0211	.0007	-.0013

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	.0005	.0008
SDev	.0001	.0001	.0003
%RSD	590.4	29.94	37.83
#1	.0000	.0006	.0010
#2	-.0000	.0004	.0006

Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	636165	10000	--	--	--	--	--
SDev	3252.691	.0000000	--	--	--	--	--
%RSD	.5112968	.0000000	--	--	--	--	--
#1	638465	10000	--	--	--	--	--
#2	633865	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: lcsw-F15W1 Operator:
Run Time: 06/15/04 12:39:19
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0505	1.908	1.995	.0023	2.012	.0494	.0049
SDev	.0005	.003	.002	.0000	.001	.0000	.0085
%RSD	.9734	.1466	.1003	1.971	.0410	.0390	174.6
#1	.0508	1.910	1.993	.0022	2.013	.0494	.0108
#2	.0501	1.906	1.996	.0023	2.012	.0494	-.0011

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	20.96	.0497	.4992	.2084	.2519	1.141	17.05
SDev	.01	.0003	.0001	.0011	.0005	.019	.00
%RSD	.0293	.6727	.0145	.5297	.2099	1.626	.0236
#1	20.96	.0499	.4993	.2092	.2523	1.154	17.04
#2	20.95	.0494	.4992	.2076	.2515	1.128	17.05

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0003	.0001	20.69	.5036	.0009	17.78	12.28
SDev	.0001	.0001	.03	.0001	.0007	.00	.01
%RSD	55.05	47.95	.1689	.0105	79.64	.0174	.1080
#1	.0004	.0001	20.71	.5037	.0014	17.78	12.29
#2	.0002	.0001	20.66	.5036	.0004	17.79	12.27

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.4979	-.0011	.4981	.4965	.0008	.0017	.4896
SDev	.0017	.0210	.0026	.0000	.0016	.0031	.0002
%RSD	.3340	1860.	.5306	.0022	213.2	184.2	.0410
#1	.4991	-.0160	.4962	.4964	-.0004	.0039	.4898
#2	.4967	.0138	.5000	.4965	.0019	-.0005	.4895

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	97.50	2.026	2.040	.0277	.4970	2.035	-.0014
SDev	.34	.021	.020	.0009	.0009	.020	.0001
%RSD	.3533	1.018	.9925	3.332	.1787	1.001	10.49
#1	97.74	2.011	2.026	.0270	.4964	2.021	-.0015
#2	97.25	2.041	2.054	.0283	.4977	2.050	-.0013

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0007	-.0128	.0002	2.059	-.0008	.4981	-.0001
SDev	.0000	.0008	.0001	.012	.0089	.0004	.0010
%RSD	2.140	5.951	32.62	.5656	1076.	.0870	756.7
#1	.0007	-.0133	.0001	2.050	.0055	.4984	.0006
#2	.0008	-.0123	.0002	2.067	-.0071	.4978	-.0009

010102

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	.4969	.0003
SDev	.0000	.0016	.0003
%RSD	11.89	.3251	97.89
#1	-.0001	.4958	.0005
#2	-.0001	.4981	.0001

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	628807	10000	--	--	--	--	--
SDev	2187.788	.0000000	--	--	--	--	--
%RSD	.3479269	.0000000	--	--	--	--	--
#1	630354	10000	--	--	--	--	--
#2	627260	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 243222 Operator:
Run Time: 06/15/04 12:44:05 **010103**
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	-.0136	-.0007	1.688	.2966	.0001	.0030
SDev	.0004	.0032	.0010	.011	.0014	.0000	.0008
%RSD	129.4	23.73	136.1	.6219	.4832	21.86	25.63
#1	-.0006	-.0159	-.0014	1.696	.2956	.0000	.0025
#2	-.0000	-.0113	-.0000	1.681	.2976	.0001	.0035

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	29.11	.0004	.0025	-.0007	-.0006	.0802	.1416
SDev	.04	.0000	.0001	.0001	.0003	.0011	.0058
%RSD	.1349	5.568	3.929	9.294	49.43	1.321	4.096
#1	29.08	.0004	.0024	-.0007	-.0009	.0810	.1457
#2	29.13	.0004	.0025	-.0007	-.0004	.0795	.1375

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0002	.0002	.0976	.0041	.0015	2.930	1.865
SDev	.0004	.0000	.0004	.0000	.0000	.077	.006
%RSD	239.4	14.57	.3797	1.061	2.018	2.623	.3338
#1	-.0005	.0002	.0973	.0041	.0015	2.984	1.860
#2	.0001	.0001	.0978	.0041	.0015	2.875	1.869

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0588	-.0026	-.0008	.0025	-.0018	24.94	.0019
SDev	.0026	.0085	.0020	.0011	.0001	.40	.0036
%RSD	4.446	320.6	252.7	43.46	5.638	1.587	186.5
#1	.0569	-.0086	-.0022	.0018	-.0017	25.22	.0045
#2	.0606	.0033	.0006	.0033	-.0019	24.66	-.0006

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	104.9	.0098	-.0010	.2740	.0014	.0026	-.0009
SDev	.1	.0005	.0014	.0063	.0014	.0008	.0008
%RSD	.1162	4.870	139.5	2.300	95.70	29.89	89.18
#1	104.9	.0102	-.0020	.2695	.0005	.0021	-.0015
#2	105.0	.0095	-.0000	.2785	.0024	.0032	-.0003

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.2122	-.0014	.0001	.0022	.0082	.0002	-.0013
SDev	.0002	.0003	.0001	.0026	.0129	.0001	.0011
%RSD	.1029	22.02	124.9	116.1	157.6	28.70	86.41
#1	.2120	-.0012	.0000	.0004	-.0009	.0002	-.0005
#2	.2123	-.0016	.0001	.0041	.0174	.0001	-.0021

010104

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0002	.1116	.0001
SDev	.0000	.0001	.0001
%RSD	26.15	.1205	94.89
#1	-.0002	.1117	.0000
#2	-.0001	.1116	.0002

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	676798	10000	--	--	--	--	--
SDev	796.2022	.0000000	--	--	--	--	--
%RSD	.1176425	.0000000	--	--	--	--	--
#1	676235	10000	--	--	--	--	--
#2	677361	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 243223 Operator:
Run Time: 06/15/04 12:48:50
Comment:
Mode: CONC Corr. Factor: 1

010105

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0004	-.0177	.0019	.1383	.0072	.0001	-.0002
SDev	.0004	.0001	.0003	.0020	.0000	.0000	.0031
%RSD	95.42	.3041	15.19	1.478	.4997	11.03	1346.
#1	-.0001	-.0177	.0017	.1397	.0071	.0001	.0019
#2	-.0006	-.0176	.0021	.1368	.0072	.0001	-.0024

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	17.75	.0002	.0010	-.0009	-.0010	.0087	4.888
SDev	.04	.0003	.0014	.0001	.0003	.0066	.017
%RSD	.2057	186.8	141.0	14.44	29.41	75.67	.3484
#1	17.78	.0004	.0020	-.0008	-.0008	.0133	4.876
#2	17.73	-.0001	.0000	-.0009	-.0012	.0040	4.900

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0002	.0283	2.783	.0254	.0031	32.05	20.99
SDev	.0002	.0001	.002	.0001	.0014	.07	.02
%RSD	94.73	.3177	.0888	.5084	43.77	.2100	.0973
#1	-.0003	.0284	2.785	.0255	.0021	32.00	20.97
#2	-.0001	.0283	2.781	.0253	.0041	32.10	21.00

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0008	.0202	-.0033	.0036	-.0012	6.809	.0017
SDev	.0003	.0081	.0008	.0004	.0004	.006	.0044
%RSD	38.83	39.88	24.42	10.05	32.02	.0846	260.1
#1	.0011	.0260	-.0039	.0033	-.0009	6.814	-.0014
#2	.0006	.0145	-.0027	.0039	-.0015	6.805	.0048

Elem	Sc3613	1960/1	1960/2	Si2881	Th220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	103.8	.0186	.0004	19.50	.0013	.0065	.0146
SDev	.7	.0033	.0024	.06	.0005	.0005	.0016
%RSD	.6597	17.88	634.4	.3219	39.23	8.193	10.72
#1	103.3	.0162	.0021	19.55	.0010	.0068	.0158
#2	104.3	.0209	-.0013	19.46	.0017	.0061	.0135

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0787	-.0025	-.0003	-.0124	.0111	.0017	-.0028
SDev	.0001	.0008	.0001	.0013	.0060	.0003	.0020
%RSD	.1200	30.74	24.51	10.65	54.27	17.46	72.30
#1	.0786	-.0030	-.0004	-.0134	.0154	.0015	-.0042
#2	.0787	-.0020	-.0003	-.0115	.0069	.0019	-.0013

010106

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	.0003	-.0001
SDev	.0001	.0004	.0002
%RSD	117.6	161.3	182.3
#1	-.0000	.0006	.0000
#2	-.0001	-.0000	-.0003

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	669552	10000	--	--	--	--	--
SDev	4429.317	.0000000	--	--	--	--	--
%RSD	.6615344	.0000000	--	--	--	--	--
#1	666420	10000	--	--	--	--	--
#2	672684	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 243224 Operator:
Run Time: 06/15/04 12:53:36
Comment:
Mode: CONC Corr. Factor: 1

010107

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0001	-.0134	.0006	-.0019	.0002	.0000	.0023
SDev	.0001	.0038	.0023	.0002	.0000	.0000	.0046
%RSD	89.77	28.36	415.6	10.78	4.618	158.1	201.0
#1	-.0000	-.0107	.0022	-.0017	.0002	-.0000	.0055
#2	-.0002	-.0160	-.0011	-.0020	.0002	.0000	-.0010

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.997	.0005	.0001	-.0002	-.0004	-.0031	.0012
SDev	.005	.0003	.0001	.0004	.0001	.0021	.0054
%RSD	.0929	72.82	120.2	176.2	22.21	66.96	450.0
#1	5.001	.0007	.0002	.0001	-.0004	-.0046	.0050
#2	4.994	.0002	.0000	-.0005	-.0005	-.0016	-.0026

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0000	-.0002	.0002	-.0000	.0002	7.468	4.521
SDev	.0003	.0000	.0013	.0001	.0003	.109	.000
%RSD	6430.	21.73	578.1	276.0	159.0	1.460	.0097
#1	-.0002	-.0002	-.0007	.0000	-.0000	7.391	4.522
#2	.0002	-.0002	.0011	-.0001	.0004	7.545	4.521

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0008	.0076	-.0035	-.0003	-.0005	-.0309	-.0005
SDev	.0010	.0047	.0013	.0017	.0008	.0128	.0000
%RSD	126.8	62.03	37.43	498.5	158.7	41.54	6.443
#1	.0001	.0110	-.0025	-.0015	-.0010	-.0218	-.0005
#2	.0014	.0043	-.0044	.0009	.0001	-.0399	-.0005

Elem	Sc3613	1960/1	1960/2	Si2881	Th220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	104.1	.0040	-.0060	.0323	-.0014	-.0026	-.0006
SDev	1.1	.0034	.0001	.0023	.0007	.0010	.0008
%RSD	1.016	84.16	2.480	7.071	51.56	38.62	134.1
#1	103.4	.0016	-.0059	.0307	-.0019	-.0034	-.0000
#2	104.9	.0064	-.0061	.0339	-.0009	-.0019	-.0012

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0016	.0001	-.0002	-.0095	.0005	-.0009
SDev	.0000	.0016	.0000	.0005	.0062	.0006	.0007
%RSD	4.540	102.9	71.43	251.3	64.66	123.1	81.63
#1	.0001	.0004	.0001	.0002	-.0139	.0001	-.0014
#2	.0001	.0027	.0000	-.0006	-.0052	.0010	-.0004

010108

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	.0003	.0003
SDev	.0001	.0000	.0001
%RSD	329.1	1.006	25.74
#1	.0000	.0003	.0004
#2	-.0001	.0003	.0002

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	671668	10000	--	--	--	--	--
SDev	6832.773	.0000000	--	--	--	--	--
%RSD	1.017285	.0000000	--	--	--	--	--
#1	666836	10000	--	--	--	--	--
#2	676499	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 243225 Operator:
Run Time: 06/15/04 12:58:21
Comment:
Mode: CONC Corr. Factor: 1

010109

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	-.0027	-.0001	1.232	.1832	.0000	.0065
SDev	.0004	.0048	.0018	.009	.0003	.0000	.0045
%RSD	370.7	180.7	1344.	.7070	.1493	36.63	68.90
#1	.0004	.0007	.0011	1.238	.1834	.0001	.0096
#2	-.0002	-.0061	-.0014	1.226	.1830	.0000	.0033

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.2477	.0005	.0007	-.0007	-.0006	-.0008	.0682
SDev	.0021	.0002	.0010	.0000	.0001	.0035	.0053
%RSD	.8574	46.20	139.9	.1800	10.14	434.9	7.779
#1	.2492	.0006	.0015	-.0007	-.0005	-.0033	.0645
#2	.2462	.0003	.0000	-.0007	-.0006	.0017	.0720

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0002	.0001	.0302	.0011	.0006	2.317	1.360
SDev	.0003	.0000	.0024	.0000	.0003	.043	.005
%RSD	201.2	.7869	7.880	1.180	53.83	1.856	.3440
#1	.0004	.0001	.0318	.0011	.0008	2.348	1.364
#2	-.0001	.0001	.0285	.0011	.0004	2.287	1.357

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0157	.0039	-.0018	.0013	-.0014	.4319	-.0029
SDev	.0003	.0020	.0004	.0005	.0040	.0171	.0064
%RSD	1.749	51.08	20.57	40.76	284.8	3.971	222.9
#1	.0159	.0053	-.0016	.0009	.0014	.4441	.0017
#2	.0155	.0025	-.0021	.0016	-.0042	.4198	-.0074

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	104.0	.0063	-.0036	.4648	.0003	-.0003	.0016
SDev	.4	.0024	.0021	.0007	.0002	.0006	.0010
%RSD	.3634	38.60	59.28	.1534	83.33	228.1	66.09
#1	103.8	.0080	-.0050	.4653	.0001	-.0007	.0008
#2	104.3	.0046	-.0021	.4643	.0004	.0002	.0023

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0014	-.0014	.0002	.0019	.0279	.0000	.0015
SDev	.0000	.0001	.0000	.0008	.0233	.0001	.0022
%RSD	.3380	5.852	12.76	39.25	83.59	389.1	147.1
#1	.0014	-.0014	.0002	.0024	.0443	-.0000	-.0001
#2	.0014	-.0015	.0002	.0014	.0114	.0001	.0030

010110

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	.0324	.0004
SDev	.0000	.0007	.0001
%RSD	100.9	2.185	23.99
#1	-.0000	.0329	.0005
#2	-.0001	.0319	.0004

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	671044	10000	--	--	--	--	--
SDev	2440.226	.0000000	--	--	--	--	--
%RSD	.3636458	.0000000	--	--	--	--	--
#1	669319	10000	--	--	--	--	--
#2	672770	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 243225d Operator:
Run Time: 06/15/04 13:03:07
Comment:
Mode: CONC Corr. Factor: 1

010111

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0001	-.0084	.0009	1.218	.1816	.0000	.0012
SDev	.0003	.0053	.0013	.006	.0003	.0000	.0036
%RSD	207.7	62.53	145.7	.5000	.1390	26.48	304.3
#1	.0001	-.0047	-.0000	1.223	.1818	.0000	.0037
#2	-.0004	-.0122	.0017	1.214	.1815	.0000	-.0014

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.2422	.0005	.0011	.0004	-.0005	.0018	.0602
SDev	.0010	.0001	.0001	.0003	.0005	.0136	.0068
%RSD	.4086	14.09	14.16	70.16	91.88	742.4	11.22
#1	.2415	.0004	.0009	.0005	-.0002	.0114	.0554
#2	.2429	.0005	.0012	.0002	-.0009	-.0078	.0650

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0002	.0001	.0296	.0010	.0003	2.161	1.347
SDev	.0003	.0000	.0005	.0001	.0007	.093	.006
%RSD	142.7	11.24	1.649	9.082	221.9	4.283	.4226
#1	-.0000	.0001	.0299	.0010	-.0002	2.226	1.343
#2	.0004	.0001	.0292	.0011	.0008	2.095	1.351

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0148	.0020	-.0017	-.0018	-.0019	.4193	.0024
SDev	.0014	.0046	.0004	.0020	.0009	.0033	.0032
%RSD	9.503	234.5	25.80	109.9	46.26	.7968	133.4
#1	.0158	.0052	-.0020	-.0004	-.0025	.4169	.0001
#2	.0138	-.0013	-.0014	-.0033	-.0013	.4217	.0047

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	105.3	.0071	-.0039	.4560	-.0018	-.0002	.0019
SDev	1.0	.0035	.0014	.0022	.0012	.0002	.0006
%RSD	.9075	48.56	35.72	.4873	67.97	117.5	33.16
#1	104.6	.0096	-.0049	.4576	-.0009	-.0000	.0024
#2	106.0	.0047	-.0029	.4544	-.0026	-.0004	.0015

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0014	-.0018	.0002	.0012	.0039	.0006	-.0007
SDev	.0000	.0015	.0001	.0002	.0132	.0000	.0003
%RSD	.9277	84.36	51.18	15.93	340.7	2.449	43.40
#1	.0014	-.0029	.0003	.0011	.0132	.0006	-.0005
#2	.0014	-.0007	.0001	.0013	-.0054	.0006	-.0010

010112

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	.0318	.0001
SDev	.0000	.0009	.0001
%RSD	98.81	2.802	95.99
#1	-.0001	.0324	.0000
#2	-.0000	.0312	.0001

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	679264	10000	--	--	--	--	--
SDev	6206.983	.0000000	--	--	--	--	--
%RSD	.9137807	.0000000	--	--	--	--	--
#1	674875	10000	--	--	--	--	--
#2	683653	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 243226 Operator:
Run Time: 06/15/04 13:07:52
Comment:
Mode: CONC Corr. Factor: 1

010113

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0003	.0028	-.0092	2.091	.2733	.0001	-.0034
SDev	.0001	.0007	.0001	.018	.0002	.0000	.0060
%RSD	41.93	23.03	1.303	.8487	.0598	10.07	172.8
#1	-.0002	.0033	-.0091	2.104	.2734	.0001	-.0077
#2	-.0004	.0024	-.0093	2.079	.2732	.0001	.0008

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.2018	.0002	.0008	-.0002	-.0003	-.0083	.1393
SDev	.0014	.0004	.0007	.0003	.0002	.0080	.0072
%RSD	.7149	227.2	88.82	120.0	50.04	95.99	5.136
#1	.2008	-.0001	.0013	-.0000	-.0002	-.0139	.1342
#2	.2028	.0004	.0003	-.0004	-.0005	-.0027	.1443

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0003	.0006	.0293	.0011	-.0012	3.616	2.261
SDev	.0004	.0001	.0038	.0001	.0005	.255	.001
%RSD	127.4	7.984	13.08	4.489	39.86	7.059	.0529
#1	-.0006	.0006	.0266	.0011	-.0009	3.435	2.260
#2	-.0000	.0006	.0320	.0011	-.0015	3.796	2.261

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0356	.0590	.0063	.0034	-.0019	.3949	.0130
SDev	.0004	.0026	.0024	.0023	.0026	.0024	.0024
%RSD	1.089	4.377	37.43	67.54	140.1	.6145	18.44
#1	.0353	.0571	.0046	.0050	-.0038	.3932	.0147
#2	.0358	.0608	.0080	.0018	-.0000	.3967	.0113

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	108.0	.0678	.0112	1.572	.0044	.0301	.0792
SDev	.9	.0042	.0046	.015	.0007	.0017	.0025
%RSD	.8676	6.205	41.44	.9247	16.98	5.605	3.185
#1	107.3	.0708	.0079	1.582	.0049	.0289	.0774
#2	108.7	.0649	.0145	1.561	.0039	.0313	.0810

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0016	-.0005	.0012	-.0728	-.0001	.0003	-.0082
SDev	.0000	.0003	.0001	.0078	.0176	.0004	.0003
%RSD	.7993	54.28	8.083	10.66	17420.	104.2	3.159
#1	.0016	-.0007	.0013	-.0673	-.0125	.0006	-.0084
#2	.0016	-.0003	.0012	-.0783	.0123	.0001	-.0080

010114

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	.0773	.0006
SDev	.0001	.0001	.0001
%RSD	621.6	.1840	21.00
#1	.0000	.0774	.0007
#2	-.0001	.0772	.0005

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	696538	10000	--	--	--	--	--
SDev	6064.855	.0000000	--	--	--	--	--
%RSD	.8707135	.0000000	--	--	--	--	--
#1	692250	10000	--	--	--	--	--
#2	700827	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 243227 Operator:
Run Time: 06/15/04 13:12:38 010115
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	.0452	-.0014	2.012	.7653	.0001	.0071
SDev	.0003	.0013	.0015	.010	.0012	.0000	.0030
%RSD	72.73	2.837	114.3	.4937	.1589	10.75	41.43
#1	-.0006	.0442	-.0024	2.020	.7645	.0001	.0092
#2	-.0002	.0461	-.0003	2.005	.7662	.0001	.0050

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	2.620	.0003	.0019	.0018	.0084	.0339	8.919
SDev	.001	.0003	.0003	.0000	.0003	.0101	.039
%RSD	.0418	85.99	15.69	2.050	3.164	29.87	.4357
#1	2.621	.0001	.0017	.0018	.0085	.0267	8.891
#2	2.619	.0006	.0022	.0019	.0082	.0410	8.946

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	.0006	.5374	.0485	.0011	18.17	11.90
SDev	.0001	.0000	.0032	.0000	.0003	.28	.01
%RSD	578.7	5.350	.5858	.0134	22.74	1.522	.0514
#1	-.0001	.0006	.5352	.0485	.0013	18.36	11.89
#2	.0001	.0006	.5396	.0485	.0010	17.97	11.90

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0238	.0078	.0015	.0007	-.0016	1.036	.0015
SDev	.0015	.0126	.0006	.0008	.0014	.004	.0025
%RSD	6.352	161.9	41.19	104.7	87.99	.3484	167.4
#1	.0249	-.0011	.0020	.0002	-.0026	1.034	.0032
#2	.0227	.0167	.0011	.0013	-.0006	1.039	-.0003

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	102.7	.0146	-.0025	1.535	.0010	.0032	.0069
SDev	.5	.0014	.0023	.007	.0003	.0010	.0017
%RSD	.4632	9.632	88.68	.4346	29.69	32.58	25.23
#1	102.4	.0156	-.0041	1.540	.0008	.0024	.0081
#2	103.0	.0136	-.0009	1.531	.0012	.0039	.0056

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0144	-.0009	.0016	-.0042	.0105	.0009	-.0026
SDev	.0000	.0007	.0001	.0041	.0033	.0002	.0010
%RSD	.1870	79.85	3.010	96.38	31.22	17.86	36.81
#1	.0144	-.0004	.0016	-.0071	.0082	.0010	-.0033
#2	.0144	-.0014	.0016	-.0014	.0129	.0008	-.0019

010116

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0000	.2684	.0005
SDev	.0001	.0014	.0001
%RSD	975.8	.5268	13.99
#1	.0001	.2694	.0006
#2	-.0000	.2674	.0005

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	662456	10000	--	--	--	--	--
SDev	3067.429	.0000000	--	--	--	--	--
%RSD	.4630390	.0000000	--	--	--	--	--
#1	660287	10000	--	--	--	--	--
#2	664625	10000	--	--	--	--	--

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Method: DAILYP Sample Name: P43228 Operator:
010117
Run Time: 06/15/04 13:17:23
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0002	.1941	.0002	2.468	.4642	.0000	.0040
SDev	.0001	.0096	.0002	.009	.0007	.0000	.0041
%RSD	33.68	4.958	116.9	.3446	.1494	39.96	103.5
#1	-.0001	.2009	.0000	2.474	.4647	.0000	.0011
#2	-.0002	.1873	.0004	2.462	.4637	.0000	.0069

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.308	.0003	.0009	.0005	.0010	.0626	.9038
SDev	.000	.0002	.0001	.0000	.0005	.0059	.0020
%RSD	.0116	69.23	5.150	3.246	51.59	9.481	.2221
#1	1.308	.0004	.0009	.0005	.0006	.0668	.9024
#2	1.308	.0002	.0009	.0005	.0013	.0584	.9052

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0004	.0005	.3642	.0004	-.0002	6.128	3.827
SDev	.0005	.0000	.0060	.0001	.0001	.038	.013
%RSD	151.6	8.194	1.656	22.94	76.35	.6181	.3405
#1	.0000	.0005	.3685	.0003	-.0001	6.102	3.836
#2	-.0007	.0005	.3600	.0004	-.0002	6.155	3.817

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0002	.0373	-.0002	.0021	-.0022	.9869	-.0037
SDev	.0017	.0122	.0016	.0024	.0010	.0153	.0035
%RSD	707.6	32.68	1041.	116.2	44.92	1.554	96.35
#1	-.0009	.0287	.0010	.0004	-.0015	.9761	-.0061
#2	.0014	.0459	-.0013	.0038	-.0029	.9978	-.0012

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	104.0	.0134	-.0009	2.973	.0014	.0039	.0041
SDev	.7	.0060	.0004	.030	.0011	.0017	.0012
%RSD	.6455	44.95	48.99	.9952	79.81	44.17	30.15
#1	103.5	.0176	-.0012	2.994	.0006	.0051	.0049
#2	104.5	.0091	-.0006	2.952	.0021	.0027	.0032

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0081	-.0038	.0075	.0010	.0044	.0011	-.0015
SDev	.0001	.0019	.0002	.0025	.0050	.0004	.0009
%RSD	.7050	49.96	2.165	257.1	112.7	36.84	57.22
#1	.0082	-.0051	.0076	.0028	.0009	.0008	-.0022
#2	.0081	-.0025	.0073	-.0008	.0079	.0014	-.0009

010118

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0000	.1189	.0005
SDev	.0002	.0014	.0005
%RSD	1260.	1.153	92.06
#1	-.0001	.1199	.0002
#2	.0002	.1179	.0008

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	670641	10000	--	--	--	--	--
SDev	4352.949	.0000000	--	--	--	--	--
%RSD	.6490729	.0000000	--	--	--	--	--
#1	667563	10000	--	--	--	--	--
#2	673719	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: ~~CCV2~~ CCB2 on 6-15-04 Operator:
Run Time: 06/15/04 13:25:49
Comment:
Mode: CONC Corr. Factor: 1

010119

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	L-.0001	L-.0034	L.0026	L.0074	L.0001	L.0001	L-.0009
SDev	.0005	.0037	.0036	.0016	.0000	.0000	.0047
%RSD	487.9	107.6	138.5	21.53	14.99	25.31	551.4
#1	L.0002	L-.0060	L.0001	L.0085	L.0001	L.0001	L.0025
#2	L-.0004	L-.0008	L.0052	L.0063	L.0001	L.0001	L-.0042
Errors	LC Low	LC Low	LC Low	LC Low	LC Low	LC Low	LC Low
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	L.0071	L.0005	L.0000	L-.0010	L-.0002	L-.0034	L-.0032
SDev	.0099	.0001	.0005	.0002	.0001	.0016	.0022
%RSD	138.4	28.21	1290.	20.42	64.05	45.37	69.30
#1	L.0002	L.0004	L.0004	L-.0009	L-.0001	L-.0023	L-.0048
#2	L.0141	L.0006	L-.0003	L-.0012	L-.0003	L-.0046	L-.0016
Errors	LC Low	LC Low	LC Low	LC Low	LC Low	LC Low	LC Low
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	L-.0002	L.0000	L.0015	L-.0000	L.0009	L-.0045	L.0016
SDev	.0000	.0000	.0006	.0000	.0004	.0268	.0007
%RSD	29.12	162.3	41.46	110.1	46.90	593.5	42.65
#1	L-.0001	L.0000	L.0011	L-.0000	L.0012	L-.0235	L.0021
#2	L-.0002	L-.0000	L.0020	L-.0000	L.0006	L.0144	L.0012
Errors	LC Low	LC Low	LC Low	LC Low	LC Low	LC Low	LC Low
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	L-.0006	L.0038	-.0017	.0001	L-.0011	L.0031	L.0044
SDev	.0004	.0041	.0038	.0022	.0007	.0050	.0020
%RSD	67.76	108.3	220.7	2936.	64.07	164.1	46.11
#1	L-.0008	L.0009	.0010	.0016	L-.0006	L-.0005	L.0030
#2	L-.0003	L.0067	-.0044	-.0015	L-.0016	L.0066	L.0059
Errors	LC Low	LC Low	NOCHECK	NOCHECK	LC Low	LC Low	LC Low
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

010120

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	100.8	.0046	-.0028	L.0105	L-.0005	L-.0003	L-.0004
SDev	.2	.0027	.0013	.0008	.0027	.0000	.0001
%RSD	.1706	58.04	45.64	7.575	536.8	9.350	18.51
#1	100.9	.0027	-.0019	L.0099	L.0014	L-.0004	L-.0003
#2	100.7	.0065	-.0037	L.0110	L-.0024	L-.0003	L-.0004
Errors	NOCHECK	NOCHECK	NOCHECK	LC Low	LC Low	LC Low	LC Low
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	L.0000	L-.0021	L.0000	L-.0067	L.0195	L.0004	L.0016
SDev	.0000	.0009	.0002	.0002	.0070	.0005	.0005
%RSD	44.92	41.49	4352.	2.541	35.87	128.9	32.34
#1	L.0000	L-.0015	L.0001	L-.0068	L.0244	L.0007	L.0019
#2	L.0000	L-.0028	L-.0001	L-.0065	L.0145	L.0000	L.0012

Errors	LC Low	LC Low	LC Low	LC Low	LC Low	LC Low	LC Low
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	L-.0000	L.0015	L.0001
SDev	.0001	.0032	.0004
%RSD	223.1	215.9	305.4
#1	L.0000	L-.0008	L.0004
#2	L-.0001	L.0038	L-.0002

Errors	LC Low	LC Low	LC Low
High	5.500	1.100	5.500
Low	4.500	.9000	4.500

010121

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	649998	10000	--	--	--	--	--
SDev	1071.267	.0000000	--	--	--	--	--
%RSD	.1648109	.0000000	--	--	--	--	--
#1	650755	10000	--	--	--	--	--
#2	649240	10000	--	--	--	--	--

Method: DAILY2 Sample Name: ~~CCB2~~ CCV2 on 6-15-04 Operator:
Run Time: 06/15/04 13:32:24 010122
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	H.9899	H9.677	H4.922	H4.769	H9.978	H.9720	H4.988
SDev	.0019	.029	.016	.001	.006	.0025	.012
%RSD	.1920	.2965	.3154	.0229	.0594	.2615	.2419
#1	H.9912	H9.697	H4.933	H4.768	H9.973	H.9738	H4.997
#2	H.9885	H9.656	H4.911	H4.770	H9.982	H.9702	H4.979
Errors	LC High	LC High	LC High	LC High	LC High	LC High	LC High
High	.0050	.0500	.0050	.0500	.0050	.0050	.0100
Low	-.0050	-.0500	-.0050	-.0500	-.0050	-.0050	-.0100

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	H20.00	H.9955	H4.957	H1.945	H2.014	H10.15	H18.24
SDev	.01	.0016	.007	.002	.002	.01	.01
%RSD	.0680	.1587	.1390	.0803	.0864	.0820	.0285
#1	H20.01	H.9966	H4.962	H1.946	H2.015	H10.15	H18.23
#2	H19.99	H.9944	H4.952	H1.944	H2.013	H10.14	H18.24
Errors	LC High	LC High	LC High	LC High	LC High	LC High	LC High
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	H4.927	H4.441	H19.84	H1.006	H4.942	H26.84	H18.95
SDev	.001	.019	.03	.001	.004	.28	.01
%RSD	.0118	.4323	.1367	.1365	.0874	1.042	.0637
#1	H4.928	H4.427	H19.86	H1.007	H4.939	H27.04	H18.94
#2	H4.927	H4.454	H19.82	H1.005	H4.945	H26.65	H18.96
Errors	LC High	LC High	LC High	LC High	LC High	LC High	LC High
High	.0050	.0050	.0500	.0050	.0050	.0500	.0500
Low	-.0050	-.0050	-.0500	-.0050	-.0050	-.0500	-.0500

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	H4.858	H4.918	4.994	4.961	H1.017	H.9918	H.9852
SDev	.003	.094	.008	.006	.002	.0204	.0054
%RSD	.0603	1.902	.1660	.1117	.1613	2.052	.5506
#1	H4.856	H4.984	4.999	4.965	H1.016	H1.006	H.9814
#2	H4.860	H4.852	4.988	4.957	H1.018	H.9774	H.9891
Errors	LC High	LC High	NOCHECK	NOCHECK	LC High	LC High	LC High
High	.0050	.0100			.0050	.0100	.0100
Low	-.0050	-.0100			-.0050	-.0100	-.0100

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

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	99.43	5.161	5.147	H4.943	H4.972	H5.151	H4.911
SDev	.08	.013	.016	.003	.006	.015	.003
%RSD	.0765	.2425	.3179	.0589	.1299	.2927	.0648
#1	99.37	5.152	5.135	H4.945	H4.976	H5.141	H4.914
#2	99.48	5.170	5.158	H4.941	H4.967	H5.162	H4.909
Errors	NOCHECK	NOCHECK	NOCHECK	LC High	LC High	LC High	LC High
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	H5.049	H.9684	H4.857	H5.172	H.9760	H4.928	H.9860
SDev	.008	.0021	.001	.020	.0202	.001	.0027
%RSD	.1601	.2153	.0213	.3919	2.072	.0287	.2786
#1	H5.055	H.9699	H4.858	H5.157	H.9903	H4.929	H.9840
#2	H5.043	H.9669	H4.856	H5.186	H.9617	H4.927	H.9879
Errors	LC High	LC High	LC High	LC High	LC High	LC High	LC High
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	H4.967	H.9953	H4.808
SDev	.007	.0000	.023
%RSD	.1355	.0005	.4882
#1	H4.972	H.9953	H4.792
#2	H4.962	H.9953	H4.825
Errors	LC High	LC High	LC High
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	641224	10000	--	--	--	--	--
SDev	460.3265	.0000000	--	--	--	--	--
%RSD	.0717888	.0000000	--	--	--	--	--
#1	640898	10000	--	--	--	--	--
#2	641549	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 243229 Operator:
Run Time: 06/15/04 13:37:10
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0001	-.0206	.0037	.1417	.0121	.0001	.0028
SDev	.0004	.0029	.0025	.0020	.0001	.0000	.0013
%RSD	365.9	14.17	68.18	1.394	.7040	28.39	44.61
#1	-.0004	-.0227	.0019	.1431	.0121	.0001	.0019
#2	.0002	-.0185	.0055	.1403	.0122	.0001	.0037

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	24.72	.0004	.0008	-.0000	-.0001	-.0032	5.348
SDev	.05	.0002	.0001	.0002	.0003	.0051	.012
%RSD	.1959	43.45	19.27	2550.	269.4	160.2	.2214
#1	24.69	.0003	.0007	-.0002	.0001	-.0068	5.340
#2	24.75	.0005	.0009	.0001	-.0004	.0004	5.357

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0001	.0298	3.286	-.0000	.0059	34.42	22.50
SDev	.0008	.0001	.005	.0001	.0008	.14	.01
%RSD	592.0	.2006	.1555	810.3	13.81	.4115	.0632
#1	-.0007	.0297	3.283	.0000	.0065	34.32	22.49
#2	.0004	.0298	3.290	-.0001	.0053	34.52	22.51

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0013	.0248	-.0036	.0011	-.0026	8.522	-.0001
SDev	.0013	.0066	.0005	.0014	.0034	.038	.0000
%RSD	100.6	26.53	14.90	123.7	132.5	.4486	10.41
#1	-.0004	.0202	-.0033	.0021	-.0050	8.549	-.0001
#2	-.0022	.0295	-.0040	.0001	-.0002	8.495	-.0001

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	103.9	.0176	-.0006	24.29	-.0004	.0055	.0160
SDev	.1	.0003	.0003	.11	.0011	.0001	.0054
%RSD	.1065	1.695	45.09	.4673	260.2	1.557	34.07
#1	104.0	.0174	-.0004	24.37	.0004	.0055	.0198
#2	103.9	.0178	-.0008	24.21	-.0012	.0054	.0121

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.1004	-.0052	-.0003	.0052	.0004	.0033	-.0016
SDev	.0000	.0013	.0000	.0145	.0248	.0008	.0015
%RSD	.0364	24.24	9.554	277.7	5642.	24.11	90.89
#1	.1004	-.0043	-.0003	.0155	-.0171	.0027	-.0026
#2	.1004	-.0061	-.0003	-.0050	.0180	.0038	-.0006

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Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	.0032	-.0000
SDev	.0000	.0003	.0003
%RSD	41.20	15.43	1625.
#1	-.0001	.0025	.0002
#2	-.0001	.0020	-.0002

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	670390	10000	--	--	--	--	--
SDev	677.4083	.0000000	--	--	--	--	--
%RSD	.1010469	.0000000	--	--	--	--	--
#1	670869	10000	--	--	--	--	--
#2	669911	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 243230 Operator:
Run Time: 06/15/04 13:41:56
Comment:
Mode: CONC Corr. Factor: 1

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Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0190	-.0027	.2584	.0028	.0000	-.0030
SDev	.0007	.0010	.0034	.0052	.0001	.0000	.0063
%RSD	532.5	5.149	127.4	1.999	2.456	114.3	207.7
#1	-.0004	.0183	-.0003	.2621	.0028	.0000	-.0075
#2	.0006	.0196	-.0050	.2548	.0027	.0000	.0014

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	2.492	.0003	.0001	-.0006	.0015	.1358	4.511
SDev	.021	.0001	.0001	.0009	.0001	.0081	.050
%RSD	.8504	23.43	115.2	167.4	5.382	6.005	1.109
#1	2.507	.0004	.0001	-.0012	.0015	.1415	4.546
#2	2.477	.0003	.0000	.0001	.0016	.1300	4.475

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0003	.2591	.1121	.0037	.0459	213.4	127.8
SDev	.0012	.0035	.0055	.0007	.0009	3.5	2.0
%RSD	404.0	1.342	4.891	18.39	2.076	1.662	1.544
#1	-.0006	.2615	.1082	.0042	.0466	215.9	129.2
#2	.0012	.2566	.1160	.0032	.0452	210.9	126.5

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0008	.0571	.0044	.0036	-.0000	10.40	.0138
SDev	.0014	.0030	.0020	.0059	.0043	.21	.0060
%RSD	175.3	5.210	44.96	163.7	19960.	1.981	43.39
#1	-.0018	.0592	.0030	.0077	-.0031	10.55	.0180
#2	.0002	.0550	.0058	-.0006	.0030	10.26	.0095

Elem	Sc3613	1960/1	1960/2	Si2881	Ph220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	87.83	.0546	.0111	7.883	.0039	.0256	.0623
SDev	1.93	.0214	.0009	.236	.0032	.0065	.0183
%RSD	2.200	39.21	8.045	2.865	83.42	25.54	29.31
#1	86.46	.0697	.0105	8.043	.0062	.0302	.0752
#2	89.19	.0395	.0117	7.724	.0016	.0210	.0494

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0070	-.0002	-.0001	-.0751	-.0030	-.0003	.0014
SDev	.0000	.0032	.0002	.0022	.0245	.0011	.0019
%RSD	.1029	1556.	109.2	2.888	818.6	307.0	142.2
#1	.0070	.0020	-.0000	-.0735	-.0203	-.0011	-.0000
#2	.0070	-.0024	-.0002	-.0766	.0143	.0004	.0027

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Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	.0001	.0001
SDev	.0001	.0005	.0001
%RSD	475.3	626.6	69.97
#1	-.0001	.0005	.0002
#2	.0000	-.0003	.0001

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	566438	10000	--	--	--	--	--
SDev	12483.97	.0000000	--	--	--	--	--
%RSD	2.203945	.0000000	--	--	--	--	--
#1	557610	10000	--	--	--	--	--
#2	575265	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 243231 Operator:
Run Time: 06/15/04 13:46:41
Comment:
Mode: CONC Corr. Factor: 1

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Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0004	-.0199	.0096	.1360	.0081	.0001	.0018
SDev	.0004	.0037	.0043	.0016	.0000	.0000	.0063
%RSD	87.31	18.50	44.46	1.155	.2856	8.566	343.4
#1	-.0007	-.0173	.0126	.1371	.0082	.0001	.0063
#2	-.0002	-.0226	.0066	.1349	.0081	.0001	-.0026

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	13.29	.0002	.0009	-.0001	-.0006	.0144	5.487
SDev	.05	.0001	.0001	.0003	.0000	.0015	.043
%RSD	.3715	30.09	16.31	237.4	3.883	10.42	.7770
#1	13.26	.0001	.0011	-.0003	-.0005	.0154	5.457
#2	13.33	.0002	.0008	.0001	-.0006	.0133	5.518

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	.0310	2.053	.0057	.0098	39.08	25.33
SDev	.0006	.0001	.015	.0000	.0001	.00	.16
%RSD	2163.	.3252	.7379	.1634	1.238	.0045	.6361
#1	-.0004	.0310	2.043	.0057	.0098	39.08	25.22
#2	.0004	.0311	2.064	.0057	.0097	39.08	25.45

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0002	.0187	-.0010	.0003	.0018	6.957	.0028
SDev	.0016	.0109	.0020	.0013	.0009	.025	.0022
%RSD	737.7	58.50	195.0	459.1	54.10	.3575	79.95
#1	.0013	.0110	.0004	.0012	.0024	6.975	.0044
#2	-.0009	.0264	-.0025	-.0006	.0011	6.940	.0012

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	104.1	.0137	-.0016	25.68	-.0001	.0035	.0129
SDev	.9	.0022	.0015	.12	.0015	.0003	.0001
%RSD	.8688	15.96	93.83	.4819	1079.	7.623	.3784
#1	103.5	.0153	-.0027	25.77	.0009	.0033	.0130
#2	104.7	.0122	-.0005	25.60	-.0012	.0037	.0129

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0666	-.0031	-.0003	-.0089	.0122	.0056	.0006
SDev	.0004	.0018	.0000	.0030	.0121	.0002	.0006
%RSD	.5745	59.78	9.299	33.93	99.02	4.291	103.7
#1	.0663	-.0044	-.0003	-.0111	.0207	.0055	.0002
#2	.0668	-.0018	-.0003	-.0068	.0037	.0058	.0010

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Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	.0016	.0002
SDev	.0000	.0000	.0001
%RSD	50.94	2.194	27.96
#1	-.0000	.0016	.0003
#2	-.0001	.0017	.0002

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	671378	10000	--	--	--	--	--
SDev	5786.962	.0000000	--	--	--	--	--
%RSD	.8619528	.0000000	--	--	--	--	--
#1	667286	10000	--	--	--	--	--
#2	675470	10000	--	--	--	--	--

Method: DATLY2 Sample Name: 243231s Operator:
Run Time: 06/15/04 13:51:27
Comment:
Mode: CONC Corr. Factor: 1

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Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0513	1.946	2.044	.1407	2.027	.0494	.0082
SDev	.0005	.004	.008	.0002	.004	.0000	.0046
%RSD	1.025	.2134	.3922	.1608	.1938	.0047	55.81
#1	.0516	1.943	2.038	.1409	2.024	.0494	.0114
#2	.0509	1.949	2.050	.1406	2.030	.0494	.0050

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	33.68	.0497	.5010	.1971	.2519	1.084	27.47
SDev	.06	.0001	.0008	.0013	.0007	.015	.10
%RSD	.1741	.2350	.1690	.6459	.2643	1.410	.3747
#1	33.64	.0497	.5004	.1980	.2514	1.073	27.40
#2	33.73	.0498	.5016	.1962	.2524	1.095	27.55

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0348	22.35	.5090	.0110	61.56	40.81
SDev	.0006	.0001	.05	.0000	.0007	.27	.02
%RSD	552.0	.2740	.2055	.0039	6.365	.4462	.0414
#1	-.0003	.0349	22.32	.5090	.0105	61.36	40.80
#2	.0005	.0348	22.38	.5090	.0115	61.75	40.83

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.4900	.0289	.4949	.4975	.0000	7.038	.5055
SDev	.0005	.0089	.0017	.0005	.0009	.064	.0015
%RSD	.1074	30.86	.3441	.0990	2094.	.9100	.2911
#1	.4903	.0352	.4961	.4978	-.0006	7.083	.5044
#2	.4896	.0226	.4937	.4971	.0007	6.993	.5065

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	100.7	2.243	2.226	25.89	.4966	2.232	.0127
SDev	.2	.008	.015	.05	.0009	.013	.0026
%RSD	.2380	.3776	.6636	.2073	.1804	.5677	20.77
#1	100.5	2.249	2.236	25.93	.4973	2.241	.0145
#2	100.8	2.237	2.216	25.85	.4960	2.223	.0108

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0675	-.0157	-.0002	2.075	.0081	.5050	.0007
SDev	.0001	.0046	.0001	.004	.0006	.0010	.0009
%RSD	.1367	29.10	36.07	.2165	6.908	.2012	126.2
#1	.0674	-.0189	-.0001	2.072	.0077	.5043	.0001
#2	.0675	-.0125	-.0002	2.079	.0085	.5057	.0013

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Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	.5090	.0001
SDev	.0001	.0015	.0001
%RSD	121.0	.2892	99.45
#1	-.0001	.5079	.0000
#2	-.0000	.5100	.0002

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	649190	10000	--	--	--	--	--
SDev	1520.280	.0000000	--	--	--	--	--
%RSD	.2341810	.0000000	--	--	--	--	--
#1	648115	10000	--	--	--	--	--
#2	650265	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 243232 Operator:
Run Time: 06/15/04 13:56:13
Comment:
Mode: CONC Corr. Factor: 1

010133

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0002	.0071	.0078	.1423	.0138	.0001	.0039
SDev	.0004	.0053	.0014	.0024	.0000	.0000	.0007
%RSD	234.9	74.08	17.52	1.705	.3017	2.176	17.00
#1	.0001	.0108	.0068	.1440	.0138	.0001	.0043
#2	-.0004	.0034	.0088	.1406	.0139	.0001	.0034

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	12.80	.0002	.0000	.0003	-.0003	.0061	3.814
SDev	.01	.0000	.0003	.0008	.0006	.0027	.008
%RSD	.0717	.2813	11800.	245.7	203.9	44.77	.1987
#1	12.79	.0002	.0003	-.0002	.0001	.0080	3.819
#2	12.81	.0002	-.0002	.0009	-.0007	.0042	3.808

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0001	.0385	1.065	.0002	.0043	45.98	29.87
SDev	.0003	.0001	.005	.0002	.0005	.01	.04
%RSD	333.0	.1595	.4953	91.21	12.32	.0326	.1259
#1	.0001	.0384	1.069	.0004	.0039	45.97	29.90
#2	-.0003	.0385	1.061	.0001	.0047	45.99	29.84

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0007	.0088	.0011	-.0014	-.0014	8.093	.0015
SDev	.0004	.0088	.0013	.0009	.0021	.108	.0026
%RSD	61.97	100.4	121.4	64.58	150.0	1.331	168.2
#1	-.0010	.0150	.0020	-.0008	.0001	8.169	-.0003
#2	-.0004	.0025	.0002	-.0021	-.0028	8.017	.0033

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	102.9	.0167	-.0025	26.22	-.0006	.0039	.0123
SDev	1.2	.0069	.0054	.19	.0010	.0059	.0022
%RSD	1.183	41.31	218.9	.7273	182.5	151.0	17.88
#1	102.0	.0215	.0014	26.36	.0002	.0081	.0139
#2	103.7	.0118	-.0063	26.09	-.0013	-.0003	.0107

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0707	-.0023	-.0001	-.0094	.0224	.0067	.0005
SDev	.0000	.0031	.0002	.0015	.0224	.0003	.0018
%RSD	.0290	134.6	127.2	15.84	100.3	4.169	337.7
#1	.0707	-.0045	-.0000	-.0104	.0382	.0065	.0018
#2	.0707	-.0001	-.0002	-.0083	.0065	.0069	-.0007

010134

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	-.0010	-.0001
SDev	.0000	.0003	.0002
%RSD	42.55	26.84	114.2
#1	-.0001	-.0008	-.0003
#2	-.0001	-.0011	-.0000

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	663352	10000	--	--	--	--	--
SDev	7814.237	.0000000	--	--	--	--	--
%RSD	1.177992	.0000000	--	--	--	--	--
#1	657827	10000	--	--	--	--	--
#2	668878	10000	--	--	--	--	--

Analysis Report 06/15/04 02:05:33 PM

Method: DAILY2 Sample Name: 245108 Operator:
Run Time: 06/15/04 14:00:58
Comment:
Mode: CONC Corr. Factor: 1

010135

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0001	-.0125	.0061	.1450	.0106	.0002	.0022
SDev	.0001	.0026	.0018	.0008	.0000	.0000	.0015
%RSD	59.76	21.16	29.28	.5430	.1696	14.52	72.01
#1	-.0002	-.0106	.0049	.1445	.0106	.0002	.0011
#2	-.0001	-.0143	.0074	.1456	.0106	.0002	.0032

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	13.59	.0000	.0012	.0003	.0005	.0120	3.705
SDev	.02	.0000	.0005	.0009	.0002	.0110	.008
%RSD	.1350	76.03	38.58	274.5	29.32	91.84	.2253
#1	13.57	.0000	.0009	.0009	.0006	.0198	3.699
#2	13.60	.0001	.0015	-.0003	.0004	.0042	3.710

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0372	1.345	.0017	.0082	50.06	32.54
SDev	.0001	.0001	.005	.0001	.0005	.12	.03
%RSD	44.40	.1373	.3919	4.000	6.237	.2409	.0818
#1	.0001	.0372	1.341	.0018	.0086	49.98	32.52
#2	.0002	.0371	1.349	.0017	.0078	50.15	32.56

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0000	.0172	-.0023	-.0012	.0006	9.427	-.0005
SDev	.0010	.0006	.0007	.0035	.0004	.031	.0017
%RSD	207000.	3.386	30.64	300.2	75.20	.3255	350.9
#1	.0007	.0168	-.0028	-.0036	.0003	9.449	.0007
#2	-.0007	.0176	-.0018	.0013	.0009	9.405	-.0017

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	102.9	.0096	-.0045	19.71	-.0015	.0003	.0042
SDev	.4	.0017	.0014	.07	.0026	.0003	.0006
%RSD	.3549	17.96	31.06	.3508	168.1	138.6	14.03
#1	102.7	.0084	-.0035	19.76	-.0033	.0005	.0046
#2	103.2	.0108	-.0054	19.66	.0003	.0000	.0037

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0747	-.0030	-.0003	-.0023	.0154	.0133	.0057
SDev	.0002	.0025	.0000	.0005	.0028	.0001	.0020
%RSD	.2074	82.96	4.678	22.68	18.35	.3668	35.22
#1	.0746	-.0047	-.0003	-.0026	.0174	.0134	.0071
#2	.0749	-.0012	-.0003	-.0019	.0134	.0133	.0043

010136

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	.0015	.0006
SDev	.0001	.0005	.0001
%RSD	49.46	31.31	9.715
#1	-.0001	.0019	.0006
#2	-.0002	.0012	.0007

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	663732	10000	--	--	--	--	--
SDev	2319.310	.0000000	--	--	--	--	--
%RSD	.3494347	.0000000	--	--	--	--	--
#1	662092	10000	--	--	--	--	--
#2	665372	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 245108d Operator:
Run Time: 06/15/04 14:05:44
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	-.0000	-.0204	.0085	.1399	.0103	.0002	.0046
SDev	.0006	.0022	.0017	.0001	.0000	.0000	.0016
%RSD	2164.	10.75	19.91	.1103	.3152	19.45	35.77
#1	-.0004	-.0188	.0097	.1398	.0103	.0002	.0058
#2	.0004	-.0219	.0073	.1400	.0104	.0002	.0034

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	13.20	.0004	.0000	-.0004	.0006	.0032	3.593
SDev	.00	.0003	.0001	.0011	.0001	.0020	.002
%RSD	.0200	57.08	113.9	287.9	14.60	64.36	.0579
#1	13.20	.0006	.0000	.0004	.0006	.0017	3.591
#2	13.20	.0003	.0001	-.0011	.0005	.0046	3.594

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0000	.0361	1.309	.0016	.0083	48.93	31.58
SDev	.0004	.0001	.002	.0000	.0002	.04	.03
%RSD	82510.	.3504	.1444	2.072	1.985	.0878	.0955
#1	-.0003	.0360	1.310	.0016	.0084	48.96	31.60
#2	.0003	.0361	1.307	.0016	.0082	48.90	31.56

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0007	.0128	-.0036	.0012	-.0008	9.202	.0017
SDev	.0015	.0084	.0006	.0004	.0010	.032	.0021
%RSD	217.1	65.56	17.80	33.04	131.2	.3498	121.8
#1	.0017	.0069	-.0031	.0010	-.0015	9.225	.0033
#2	-.0004	.0188	-.0040	.0015	-.0001	9.180	.0002

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	106.0	.0066	-.0017	19.13	-.0004	.0011	.0050
SDev	.2	.0014	.0005	.09	.0001	.0001	.0007
%RSD	.1447	20.59	27.22	.4610	16.62	13.38	14.80
#1	106.1	.0076	-.0020	19.20	-.0004	.0012	.0055
#2	105.9	.0057	-.0014	19.07	-.0003	.0010	.0045

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0727	-.0019	-.0001	-.0034	.0162	.0131	.0036
SDev	.0002	.0014	.0001	.0028	.0101	.0005	.0012
%RSD	.2162	73.07	87.57	82.20	62.39	3.808	34.49
#1	.0726	-.0028	-.0002	-.0014	.0233	.0128	.0027
#2	.0729	-.0009	-.0001	-.0054	.0090	.0135	.0044

010138

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	.0028	.0004
SDev	.0000	.0004	.0002
%RSD	33.23	14.72	53.08
#1	-.0000	.0031	.0006
#2	-.0000	.0025	.0003

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	683556	10000	--	--	--	--	--
SDev	990.6566	.0000000	--	--	--	--	--
%RSD	.1449270	.0000000	--	--	--	--	--
#1	684256	10000	--	--	--	--	--
#2	682855	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 245108s Operator:
Run Time: 06/15/04 14:10:30
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	.0504	1.940	2.028	.1420	2.008	.0489	.0073
SDev	.0003	.003	.001	.0002	.004	.0000	.0037
%RSD	.6179	.1658	.0673	.1561	.1881	.0798	50.34
#1	.0507	1.938	2.029	.1422	2.005	.0489	.0099
#2	.0502	1.942	2.027	.1419	2.010	.0490	.0047

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	33.77	.0492	.4979	.1952	.2513	1.060	26.00
SDev	.05	.0003	.0001	.0016	.0004	.003	.02
%RSD	.1545	.5418	.0300	.7975	.1774	.2462	.0759
#1	33.73	.0490	.4978	.1941	.2510	1.062	25.99
#2	33.81	.0494	.4980	.1963	.2517	1.058	26.01

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0002	.0404	21.76	.5007	.0090	72.50	47.49
SDev	.0003	.0000	.01	.0003	.0006	.12	.05
%RSD	170.3	.0755	.0465	.0660	7.090	.1681	.0949
#1	-.0004	.0404	21.75	.5005	.0086	72.42	47.53
#2	.0000	.0404	21.76	.5009	.0095	72.59	47.46

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.4825	.0230	.4958	.4932	-.0009	9.312	.5013
SDev	.0037	.0119	.0034	.0013	.0010	.099	.0079
%RSD	.7669	51.95	.6819	.2599	110.7	1.061	1.571
#1	.4798	.0314	.4934	.4923	-.0016	9.381	.4957
#2	.4851	.0145	.4982	.4941	-.0002	9.242	.5069

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	102.7	2.176	2.171	19.42	.4941	2.173	.0031
SDev	.1	.011	.014	.07	.0020	.013	.0007
%RSD	.1453	.4900	.6443	.3498	.3995	.5927	22.72
#1	102.8	2.183	2.181	19.47	.4927	2.182	.0036
#2	102.6	2.168	2.161	19.38	.4955	2.163	.0026

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0738	-.0151	-.0003	2.079	.0006	.5071	.0070
SDev	.0000	.0036	.0000	.014	.0042	.0021	.0018
%RSD	.0071	24.01	16.45	.6730	695.3	.4125	25.27
#1	.0738	-.0176	-.0003	2.069	-.0024	.5086	.0083
#2	.0738	-.0125	-.0002	2.089	.0036	.5057	.0058

010140

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0002	.5084	.0000
SDev	.0001	.0009	.0002
%RSD	29.42	.1854	594.6
#1	-.0002	.5077	-.0001
#2	-.0001	.5091	.0002

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	662188	10000	--	--	--	--	--
SDev	965.2007	.0000000	--	--	--	--	--
%RSD	.1457594	.0000000	--	--	--	--	--
#1	662870	10000	--	--	--	--	--
#2	661505	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 245109 Operator:
Run Time: 06/15/04 14:15:16
Comment:
Mode: CONC Corr. Factor: 1

010141

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0001	.0838	.0167	.1671	.0074	.0002	.0018
SDev	.0001	.0067	.0001	.0012	.0000	.0000	.0001
%RSD	61.67	7.962	.5235	.7063	.5671	.1158	7.517
#1	-.0001	.0885	.0168	.1679	.0074	.0002	.0019
#2	-.0001	.0791	.0167	.1662	.0074	.0002	.0017

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	6.691	.0007	.0008	.0009	.0010	.0350	3.029
SDev	.006	.0001	.0001	.0004	.0004	.0005	.014
%RSD	.0953	14.86	5.847	46.46	44.86	1.406	.4667
#1	6.686	.0006	.0008	.0006	.0007	.0354	3.019
#2	6.695	.0008	.0008	.0012	.0013	.0347	3.039

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0000	.0828	.5499	.0006	.0065	77.91	49.43
SDev	.0002	.0000	.0085	.0001	.0012	.01	.07
%RSD	588.9	.0457	1.547	10.03	19.14	.0170	.1454
#1	-.0001	.0828	.5439	.0006	.0056	77.90	49.38
#2	.0001	.0829	.5560	.0007	.0073	77.92	49.48

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0003	.0332	-.0015	.0019	.0002	7.359	.0020
SDev	.0006	.0126	.0008	.0029	.0039	.040	.0026
%RSD	177.1	37.98	50.19	155.6	2542.	.5371	129.2
#1	-.0007	.0243	-.0021	.0039	-.0026	7.387	.0038
#2	.0001	.0421	-.0010	-.0002	.0029	7.331	.0002

Elem	Sc3613	1960/1	1960/2	Si2881	Sn2706	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	102.7	.0163	.0006	25.62	.0008	.0059	.0080
SDev	.1	.0068	.0011	.10	.0017	.0030	.0016
%RSD	.0611	41.37	184.7	.4073	221.2	50.90	20.39
#1	102.7	.0211	.0014	25.70	.0020	.0080	.0092
#2	102.8	.0116	-.0002	25.55	-.0004	.0037	.0069

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0315	-.0003	.0006	-.0064	.0030	.0047	.0006
SDev	.0001	.0005	.0001	.0039	.0132	.0003	.0023
%RSD	.2393	156.9	15.95	60.92	440.0	6.356	351.8
#1	.0314	.0000	.0005	-.0092	-.0063	.0045	-.0010
#2	.0315	-.0007	.0006	-.0037	.0123	.0049	.0022

010142

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	.0028	.0009
SDev	.0001	.0004	.0002
%RSD	123.6	14.11	22.47
#1	.0000	.0031	.0007
#2	.0001	.0025	.0010

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	662605	10000	--	--	--	--	--
SDev	386.0803	.0000000	--	--	--	--	--
%RSD	.0582670	.0000000	--	--	--	--	--
#1	662332	10000	--	--	--	--	--
#2	662878	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 245110 Operator:
Run Time: 06/15/04 14:20:02
Comment:
Mode: CONC Corr. Factor: 1

010143

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0005	-.0237	.0074	.1408	.0107	.0002	.0025
SDev	.0004	.0035	.0000	.0012	.0001	.0000	.0008
%RSD	85.59	14.78	.3772	.8444	1.334	9.563	30.78
#1	-.0008	-.0212	.0074	.1417	.0106	.0002	.0030
#2	-.0002	-.0262	.0074	.1400	.0108	.0002	.0019

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	13.63	.0000	.0009	-.0011	-.0004	.0030	3.725
SDev	.03	.0003	.0003	.0004	.0001	.0242	.031
%RSD	.2174	8986.	28.39	33.59	21.85	816.1	.8300
#1	13.61	-.0002	.0011	-.0008	-.0004	-.0141	3.703
#2	13.65	.0002	.0007	-.0013	-.0003	.0201	3.746

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0004	.0371	1.344	.0016	.0080	50.11	32.51
SDev	.0006	.0002	.008	.0001	.0004	.22	.08
%RSD	151.4	.4212	.5872	6.630	4.621	.4364	.2498
#1	-.0009	.0373	1.338	.0016	.0077	49.96	32.46
#2	.0000	.0370	1.350	.0017	.0082	50.27	32.57

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0009	.0271	-.0041	.0008	-.0016	9.457	.0040
SDev	.0001	.0165	.0020	.0013	.0019	.085	.0033
%RSD	9.784	60.75	47.78	162.2	114.0	.8959	82.60
#1	.0009	.0388	-.0055	-.0001	-.0030	9.517	.0063
#2	.0010	.0155	-.0027	.0017	-.0003	9.397	.0017

Elem	Sc3613	1960/1	1960/2	Si2881	Sn2020	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	104.0	.0166	-.0026	19.64	-.0008	.0038	.0166
SDev	.2	.0010	.0018	.04	.0015	.0015	.0028
%RSD	.2091	5.906	70.14	.2290	181.9	39.79	16.65
#1	103.9	.0173	-.0013	19.67	-.0019	.0049	.0185
#2	104.2	.0159	-.0038	19.61	.0002	.0028	.0146

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0752	-.0018	-.0003	-.0174	.0077	.0133	-.0007
SDev	.0001	.0017	.0000	.0015	.0112	.0007	.0010
%RSD	.0859	98.60	8.534	8.678	145.3	5.566	141.8
#1	.0752	-.0005	-.0003	-.0164	-.0002	.0138	.0000
#2	.0751	-.0030	-.0003	-.0185	.0156	.0127	-.0014

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Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	-.0002	.0002
SDev	.0001	.0003	.0003
%RSD	74.27	163.1	146.0
#1	-.0002	.0000	-.0000
#2	-.0001	-.0004	.0004

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	670985	10000	--	--	--	--	--
SDev	1401.486	.0000000	--	--	--	--	--
%RSD	.2088699	.0000000	--	--	--	--	--
#1	669994	10000	--	--	--	--	--
#2	671976	10000	--	--	--	--	--

Method: DAILY2 Sample Name: ~~SCU3~~ CCB3 DH 6-15-04 Operator:
Run Time: 06/15/04 14:28:28
Comment:
Mode: CONC Corr. Factor: 1

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Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	L-.0001	L-.0119	L.0016	L.0018	L.0001	L.0002	L.0066
SDev	.0004	.0021	.0000	.0006	.0000	.0000	.0084
%RSD	321.0	17.48	.5175	31.80	37.92	10.40	126.5
#1	L-.0004	L-.0134	L.0016	L.0022	L.0001	L.0002	L.0125
#2	L.0001	L-.0105	L.0016	L.0014	L.0001	L.0003	L.0007
Errors	LC Low	LC Low	LC Low	LC Low	LC Low	LC Low	LC Low
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	L.0004	L.0004	L.0005	L-.0003	L.0003	L-.0056	L-.0013
SDev	.0003	.0002	.0004	.0003	.0001	.0210	.0078
%RSD	85.10	52.87	94.23	117.7	24.93	378.6	583.8
#1	L.0006	L.0003	L.0002	L-.0000	L.0003	L.0093	L.0042
#2	L.0001	L.0006	L.0008	L-.0005	L.0004	L-.0204	L-.0069
Errors	LC Low	LC Low	LC Low	LC Low	LC Low	LC Low	LC Low
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	L.0003	L.0002	L.0032	L-.0001	L.0011	L-.0007	L.0100
SDev	.0001	.0000	.0071	.0002	.0015	.0014	.0003
%RSD	53.80	1.991	226.0	331.9	140.8	211.9	3.132
#1	L.0002	L.0002	L-.0019	L-.0002	L.0000	L.0003	L.0102
#2	L.0003	L.0002	L.0082	L.0001	L.0022	L-.0017	L.0098
Errors	LC Low	LC Low	LC Low	LC Low	LC Low	LC Low	LC Low
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	L-.0002	L.0028	-.0001	.0010	L-.0014	L-.0235	L.0021
SDev	.0001	.0095	.0058	.0007	.0007	.0079	.0025
%RSD	42.11	336.9	3883.	69.06	48.47	33.69	116.4
#1	L-.0002	L-.0039	.0039	.0015	L-.0009	L-.0179	L.0039
#2	L-.0003	L.0095	-.0042	.0005	L-.0018	L-.0291	L.0004
Errors	LC Low	LC Low	NOCHECK	NOCHECK	LC Low	LC Low	LC Low
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

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	100.8	.0021	-.0030	L.0055	L.0006	L-.0013	L.0014
SDev	.1	.0029	.0011	.0013	.0024	.0017	.0020
%RSD	.0960	135.9	36.48	23.10	372.8	133.3	142.4
#1	100.8	.0001	-.0037	L.0046	L.0023	L-.0024	L.0028
#2	100.7	.0041	-.0022	L.0064	L-.0010	L-.0001	L-.0000
Errors	NOCHECK	NOCHECK	NOCHECK	LC Low	LC Low	LC Low	LC Low
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	L.0000	L-.0034	L.0001	L.0022	L.0197	L.0003	L-.0015
SDev	.0000	.0013	.0000	.0010	.0021	.0004	.0023
%RSD	44.16	39.77	23.38	46.28	10.87	118.1	152.2
#1	L.0000	L-.0024	L.0001	L.0030	L.0212	L.0006	L-.0032
#2	L.0000	L-.0043	L.0001	L.0015	L.0182	L.0001	L.0001

Errors	LC Low	LC Low	LC Low	LC Low	LC Low	LC Low	LC Low
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	L-.0000	L-.0011	L.0007
SDev	.0000	.0002	.0001
%RSD	55.42	18.23	18.96
#1	L-.0001	L-.0012	L.0008
#2	L-.0000	L-.0010	L.0006

Errors	LC Low	LC Low	LC Low
High	5.500	1.100	5.500
Low	4.500	.9000	4.500

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	649814	10000	--	--	--	--	--
SDev	560.7357	.0000000	--	--	--	--	--
%RSD	.0862917	.0000000	--	--	--	--	--
#1	650211	10000	--	--	--	--	--
#2	649418	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: ~~CCB3~~ CCV3 DH 6-15-04 Operator:
Run Time: 06/15/04 14:35:04
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	H.9846	H9.644	H4.918	H4.748	H9.908	H.9699	H4.979
SDev	.0003	.002	.002	.011	.001	.0012	.007
%RSD	.0311	.0169	.0421	.2328	.0108	.1237	.1410
#1	H.9848	H9.643	H4.919	H4.740	H9.907	H.9691	H4.984
#2	H.9844	H9.645	H4.916	H4.756	H9.909	H.9708	H4.975
Errors	LC High	LC High	LC High	LC High	LC High	LC High	LC High
High	.0050	.0500	.0050	.0500	.0050	.0050	.0100
Low	-.0050	-.0500	-.0050	-.0500	-.0050	-.0050	-.0100

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	H19.97	H.9882	H4.928	H1.943	H2.013	H10.10	H18.30
SDev	.08	.0027	.008	.004	.001	.03	.05
%RSD	.3868	.2743	.1642	.1934	.0403	.3177	.2597
#1	H19.91	H.9862	H4.922	H1.940	H2.014	H10.08	H18.33
#2	H20.02	H.9901	H4.934	H1.945	H2.012	H10.12	H18.26
Errors	LC High	LC High	LC High	LC High	LC High	LC High	LC High
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	H4.925	H4.434	H19.81	H1.003	H4.936	H27.03	H18.88
SDev	.003	.010	.03	.001	.027	.03	.04
%RSD	.0635	.2284	.1582	.0942	.5543	.1089	.2375
#1	H4.923	H4.441	H19.79	H1.002	H4.917	H27.06	H18.91
#2	H4.927	H4.427	H19.83	H1.004	H4.956	H27.01	H18.85
Errors	LC High	LC High	LC High	LC High	LC High	LC High	LC High
High	.0050	.0050	.0500	.0050	.0050	.0500	.0500
Low	-.0050	-.0050	-.0500	-.0050	-.0050	-.0500	-.0500

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	H4.787	H4.976	4.943	4.939	H1.020	H.9887	H.9809
SDev	.004	.145	.009	.023	.001	.0066	.0040
%RSD	.0838	2.916	.1872	.4716	.1065	.6628	.4023
#1	H4.784	H5.079	4.937	4.922	H1.019	H.9934	H.9837
#2	H4.789	H4.874	4.950	4.955	H1.020	H.9841	H.9782
Errors	LC High	LC High	NOCHECK	NOCHECK	LC High	LC High	LC High
High	.0050	.0100			.0050	.0100	.0100
Low	-.0050	-.0100			-.0050	-.0100	-.0100

Elem	Sc3613	1960/1	1960/2	Si2881	Th220	Se196	Sn1899

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	100.0	5.178	5.123	H4.897	H4.940	H5.141	H4.904
SDev	.4	.004	.039	.004	.019	.027	.005
%RSD	.3714	.0770	.7551	.0768	.3767	.5274	.0978
#1	100.3	5.175	5.096	H4.899	H4.927	H5.122	H4.901
#2	99.74	5.181	5.150	H4.894	H4.953	H5.160	H4.907
Errors	NOCHECK	NOCHECK	NOCHECK	LC High	LC High	LC High	LC High
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	H5.064	H.9634	H4.843	H5.154	H.9829	H4.896	H.9760
SDev	.003	.0031	.001	.043	.0065	.001	.0076
%RSD	.0680	.3217	.0109	.8270	.6589	.0253	.7808
#1	H5.061	H.9656	H4.842	H5.124	H.9784	H4.897	H.9706
#2	H5.066	H.9612	H4.843	H5.184	H.9875	H4.895	H.9814

Errors	LC High	LC High	LC High	LC High	LC High	LC High	LC High
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	H4.954	H.9986	H4.880
SDev	.002	.0069	.002
%RSD	.0333	.6888	.0455
#1	H4.955	H.9938	H4.882
#2	H4.952	H1.003	H4.878

Errors	LC High	LC High	LC High
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	644960	10000	--	--	--	--	--
SDev	2440.226	.0000000	--	--	--	--	--
%RSD	.3783527	.0000000	--	--	--	--	--
#1	646686	10000	--	--	--	--	--
#2	643235	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 245111 Operator:
Run Time: 06/15/04 14:39:50
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	.3962	.0099	.1705	.0081	.0003	.0031
SDev	.0005	.0493	.0050	.0004	.0002	.0000	.0083
%RSD	169700.	12.44	50.37	.2268	2.418	4.187	266.0
#1	-.0004	.4311	.0135	.1708	.0083	.0003	-.0027
#2	.0004	.3614	.0064	.1703	.0080	.0003	.0090

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	6.970	.0001	.0008	.0006	.0005	.1379	3.126
SDev	.075	.0001	.0005	.0006	.0001	.0023	.073
%RSD	1.077	154.5	67.83	91.80	19.77	1.657	2.337
#1	6.917	-.0000	.0012	.0011	.0005	.1363	3.075
#2	7.023	.0002	.0004	.0002	.0006	.1395	3.178

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0008	.0847	.6041	.0008	.0092	79.38	50.66
SDev	.0004	.0008	.0009	.0002	.0000	1.39	.69
%RSD	46.95	.8851	.1472	22.00	.2013	1.748	1.359
#1	.0010	.0842	.6035	.0010	.0092	78.40	50.17
#2	.0005	.0852	.6048	.0007	.0093	80.36	51.15

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0009	.0388	.0006	.0036	.0003	7.423	.0010
SDev	.0023	.0094	.0027	.0020	.0019	.134	.0016
%RSD	244.5	24.23	445.6	55.36	542.6	1.798	162.8
#1	.0025	.0455	-.0013	.0022	-.0010	7.518	-.0001
#2	-.0007	.0322	.0025	.0050	.0017	7.329	.0021

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	101.6	.0239	.0000	26.99	.0026	.0080	.0234
SDev	.0	.0034	.0086	.17	.0022	.0069	.0032
%RSD	.0027	14.14	30430.	.6138	84.70	85.75	13.76
#1	101.6	.0263	.0061	27.11	.0010	.0129	.0256
#2	101.6	.0215	-.0061	26.87	.0042	.0032	.0211

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0332	-.0011	.0036	-.0049	.0291	.0050	-.0000
SDev	.0003	.0018	.0004	.0089	.0025	.0006	.0015
%RSD	.8210	159.9	10.28	182.1	8.721	12.64	35060.
#1	.0330	.0001	.0039	.0014	.0309	.0054	.0010
#2	.0334	-.0024	.0034	-.0111	.0273	.0045	-.0011

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0002	.0017	.0013
SDev	.0002	.0003	.0002
%RSD	102.8	20.71	14.76
#1	.0003	.0020	.0014
#2	.0000	.0015	.0012

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	654986	10000	--	--	--	--	--
SDev	9.899495	.0000000	--	--	--	--	--
%RSD	.0015114	.0000000	--	--	--	--	--
#1	654979	10000	--	--	--	--	--
#2	654993	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 245112 Operator:
Run Time: 06/15/04 14:44:36
Comment:
Mode: CONC Corr. Factor: 1

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Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0003	-.0176	-.0010	-.0017	.0001	.0003	.0055
SDev	.0001	.0008	.0009	.0014	.0001	.0000	.0047
%RSD	19.75	4.715	84.32	84.71	38.43	1.212	84.27
#1	-.0003	-.0170	-.0004	-.0007	.0002	.0003	.0089
#2	-.0003	-.0182	-.0017	-.0027	.0001	.0003	.0022

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	10.01	.0010	.0009	-.0002	.0001	10.14	7.902
SDev	.01	.0002	.0004	.0003	.0002	.04	.018
%RSD	.1166	21.54	42.67	112.9	296.5	.4042	.2235
#1	10.02	.0012	.0006	-.0004	-.0001	10.17	7.914
#2	10.01	.0009	.0011	-.0000	.0002	10.11	7.889

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0003	-.0001	9.838	-.0000	.0018	7.891	5.220
SDev	.0003	.0000	.017	.0001	.0002	.111	.003
%RSD	86.77	25.27	.1749	200.4	12.22	1.412	.0569
#1	-.0001	-.0001	9.850	.0000	.0017	7.970	5.218
#2	-.0005	-.0002	9.826	-.0001	.0020	7.812	5.222

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0003	.0078	.0004	.0024	-.0014	-.0292	-.0013
SDev	.0005	.0139	.0026	.0013	.0006	.0008	.0033
%RSD	174.3	178.6	682.5	53.37	44.51	2.745	257.8
#1	.0001	-.0021	-.0015	.0015	-.0009	-.0297	-.0036
#2	-.0007	.0176	.0022	.0033	-.0018	-.0286	.0010

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	102.6	.0024	-.0054	.0068	.0017	-.0028	.0004
SDev	.4	.0049	.0047	.0019	.0017	.0048	.0005
%RSD	.3505	206.3	87.32	28.52	99.14	170.8	120.6
#1	102.4	-.0011	-.0088	.0081	.0005	-.0062	.0008
#2	102.9	.0059	-.0021	.0054	.0030	.0006	.0001

Elem	Sr4215	Th2837	Ti3349	T11908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0002	-.0097	.0003	.0077	.0146	-.0004	-.0023
SDev	.0000	.0030	.0001	.0027	.0122	.0003	.0007
%RSD	1.560	30.62	50.69	34.74	83.60	82.86	31.76
#1	.0002	-.0076	.0002	.0095	.0232	-.0002	-.0028
#2	.0002	-.0118	.0004	.0058	.0060	-.0006	-.0018

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Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	.0004	.0001
SDev	.0000	.0001	.0003
%RSD	21.42	23.04	267.1
#1	-.0001	.0005	.0003
#2	-.0001	.0003	-.0001

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	661990	10000	--	--	--	--	--
SDev	2382.950	.0000000	--	--	--	--	--
%RSD	.3599676	.0000000	--	--	--	--	--
#1	660305	10000	--	--	--	--	--
#2	663675	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 245113 Operator:
Run Time: 06/15/04 14:49:22
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	.1001	.0752	.0921	-.0033	.1005	.0966	-.0012
SDev	.0015	.0012	.0035	.0001	.0002	.0002	.0021
%RSD	1.460	1.608	3.816	2.414	.2083	.1650	183.6
#1	.1011	.0761	.0896	-.0033	.1007	.0967	.0003
#2	.0991	.0743	.0945	-.0032	.1004	.0965	-.0027

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	9.959	.0996	.0988	.0968	.0959	10.12	7.932
SDev	.011	.0009	.0007	.0010	.0004	.01	.037
%RSD	.1060	.8649	.6761	1.088	.3936	.1061	.4642
#1	9.966	.1002	.0992	.0976	.0962	10.11	7.958
#2	9.951	.0990	.0983	.0961	.0957	10.12	7.906

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0003	-.0001	9.773	.1007	.0924	8.140	5.288
SDev	.0003	.0000	.015	.0004	.0027	.083	.016
%RSD	111.5	26.07	.1491	.4249	2.911	1.016	.3087
#1	-.0001	-.0001	9.783	.1010	.0905	8.198	5.300
#2	-.0005	-.0002	9.762	.1004	.0943	8.081	5.277

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0982	.0044	.0975	.0994	-.0013	-.0406	.0957
SDev	.0008	.0107	.0006	.0032	.0015	.0102	.0002
%RSD	.8565	242.3	.6512	3.216	112.1	25.23	.2148
#1	.0977	.0120	.0970	.0971	-.0023	-.0478	.0959
#2	.0988	-.0031	.0979	.1016	-.0003	-.0333	.0956

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	103.0	.0981	.0917	.0070	.0987	.0939	-.0009
SDev	.7	.0016	.0025	.0016	.0023	.0011	.0017
%RSD	.7272	1.624	2.685	22.67	2.371	1.184	179.4
#1	102.4	.0993	.0900	.0081	.0971	.0931	.0003
#2	103.5	.0970	.0935	.0058	.1004	.0947	-.0021

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	9.912	.0909	.0001	.1031	.0329	.0980	-.0002
SDev	.020	.0031	.0000	.0009	.0029	.0004	.0014
%RSD	.2055	3.417	29.52	.8611	8.872	.4583	649.5
#1	9.926	.0887	.0001	.1024	.0349	.0983	.0008
#2	9.898	.0931	.0000	.1037	.0308	.0977	-.0012

010156

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	.0986	-.0003
SDev	.0000	.0004	.0001
%RSD	27.48	.4404	33.15
#1	-.0001	.0989	-.0002
#2	-.0001	.0983	-.0003

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	664100	10000	--	--	--	--	--
SDev	4860.652	.0000000	--	--	--	--	--
%RSD	.7319157	.0000000	--	--	--	--	--
#1	660663	10000	--	--	--	--	--
#2	667537	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 245114 Operator:
Run Time: 06/15/04 14:54:07
Comment:
Mode: CONC Corr. Factor: 1

010157

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0001	-.0266	-.0025	-.0024	.0001	.0003	.0053
SDev	.0003	.0012	.0012	.0004	.0000	.0000	.0028
%RSD	235.0	4.429	48.03	16.60	10.98	.6054	52.30
#1	-.0003	-.0258	-.0016	-.0021	.0001	.0003	.0034
#2	.0001	-.0275	-.0033	-.0027	.0001	.0003	.0073

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0002	.0003	.0006	-.0004	-.0003	-.0067	-.0054
SDev	.0002	.0001	.0003	.0001	.0002	.0246	.0065
%RSD	104.2	28.44	46.10	21.78	67.50	368.6	120.9
#1	-.0003	.0004	.0004	-.0004	-.0004	.0107	-.0008
#2	-.0000	.0003	.0007	-.0005	-.0001	-.0241	-.0099

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0004	-.0001	.0003	.0000	.0009	-.0124	-.0005
SDev	.0011	.0000	.0011	.0001	.0002	.0241	.0000
%RSD	252.2	4.944	358.0	1066.	25.28	195.0	5.616
#1	-.0003	-.0001	.0011	-.0000	.0011	.0047	-.0006
#2	.0012	-.0001	-.0005	.0000	.0008	-.0294	-.0005

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0003	.0061	-.0031	.0007	.0004	-.0357	-.0049
SDev	.0001	.0089	.0044	.0036	.0018	.0078	.0032
%RSD	21.78	145.3	143.4	542.1	394.6	21.97	65.45
#1	.0003	.0124	-.0062	-.0019	-.0008	-.0301	-.0072
#2	.0003	-.0002	.0000	.0032	.0017	-.0412	-.0027

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	101.7	.0057	-.0046	.0061	-.0006	-.0012	-.0017
SDev	1.1	.0029	.0019	.0017	.0039	.0003	.0044
%RSD	1.037	51.21	40.58	27.14	681.0	23.72	267.2
#1	101.0	.0036	-.0033	.0073	-.0033	-.0010	-.0048
#2	102.5	.0077	-.0059	.0049	.0022	-.0013	.0015

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	-.0018	.0000	.0004	.0070	-.0001	-.0015
SDev	.0001	.0034	.0001	.0001	.0130	.0004	.0002
%RSD	50.43	187.1	925.9	28.88	185.1	344.7	12.49
#1	.0002	.0006	.0001	.0003	-.0022	-.0004	-.0016
#2	.0001	-.0042	-.0001	.0005	.0162	.0002	-.0014

010158

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	-.0014	.0001
SDev	.0001	.0001	.0000
%RSD	355.7	7.001	29.10
#1	-.0001	-.0015	.0001
#2	.0000	-.0014	.0000

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	656188	10000	--	--	--	--	--
SDev	6807.317	.0000000	--	--	--	--	--
%RSD	1.037404	.0000000	--	--	--	--	--
#1	651374	10000	--	--	--	--	--
#2	661001	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 245115 Operator:
Run Time: 06/15/04 14:58:53
Comment:
Mode: CONC Corr. Factor: 1

010159

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0003	.3362	.0052	.1416	.0118	.0003	-.0004
SDev	.0002	.0510	.0011	.0005	.0000	.0000	.0047
%RSD	63.24	15.16	20.22	.3849	.3086	7.501	1292.
#1	.0001	.3722	.0060	.1419	.0118	.0003	.0030
#2	.0004	.3001	.0045	.1412	.0117	.0003	-.0037

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	13.97	.0005	.0007	-.0002	.0007	.1819	3.774
SDev	.05	.0001	.0003	.0006	.0003	.0197	.026
%RSD	.3590	11.78	44.63	245.5	34.90	10.84	.6804
#1	13.94	.0004	.0005	.0002	.0006	.1958	3.756
#2	14.01	.0005	.0009	-.0006	.0009	.1679	3.792

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0003	.0374	1.420	.0045	.0079	50.67	32.79
SDev	.0002	.0000	.004	.0002	.0014	.13	.03
%RSD	66.30	.0541	.2856	5.366	17.17	.2655	.0944
#1	.0001	.0375	1.417	.0047	.0089	50.58	32.76
#2	.0004	.0374	1.422	.0044	.0069	50.77	32.81

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0372	-.0019	.0005	-.0022	9.502	.0024
SDev	.0006	.0048	.0044	.0035	.0022	.170	.0013
%RSD	466.6	13.01	231.9	721.8	101.2	1.789	54.22
#1	-.0003	.0338	.0012	.0029	-.0037	9.622	.0033
#2	.0005	.0406	-.0051	-.0020	-.0006	9.382	.0015

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	103.2	.0145	.0003	20.74	-.0003	.0050	.0089
SDev	1.1	.0077	.0005	.28	.0038	.0022	.0008
%RSD	1.020	52.98	208.2	1.357	1261.	43.97	9.103
#1	102.4	.0091	.0006	20.94	.0024	.0035	.0095
#2	103.9	.0200	-.0001	20.54	-.0030	.0066	.0083

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0770	-.0007	.0038	-.0090	.0099	.0136	-.0019
SDev	.0002	.0013	.0004	.0048	.0171	.0003	.0004
%RSD	.2929	180.6	11.17	53.26	173.1	2.574	22.91
#1	.0768	-.0017	.0041	-.0056	-.0022	.0139	-.0022
#2	.0771	.0002	.0035	-.0124	.0219	.0134	-.0016

010160

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	.0011	.0011
SDev	.0000	.0002	.0000
%RSD	13.00	17.41	.4020
#1	.0001	.0013	.0011
#2	.0001	.0010	.0011

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	665406	10000	--	--	--	--	--
SDev	6843.379	.0000000	--	--	--	--	--
%RSD	1.028452	.0000000	--	--	--	--	--
#1	660567	10000	--	--	--	--	--
#2	670245	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 245116 Operator:
Run Time: 06/15/04 15:03:39 **010161**
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	.4978	.0019	.1721	.0084	.0004	.0021
SDev	.0002	.1567	.0031	.0020	.0001	.0000	.0045
%RSD	58.51	31.48	165.8	1.185	1.203	11.90	212.8
#1	-.0002	.6085	.0041	.1736	.0084	.0003	.0053
#2	-.0004	.3870	-.0003	.1707	.0083	.0004	-.0011

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	7.315	.0002	.0013	.0002	.0005	.1665	3.224
SDev	.021	.0000	.0005	.0001	.0004	.0273	.015
%RSD	.2881	22.17	41.87	69.79	72.54	16.41	.4656
#1	7.300	.0002	.0009	.0001	.0007	.1859	3.214
#2	7.329	.0002	.0016	.0003	.0002	.1472	3.235

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0005	.0879	.6405	.0012	.0052	82.50	52.47
SDev	.0005	.0005	.0137	.0001	.0005	.51	.21
%RSD	107.3	.5711	2.139	13.01	9.945	.6160	.3935
#1	.0001	.0876	.6501	.0013	.0048	82.14	52.32
#2	.0009	.0883	.6308	.0011	.0056	82.86	52.62

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0002	.0391	-.0019	.0028	.0000	7.566	.0044
SDev	.0001	.0155	.0027	.0008	.0008	.128	.0023
%RSD	23.19	39.66	137.7	28.06	1877.	1.694	53.30
#1	.0002	.0501	-.0001	.0034	-.0005	7.657	.0060
#2	.0002	.0282	-.0038	.0023	.0006	7.475	.0027

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	98.94	.0255	-.0003	27.84	.0013	.0083	.0066
SDev	.76	.0019	.0043	.61	.0014	.0035	.0050
%RSD	.7636	7.378	1513.	2.206	112.8	41.97	19.00
#1	98.40	.0269	.0028	28.27	.0023	.0108	.0302
#2	99.47	.0242	-.0033	27.40	.0003	.0059	.0230

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0355	.0004	.0043	-.0263	.0116	.0036	-.0052
SDev	.0001	.0020	.0013	.0021	.0068	.0000	.0020
%RSD	.4236	463.2	30.84	8.001	58.64	.2739	38.46
#1	.0354	-.0010	.0052	-.0248	.0163	.0036	-.0066
#2	.0356	.0019	.0034	-.0278	.0068	.0036	-.0038

010162

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	.0021	.0012
SDev	.0000	.0004	.0005
%RSD	.8400	21.13	40.81
#1	.0001	.0024	.0016
#2	.0001	.0018	.0009

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	638104	10000	--	--	--	--	--
SDev	4838.732	.0000000	--	--	--	--	--
%RSD	.7582989	.0000000	--	--	--	--	--
#1	634682	10000	--	--	--	--	--
#2	641525	10000	--	--	--	--	--

Analysis Report

06/15/04 03:19:26 PM

Method: DAILY2 Sample Name: ccv4
Run Time: 06/15/04 15:14:52
Comment:
Mode: CONC Corr. Factor: 1

Operator:

010163

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.9813	9.668	4.894	4.745	9.925	.9651	4.957
SDev	.0001	.003	.003	.000	.001	.0001	.004
%RSD	.0120	.0321	.0581	.0048	.0087	.0129	.0766
#1	.9814	9.670	4.892	4.744	9.924	.9650	4.960
#2	.9812	9.666	4.896	4.745	9.925	.9651	4.955
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	19.86	.9823	4.898	1.931	2.013	10.04	18.38
SDev	.02	.0021	.003	.002	.003	.02	.05
%RSD	.0819	.2107	.0571	.1275	.1634	.1874	.2892
#1	19.85	.9809	4.896	1.929	2.011	10.03	18.34
#2	19.87	.9838	4.900	1.933	2.015	10.05	18.42
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	4.925	L4.457	19.73	.9989	4.920	L26.92	L18.91
SDev	.001	.006	.01	.0005	.020	.05	.02
%RSD	.0302	.1251	.0727	.0521	.4008	.1984	.1274
#1	4.924	L4.461	19.72	.9986	4.906	L26.89	L18.90
#2	4.926	L4.453	19.74	.9993	4.934	L26.96	L18.93
Errors	LC Pass	LC Low	LC Pass	LC Pass	LC Pass	LC Low	LC Low
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	4.759	4.873	4.927	4.893	1.024	.9855	.9846
SDev	.001	.067	.015	.003	.003	.0041	.0009
%RSD	.0116	1.384	.3083	.0620	.3361	.4152	.0953
#1	4.759	4.921	4.937	4.891	1.022	.9884	.9852
#2	4.758	4.825	4.916	4.895	1.026	.9826	.9839
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass
High	5.500	5.500			1.100	1.100	1.100
Low	4.500	4.500			.9000	.9000	.9000

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

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	100.7	5.178	5.119	4.926	4.904	5.139	4.887
SDev	.1	.005	.007	.001	.003	.003	.002
%RSD	.0958	.0997	.1321	.0168	.0620	.0542	.0414
#1	100.8	5.182	5.114	4.926	4.906	5.137	4.889
#2	100.6	5.174	5.124	4.925	4.902	5.140	4.886
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	5.065	.9635	4.850	5.125	.9755	4.871	.9762
SDev	.000	.0034	.003	.068	.0142	.002	.0040
%RSD	.0097	.3581	.0697	1.321	1.454	.0454	.4073
#1	5.065	.9610	4.847	5.077	.9654	4.869	.9734
#2	5.066	.9659	4.852	5.173	.9855	4.872	.9790
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	5.500	1.100	5.500	5.500	1.100	5.500	1.100
Low	4.500	.9000	4.500	4.500	.9000	4.500	.9000

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	4.945	.9879	4.779
SDev	.004	.0007	.024
%RSD	.0870	.0673	.5104
#1	4.948	.9874	4.761
#2	4.942	.9883	4.796
Errors	LC Pass	LC Pass	LC Pass
High	5.500	1.100	5.500
Low	4.500	.9000	4.500

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	649448	10000	--	--	--	--	--
SDev	596.0910	.0000000	--	--	--	--	--
%RSD	.0917842	.0000000	--	--	--	--	--
#1	649870	10000	--	--	--	--	--
#2	649027	10000	--	--	--	--	--

Analysis Report 06/15/04 03:26:02 PM page 1

Method: DAILY2 Sample Name: ccb4 Operator:
Run Time: 06/15/04 15:21:28
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	-.0224	.0011	.0037	.0003	.0004	-.0018
SDev	.0008	.0058	.0000	.0020	.0003	.0001	.0023
%RSD	580.3	25.76	1.248	53.14	90.21	13.33	127.8
#1	.0004	-.0183	.0011	.0051	.0001	.0004	-.0002
#2	-.0007	-.0265	.0011	.0023	.0005	.0004	-.0035
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0500	.0050	.0500	.0050	.0050	.0100
Low	-.0050	-.0500	-.0050	-.0500	-.0050	-.0050	-.0100

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0016	.0004	-.0001	-.0014	.0004	-.0052	-.0038
SDev	.0005	.0001	.0002	.0000	.0004	.0043	.0047
%RSD	28.84	36.56	145.2	1.174	86.36	82.11	125.9
#1	.0013	.0005	.0000	-.0014	.0002	-.0082	-.0004
#2	.0020	.0003	-.0003	-.0014	.0007	-.0022	-.0071
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0500	.0050	.0050	.0050	.0050	.0250	.1000
Low	-.0500	-.0050	-.0050	-.0050	-.0050	-.0250	-.1000

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0003	.0002	-.0046	-.0000	H.0062	H.0550	.0087
SDev	.0003	.0001	.0050	.0001	.0016	.0180	.0010
%RSD	121.2	30.34	109.2	3669.	25.83	32.68	11.76
#1	-.0000	.0002	-.0011	-.0001	H.0073	H.0677	.0094
#2	-.0005	.0003	-.0082	.0001	H.0050	.0423	.0080
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC High	LC High	LC Pass
High	.0050	.0050	.0500	.0050	.0050	.0500	.0500
Low	-.0050	-.0050	-.0500	-.0050	-.0050	-.0500	-.0500

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0005	.0027	-.0003	-.0004	-.0006	L-.0155	.0003
SDev	.0001	.0214	.0011	.0007	.0028	.0009	.0024
%RSD	28.15	799.2	416.5	188.7	506.9	5.980	899.1
#1	-.0006	L-.0125	-.0011	.0001	.0014	L-.0149	-.0014
#2	-.0004	H.0178	.0005	-.0009	-.0026	L-.0162	.0020
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	LC Pass	LC Low	LC Pass
High	.0050	.0100			.0050	.0100	.0100
Low	-.0050	-.0100			-.0050	-.0100	-.0100

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

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	101.8	.0035	-.0008	.0059	-.0003	.0006	-.0015
SDev	.4	.0030	.0035	.0014	.0001	.0013	.0018
%RSD	.4256	86.48	427.2	22.92	31.41	213.4	120.9
#1	101.5	.0014	.0017	.0068	-.0003	.0016	-.0002
#2	102.1	.0056	-.0033	.0049	-.0004	-.0003	-.0028
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	-.0014	-.0000	.0081	.0023	-.0003	.0009
SDev	.0001	.0005	.0000	.0000	.0118	.0002	.0002
%RSD	104.5	31.37	129.7	.5143	519.5	63.24	25.59
#1	.0000	-.0011	-.0000	.0080	.0106	-.0004	.0011
#2	.0002	-.0018	-.0000	.0091	-.0060	-.0001	.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	.0001	-.0011	.0018
SDev	.0001	.0001	.0003
%RSD	161.0	6.482	15.04
#1	-.0000	-.0011	.0020
#2	.0002	-.0010	.0016
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	656498	10000	--	--	--	--	--
SDev	2836.912	.0000000	--	--	--	--	--
%RSD	.4321281	.0000000	--	--	--	--	--
#1	654492	10000	--	--	--	--	--
#2	658504	10000	--	--	--	--	--

010169

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040521-6
SRR: 25943
SDG: 245108
CASE: CNWRA
VTSR: May 20, 2004
PROJECT#: 06002.01.141

Certificates of Analysis

010170

FISHER SCIENTIFIC
TRACEMETAL GRADE NITRIC ACID

CERTIFICATE OF ANALYSIS

Catalog No. A509

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

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

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

B McKelvey

Dr. B. McKelvey
QA/QC Manager

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

Fisher Chemical
A Fisher Scientific Company

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 06/01/04
DATE EXPIRED: 01/01/2007 WCX
DATE OPENED: 06/01/04
INORG: 4580-45885 PO: F53383

010171

FISHER SCIENTIFIC
TRACEMETAL GRADE NITRIC ACID
CERTIFICATE OF ANALYSIS

Catalog No. A509

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

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

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

B McKelvey

Dr. B. McKelvey
QA/QC Manager

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Fisher Chemical
A Fisher Scientific Company

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 05/05/04
DATE EXPIRED: 02/02/2007
DATE OPENED: 05/05/04
INORG: 4558-4563 PO: F53313

010172

FISHER SCIENTIFIC
TRACEMETAL GRADE HYDROCHLORIC ACID

CERTIFICATE OF ANALYSIS

Catalog No. A508

Lot No: 4103101
Release Date: January, 2004
Expiry Date: January, 2007

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

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

B McKelvey

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

010173

FISHER SCIENTIFIC
TRACEMETAL GRADE HYDROCHLORIC ACID

CERTIFICATE OF ANALYSIS

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

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

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

B McKelvey

Dr. B. McKelvey
QA/QC Manager

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Fisher Chemical
A Fisher Scientific Company

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

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 10/31/03
DATE EXPIRED: 10/31/04 OK
DATE OPENED: 11/3/03
INORG: 4306 PO: 45281

SPEXertificate™ 010174

Certificate of Reference Material

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

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

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

Refer to side 2 for details of measurement uncertainties.

Instrumental Analysis by ICP Spectrometer:

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

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

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

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

010175

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

010176

SPEXertificate™

Certificate of Reference Material

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

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

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

Refer to side 2 for details of measurement uncertainties.

Instrumental Analysis by ICP Spectrometer:

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

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

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

Date of Certification: MAR [illegible] 2001 Certifying Officer: N. Kocherlakota

Report of Certification 010177

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

010178

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

CUSTOM-GRADE SOLUTION — 10,000 µg/mL Scandium IN 5% HNO_3 (abs)

Catalog Number: CGSC10-1and CGSC10-5

Lot Number: **T-SC02053**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 09/24/03
DATE EXPIRED: 10/01/2004 V03
DATE OPENED: 09/24/03
INORG: 4262 PO: E52232

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

CERTIFIED CONCENTRATION: 10,047 ± 29 µg/mL

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

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

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

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

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

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

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

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

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

(over)

QA:KL Rev.02120304

Paul R. Haines
Quality Assurance Manager

Expires:

EXPIRES
01/2004

QUALITY STANDARD DOCUMENTATION

1. ISO 9001:2000 QMI Registered Quality System (Certificate Number 010105)

Members of IQ Net : Argentina **(IRAM)**, Australia **(QAS)**, Austria **(ÖQS)**, Belgium **(Avinter)** , Brazil **(FCAV)**, Canada **(QMI)**, Hong Kong **(HKQAA)**, Columbia **(ICONTEC)**, Czech Republic **(CQS)**, Denmark **(DS)**, Finland **(SFS)**, France **(AFAQ)**, Germany **(DQS)**, Greece **(ELOT)**, Hungary **(MSZT)**, Ireland **(NSAI)**, Israel **(SII)**, Italy **(CISQ)**, Japan **(JQA)**, Korea **(KSA-QA)**, Netherlands **(KEMA)**, Norway **(NCS)**, Poland**(PCBC)**, Portugal **(APCER)**, Singapore **(PSB)**, Slovenia **(SIQ)**, Spain **(AENOR)**, Switzerland **(SQS)**

2. ISO/IEC Guide 34-2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate 883.02
3. ISO/IEC17025-1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate 883.01
4. MIL-STD-45662A
5. 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licencing of Production and Utilization Facilities
6. 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

Please contact our Quality Assurance Department for further information and copies of documents pertaining to our Quality Standard certifications.

STABILITY/ EXPIRATION DOCUMENTATION

Shelf Life - The length of time that a properly stored and packaged standard will remain within the specified uncertainty. Shelf life is affected by chemical stability and transpiration issues. Inorganic Ventures' Standard Solutions are chemically stable indefinitely. Transpiration loss is linear with time and limits the time a standard can be used with confidence. The smaller the bottle the higher the rate of transpiration. Inorganic Ventures' studies indicate that the shelf life of our 500 mL bottle is 4 years and the shelf life of our 125 mL bottle is 21 months.

Expiration Date - The date after which a standard solution should not be used. A one year expiration date is recommended by most state and federal regulatory agencies. Transpiration issues and repeated use of solutions over a one year period may adversely affect the integrity of th 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

010180

SPEXertificate™

Certificate of Reference Material

Catalog Number: PLB9-2X/2Y/2T **Lot No.** 10-119B
Description: 1000 mg/L Boron
Matrix: H2O

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

Certified Value: 1001 mg/L
Uncertainty Associated with Measurement: +/- 3.0 mg/L
Certified Value is Traceable to: NIST SRM 3107

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

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1001 mg/L

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

Instrumental Analysis by ICP spectrometer: 1001 mg/L

Uncertified Properties:

Density: 1.001 @ 22.3 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.06	Cu	<0.001	Pb	<0.001
As	<0.001	Fe	0.001	Re	<0.001
Ag	0.002	Ga	<0.001	Rb	<0.001
Ba	<0.001	In	<0.001	Sr	<0.001
Be	<0.001	K	<0.06	Sb	<0.001
Bi	0.03	Li	<0.001	Si	0.01
Cd	<0.001	Mn	<0.001	Ti	<0.001
Co	<0.001	Mo	<0.001	Tl	<0.001
Ca	0.001	Mg	<0.001	V	0.003
Cr	<0.001	Na	0.01	Zr	<0.001
		Ni	0.001	Zn	0.004

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

Date of Certification: APR '04 Certifying Officer: N. Kocherlakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 5/7/04
DATE EXPIRED: 4/30/05 DC
DATE OPENED: 5/11/04
INORG: 4564 PO: F5337L

Report of Certification

010181

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

010182

SPEXertificate™

Certificate of Reference Material

Catalog Number: PLLI2-2X/2Y **Lot No.** 10-12LI

Description: 1000 mg/L Lithium

Matrix: 2% HNO3

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

Certified Value: 997.5 mg/L

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

Certified Value is Traceable to: NIST SRM 3129a

The CRM is prepared gravimetrically using high purity Lithium Carconate Lot# 03021A. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 997 mg/L

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

Instrumentation Analysis By ICP spectrometer: 998 mg/L

Uncertified Properties:

Density: 1.014 @ 22.2 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.001	Cu	<0.001	Pb	<0.001
As	<0.001	Fe	0.007	Re	<0.001
Ag	<0.003	Ga	<0.001	Rb	<0.001
B	<0.008	In	<0.001	Sr	<0.001
Ba	0.001	K	0.20	Sb	<0.001
Be	<0.001	Mn	<0.001	Si	0.007
Bi	<0.001	Mo	<0.001	Ti	<0.001
Ca	0.017	Mg	<0.001	Tl	<0.001
Cr	<0.001	Na	0.01	V	<0.001
Cd	0.008	Ni	<0.001	Zr	<0.001
Co	<0.001			Zn	0.035

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

Date of Certification: JAN '04 Certifying Officer: N. Kocherlakota

DATE RECEIVED: 01/23/04
DATE EXPIRED: 01/30/2005 VO3
DATE OPENED: 01/23/04
INORG: 4439 PO: F52306

Report of Certification

010183

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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010184

SPEXertificate™

Certificate of Reference Material

Catalog Number: PLMO9-2X/2Y/2T **Lot No.** 10-74MO

Description: 1000 mg/L Molybdenum

Matrix: H2O

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

Certified Value: 998 mg/ L

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

Certified Value is Traceable to: NIST SRM #3134

The CRM is prepared gravimetrically using high purity (NH4)6Mo7(O)24 Lot# 03011C. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 998 mg/L

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

Instrumental Analysis by ICP spectrometer: 999 mg/L

Uncertified Properties:

Density: 0.9989 @ 23.7 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.002	Cu	0.003	Pb	0.002
As	0.04	Fe	<0.10	Re	0.03
Ag	<0.001	Ga	<0.001	Rb	<0.001
B	<0.006	In	<0.001	Sr	<0.001
Ba	0.001	K	0.01	Sb	0.005
Be	<0.01	Li	<0.001	Si	<0.50
Bi	<0.001	Mg	0.10	Ti	0.004
Ca	0.01	Mn	0.001	Tl	<0.001
Cr	<0.002	Na	0.007	V	0.003
Cd	<0.10	Ni	<0.001	Zr	<0.001
Co	0.002			Zn	0.009

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

Date of Certification: JAN 04 Certifying Officer: N. Kocherlakota

DATE RECEIVED: 01/23/04
DATE EXPIRED: 01/31/2005 VDS
DATE OPENED: 01/23/04
INORG: 4440 PO: F58396

010185

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

010186

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

SPEXertificate™

Certificate of Reference Material

Catalog Number: PLP9-2X/2Y/2T **Lot No.** 9-150P
Description: 1000 mg/L Phosphorus
Matrix: H2O

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

Certified Value: 1002.5 mg/L
Uncertainty Associated with Measurement: +/- 3 mg/L
Certified Value is Traceable to: NIST SRM 3139a

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

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1003 mg/L

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

Instrumentation Analysis By ICP spectrometer: 1002 mg/L

Uncertified Properties:

Density: 0.9996 @ 24.0 Degrees Celsius

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

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

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

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

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.

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CRMSales@spexcsp.com • www.spexcsp.com
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010188

SPEXertificate ™

Certificate of Reference Material

Catalog Number: PLSI9-2X/2Y/2T **Lot No.** 10-07SI
Description: 1000 mg/L Silicon
Matrix: H2O / 0.4% F-

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

Certified Value: 998.5 mg/L
Uncertainty Associated with Measurement: +/- 3 mg/L
Certified Value is Traceable to: NIST SRM #3150

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

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 997 mg/L

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

Instrumentation Analysis By ICP spectrometer: 1000 mg/L

Uncertified Properties:

Density: 1.010 @ 26.5 Degrees Celsius

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

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

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

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

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 09/05/03
DATE EXPIRED: 08/30/2004 VC5
DATE OPENED: 09/05/03
INORG: 42332 PO: E53225

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 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

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

Statistical estimator and Confidence limits:

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

Certification Traveler Report:

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

Legal Notice:

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

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Certificate of Reference Material

Catalog Number: PLTI9-2X/2Y/2T **Lot No.** 10-38TI
Description: 1000 mg/L Titanium
Matrix: H2O/ 0.24% F-

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

Certified Value: 1001 mg/L
Uncertainty Associated with Measurement: 3.0mg/L
Certified Value is Traceable to: NIST SRM #3162a

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

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1003 mg/L

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

Instrumentation Analysis By ICP spectrometer: 999 mg/L

Uncertified Properties:

Density: 1.001 @ 22.5 Degrees Celsius

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

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

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

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

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 09/05/03
DATE EXPIRED: 08/30/2004 VDS
DATE OPENED: 09/05/03
INORG: 4234 PO: F50005

Report of Certification

010191

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

Material Source:

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

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

Statistical estimator and Confidence limits:

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

Certification Traveler Report:

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

Legal Notice:

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DATE RECEIVED: 10/31/03
DATE EXPIRED: 10/31/2004
DATE OPENED: 11/3/03
INORG: 4308 PO: F5241

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Certificate of Reference Material

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

Description: 1000 mg/L Strontium in 2% HNO3

Matrix: 2% HNO3

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

Certified Value: 1002.5 mg/L

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

Certified Value is Traceable to: NIST SRM 3153a

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

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1002 mg/L

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

Instrumentation Analysis By ICP spectrometer: 1003 mg/L

Uncertified Properties:

Density: 1.010 @ 22.7 Degrees Celsius

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

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

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

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

Report of Certification

010193

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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010194

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DATE RECEIVED: 5/2/04
DATE EXPIRED: 4/30/05 OK
DATE OPENED: 5/11/04
INORG: 4565 PO: F53371

SPEXertificate™

Certificate of Reference Material

Catalog Number: PLSN5-2X/2Y/2T **Lot No.** 10-87SN
Description: 1000 mg/L Tin
Matrix: 20% HCL

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

Certified Value: 1003 mg/ L
Uncertainty Associated with Measurement: +/-3.0mg/L
Certified Value is Traceable to: NIST SRM 3161a

The CRM is prepared gravimetrically using high purity Tin Metal Lot# 05021C. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1004 mg/L

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

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

Density: 1.034 @24.8C Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.003	Cu	0.001	Pb	0.004
As	<0.20	Fe	0.18	Rb	<0.001
Ag	0.006	Ga	<0.001	Re	<0.001
B	<0.002	In	0.05	Si	0.20
Ba	0.004	K	<0.20	Sr	<0.001
Be	<0.001	Li	<0.001	Sb	0.003
Bi	<0.001	Mg	0.004	Ti	0.009
Ca	0.02	Mn	0.003	Tl	<0.001
Cr	0.02	Mo	<0.001	V	<0.40
Cd	0.002	Na	0.02	Zr	<0.001
Co	0.007	Ni	0.06	Zn	0.05

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

Date of Certification: APR '04 Certifying Officer: N. Kocherlakota

Report of Certification

010195

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

Material Source:

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

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

Statistical estimator and Confidence limits:

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

Certification Traveler Report:

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

Legal Notice:

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

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Certificate of Reference Material

Catalog Number: PLBI4-2X/2Y **Lot No.** 10-68BI

Description: 1000 mg/L Bismuth

Matrix: 10% HNO3

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

Certified Value: 1001 mg/L

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

Certified Value is Traceable to: NIST SRM 3106

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

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1000 mg/L

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

Instrumental Analysis by ICP spectrometer: 1002 mg/L

Uncertified Properties:

Density: 1.052@23.1 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.006	Cu	0.002	Pb	0.009
As	<0.001	Fe	0.001	Re	<0.001
Ag	<0.001	Ga	<0.001	Rb	<0.001
B	<0.003	In	<0.001	Sr	<0.001
Ba	<0.001	K	0.002	Sb	0.002
Be	<0.001	Li	<0.001	Si	<0.01
Cd	<0.001	Mn	<0.001	Ti	<0.001
Co	<0.001	Mo	<0.001	Tl	<0.001
Ca	0.006	Mg	0.002	V	<0.001
Cr	<0.001	Na	0.009	Zr	<0.001
		Ni	0.001	Zn	0.01

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

Date of Certification: FEB '04 Certifying Officer: N. Kocherlakota

Report of Certification

010197

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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010198

SPEXertificate™

Certificate of Reference Material

Catalog Number: PLLA2-2X/2Y **Lot No.** 10-27LA

Description: 1000 mg/L Lanthanum

Matrix: 2% HNO3

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

Certified Value: 1000 mg/L

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

Certified Value is Traceable to: NIST SRM #3127a

The CRM is prepared gravimetrically using high purity La(NO3)3-6H2O Lot# 03951B. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1000 mg/L

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

Instrumentation Analysis By ICP spectrometer: 999 mg/L

Uncertified Properties:

Density: 1.010 @ 22.3 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Ce	0.02	Lu	<0.001	Th	<0.001
Ca	0.029	Mn	<0.001	Tm	<0.001
Dy	<0.001	Mo	<0.001	Ti	<0.001
Er	<0.001	Nd	<0.001	Tb	<0.001
Eu	<0.001	Ni	<0.001	Ta	<0.001
Fe	0.005	Na	0.01	Tl	<0.001
Gd	<0.001	Pr	<0.001	V	<0.001
Ga	<0.001	Rb	<0.001	W	<0.001
Hf	<0.001	Sc	0.002	Y	<0.001
Ho	<0.001	Sm	<0.001	Yb	<0.001
In	<0.001			Zr	<0.001

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

Date of Certification: JAN '04 Certifying Officer: N. Kocherlakota

INORGANIC LABORATORY

DATE RECEIVED: 01/23/04

DATE EXPIRED: 01/30/2005 VDS

DATE OPENED: 01/23/04

INORG: 4438 PO: F52306

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.

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010200

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Certificate of Reference Material

Catalog Number: PLY2-2X/2Y/2T **Lot No.** 9-152Y

Description: 1,000 mg/L Yttrium

Matrix: 2% HNO3

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

Certified Value: 1001.5 mg/L

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

Certified Value is Traceable to: NIST SRM 3167a.

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

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1002 mg/L

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

Instrumentation Analysis By ICP spectrometer: 1001 mg/L

Uncertified Properties:

Density: 1.010 @ 24.8 Degrees Celsius

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

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

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

Date of Certification: JAN '04 Certifying Officer: N. Kocherlakota

DATE RECEIVED: 01/23/04
DATE EXPIRED: 01/30/2005 YDO
DATE OPENED: 01/23/04
INORG: 4444 PO: F50396

Report of Certification

010201

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 35: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

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

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 35, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s=s^2m$ 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 uncertainty of the certified value listed on the reverse of this document is the total uncertainty U.
$U = 2U_c + B$ mg/L
Where U_c = combined uncertainty components associated with volumetric and gravimetric factors, B is the uncertainty component of two independent methods of analysis (including the systematic and random uncertainties)
95% confidence limits = $X \pm t_{0.05}\sqrt{\Sigma U_c^2}$
where X = grand mean
$t_{0.05}$ = the percentile of the student's t distribution for (k-1) degrees of freedom.

Certification Traveler Report:

All certified values reported were derived from the Traveler Report identified by the lot number of this CRM. For further information contact the certifying organization.

Legal Notice:

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

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010202

SPEXertificate™

Certificate of Reference Material

Catalog Number: PLPD3-2X/2Y **Lot No.** 10-108PD

Description: 1000 mg/L Palladium

Matrix: 10% HCl

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

Certified Value: 1002.5 mg/L

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

Certified Value is Traceable to: NIST SRM 3138

The CRM is prepared gravimetrically using high purity Palladium Powder Lot# 01021A. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1002 mg/L

Method: Precipitation using Glyoxime. Filter, dry, and weigh as $Pd(C_4H_7O_2N_2)_2$

Instrumental Analysis by ICP spectrometer: 1003 mg/L

Uncertified Properties:

Density: 1.017 @ 23.6 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.01	Fe	0.024	Re	<0.001
Au	0.003	Ga	<0.001	Rh	0.001
Ag	0.005	Ir	<0.001	Rb	<0.001
B	<0.002	In	<0.001	Ru	<0.001
Be	<0.003	Mg	0.008	Sn	0.007
Bi	<0.001	Mn	<0.001	Te	<0.002
Ca	0.014	Na	0.02	Ti	<0.001
Cd	<0.001	Ni	<0.001	W	<0.001
Co	0.004	Pb	0.002	Zr	<0.001
Cr	<0.003	Pt	<0.001	Zn	1.0
Cu	0.001				

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

Date of Certification: JAN '04 Certifying Officer: N. Kocherlakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 01/13/04
DATE EXPIRED: 01/15/2005 VP3
DATE OPENED: 01/13/04
INORG: 4417 PO: F52299

Report of Certification

010203

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

Material Source:

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

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

Statistical estimator and Confidence limits:

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

Certification Traveler Report:

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

Legal Notice:

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

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010204

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 06/20/03
DATE EXPIRED: 06/30/2004 MS
DATE OPENED: 06/23/03
INORG: 4140 PO: F52370

SPEXertificate™

Certificate of Reference Material

Catalog Number: PLS9-2X/2Y/2T **Lot No.** 8-74S
Description: 1000 mg/L Sulfur
Matrix: H2O

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

Certified Value: 1003 mg/L
Uncertainty Associated with Measurement: +/- 3 mg/L
Certified Value is Traceable to: NIST SRM 3154

The CRM is prepared gravimetrically using high purity Ammonium Sulfate Lot# 05891M. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1003 mg/L

Method: Precipitation using barium chloride,filter,ignite and weigh as BaS04.

Instrumentation Analysis By ICP spectrometer: 1003 mg/L

Uncertified Properties:

Density: 1.007 @ 23.6 Degrees Celsius

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

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

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

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

010205

Report of Certification

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

Material Source:

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

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

Statistical estimator and Confidence limits:

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

Certification Traveler Report:

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

Legal Notice:

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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CRMSales@spexcsp.com • www.spexcsp.com
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SPEXertificate ™

Certificate of Reference Material

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

Description: 1000 mg/L Thorium

Matrix: 2% HNO_3

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

Certified Value: 999 mg/L

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

Certified Value is Traceable to: NIST SRM #3159

The CRM is prepared gravimetrically using high purity $Th(NO_3)_4 \cdot 4H_2O$ 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 $Pb(NO_3)_2$ NIST SRM #928.

Instrumentation Analysis By ICP spectrometer: 998 mg/L

Uncertified Properties:

Density: 1.010 @ 22.0 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Ce	0.01	La	0.003	Tb	<0.001
Ca	0.27	Lu	<0.001	Tm	<0.001
Dy	<0.001	Mn	<0.001	Ti	<0.002
Er	<0.001	Mo	<0.001	Ta	<0.001
Eu	<0.001	Nd	0.003	Tl	<0.001
Fe	<0.01	Ni	<0.001	V	<0.001
Gd	<0.001	Na	0.04	W	<0.001
Ga	<0.001	Pr	<0.001	Y	0.002
Hf	<0.001	Rb	<0.001	Yb	<0.001
Ho	<0.001	Sc	<0.03	Zr	<0.001
In	<0.001	Sm	<0.001		

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

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

INORGANIC LABS/KAULHEM LABS
DATE RECEIVED: 09/05/03
DATE EXPIRED: 08/30/2004 vo5
DATE OPENED: 09/05/03
INORG: 4233 PO: F52225

Report of Certification

010207

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

SPEXertificate™

Certificate of Reference Material

Catalog Number: PLU2-2X/2Y **Lot No.** 9-179U

Description: 1000 mg/L Uranium

Matrix: 2% HNO3

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

Certified Value: 999.5 mg/L

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

Certified Value is Traceable to: NIST SRM 3164.

The CRM is prepared gravimetrically using high purity Uranium Oxide Lot# 04001D. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 999 mg/L

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

Instrumentation Analysis By ICP spectrometer: 1000 mg/L

Uncertified Properties:

Density: 1.010 @ 23.6 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.005	Cu	0.02	Pb	0.004
As	0.06	Fe	0.011	Rb	<0.001
Ag	<0.001	Ga	<0.001	Re	<0.001
B	<0.005	In	<0.001	Si	<0.10
Ba	0.004	K	0.008	Sr	0.003
Be	<0.001	Li	<0.001	Sb	0.003
Bi	<0.001	Mg	0.003	Ti	<0.001
Ca	0.012	Mn	0.003	Tl	<0.001
Cr	<0.010	Mo	0.006	V	<0.003
Cd	<0.001	Na	0.10	Zr	<0.001
Co	<0.001	Ni	<0.001	Zn	0.008

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

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

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 06/20/03
DATE EXPIRED: 06/30/2004 YOS
DATE OPENED: 06/23/03
INDRG: 4142 PO: F52370

010209

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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010210

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DATE RECEIVED: 08/11/03
DATE EXPIRED: 08/15/2004 +03
DATE OPENED: 08/13/03
INORG: 4212 PO: F52218

SPEXertificate™

Certificate of Reference Material

Catalog Number: PLW9-2X/2Y **Lot No.** 9-177W

Description: 1000 mg/L Tungsten

Matrix: H2O

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

Certified Value: 1,000 mg/L

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

Certified Value is Traceable to: NIST SRM 3163

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

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1000 mg/L

Method: Fume with Sulfuric Acid to dryness. Ignite and weigh as WO3.

Instrumentation Analysis By ICP spectrometer: 1000 mg/L

Uncertified Properties:

Density: 0.9979 @ 23.7 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.002	Cu	<0.001	Pb	<0.001
As	0.01	Fe	<0.01	Rb	<0.001
Ag	<0.003	Ga	<0.001	Re	0.004
B	<0.005	In	<0.001	Si	.56
Ba	<0.001	K	0.05	Sr	<0.001
Be	<0.001	Li	<0.001	Sb	0.001
Bi	<0.001	Mg	<0.001	Ti	<0.001
Ca	0.009	Mn	<0.001	Tl	<0.001
Cr	<0.001	Mo	0.005	V	0.001
Cd	<0.001	Na	0.03	Zr	<0.001
Co	0.001	Ni	<0.001	Zn	0.01

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

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

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

SPEXertificate™

Certificate of Reference Material

Catalog Number: PLZR2-2X/2Y/2T **Lot No.** 10-05ZR

Description: 1000 mg/L Zirconium

Matrix: 2% HNO3

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

Certified Value: 997 mg/L

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

Certified Value is Traceable to: NIST SRM 3169

The CRM is prepared gravimetrically using high purity Zirconyl Nitrate Lot# 11011C. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 997 mg/L

Method: Evaporate to dryness. Fume with Sulfuric Acid. Ignite and weigh as ZrO2.

Instrumentation Analysis By ICP spectrometer: 997 mg/L

Uncertified Properties:

Density: 1.010 @ 23.6 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.03	Cu	0.002	Pb	0.002
As	<0.001	Fe	0.017	Rb	<0.001
Ag	<0.05	Ga	<0.001	Re	<0.001
B	<0.004	In	<0.001	Si	0.10
Ba	<0.001	K	0.10	Sr	<0.001
Be	<0.001	Li	0.002	Sb	<0.001
Bi	<0.001	Mg	0.003	Ti	<0.001
Ca	0.11	Mn	<0.001	Tl	<0.001
Cr	<0.009	Mo	<0.001	V	<0.001
Cd	0.004	Na	0.04	Zn	0.02
Co	<0.001	Ni	<0.001		

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

Date of Certification: APR '04 Certifying Officer: N. Kocherlakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 5/7/04
DATE EXPIRED: 4/30/05
DATE OPENED: 5/11/04 DK
INORG: 4566 PO: F53324

Report of Certification 010213

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

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Certificate of Reference Material

Catalog Number: PLNA2-3X/3Y **Lot No.** U8-128NA

Description: 10,000 mg/L Sodium

Matrix: 5% HNO3

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

Certified Value: 9998 mg/L

Uncertainty Associated with Measurement: +/- 30 mg/L

Certified Value is Traceable to: NIST SRM 3152a.

The CRM is prepared gravimetrically using high purity Sodium Carbonate Lot# 02021A. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 9998 mg/L

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

Instrumentation Analysis By ICP spectrometer: 9998 mg/L

Uncertified Properties:

Density: 1.049 @ 23.9 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.02	Cu	0.003	Pb	<0.001
As	<0.003	Fe	0.03	Re	<0.001
Ag	<0.03	Ga	<0.001	Rb	<0.001
B	<0.03	In	<0.001	Sr	<0.002
Ba	0.03	K	0.14	Sb	<0.001
Be	<0.02	Li	<0.002	Sn	<0.001
Bi	<0.001	Mg	0.30	Ti	<0.004
Ca	0.52	Mn	0.008	Tl	<0.001
Cr	<0.004	Mo	<0.001	V	<0.001
Cd	<0.001	Ni	<0.002	Zr	<0.001
Co	<0.001			Zn	<0.03

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

Date of Certification: JAN '04 Certifying Officer: N. Kocherlakota

010215

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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010216

Certificate of Reference Material

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/20/03
DATE EXPIRED: 11/30/2004 VD
DATE OPENED: 11/21/03
INORG: 4328 PO: F52278

Catalog Number: ICV-2A **Lot No.:** 24-84AS
Description: **Initial Calibration Verification Standard II**
Matrix: 5% Nitric Acid

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

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

Refer to side 2 for details of measurement uncertainties.

Instrumental Analysis by ICP Spectrometer:

Element	Labeled (mg/L)	Measured (mg/L)	NIST SRM	Element	Labeled (mg/L)	Measured (mg/L)	NIST SRM
Ca	2,000	2,005.40	3109a	Ni	500	500.58	3136
K	2,000	1,997.89	3141a	V	500	504.23	3165
Mg	2,000	1,992.26	3131a	Cr	200	203.21	3112a
Na	2,000	1,992.99	3152a	Cu	200	199.75	3114
Al	1,000	1,005.90	3101a	Ag	100	100.46	3151
Ba	1,000	1,001.51	3104a	Be	100	100.04	3105a
Fe	1,000	1,003.17	3126a	Mn	100	100.64	3132
Co	500	505.10	3113	Zn	100	100.52	3168a

Spex Reference Multi: Lot #4-63BD, 14-125AS

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

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

Report of Certification

010217

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
$X = x \pm U$ 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
Always Providing Superior Quality... Unparalleled Service™

SPEXertificate™ 010218

Certificate of Reference Material

Catalog Number: PLSB7-2X/2Y/2T **Lot No.** 10-43SB
Description: 1000 mg/L Antimony
Matrix: H2O/0.6Tart.Acid/tr.HNO3

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

Certified Value: 1004 mg/ L
Uncertainty Associated with Measurement: +/-3.0mg/L
Certified Value is Traceable to: NIST SRM 3102a

The CRM is prepared gravimetrically using high purity Antimony Metal Lot# 04021A. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1005 mg/L

Method: Evaporate to dryness. Fume with Nitric Acid. Ignite and weigh as Sb2O4.

Instrumental Analysis by ICP spectrometer: 1002 mg/ L
Uncertified Properties:

Density: 1.046 @ 25.5 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.03	Cu	0.002	Pb	0.009
As	<0.001	Fe	0.03	Rb	<0.001
Ag	<0.001	Ga	<0.001	Re	<0.001
B	<0.004	In	<0.001	Sr	<0.001
Ba	<0.001	K	0.01	Si	<0.01
Be	<0.001	Li	<0.001	Ti	<0.003
Bi	0.002	Mg	0.005	Tl	<0.001
Ca	0.14	Mn	<0.001	V	<0.001
Cr	<0.002	Mo	<0.001	Zr	<0.001
Cd	<0.001	Na	0.005	Zn	0.02
Co	<0.001	Ni	<0.001		

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

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

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/20/03
DATE EXPIRED: 11/30/2004 WS
DATE OPENED: 11/21/03
INORG: 4329 PO: F52278

Report of Certification

010219

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

INORGANIC LABS/RADCHEN LABS
DATE RECEIVED: 11/20/03
DATE EXPIRED: 11/30/2004 VOS
DATE OPENED: 11/21/03
INORG: 4330 PO: F52278

Catalog Number: ICV-2C **Lot No.:** 24-85AS
Description: **Initial Calibration Verification Standard II**
Matrix: 5% Nitric Acid

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

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

Refer to side 2 for details of measurement uncertainties.

Instrumental Analysis by ICP Spectrometer:

Element	Labeled (mg/L)	Measured (mg/L)	NIST SRM
As	500	497.85	3103a
Pb	500	495.41	3128
Se	500	501.98	3149
TL	500	501.89	3158
Cd	100	99.77	3108

Spex Reference Multi: Lot #4-51BDREF, 15-39AS, 11-173AS

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

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

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.

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732-549-7144 • 1-800-LAB-SPEX • Fax: 732-603-9647
CRMSales@spexcsp.com • www.spexcsp.com
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010222

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **10000 µg/mL Aluminum in 5% (abs) HNO_3**

Catalog Number:	CGAL10-1 and CGAL10-5
Lot Number:	**W-AL04008**
Starting Material:	Al metal
Starting Material Purity (%):	99.998460
Starting Material Lot No	607116
Matrix:	5% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 08/26/03
DATE EXPIRED: 09/01/2004 V05
DATE OPENED: 08/26/03
INORG: 4280 PO: F52224

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 10070 ± 31 µg/mL

Certified Density: 1.059 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = 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** **10006 ± 55 µg/mL**
ICP Assay NIST SRM 3101a Lot Number: 992003

Assay Method #2 **10070 ± 31 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

S	Al		M	Dy	< 0.02695	O	Li	0.00011	M	Pr	< 0.00135	M	Te	< 0.13473
M	Sb	< 0.00225	M	Er	< 0.02245	M	Lu	< 0.00180	M	Re	< 0.00449	M	Tb	< 0.00135
M	As	< 0.04491	M	Eu	< 0.01347	O	Mg	0.00470	M	Rh	< 0.00449	M	Tl	< 0.00449
M	Ba	< 0.04491	M	Gd	< 0.00449	M	Mn	< 0.01796	M	Rb	< 0.00449	M	Th	< 0.00449
O	Be	< 0.00017	M	Ga	< 0.00449	O	Hg	< 0.00700	M	Ru	< 0.00898	M	Tm	< 0.00180
M	Bi	< 0.00180	M	Ge	< 0.02695	M	Mo	< 0.00898	M	Sm	< 0.00449	M	Sn	< 0.02245
O	B	0.01164	M	Au	< 0.01347	M	Nd	< 0.00898	M	Sc	< 0.04491	M	Ti	< 0.22454
M	Cd	< 0.01347	M	Hf	< 0.00898	O	Ni	< 0.00600	M	Se	< 0.03593	M	W	< 0.04491
O	Ca	0.01903	M	Ho	< 0.00225	M	Nb	< 0.00225	O	Si	0.07389	M	U	< 0.00898
M	Ce	< 0.02245	O	In	< 0.03000	n	Os		M	Ag	< 0.00898	M	V	< 0.00898
M	Cs	< 0.00135	M	Ir	< 0.02245	M	Pd	< 0.02245	O	Na	0.03359	M	Yb	< 0.00449
O	Cr	0.00336	O	Fe	0.00493	O	P	< 0.03000	M	Sr	< 0.00225	M	Y	< 0.17963
M	Co	< 0.01347	M	La	< 0.00225	M	Pt	< 0.00898	O	S	< 0.10000	M	Zn	< 0.08982
M	Cu	< 0.02695	M	Pb	< 0.01347	O	K	0.02911	M	Ta	< 0.03144	M	Zr	< 0.02245

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL 010224

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[a]); γ- Al_2O_3 (Soluble in acids such as HCl); Ores (Carbonate fusion in Pt[a] 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 ≥ 100 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	Mo, Zr, Ce
ICP-OES 167.078 nm	0.1 / 0.009 µg/mL	1	ion	Fe
ICP-MS 27 amu	30 ppt	n/a	M[+]	$^{12}C^{15}N$, $^{13}C^{14}N$, $^{1}H^{13}C^{14}N$, $^{11}B^{16}O$, $^{54}Cr^{+}$, $^{54}Fe^{+}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 08/26/03
DATE EXPIRED: 09/01/2004 WD3
DATE OPENED: 08/26/03
INORG: 4220 PO: F52224

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010225

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: February 13, 2003

Expiration Date:

EXPIRES
1 FEB 2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul Gaines

010226

inorganic ventures / iv labs

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phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
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certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **10000 µg/mL Calcium in 1.4% (abs) HNO_3**

Catalog Number:	CGCA10-1, CGCA10-2, and CGCA10-5
Lot Number:	**W-CA03022**
Starting Material:	CaO
Starting Material Purity (%):	99.999389
Starting Material Lot No	C27L01
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg 2 of 2
DATE RECEIVED: 01/30/04
DATE EXPIRED: 02/01/2005 V03
DATE OPENED: 01/30/04
INORG: 4436 PO: F52303

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 9968 ± 18 µg/mL

Certified Density: 1.038 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = 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** **9968 ± 18 µg/mL**
ICP Assay NIST SRM 3109a Lot Number: 000622

Assay Method #2 **9973 ± 25 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.00013	M	Dy	< 0.03067	O	Li	0.00011	M	Pr	< 0.00153	M	Te	< 0.15333
M	Sb	< 0.00256	M	Er	< 0.02556	M	Lu	< 0.00204	M	Re	< 0.00511	M	Tb	< 0.00153
M	As	< 0.05111	M	Eu	< 0.01533	O	Mg	0.03453	M	Rh	< 0.00511	M	Tl	< 0.00511
O	Ba	0.00063	M	Gd	< 0.00511	O	Mn	< 0.00030	M	Rb	< 0.00511	M	Th	< 0.00511
O	Be	< 0.00009	M	Ga	< 0.00511	O	Hg	< 0.01100	M	Ru	< 0.01022	M	Tm	< 0.00204
M	Bi	< 0.00204	M	Ge	< 0.03067	M	Mo	< 0.01022	M	Sm	< 0.00511	M	Sn	< 0.02556
O	B	< 0.00054	M	Au	< 0.01533	M	Nd	< 0.01022	O	Sc	< 0.00002	M	Ti	< 0.25555
O	Cd	< 0.00450	M	Hf	< 0.01022	O	Ni	< 0.00230	O	Se	< 0.00620	M	W	< 0.05111
S	Ca		M	Ho	< 0.00256	M	Nb	< 0.00256	O	Si	0.00253	M	U	< 0.01022
M	Ce	< 0.02556	O	In	< 0.00200	n	Os		M	Ag	< 0.01022	O	V	< 0.00090
M	Cs	< 0.00153	M	Ir	< 0.02556	M	Pd	< 0.02556	O	Na	< 0.00010	M	Yb	< 0.00511
O	Cr	0.00183	O	Fe	< 0.00110	O	P	< 0.00480	O	Sr	0.02021	M	Y	< 0.20444
O	Co	< 0.00120	M	La	< 0.00256	M	Pt	< 0.01022	O	S	0.01053	O	Zn	0.02232
O	Cu	< 0.00400	M	Pb	< 0.01533	O	K	< 0.00170	M	Ta	< 0.03578	M	Zr	< 0.02556

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 40.078; +2; 6; $Ca(H_2O)_6^{+2}$
Chemical Compatibility - Soluble in HCl and HNO_3. Avoid H_2SO_4, HF, H_3PO_4 and neutral to basic media. Stable with most metals and inorganic anions forming insoluble silicate, carbonate, hydroxide, oxide, fluoride, sulfate, oxalate, chromate, arsenate and tungstate in neutral aqueous media.
Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-10% HNO_3 / LDPE container.
Ca Containing Samples (Preparation and Solution) - Metal (best dissolved in diluted HNO_3); Ores (Carbonate fusion in Pt* followed by HCl dissolution); Organic Matrices (dry ash and dissolution in dilute HCl. Do not heat when dissolving to avoid precipitation of SiO_2). The oxide, hydroxide, carbonate, phosphate, and fluoride of calcium are soluble in % levels of HCl or HNO_3. The sulfates (gypsum, anhydrite, etc.), certain silicates and complex compounds require fusion with Na_2CO_3 followed by HCl / water dissolution. Contamination is a very real problem when analyzing for trace levels.
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe interferences.)
ICP-OES	393.366 nm	0.0002 / 0.00004 µg/mL	1	ion	U, Ce
ICP-OES	396.847 nm	0.0005 / 0.00006 µg/mL	1	ion	Th
ICP-OES	422.673 nm	0.01 / 0.001 µg/mL	1	atom	Ge
ICP-MS	44 amu	1200 ppt	n/a	M⁺	$^{16}O_2{}^{12}C$, $^{28}Si^{16}O$, $^{88}Sr^{+2}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"
- Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"
- Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission
- Domestic Licensing of Production and Utilization Facilities

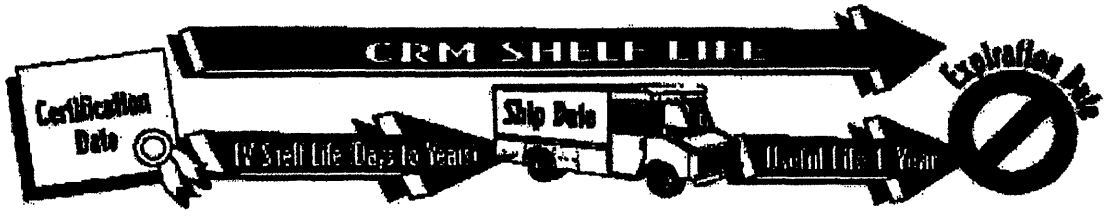
10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 01/20/04
DATE EXPIRED: 02/01/2005 VDS
DATE OPENED: 01/20/04
INORG: 4436 PO: F52303

010229

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: July 23, 2003

Expiration Date: EXPIRES 1 FEB 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010230

inorganic ventures / iv labs

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e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **10000 µg/mL Iron in 3.5% (abs) HNO_3**

Catalog Number:	CGFE10-1, CGFE10-2, and CGFE10-5
Lot Number:	**W-FE03030**
Starting Material:	Fe metal
Starting Material Purity (%):	99.999569
Starting Material Lot No	23166
Matrix:	3.5% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg.1 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 VOS
DATE OPENED: 02/25/04
INORG: 4470 PO: F52323

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 10,016 ± 25 µg/mL

Certified Density: 1.050 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **10,031 ± 33 µg/mL**
ICP Assay NIST SRM 3126a Lot Number: 000606

Assay Method #2 **10,016 ± 25 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557076, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al < 0.00270	M Dy < 0.02413	O Li < 0.00003	M Pr < 0.00121	M Te < 0.12066
M Sb < 0.00201	M Er < 0.02011	M Lu < 0.00161	M Re < 0.00402	M Tb < 0.00121
M As < 0.04022	M Eu < 0.01207	O Mg < 0.00006	M Rh < 0.00402	M Tl < 0.00402
M Ba < 0.04022	M Gd < 0.00402	O Mn < 0.02000	M Rb < 0.00402	M Th < 0.00402
O Be < 0.00005	M Ga < 0.00402	O Hg < 0.01100	M Ru < 0.00804	M Tm < 0.00161
M Bi < 0.00161	i Ge	M Mo < 0.00804	M Sm < 0.00402	M Sn < 0.02011
O B < 0.00090	M Au < 0.01207	M Nd < 0.00804	M Sc < 0.04022	M Ti < 0.20109
M Cd < 0.01207	M Hf < 0.00804	O Ni < 0.05000	M Se < 0.03218	M W < 0.04022
O Ca 0.00291	M Ho < 0.00201	M Nb < 0.00201	O Si < 0.01000	M U < 0.00804
M Ce < 0.02011	M In < 0.04022	n Os	M Ag < 0.00804	M V < 0.00804
M Cs < 0.00121	M Ir < 0.02011	M Pd < 0.02011	O Na 0.00776	M Yb < 0.00402
M Cr < 0.02011	s Fe	i P	M Sr < 0.00201	M Y < 0.16087
O Co < 0.00110	M La < 0.00201	M Pt < 0.00804	O S < 0.07200	M Zn 0.04876
M Cu < 0.02413	M Pb < 0.01207	O K < 0.00170	M Ta < 0.02815	M Zr < 0.02011

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 55.847; +3; 6; $Fe(H_2O)_6^{3+}$
Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, HF and H_3PO_4. Avoid basic media. Stable with most metals and inorganic anions in acidic media.
Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.
Fe Containing Samples (Preparation and Solution) - Metal (Soluble in HCl); Oxides (If the oxide has been at a high temperature then Na_2CO_3 fusion in Pt* followed by HCl dissolution otherwise dissolve in dilute HCl); Ores (See Oxides above using only the fusion approach).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≈ Conc.)
ICP-OES	238.204 nm	0.005 / 0.001 µg/mL	1	ion	Ru, Co
ICP-OES	239.562 nm	0.005 / 0.001 µg/mL	1	ion	Co, W, Cr
ICP-OES	259.940 nm	0.006 / 0.001 µg/mL	1	ion	Hf, Nb
ICP-MS	56 amu	970 ppt	n/a	M+	$^{40}Ar^{16}N^{1}H$, $^{40}Ar^{16}O$, $^{40}Ar^{16}O^{1}H$, $^{40}Ar^{16}O$, $^{40}Cl^{16}O^{1}H$, $^{40}Ca^{16}O$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 VOS
DATE OPENED: 02/25/04
INORG: 4470 PO: E52323

010233

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: March 20, 2003

Expiration Date:

EXPIRES
1 MAR 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	J.A. Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	K. Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	P.R. Gaines

010234

inorganic ventures / iv labs

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e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02. The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 DESCRIPTION OF CRM Custom-Grade **10000 µg/mL Potassium in 1.4% (abs) HNO_3**

Catalog Number:	CGK10-1, CGK10-2, and CGK10-5
Lot Number:	**W-K02111**
Starting Material:	KNO_3
Starting Material Purity (%):	99.997230
Starting Material Lot No	K18J19
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/5/03 1/2
DATE EXPIRED: 12/1/2004 OK
DATE OPENED: 11/5/03
INORG: 4320 PO: ES2258

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 9930 ± 9 µg/mL

Certified Density: 1.024 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = 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 **9926 ± 62 µg/mL**
ICP Assay NIST SRM 3141a Lot Number: 891312

Assay Method #2 **9930 ± 9 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	< 0.00090	M	Dy	< 0.02400	O	Li	< 0.00003	M	Pr	< 0.00120	M	Te	< 0.11998
M	Sb	< 0.00200	M	Er	< 0.02000	M	Lu	< 0.00160	M	Re	< 0.00400	M	Tb	< 0.00120
M	As	< 0.03999	M	Eu	< 0.01200	O	Mg	0.00100	M	Rh	< 0.00400	M	Tl	< 0.00400
M	Ba	< 0.03999	M	Gd	< 0.00400	O	Mn	< 0.00003	M	Rb	0.49948	M	Th	< 0.00400
O	Be	< 0.00020	M	Ga	< 0.00400	O	Hg	< 0.01500	M	Ru	< 0.00800	M	Tm	< 0.00160
M	Bi	< 0.00160	O	Ge	< 0.00150	M	Mo	< 0.00800	M	Sm	< 0.00400	M	Sn	< 0.02000
O	B	< 0.00060	O	Au	< 0.00300	M	Nd	< 0.00800	O	Sc	< 0.00002	O	Ti	< 0.00070
M	Cd	< 0.01200	M	Hf	< 0.00800	O	Ni	< 0.00230	O	Se	< 0.05000	M	W	< 0.03999
O	Ca	0.00075	M	Ho	< 0.00200	M	Nb	< 0.00200	O	Si	< 0.00340	M	U	< 0.00800
M	Ce	< 0.02000	M	In	< 0.03999	n	Os		M	Ag	< 0.00800	O	V	< 0.00090
M	Cs	< 0.00120	M	Ir	< 0.02000	M	Pd	< 0.02000	O	Na	0.21730	M	Yb	< 0.00400
M	Cr	< 0.02000	O	Fe	0.00212	O	P	< 0.00250	M	Sr	< 0.00200	M	Y	< 0.15998
M	Co	< 0.01200	M	La	< 0.00200	M	Pt	< 0.00800	O	S	< 0.07200	O	Zn	0.00050
M	Cu	< 0.02400	M	Pb	< 0.01200	S	K		M	Ta	< 0.02800	M	Zr	< 0.02000

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 29.0983; +1; (6); $K^{+}(aq)$
(Coordination Number in parentheses is assumed, not certain.)

Chemical Compatibility - Soluble in HCl, HNO_3, H_2SO_4 and HF aqueous matrices. Avoid use of $HClO_4$ due to insolubility of the perchlorate. Stable with all metals and inorganic anions except ClO_4^-.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

K Containing Samples (Preparation and Solution) - Metal (Dissolves very rapidly in water); Ores (Sodium carbonate fusion in Pt* followed by HCl dissolution-blank levels of K in sodium carbonate critical); Organic Matrices (Sulfuric/peroxide digestion)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≈Conc.)
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, $^{23}Na^{16}O$, $^{78}Se^{++}$

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8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: January 30, 2003

Expiration Date:

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/5/03 2 of 2
DATE EXPIRED: 12/1/2004 DR
DATE OPENED: 11/5/03
INORG: 4326 PO: ES22258

EXPIRES
12/2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

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inorganic ventures / iv labs

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certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** *The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."*

2.0 DESCRIPTION OF CRM Custom-Grade 10000 µg/mL Magnesium in 1.4% (abs) HNO_3

Catalog Number:	CGMG10-1 and CGMG10-5
Lot Number:	T-MG03006
Starting Material:	Mg metal
Starting Material Purity (%):	99.9968
Starting Material Lot No	RML91191
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 07/31/03
DATE EXPIRED: 08/01/2004 V03
DATE OPENED: 08/01/03
INORG: 4204 PO: F52391

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 9921 ± 20 µg/mL

Certified Density: 1.050 g/mL (measured at 22° C)

The Certified Value is the instrument analysis value. The following equations are used in the calculation of the certified value and the uncertainty:

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

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

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements
$\sum S$ = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

"Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **9998 ± 20 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

Assay Method #2 **9921 ± 20 µg/mL**
ICP Assay NIST SRM 3131a Lot Number: 991107

4.2 BALANCE CALIBRATION - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 THERMOMETER CALIBRATION - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 GLASSWARE CALIBRATION - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.02454	M	Dy	< 0.02455	O	Li	0.00797	M	Pr	< 0.00123	M	Te	< 0.12275
M	Sb	0.00306	M	Er	< 0.02046	M	Lu	< 0.00164	M	Re	< 0.00409	M	Tb	< 0.00123
M	As	< 0.04092	M	Eu	< 0.01228	S	Mg		M	Rh	< 0.00409	M	Tl	< 0.00409
M	Ba	< 0.04092	M	Gd	< 0.00409	M	Mn	< 0.01637	M	Rb	< 0.00409	M	Th	< 0.00409
O	Be	< 0.00017	M	Ga	< 0.00409	O	Hg	< 0.00900	M	Ru	< 0.00818	M	Tm	< 0.00164
M	Bi	< 0.00164	M	Ge	< 0.02455	M	Mo	< 0.00818	M	Sm	< 0.00409	M	Sn	< 0.02046
O	B	0.00871	M	Au	< 0.01228	M	Nd	< 0.00818	M	Sc	< 0.04092	O	Ti	0.10206
M	Cd	< 0.01228	M	Hf	< 0.00818	O	Ni	0.01404	M	Se	< 0.03273	M	W	< 0.04092
O	Ca	0.01070	M	Ho	< 0.00205	M	Nb	< 0.00205	O	Si	0.03186	M	U	< 0.00818
M	Ce	< 0.02046	M	In	< 0.04092	n	Os		M	Ag	< 0.00818	M	V	< 0.00818
M	Cs	< 0.00123	M	Ir	< 0.02046	M	Pd	< 0.02046	O	Na	0.01817	M	Yb	< 0.00409
O	Cr	0.02315	O	Fe	0.02467	O	P	< 0.01600	M	Sr	< 0.00205	M	Y	< 0.16367
M	Co	< 0.01228	M	La	< 0.00205	M	Pt	< 0.00818	n	S		O	Zn	0.01892
O	Cu	0.00672	O	Pb	0.03236	O	K	< 0.05000	M	Ta	< 0.02864	M	Zr	< 0.02046

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended usee, 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 - 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[3] 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 Pg. 2 of 2
DATE RECEIVED: 07/31/03
DATE EXPIRED: 08/01/2004 VOID
DATE OPENED: 08/01/03
INORG: 4204 PO: E52391

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: August 28, 2002

Expiration Date: EXPIRES 01 2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Debbie Newman, QA Administrator

Certificate Approved By: Katalin Le, QC Supervisor

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

010242

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** *The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."*

2.0 **DESCRIPTION OF CRM** Custom-Grade **10000 µg/mL Sodium in 1.4% (abs) HNO_3**

Catalog Number:	CGNA10-1, CGNA10-2, and CGNA10-5
Lot Number:	**T-NA03006**
Starting Material:	Na_2CO_3
Starting Material Purity (%):	99.999936
Starting Material Lot No	42095
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 07/31/03
DATE EXPIRED: 08/01/2004 yrs
DATE OPENED: 08/01/03
INORG: 4205 PO: F52391

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 10,005 ± 7 µg/mL

Certified Density: 1.032 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = 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** **10,067 ± 75 µg/mL**
ICP Assay NIST SRM 3152a Lot Number: 990907

Assay Method #2 **10,005 ± 7 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al < 0.00090	M Dy < 0.02499	O Li < 0.00003	M Pr < 0.00125	M Te < 0.12494
M Sb < 0.00208	M Er < 0.02082	M Lu < 0.00167	M Re < 0.00417	M Tb < 0.00125
M As < 0.04165	M Eu < 0.01249	O Mg 0.00015	M Rh < 0.00417	M Tl < 0.00417
M Ba < 0.04165	M Gd < 0.00417	O Mn < 0.00003	M Rb < 0.00417	M Th < 0.00417
O Be < 0.00020	M Ga < 0.00417	O Hg < 0.01500	M Ru < 0.00833	M Tm < 0.00167
M Bi < 0.00167	O Ge < 0.00150	M Mo < 0.00833	M Sm < 0.00417	M Sn < 0.02082
O B < 0.00060	O Au < 0.00300	M Nd < 0.00833	O Sc < 0.00002	O Ti < 0.00070
M Cd < 0.01249	M Hf < 0.00833	O Ni < 0.00230	O Se < 0.05000	M W < 0.04165
O Ca 0.00160	M Ho < 0.00208	M Nb < 0.00208	O Si < 0.00340	M U < 0.00833
M Ce < 0.02082	M In < 0.04165	n Os	M Ag < 0.00833	O V < 0.00090
M Cs 0.00104	M Ir < 0.02082	M Pd < 0.02082	S Na	M Yb < 0.00417
M Cr < 0.02082	O Fe < 0.00110	O P < 0.04000	M Sr < 0.00208	M Y < 0.16658
M Co < 0.01249	M La < 0.00208	M Pt < 0.00833	O S < 0.07200	O Zn 0.00130
O Cu < 0.00140	M Pb < 0.01249	O K 0.00873	M Ta < 0.02915	M Zr < 0.02082

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 22.98977; +1; (6); Na⁺(aq) largely ionic in nature (Coordination Number in parentheses is assumed, not certain.)
Chemical Compatibility - Soluble in HCl, HNO_3, H_2SO_4 and HF aqueous matrices. Stable with all metals and inorganic anions.
Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.
Na Containing Samples (Preparation and Solution) - Metal (Dissolves very rapidly in water); Ores (Lithium carbonate fusion in graphite crucible followed by HCl dissolution - blank levels of Na in lithium carbonate critical); Organic Matrices (Sulfuric / peroxide digestion or nitric/sulfuric/perchloric acid decomposition).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤ppm conc.)
ICP-OES	589.595 nm	0.07 / 0.00009 µg/mL	1	atom	2nd order radiation from R.E.s on some optical designs
ICP-OES	588.995 nm	0.03 / 0.006 µg/mL	1	atom	2nd order radiation from R.E.s on some optical designs
ICP-OES	330.237 nm	2.0 / 0.09 µg/mL	1	atom	Pd, Zn
ICP-MS	23 amu	310 ppt	n/a	M⁺	$^{46}Ti^{++}$, $^{46}Ca^{++}$

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: January 24, 2003

Expiration Date: EXPIRES 01/2004

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 01/31/03
DATE EXPIRED: 08/01/2004 VB
DATE OPENED: 08/01/03
INORG: 4205 PO: F52391

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

010245

Certificate Prepared By: Debbie Newman, LIMS Administrator

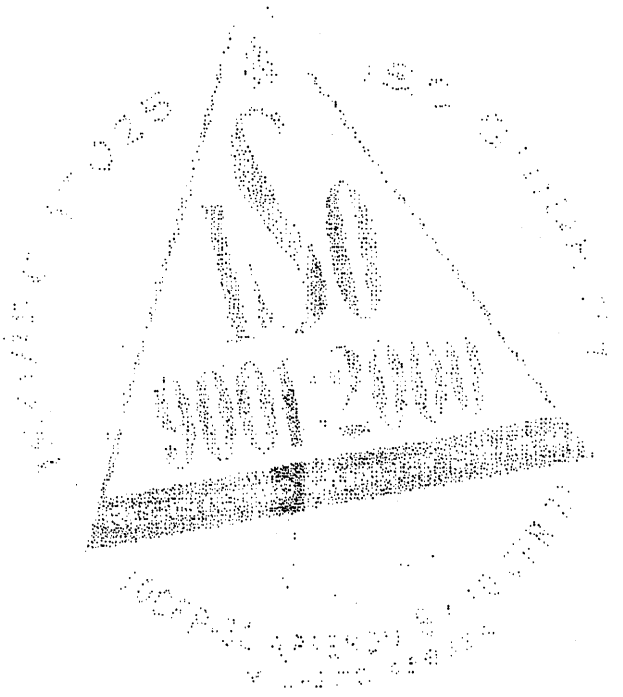
Debbie Newman

Certificate Approved By: Katalin Le, QC Supervisor

Katalin Le

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

Paul R Gaines



010246

Certificate of Analysis

CUSTOM-GRADE SOLUTION 1000 µg/mL Lithium in 0.1% HNO_3 (abs)

Catalog Number: CGLI1-1, CGLI1-2 and CGLI1-5

Lot Number: **W-LI02066**

Starting Material:	Li_2CO_3
Starting Material Purity:	99.999%
Starting Material Lot No:	1053

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 06/20/03
DATE EXPIRED: 07/01/2004 VØ
DATE OPENED: 06/23/03
INORG: 4149 PO: E52379

CERTIFIED CONCENTRATION: 998 ± 2 µg/mL

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

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

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

Classical Wet Assay: 998 ± 2 µg/mL
Method: Gravimetric as the Sulfate vs NIST weights #822/254143-94.

Instrument Analysis: 1000 ± 4 µg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3129a.

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

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

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

O	Al	<0.010	M	Dy	<0.00060	s	Li		M	Pr	<0.000030	O	Te	<0.0090
M	Sb	<0.000050	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030
O	As	<0.044	M	Eu	<0.00030	O	Mg	<0.00010	M	Rh	<0.00010	M	Tl	<0.00010
M	Ba	<0.0010	M	Gd	<0.00010	O	Mn	<0.00020	M	Rb	<0.00010	M	Th	<0.00010
O	Be	<0.000050	M	Ga	<0.00010	O	Hg	<0.0070	M	Ru	<0.00020	M	Tm	<0.000040
M	Bi	<0.000040	M	Ge	<0.00060	M	Mo	<0.00020	M	Sm	<0.00010	M	Sn	<0.00050
O	B	<0.0060	O	Au	<0.010	M	Nd	<0.00020	M	Sc	<0.0010	O	Ti	<0.00030
O	Cd	<0.0018	M	Hf	<0.00020	O	Ni	<0.0040	O	Se	<0.020	M	W	<0.0010
O	Ca	0.051	M	Ho	<0.000050	M	Nb	<0.000050	O	Si	0.023	M	U	<0.00020
M	Ce	<0.00050	O	In	<0.030	n	Os		O	Ag	<0.0040	O	V	<0.0010
M	Cs	0.0018	M	Ir	<0.00050	M	Pd	<0.00050	O	Na	<0.10	M	Yb	<0.00010
O	Cr	<0.0020	O	Fe	<0.0020	O	P	<0.030	O	Sr	<0.0010	M	Y	<0.0040
M	Co	<0.00030	M	La	<0.000050	M	Pt	<0.00020	O	S	<0.050	O	Zn	<0.030
M	Cu	<0.00060	M	Pb	<0.00030	O	K	0.0070	M	Ta	<0.00070	M	Zr	<0.00050

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

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.004 g/mL (over)

QA:KL Rev.022403DN

Inorganic Ventures, Inc.
195 Lehigh Avenue • Suite 4 • Lakewood, NJ 08701
Orders: 800-669-6799 • FAX (732) 901-1903
Technical Support: 800-569-6799

Quality Assurance Manager

EXPIRES 01/2004

QUALITY STANDARD DOCUMENTATION

1. ISO 9001:2000 QMI Registered Quality System (Certificate Number 010105)

   Members of IQ Net : Argentina **(IRAM)**, Australia **(QAS)**, Austria **(ÖQS)**, Belgium **(Avinter)** , Brazil **(FCAV)**, Canada **(QMI)**, Hong Kong **(HKQAA)**, Columbia **(ICONTEC)**, Czech Republic **(CQS)**, Denmark **(DS)**, Finland **(SFS)**, France **(AFAQ)**, Germany **(DQS)**, Greece **(ELOT)**, Hungary **(MSZT)**, Ireland **(NSAI)**, Israel **(SII)**, Italy **(CISQ)**, Japan **(JQA)**, Korea **(KSA-QA)**, Netherlands **(KEMA)**, Norway **(NCS)**, Poland**(PCBC)**, Portugal **(APCER)**, Singapore **(PSB)**, Slovenia **(SIQ)**, Spain **(AENOR)**, Switzerland **(SQS)**

2. ISO/IEC Guide 34-2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate 883.02
3. ISO/IEC17025-1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate 883.01
4. MIL-STD-45662A
5. 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licencing of Production and Utilization Facilities
6. 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

Please contact our Quality Assurance Department for further information and copies of documents pertaining to our Quality Standard certifications.

STABILITY/ EXPIRATION DOCUMENTATION

Shelf Life - The length of time that a properly stored and packaged standard will remain within the specified uncertainty. Shelf life is affected by chemical stability and transpiration issues. Inorganic Ventures' Standard Solutions are chemically stable indefinitely. Transpiration loss is linear with time and limits the time a standard can be used with confidence. The smaller the bottle the higher the rate of transpiration. Inorganic Ventures' studies indicate that the shelf life of our 500 mL bottle is 4 years and the shelf life of our 125 mL bottle is 21 months.

Expiration Date - The date after which a standard solution should not be used. A one year expiration date is recommended by most state and federal regulatory agencies. Transpiration issues and repeated use of solutions over a one year period may adversely affect the integrity of the standard.

PACKAGING DOCUMENTATION

Purified acid, 18 megohm double deionized water that has been filtered through a 0.2 μm filter and in-house procedure IV-PACK-001 is used to clean all bottles. Contact us for technical information relating to contamination issues in packaging materials.

GLASSWARE CALIBRATION

In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

BALANCE CALIBRATION

All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 428359B and 454678. The NIST test number is 822/260017-98.

All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-8.

THERMOMETER CALIBRATION

The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

TECHNICAL SUPPORT

All customers are encouraged to contact us for technical support for the proper use of our products.

TEL 1-800-569-6799 INT'L 1-732-901-1900 FAX 1-732-901-1903 E-MAIL IVtech@ivstandards.com

010248

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02. The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 DESCRIPTION OF CRM Custom-Grade **1000 µg/mL Cadmium in 2% (abs) HNO_3**

Catalog Number:	CGCD1-1, CGCD1-2, and CGCD1-5
Lot Number:	**W-CD01127**
Starting Material:	Cd shot
Starting Material Purity (%):	99.998904
Starting Material Lot No	C14M30
Matrix:	2% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 VOS
DATE OPENED: 02/25/04
INORG: 4467 PO: F52323

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1007 ± 2 µg/mL

Certified Density: 1.014 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 Assay Method #1 **1007 ± 2 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

Assay Method #2 **1005 ± 5 µg/mL**
ICP Assay NIST SRM 3108 Lot Number: 890312

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al < 0.00090	M Dy < 0.01191	O Li < 0.00002	M Pr < 0.00060	O Te < 0.00700
M Sb 0.00039	M Er < 0.00993	M Lu < 0.00079	M Re < 0.00199	M Tb < 0.00060
M As < 0.01985	M Eu < 0.00596	O Mg 0.00002	M Rh < 0.00199	M Tl < 0.00199
M Ba < 0.01985	M Gd < 0.00199	M Mn < 0.00794	M Rb < 0.00199	M Th < 0.00199
M Be < 0.00099	M Ga < 0.00199	O Hg < 0.01200	M Ru < 0.00397	M Tm < 0.00079
M Bi < 0.00079	M Ge < 0.01191	M Mo < 0.00397	M Sm < 0.00199	M Sn < 0.00993
O B < 0.00900	M Au < 0.00596	M Nd < 0.00397	M Sc < 0.01985	M Ti < 0.09925
s Cd	M Hf < 0.00397	O Ni < 0.00300	M Se < 0.01588	M W < 0.01985
O Ca 0.00378	M Ho < 0.00099	M Nb < 0.00099	O Si < 0.00340	M U < 0.00397
M Ce < 0.00993	O In < 0.00200	n Os	M Ag < 0.00397	M V < 0.00397
M Cs < 0.00060	M Ir < 0.00993	M Pd 0.00691	M Na < 0.19849	M Yb < 0.00199
M Cr < 0.00993	O Fe < 0.00110	O P < 0.00300	M Sr < 0.00099	M Y < 0.07940
M Co < 0.00596	M La < 0.00099	M Pt < 0.00397	O S < 0.03000	O Zn 0.00040
M Cu < 0.01191	M Pb < 0.00596	O K 0.00015	M Ta < 0.01389	M Zr < 0.00993

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

010250

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 112.41; +2; 4; $Cd_2(OH)_{(aq)}^{3+}$ and $Cd(OH)_{(aq)}^{+}$
Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, and HF. Avoid basic media forming insoluble carbonate and hydroxide. Stable with most metals and inorganic anions in acidic media. The sulfide, carbonate, oxalate, phosphate, and cyanide are insoluble in water and soluble in HCl, HNO_3 and NH_4OH. The chloride, bromide and iodide are soluble in water. CdI_2 is one of the few iodides soluble in ethanol. All compounds of Cd are soluble in excess NaI, due to the formation of the complex ion, CdI_4^{2-}.
Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5 % HNO_3/LDPE container.
Cd Containing Samples (Preparation and Solution) - Metal (soluble in HNO_3); Oxides (Soluble in HCl or HNO_3); Ores (Dissolve in HCl / HNO_3, then take to fumes with H_2SO_4. The silica and lead sulfate are filtered off after addition of water.); Organic based (dry ash at 450°C and dissolve ash in HCl) (sulfuric/peroxide acid digestion).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique	Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤1ppm.)
ICP-OES	214.438 nm	0.003 / 0.0003 µg/mL	1	ion	Pt, Ir
ICP-OES	228.802 nm	0.003 / 0.0003 µg/mL	1	atom	Co, Ir, As, Pt
ICP-OES	226.502 nm	0.003 / 0.0003 µg/mL	1	ion	Ir
ICP-MS	111 amu	11 ppt	n/a	M^+	$^{95}Mo^{16}O$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

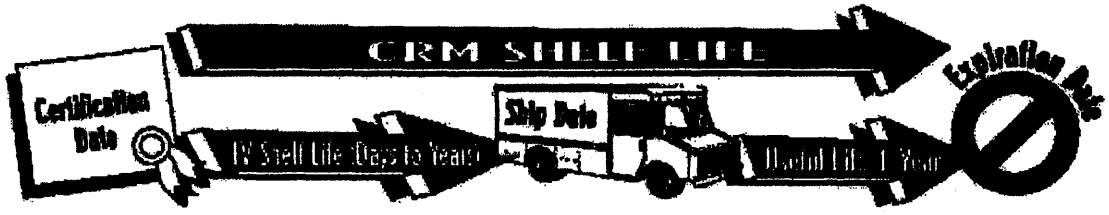
10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 VOS
DATE OPENED: 02/25/04
INORG: 4467 PO: F53333

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010251



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: April 24, 2003

Expiration Date: EXPIRES 1 MAR 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

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 **1000 µg/mL Cobalt in 2% (abs) HNO_3**

Catalog Number:	CGCO1-1, CGCO1-2, and CGCO1-5
Lot Number:	**W-QCO01114**
Starting Material:	Co powder
Starting Material Purity (%):	99.995670
Starting Material Lot No	22897
Matrix:	2% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 VOID
DATE OPENED: 02/25/04
INORG: 4468 PO: F52323

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1002 ± 3 µg/mL

Certified Density: 1.016 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **998 ± 4 µg/mL**
ICP Assay NIST SRM 3181 Lot Number: 000630

Assay Method #2 **1002 ± 3 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.00025	M	Dy	< 0.02419	O	Li	0.00001	M	Pr	< 0.00121	M	Te	< 0.12097
M	Sb	< 0.00202	M	Er	< 0.02016	M	Lu	< 0.00161	M	Re	< 0.00403	M	Tb	< 0.00121
O	As	< 0.10000	M	Eu	< 0.01210	O	Mg	0.00045	M	Rh	< 0.00403	M	Tl	< 0.00403
M	Ba	< 0.04032	M	Gd	< 0.00403	O	Mn	0.00003	M	Rb	< 0.00403	M	Th	< 0.00403
M	Be	< 0.00202	M	Ga	< 0.00403	O	Hg	< 0.05000	M	Ru	< 0.00807	M	Tm	< 0.00161
M	Bi	< 0.00161	M	Ge	< 0.02419	M	Mo	< 0.00807	M	Sm	< 0.00403	M	Sn	< 0.02016
O	B	< 0.04000	M	Au	< 0.01210	M	Nd	< 0.00807	M	Sc	< 0.04032	M	Ti	< 0.20162
M	Cd	< 0.01210	M	Hf	< 0.00807	O	Ni	< 0.02000	M	Se	< 0.03226	M	W	< 0.04032
O	Ca	0.00325	M	Ho	< 0.00202	M	Nb	< 0.00202	O	Si	< 0.00400	M	U	< 0.00807
M	Ce	< 0.02016	M	In	< 0.04032	n	Os		M	Ag	< 0.00807	M	V	< 0.00807
M	Cs	< 0.00121	M	Ir	< 0.02016	M	Pd	< 0.02016	O	Na	0.00138	M	Yb	< 0.00403
M	Cr	< 0.02016	O	Fe	0.00875	n	P		M	Sr	< 0.00202	M	Y	< 0.16129
s	Co		M	La	< 0.00202	M	Pt	< 0.00807	n	S		M	Zn	< 0.08065
M	Cu	< 0.02419	M	Pb	< 0.01210	O	K	0.03000	M	Ta	< 0.02823	M	Zr	< 0.02016

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 58.9332; +2; 6; $Co(H_2O)_6^{2+}$
Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, HF, H_3PO_4. Avoid basic media. Stable with most metals and inorganic anions in acidic media.
Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.
Co Containing Samples (Preparation and Solution) - Metal (soluble in HNO_3); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO_3).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at all concs.)
ICP-OES	238.892 nm	0.01/.002 µg/mL	1	ion	Fe, W, Ta
ICP-OES	228.616 nm	0.01/.001 µg/mL	1	ion	
ICP-OES	237.862 nm	0.01/.002 µg/mL	1	ion	W, Re, Al, Ta
ICP-MS	59 amu	2 ppt	n/a	M+	$^{42}Ca^{16}O^{1}H$, $^{40}Ar^{18}O^{1}H$, $^{40}Ar^{23}Na$, $^{43}Ca^{16}O$, $^{24}Mg^{35}Cl$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

010254

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

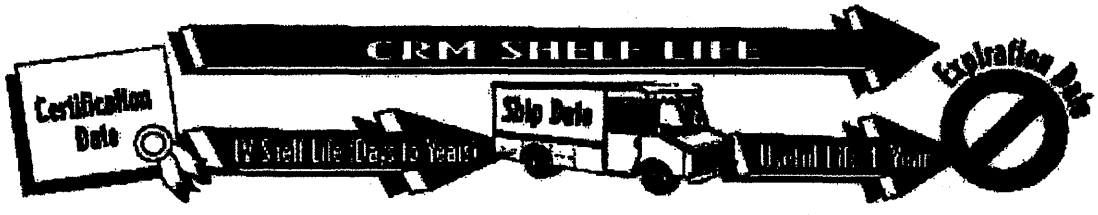
10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: August 28, 2003

Expiration Date:

EXPIRES
1 2005

INORGANIC LABS/RADCHEM LABS Pg 2 of 2
DATE RECEIVED: 03/25/04
DATE EXPIRED: 03/01/2005 V03
DATE OPENED: 03/25/04
INORG: 4468 PO: F52323

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

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 **1000 µg/mL Manganese in 2% (abs) HNO_3**

Catalog Number:	CGMN1-1, CGMN1-2, and CGMN1-5
Lot Number:	**W-MN02036**
Starting Material:	Mn pieces
Starting Material Purity (%):	99.995300
Starting Material Lot No	21563
Matrix:	2% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 01/20/04
DATE EXPIRED: 02/01/2005 VOS
DATE OPENED: 01/20/04
INORG: 4434 PO: F5230

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1000 ± 2 µg/mL

Certified Density: 1.014 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_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** **1000 ± 2 µg/mL**
ICP Assay NIST SRM 3132 Lot Number: 890903

Assay Method #2 **1003 ± 3 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.00221	M	Dy	< 0.02471	O	Li	0.00020	M	Pr	< 0.00124	M	Te	< 0.12355
M	Sb	< 0.00206	M	Er	< 0.02059	M	Lu	< 0.00165	M	Re	< 0.00412	M	Tb	< 0.00124
M	As	< 0.04118	M	Eu	< 0.01236	O	Mg	0.03350	M	Rh	< 0.00412	M	Tl	< 0.00412
M	Ba	< 0.04118	M	Gd	< 0.00412	s	Mn		M	Rb	< 0.00412	M	Th	< 0.00412
M	Be	< 0.00206	O	Ga	< 0.05000	i	Hg		M	Ru	< 0.00824	M	Tm	< 0.00165
M	Bi	< 0.00165	O	Ge	< 0.00300	M	Mo	< 0.00824	M	Sm	< 0.00412	M	Sn	< 0.02059
O	B	0.00295	M	Au	< 0.01236	M	Nd	< 0.00824	M	Sc	< 0.04118	M	Ti	< 0.20592
M	Cd	< 0.01236	M	Hf	< 0.00824	M	Ni	< 0.03295	M	Se	< 0.03295	M	W	< 0.04118
O	Ca	0.00340	M	Ho	< 0.00206	M	Nb	< 0.00206	O	Si	0.00275	M	U	< 0.00824
M	Ce	< 0.02059	M	In	< 0.04118	n	Os		M	Ag	< 0.00824	M	V	< 0.00824
M	Cs	< 0.00124	M	Ir	< 0.02059	M	Pd	< 0.02059	O	Na	0.00225	M	Yb	< 0.00412
M	Cr	< 0.02059	O	Fe	< 0.01000	i	P		M	Sr	< 0.00206	M	Y	< 0.16474
M	Co	< 0.01236	M	La	< 0.00206	M	Pt	< 0.00824	i	S		O	Zn	0.00250
M	Cu	< 0.02471	M	Pb	< 0.01236	O	K	0.00105	M	Ta	< 0.02883	M	Zr	< 0.02059

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

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7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 54.9380; +2; 6; $Mn(H_2O)_6^{2+}$
Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, HF, H_3PO_4. Avoid basic media. Stable with most metals and inorganic anions in acidic media.
Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5 % HNO_3/LDPE container.
Mn Containing Samples (Preparation and Solution) - Metal (Soluble in dilute acids); Oxides (Soluble in dilute acids); Ores (Dissolve with HCl. If silica is present add HF and then fume off silica by adding H_2SO_4 and heat to SO_3 fumes - dense white fumes).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at 100ppm)
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+	$^{40}Ar^{14}N^1H$, $^{39}K^{16}O$, $^{37}Cl^{16}O$, $^{40}Ar^{15}N$, $^{38}Ar^{17}O$, $^{38}Ar^{16}O^1H$, $^{38}Ar^{18}O^1H$, $^{37}Cl^{17}O^1H$, $^{23}Na^{32}S$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

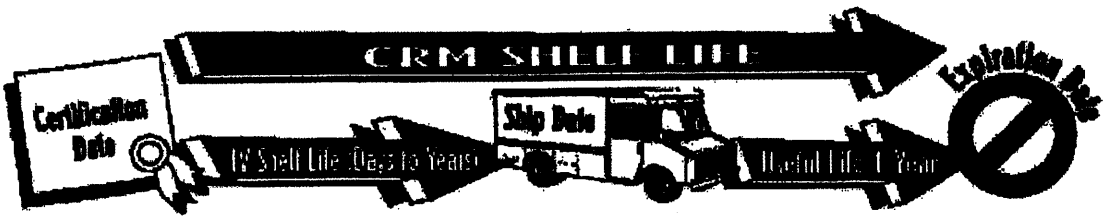
10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 01/20/04
DATE EXPIRED: 09/01/2005 VDS
DATE OPENED: 01/20/04
INORG: 4434 PO: F52391

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: August 04, 2003

Expiration Date: EXPIRES 1 FEB 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

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

CUSTOM-GRADE SOLUTION 1000 µg/mL Vanadium in 1.4% HNO_3 (abs)

Catalog Number: CGV1-1, CGV1-2 and CGV1-5

Lot Number: **T-V02032**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/5/03
DATE EXPIRED: 12/1/2004 OR
DATE OPENED: 11/5/03
INORG: 4321 PO: F53258

Starting Material:	Vanadium Pentoxide
Starting Material Purity:	99.999%
Starting Material Lot No:	46

CERTIFIED CONCENTRATION: 990 ± 2 µg/mL

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

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

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

Classical Wet Assay: 993 ± 4 µg/mL
Method: EDTA Titration vs NIST SRM 928 Lead Nitrate.

Instrument Analysis: 990 ± 2 µg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3165.

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

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

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

M	Al	0.0095	M	Dy	<0.00060	M	Li	<0.0010	M	Pr	<0.000030	M	Te	<0.0030
M	Sb	0.042	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030
M	As	<0.0010	M	Eu	<0.00030	M	Mg	0.0089	M	Rh	<0.00010	M	Tl	<0.00010
M	Ba	<0.0010	M	Gd	<0.00010	i	Mn		M	Rb	<0.00010	M	Th	<0.00010
M	Be	<0.000050	M	Ga	<0.00010	i	Hg		M	Ru	<0.00020	M	Tm	<0.000040
M	Bi	<0.000040	M	Ge	<0.00060	M	Mo	0.016	M	Sm	<0.00010	M	Sn	<0.00050
M	B	<0.0070	M	Au	<0.00030	M	Nd	<0.00020	M	Sc	<0.0010	M	Ti	<0.0050
M	Cd	<0.00030	M	Hf	<0.00020	O	Ni	<0.050	O	Se	<0.40	M	W	0.00055
O	Ca	<0.010	M	Ho	<0.000050	M	Nb	0.00024	O	Si	<0.030	M	U	0.0011
M	Ce	<0.00050	O	In	<0.070	n	Os		M	Ag	0.00044	s	V	
M	Cs	<0.000030	M	Ir	<0.00050	M	Pd	<0.00050	O	Na	<0.090	M	Yb	<0.00010
O	Cr	<0.020	O	Fe	<0.050	i	P		M	Sr	<0.000050	M	Y	<0.0040
O	Co	<0.050	M	La	<0.000050	M	Pt	<0.00020	n	S		M	Zn	0.0041
M	Cu	<0.00060	M	Pb	<0.00030	n	K		M	Ta	<0.00070	M	Zr	<0.00050

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

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.015 g/mL

(over)

QA:KL Rev.08120201DK

Paul R. Haines
Quality Assurance Manager

EXPIRES
Expires: 12/2004

QUALITY STANDARD DOCUMENTATION

1. ISO 9001 QMI Registered Quality System (Certificate Number 010105)

   Members of IQ Net : Argentina (**IRAM**), Australia (**QAS**), Austria (**ÖQS**), Belgium (**Avinter**) , Brazil (**FCAV**), Canada (**QMI**), Hong Kong (**HKQAA**), Columbia (**ICONTEC**), Czech Republic (**CQS**), Denmark (**DS**), Finland (**SFS**), France (**AFAQ**), Germany (**DQS**), Greece (**ELOT**), Hungary (**MSZT**), Ireland (**NSAI**), Israel (**SII**), Italy (**CISQ**), Japan (**JQA**), Korea (**KSA-QA**), Netherlands (**KEMA**), Norway (**NCS**), Poland(**PCBC**), Portugal (**APCER**), Singapore (**PSB**), Slovenia (**SIQ**), Spain (**AENOR**), Switzerland (**SQS**)

2. ISO Guide 25 A2LA .Accredited (Certificate Number 0883-01)
3. MIL-STD-45662A
4. 10CFR50 Appendix B
5. 10CFR21

   Please contact our Quality Assurance Department for further information and copies of documents pertaining to our Quality Standard certifications.

STABILITY/ EXPIRATION DOCUMENTATION

Shelf Life - The length of time that a properly stored and packaged standard will remain within the specified uncertainty. Shelf life is affected by chemical stability and transpiration issues. Inorganic Ventures' Standard Solutions are chemically stable indefinitely. Transpiration loss is linear with time and limits the time a standard can be used with confidence. The smaller the bottle the higher the rate of transpiration. Inorganic Ventures' studies indicate that the shelf life of our 500 mL bottle is 4 years and the shelf life of our 125 mL bottle is 21 months.

Expiration Date - The date after which a standard solution should not be used. A one year expiration date is recommended by most state and federal regulatory agencies. Transpiration issues and repeated use of solutions over a one year period may adversely affect the integrity of the standard.

PACKAGING DOCUMENTATION

Purified acid, 18 megohm double deionized water that has been filtered through a 0.2 μm filter and in-house procedure IV-PACK-001 is used to clean all bottles. Contact us for technical information relating to contamination issues in packaging materials.

GLASSWARE CALIBRATION

In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

BALANCE CALIBRATION

All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 428359B and 454678. The NIST test number is 822/260017-98.

All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-8.

THERMOMETER CALIBRATION

The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The In-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

TECHNICAL SUPPORT

All customers are encouraged to contact us for technical support for the proper use of our products.

TEL 1-800-569-6799 FAX 1-732-901-1903 E-MAIL IVtech@ivstandards.com

010262

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 Zinc in 1.4% (abs) HNO_3**

Catalog Number:	CGZN1-1, CGZN1-2, and CGZN1-5
Lot Number:	**W-ZN02018**
Starting Material:	Zn shot
Starting Material Purity (%):	99.999889
Starting Material Lot No	J17L26
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/5/03 HB2
DATE EXPIRED: 12/1/2004 DK
DATE OPENED: 11/5/03
INORG: 4319 PO: F55258

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1006 ± 3 µg/mL

Certified Density: 1.011 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
$\sigma_i s_i$ = 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 ± 6 µg/mL**
ICP Assay NIST SRM 3168a Lot Number: 001402

Assay Method #2 **1006 ± 3 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	< 0.00200	M	Dy	< 0.02440	O	Li	0.00001	M	Pr	< 0.00122	M	Te	< 0.12198
M	Sb	< 0.00203	M	Er	< 0.02033	M	Lu	< 0.00163	M	Re	< 0.00407	M	Tb	< 0.00122
M	As	< 0.04066	M	Eu	< 0.01220	O	Mg	0.00011	M	Rh	< 0.00407	M	Tl	< 0.00407
M	Ba	< 0.04066	M	Gd	< 0.00407	M	Mn	< 0.01626	M	Rb	< 0.00407	M	Th	< 0.00407
M	Be	< 0.00203	M	Ga	< 0.00407	O	Hg	< 0.01000	M	Ru	< 0.00813	M	Tm	< 0.00163
M	Bi	< 0.00163	M	Ge	< 0.02440	M	Mo	< 0.00813	M	Sm	< 0.00407	M	Sn	< 0.02033
O	B	0.00015	M	Au	< 0.01220	M	Nd	< 0.00813	M	Sc	< 0.04066	M	Ti	< 0.20331
M	Cd	< 0.01220	M	Hf	< 0.00813	O	Ni	0.00009	M	Se	< 0.03253	M	W	< 0.04066
O	Ca	0.00022	M	Ho	< 0.00203	M	Nb	< 0.00203	O	Si	< 0.00400	M	U	< 0.00813
M	Ce	< 0.02033	M	In	< 0.04066	n	Os		M	Ag	< 0.00813	M	V	< 0.00813
M	Cs	< 0.00122	M	Ir	< 0.02033	M	Pd	< 0.02033	O	Na	0.00055	M	Yb	< 0.00407
O	Cr	< 0.00100	O	Fe	0.00005	O	P	< 0.00300	M	Sr	< 0.00203	M	Y	< 0.16264
M	Co	< 0.01220	M	La	< 0.00203	M	Pt	< 0.00813	O	S	< 0.02000	s	Zn	
O	Cu	< 0.00050	M	Pb	< 0.01220	O	K	0.00018	M	Ta	< 0.02846	M	Zr	< 0.02033

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL 010264

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 65.39; +2; 4; $Zn(OH)_4^{2-}$

Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, HF, H_3PO_4. Avoid basic media that promotes the formation of insoluble carbonate and hydroxide. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

Zn Containing Samples (Preparation and Solution) - Metal (Soluble in HNO_3); Oxides (Soluble in HCl); Ores (Dissolve in HCl /HNO_3); Organic based (Dry ash at 450°C and dissolve ash in HCl) (Sulfuric/peroxide acid digestion)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.		Order	Type	Interferences (underlined indicates severe interferences.)
ICP-OES	213.856 nm	0.002 / 0.0004 µg/mL	1	atom		Ni, Cu, V
ICP-OES	202.548 nm	0.004 / 0.0002 µg/mL	1	ion		Nb, Cu, Co, Hf
ICP-OES	206.200 nm	0.006 / 0.0006 µg/mL	1	ion		Sb, Ta, Bi, Os
ICP-MS	66 amu	7 ppt		n/a	M'	$^{50}Ti^{16}O$, $^{50}Cr^{16}O$, $^{50}V^{16}O$, $^{64}S^{16}O_2$, $^{32}S^{16}O^{16}O$, $^{32}S^{16}O_2$, $^{32}S^{16}O^{16}O$, $^{32}S^{34}S$, $^{32}S_2$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

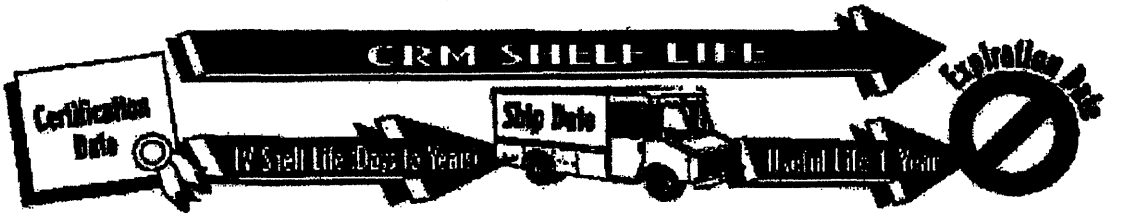
10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

010265

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 02, 2003

Expiration Date:

EXPIRES
1 2 2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/5/03 2 of 2
DATE EXPIRED: 12/1/2004 PR
DATE OPENED: 11/5/03
INORG: 4319 PO: F52268

010266

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: **T-AG02015**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 08/26/03
DATE EXPIRED: 09/01/2004 VOID
DATE OPENED: 08/26/03
INORG: 4222 PO: E52224

Starting Material:	Silver Metal
Starting Material Purity:	99.999%
Starting Material Lot No:	F15102

CERTIFIED CONCENTRATION: 1001 ± 2 µg/mL

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

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: 1004 ± 3 µg/mL
Method: Volhard Titration vs NIST SRM 999a Potassium Chloride

Instrument Analysis: 1001 ± 2 µg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3151.

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

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

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

O	Al	<0.00010	M	Dy	<0.00060	O	Li	<0.000030	M	Pr	<0.000030	O	Te	<0.030
M	Sb	<0.000050	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030
O	As	<0.0050	M	Eu	<0.00030	O	Mg	<0.000040	M	Rh	<0.00010	M	Tl	<0.00010
M	Ba	<0.0010	M	Gd	<0.00010	O	Mn	<0.00030	M	Rb	<0.00010	M	Th	<0.00010
O	Be	<0.00050	M	Ga	<0.00010	O	Hg	0.00090	M	Ru	<0.00020	M	Tm	<0.000040
M	Bi	<0.000040	M	Ge	<0.00060	M	Mo	<0.00020	M	Sm	<0.00010	M	Sn	<0.00050
O	B	<0.0020	O	Au	<0.012	M	Nd	<0.00020	M	Sc	<0.0010	O	Ti	<0.00070
O	Cd	<0.0020	M	Hf	<0.00020	O	Ni	<0.0070	O	Se	<0.036	M	W	<0.0010
O	Ca	<0.000050	M	Ho	<0.000050	M	Nb	<0.000050	O	Si	<0.0030	M	U	<0.00020
M	Ce	<0.00050	O	In	<0.020	n	Os		s	Ag		M	V	<0.00020
M	Cs	<0.000030	M	Ir	<0.00050	M	Pd	<0.00050	O	Na	<0.090	M	Yb	<0.00010
O	Cr	<0.0020	O	Fe	<0.00070	O	P	<0.030	M	Sr	<0.000050	M	Y	<0.0040
M	Co	<0.00030	M	La	<0.000050	M	Pt	<0.00020	O	S	<0.020	O	Zn	<0.0010
M	Cu	<0.00060	M	Pb	<0.00030	O	K	<0.0060	M	Ta	<0.00070	M	Zr	<0.00050

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

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.024 g/mL

QA:KL Rev.00210200

Paul R. Haines

Quality Assurance Manager

Expires:

EXPIRES
1 Sep 2004

QUALITY STANDARD DOCUMENTATION

1.ISO 9001:2000 QMI Registered Quality System (Certificate Number 010105)
Members of IQ Net : Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

2.ISO/IEC Guide 34-2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate 883.02
3.ISO/IEC17025-1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate 883.01
4.MIL-STD-45662A
5.10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licencing of Production and Utilization Facilities
6.10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance
Please contact our Quality Assurance Department for further information and copies of documents pertaining to our Quality Standard certifications.

STABILITY/ EXPIRATION DOCUMENTATION

Shelf Life -The length of time that a properly stored and packaged standard will remain within the specified uncertainty. Shelf life is affected by chemical stability and transpiration issues. Inorganic Ventures' Standard Solutions are chemically stable indefinitely. Transpiration loss is linear with time and limits the time a standard can be used with confidence. The smaller the bottle the higher the rate of transpiration. Inorganic Ventures' studies indicate that the shelf life of our 500 mL bottle is 4 years and the shelf life of our 125 mL bottle is 21 months.

Expiration Date -The date after which a standard solution should not be used. A one year expiration date is recommended by most state and federal regulatory agencies. Transpiration issues and repeated use of solutions over a one year period may adversely affect the integrity of the standard.

PACKAGING DOCUMENTATION

Purified acid, 18 megohm double deionized water that has been filtered through a 0.2 μm filter and in-house procedure IV-PACK-001 is used to clean all bottles. Contact us for technical information relating to contamination issues in packaging materials.

GLASSWARE CALIBRATION

In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

BALANCE CALIBRATION

All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 428359B and 454678. The NIST test number is 822/260017-98.

All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-8.

THERMOMETER CALIBRATION

The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

TECHNICAL SUPPORT

All customers are encouraged to contact us for technical support for the proper use of our products.

TEL 1-800-569-6799 INT'L 1-732-901-1900 FAX 1-732-901-1903 E-MAIL IVtech@ivstandards.com

010268

inorganic ventures / iv labs

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

1.0 Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02. The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 DESCRIPTION OF CRM Custom-Grade **1000 µg/mL Arsenic in 1.4% (abs) HNO_3**

Catalog Number:	CGAS1-1, CGAS1-2, and CGAS1-5
Lot Number:	**W-AS02022**
Starting Material:	POLYCRYSTALINE LUMP
Starting Material Purity (%):	99.998994
Starting Material Lot No	23115
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADIAN LABS Pg 1 of 2
DATE RECEIVED: 01/20/04
DATE EXPIRED: 02/01/2005 VDS
DATE OPENED: 01/20/04
INORG: 4433 PO: F52301

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1014 ± 3 µg/mL

Certified Density: 1.012 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 Assay Method #1 **1014 ± 3 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3103a Lot Number: 891003

Assay Method #2 **1008 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.00038	M	Dy	< 0.01596	O	Li	0.00009	M	Pr	< 0.00080	M	Te	< 0.07978
O	Sb	< 0.01000	M	Er	< 0.01330	M	Lu	< 0.00106	O	Re	< 0.01000	M	Tb	< 0.00080
s	As		M	Eu	< 0.00798	O	Mg	0.00009	M	Rh	< 0.00266	M	Tl	< 0.00266
M	Ba	< 0.02660	M	Gd	< 0.00266	O	Mn	< 0.00003	M	Rb	< 0.00266	M	Th	< 0.00266
M	Be	< 0.00133	M	Ga	< 0.00266	O	Hg	< 0.01200	M	Ru	< 0.00532	M	Tm	< 0.00106
M	Bi	< 0.00106	M	Ge	< 0.01596	M	Mo	< 0.00532	M	Sm	< 0.00266	O	Sn	0.00049
O	B	< 0.01200	M	Au	< 0.00798	M	Nd	< 0.00532	M	Sc	< 0.02660	M	Ti	< 0.13297
M	Cd	< 0.00798	M	Hf	< 0.00532	M	Ni	< 0.02128	M	Se	< 0.02128	M	W	< 0.02660
O	Ca	0.00189	M	Ho	< 0.00133	O	Nb	< 0.00200	O	Si	0.00415	M	U	< 0.00532
M	Ce	< 0.01330	M	In	< 0.02660	n	Os		M	Ag	< 0.00532	M	V	< 0.00532
M	Cs	< 0.00080	M	Ir	< 0.01330	M	Pd	< 0.01330	O	Na	0.00159	M	Yb	< 0.00266
M	Cr	< 0.01330	O	Fe	< 0.00110	O	P	< 0.00260	M	Sr	< 0.00133	M	Y	< 0.10638
M	Co	< 0.00798	M	La	< 0.00133	M	Pt	< 0.00532	O	S	< 0.02500	O	Zn	0.00057
M	Cu	< 0.01596	M	Pb	< 0.00798	O	K	0.00132	M	Ta	< 0.01862	M	Zr	< 0.01330

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 74.9216; mix of +3 and +5; 6; H_3AsO_4 and $HAsO_2$
Chemical Compatibility -Arsenic has no cationic chemistry. It is soluble in HCl, HNO_3, H_3PO_4, H_2SO_4 and HF aqueous matrices water and NH_4OH . It is stable with most inorganic anions (forms arsenate when boiled with chromate) but many cationic metals form the insoluble arsenates under pH neutral conditions. When fluorinated and / or under acidic conditions arsenate formation is typically not a problem at moderate to low concentrations.
Stability - 2-100 ppb levels stable for months alone or mixed with other elements at equivalent levels in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.
As Containing Samples (Preparation and Solution) - As^0 (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 ≤1Dancs.)
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+	$^{40}Ar^{35}Cl$, $^{59}Co^{16}O$, $^{40}Ar^{36}Ar^{1}H$, $^{38}Ar^{37}Cl$, $^{40}Ar^{35}K$, $^{150}Nd^{2+}$, $^{150}Sm^{2+}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

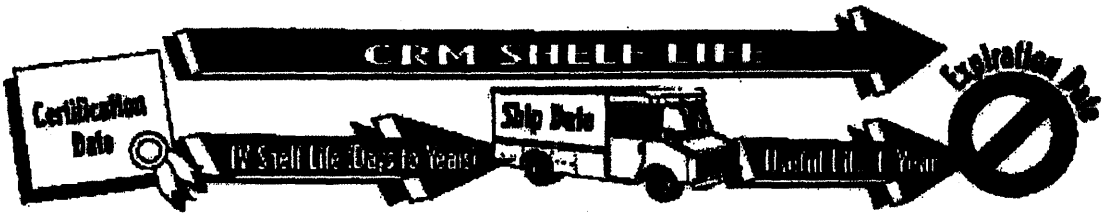
10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 01/20/04
DATE EXPIRED: 02/01/2005 V03
DATE OPENED: 01/20/04
INORG: 4433 PO: F52301

010271

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: May 01, 2003

Expiration Date: EXPIRES 1 E 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

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."

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/3/03
DATE EXPIRED: 11/1/04
DATE OPENED: 11/3/03 DL
INORG: 4313 PO: 252258

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Lead in 0.35% (abs) HNO_3**

Catalog Number:	CGPB1-1, CGPB1-2, and CGPB1-5
Lot Number:	**W-PB02114**
Starting Material:	$Pb(NO_3)_2$
Starting Material Purity (%):	99.999974
Starting Material Lot No	22150
Matrix:	0.35% (abs) HNO_3

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1006 ± 2 µg/mL

Certified Density: 1.002 g/mL (measured at 22° C)

The Certified Value is the wet assay value. The following equations are used in the calculations of the certified value and the uncertainty:

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

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

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

□ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

□ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1005 ± 2 µg/mL**
ICP Assay NIST SRM 3128 Lot Number: 991504

Assay Method #2 **1006 ± 2 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	< 0.00270	M	Dy	< 0.01193	O	Li	< 0.00002	M	Pr	< 0.00060	M	Te	< 0.05965
M	Sb	< 0.00099	M	Er	< 0.00994	M	Lu	< 0.00080	M	Re	< 0.00199	M	Tb	< 0.00060
M	As	< 0.01989	M	Eu	< 0.00597	O	Mg	0.00008	O	Rh	< 0.00900	O	Tl	0.00130
M	Ba	< 0.01989	M	Gd	< 0.00199	M	Mn	< 0.00795	M	Rb	< 0.00199	M	Th	< 0.00199
M	Be	< 0.00099	M	Ga	< 0.00199	O	Hg	< 0.01500	M	Ru	< 0.00398	M	Tm	< 0.00080
O	Bi	< 0.02000	M	Ge	< 0.01193	M	Mo	< 0.00398	M	Sm	< 0.00199	M	Sn	< 0.00994
O	B	< 0.04000	M	Au	< 0.00597	M	Nd	< 0.00398	M	Sc	< 0.01989	M	Ti	< 0.09942
M	Cd	< 0.00597	M	Hf	< 0.00398	M	Ni	< 0.01591	M	Se	< 0.01591	M	W	< 0.01989
O	Ca	0.00009	M	Ho	< 0.00099	M	Nb	< 0.00099	O	Si	< 0.00340	M	U	< 0.00398
M	Ce	< 0.00994	M	In	< 0.01989	n	Os		M	Ag	< 0.00398	M	V	< 0.00398
M	Cs	< 0.00060	M	Ir	< 0.00994	M	Pd	< 0.00994	O	Na	< 0.00600	M	Yb	< 0.00199
M	Cr	< 0.00994	O	Fe	0.00011	O	P	< 0.00500	M	Sr	< 0.00099	M	Y	< 0.07954
M	Co	< 0.00597	M	La	< 0.00099	M	Pt	< 0.00398	O	S	< 0.10000	M	Zn	< 0.03977
M	Cu	< 0.01193	s	Pb		O	K	< 0.00180	M	Ta	< 0.01392	M	Zr	< 0.00994

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 207.2; +2; 6; $Pb(H_2O)_6^{+2}$

Chemical Compatibility - Soluble in HCl, HF and HNO_3. Avoid H_2SO_4. Stable with most metals and inorganic anions forming insoluble carbonate, borate, sulfate, sulfite, sulfide, phosphate, oxalate, chromate, tannate, iodate, and cyanide in neutral aqueous media.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO_3 / LDPE container.

Pb Containing Samples (Preparation and Solution) - Metal (Best dissolved in 1:1 H_2O / HNO_3); Oxides (The many different Pb oxides are soluble in HNO_3 with the exception of PbO_2 which is soluble in HCl or HF); Ores and Alloys (Best attacked using 1:1 H_2O / HNO_3); Organic Matrices (Dry ash and dissolve in dilute HCl.).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤Boncs.)
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)

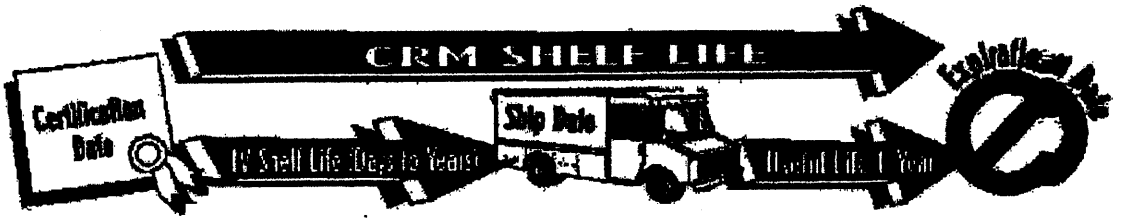
10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

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.

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/3/03
DATE EXPIRED: 11/1/04 OK
DATE OPENED: 11/3/03
INORG: 4313 PO: F52358

Certification Date: January 23, 2003

Expiration Date: EXPIRES 1 2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

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 Antimony in 0.7% (abs) HNO_3 / 3% Tartaric Acid**

Catalog Number:	CGSB1-1, CGSB1-2 and CGSB1-5
Lot Number:	**W-SB02078**
Starting Material:	Sb shot
Starting Material Purity (%):	99.989188
Starting Material Lot No	D17L24
Matrix:	0.7% (abs) HNO_3 / 3% Tartaric Acid

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1005 ± 2 µg/mL

Certified Density: 1.019 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 Assay Method #1 **1005 ± 2 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3102a Lot Number: 990707

Assay Method #2 **1000 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 VIS
DATE OPENED: 02/25/04
INORG: 4404 PO: F52323

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.04519	M	Dy	< 0.00597	O	Li	0.00004	M	Pr	< 0.00030	M	Te	< 0.02983
S	Sb		M	Er	< 0.00497	M	Lu	< 0.00040	M	Re	< 0.00099	M	Tb	< 0.00030
M	As	< 0.00994	M	Eu	< 0.00298	O	Mg	0.00171	M	Rh	< 0.00099	M	Tl	0.00040
O	Ba	0.00003	M	Gd	< 0.00099	O	Mn	0.00321	M	Rb	< 0.00099	M	Th	< 0.00099
O	Be	< 0.00001	M	Ga	< 0.00099	O	Hg	< 0.01500	M	Ru	< 0.00199	M	Tm	< 0.00040
M	Bi	0.00170	M	Ge	< 0.00597	M	Mo	< 0.00199	M	Sm	< 0.00099	M	Sn	0.00050
O	B	0.00100	M	Au	< 0.00298	M	Nd	< 0.00199	O	Sc	< 0.00016	O	Ti	0.00131
M	Cd	< 0.00298	M	Hf	< 0.00199	O	Ni	0.00100	M	Se	< 0.49711	M	W	< 0.00994
O	Ca	0.00884	M	Ho	< 0.00050	M	Nb	< 0.00050	O	Si	0.00502	M	U	< 0.00199
O	Ce	< 0.00300	M	In	< 0.00994	n	Os		M	Ag	< 0.00199	M	V	< 0.00199
M	Cs	< 0.00030	M	Ir	< 0.00497	M	Pd	< 0.00497	O	Na	0.00362	M	Yb	< 0.00099
O	Cr	0.00954	O	Fe	0.01306	O	P	< 0.04000	M	Sr	< 0.00050	M	Y	< 0.03977
M	Co	< 0.00298	O	La	< 0.00120	M	Pt	< 0.00199	i	S		O	Zn	0.00141
O	Cu	0.00321	M	Pb	0.00060	O	K	0.01004	M	Ta	< 0.00696	M	Zr	< 0.00497

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 121.75; +3 ; 6; $Sb(O)C_4H_4O_6^-$

Chemical Compatibility - Stable in concentrated HCl, dilute or concentrated HF. Stable in dilute HNO_3 as the fluoride or tartrate complex. Avoid basic media. Stable with most metals and inorganic anions in acidic media as the tartrate provided the acidity is not too high or the acid is oxidizing causing loss of the stabilizing tartrate ion. The fluoride complex of antimony is stable in strong acid but you should only mix with other metals that are fluorinated.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-2% HNO_3 / LDPE container.

Sb Containing Samples (Preparation and Solution) - Metal and alloys (Soluble in H_2O / HF / HNO_3 mixture); Oxides (Soluble in HCl and tartaric acid or H_2O / HF / HNO_3 mixtures); Ores (Fusion with Na_2CO_3 in Pt[6] followed by dissolving the fuseate in a H_2O / HF / HNO_3 mixture); Organic based (Sulfuric acid / hydrogen peroxide digestion)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤5ppm cs.)
ICP-OES 206.833 nm	0.03 / 0.003 µg/mL	1	atom	Ta, Cr, Ge, Hf
ICP-OES 217.581 nm	0.05 / 0.005 µg/mL	1	atom	Nb, W, Re, Fe,
ICP-OES 231.147 nm	0.06 / 0.006 µg/mL	1	atom	Ni, Co ,Pt
ICP-MS 121 amu	5 ppt	n/a	M+	$^{105}Pd^{16}O$, $^{89}Y^{16}O_2$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg 2 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 VOS
DATE OPENED: 02/25/04
INORG: 4464 PO: F52393

010279

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: July 23, 2003

Expiration Date: EXPIRES 1 MAR 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	
Certificate Approved By:	Katalin Le, QC Supervisor	
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	

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 Selenium in 1.4% (abs) HNO_3**

Catalog Number:	CGSE1-1, CGSE1-2, and CGSE1-5
Lot Number:	**T-SE01102**
Starting Material:	Se shot
Starting Material Purity (%):	99.9971
Starting Material Lot No	C09L08
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 06/20/03
DATE EXPIRED: 01/01/2004 YRS
DATE OPENED: 06/23/03
INORG: 4152 PO: 159370

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 995 ± 3 µg/mL

Certified Density: 1.010 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

"Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **995 ± 3 µg/mL (Avg. 2 runs)**
ICP Assay NIST SRM 3149 Lot Number: 992106

Assay Method #2 **1002 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.00017	M	Dy	< 0.01196	O	Li	< 0.00003	M	Pr	< 0.00060	M	Te	< 0.05981
M	Sb	0.00160	M	Er	< 0.00997	M	Lu	< 0.00080	O	Re	< 0.00900	M	Tb	< 0.00060
O	As	< 0.00500	M	Eu	< 0.00598	O	Mg	< 0.00003	M	Rh	< 0.00199	M	Tl	< 0.00199
M	Ba	< 0.01994	M	Gd	< 0.00199	M	Mn	< 0.00798	M	Rb	< 0.00199	M	Th	< 0.00199
O	Be	< 0.00009	M	Ga	< 0.00199	O	Hg	0.01950	O	Ru	0.00220	M	Tm	< 0.00080
M	Bi	< 0.00080	M	Ge	< 0.01196	O	Mo	< 0.00400	M	Sm	< 0.00199	M	Sn	< 0.00997
O	B	< 0.00006	M	Au	< 0.00598	M	Nd	< 0.00399	M	Sc	< 0.01994	M	Ti	< 0.09969
M	Cd	< 0.00598	M	Hf	< 0.00399	O	Ni	< 0.00090	S	Se		M	W	< 0.01994
O	Ca	0.00200	M	Ho	< 0.00100	O	Nb	< 0.00400	O	Si	0.00055	M	U	< 0.00399
M	Ce	< 0.00997	M	In	< 0.01994	n	Os		M	Ag	0.00070	M	V	< 0.00399
M	Cs	< 0.00060	M	Ir	< 0.00997	M	Pd	< 0.00997	O	Na	0.00355	M	Yb	< 0.00199
M	Cr	< 0.00997	O	Fe	0.00060	O	P	< 0.00300	M	Sr	< 0.00100	M	Y	< 0.07975
M	Co	< 0.00598	M	La	< 0.00100	M	Pt	< 0.00399	O	S	0.00500	M	Zn	< 0.03988
M	Cu	< 0.01196	M	Pb	< 0.00598	O	K	0.00070	M	Ta	< 0.01396	O	Zr	< 0.00040

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 78.96; +4; 6; H_2SeO_3
Chemical Compatibility - Soluble in HCl, HNO_3, H_3PO_4, H_2SO_4 and HF aqueous matrices and water. It is stable with most inorganic anions but many cationic metals form the insoluble selenites under pH neutral conditions. When fluorinated and/or under acidic conditions precipitation is typically not a problem at moderate to low concentrations.
Stability - 2-100 ppb levels - stable for months alone or mixed with other elements at equivalent levels - in 1 % HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.
Se Containing Samples (Preparation and Solution) - Metal (Soluble in HNO_3); Oxides (Readily soluble in water); Minerals and alloys (Acid digestion with HNO_3 or HNO_3 / HF); Organic Matrices (Acid digestion with hot concentrated H_2SO_4 accompanied by the careful dropwise addition of H_2O_2 until clear)
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤ppms.)
ICP-OES 196.026 nm	0.08 / 0.006 µg/mL	1	atom	Fe
ICP-OES 203.985 nm	0.2 / 0.05 µg/mL	1	atom	Sb, Ir, Cr, Ta
ICP-OES 206.279 nm	0.3 / 0.16 µg/mL	1	atom	Cr, Pt
ICP-MS 82 amu	200 ppt	n/a	M+	$^{12}C^{35}Cl_2$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS 2 of 3
DATE RECEIVED: 06/20/03
DATE EXPIRED: 07/01/2004 VOS
DATE OPENED: 06/23/03
INORG: 4152 PO: E52370

010283

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: November 27, 2002

Expiration Date: EXPIRES 01 2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Debbie Newman, QA Administrator

Certificate Approved By: Katalin Le, QC Supervisor

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

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 Thallium in 0.5% (abs) HNO_3**

Catalog Number:	CGTL1-1, CGTL1-2, and CGTL1-5
Lot Number:	**W-QTL01094**
Starting Material:	TLNO3
Starting Material Purity (%):	99.996539
Starting Material Lot No	22928
Matrix:	0.5% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg 2 of 2
DATE RECEIVED: 01/20/04
DATE EXPIRED: 02/01/2005 V03
DATE OPENED: 01/20/04
INORG: 4435 PO: F52301

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1001 ± 4 µg/mL

Certified Density: 1.002 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = 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** **1001 ± 4 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3158 Lot Number: 993012

Assay Method #2 **1000 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - *In-house procedure* 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Al < 0.01000	M Dy < 0.00600	O Li < 0.00002	M Pr < 0.00030	M Te < 0.03000
M Sb < 0.00050	M Er < 0.00500	M Lu < 0.00040	M Re < 0.00100	M Tb < 0.00030
M As < 0.01000	M Eu < 0.00300	O Mg 0.00012	M Rh < 0.00100	s Tl
M Ba < 0.01000	M Gd < 0.00100	M Mn < 0.00400	M Rb < 0.00100	M Th < 0.00100
M Be < 0.00050	M Ga < 0.00100	O Hg < 0.01200	M Ru < 0.00200	M Tm < 0.00040
M Bi < 0.00040	M Ge < 0.00600	M Mo < 0.00200	M Sm < 0.00100	M Sn < 0.00500
O B < 0.00140	M Au < 0.00300	M Nd < 0.00200	M Sc < 0.01000	M Ti < 0.05000
O Cd 0.00150	M Hf < 0.00200	M Ni < 0.00800	M Se < 0.00800	M W < 0.01000
O Ca 0.00085	M Ho < 0.00050	M Nb < 0.00050	O Si < 0.00340	M U < 0.00200
M Ce < 0.00500	M In < 0.01000	n Os	M Ag 0.04000	M V < 0.00200
M Cs < 0.00030	M Ir < 0.00500	M Pd < 0.00500	O Na 0.00050	M Yb < 0.00100
M Cr < 0.00500	O Fe 0.00030	O P < 0.00260	M Sr < 0.00050	M Y < 0.04000
M Co < 0.00300	M La < 0.00050	M Pt < 0.00200	O S < 0.03000	O Zn 0.00110
M Cu < 0.00600	M Pb 0.00210	O K < 0.00180	M Ta < 0.00700	M Zr < 0.00500

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do nd return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 204.383; +1; 6; $Tl(H_2O)_6^{+}$
Chemical Compatibility - Soluble in HCl, HNO_3, and H_2SO_4. Stable with most metals and inorganic anions. The sulfite, thiocyanate and oxalate are moderately soluble; the phosphate and arsenite are slightly soluble and the sulfide is insoluble.
Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO_3 / LDPE container.
Tl Containing Samples (Preparation and Solution) - Metal (Best dissolved in HNO_3 which forms chiefly the Tl^{+} ion.); Oxide (The thallous oxide is readily soluble in water. The thallic oxide requires high levels of acid); Ores (Carbonate fusion in Pt* followed by HCl dissolution); Organic Matrices (Sulfuric/peroxide digestion or dry ash and dissolution in HCl).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe et «ffonc.)
ICP-OES	190.864 nm	0.04 / 0.004 µg/mL	1	ion	V, Ti
ICP-OES	276.787 nm	0.1 / 0.01 µg/mL	1	atom	Te, V, Fe, Cr
ICP-OES	351.924 nm	0.2 / 0.02 µg/mL	1	atom	Th, Ce, Zr
ICP-MS	205 amu	2 ppt	n/a	M⁺	$^{189}Os^{16}O$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg 2 of 2
DATE RECEIVED: 01/20/04
DATE EXPIRED: 02/01/2005 V05
DATE OPENED: 01/20/04
INORG: 4435 PO: F52301

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: December 09, 2003

Expiration Date: EXPIRES 1 FEB 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	Debbie Newman, Production Manager	Debbie Newman
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010288

Certificate of Analysis

CUSTOM-GRADE SOLUTION 1000 µg/mL Lanthanum in 1.4% HNO_3 (abs)

Catalog Number: CGLA1-1 and CGLA1-5

Lot Number: **T-QLA01057**

Starting Material:	Lanthanum Oxide
Starting Material Purity:	99.999%
Starting Material Lot No:	LA-0-5-017

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 08/26/03
DATE EXPIRED: 09/01/2004
DATE OPENED: 08/26/03
INORG: 4221 PO: E52224

CERTIFIED CONCENTRATION: 1002 ± 3 µg/mL

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

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

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

Classical Wet Assay: 1002 ± 3 µg/mL
Method: EDTA Titration vs NIST SRM 928 Lead Nitrate.

Instrument Analysis: 1007 ± 3 µg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3127a.

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

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

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

O	Al	<0.040	M	Dy	<0.00060	M	Li	<0.0010	O	Pr	<0.020	M	Te	<0.0030
M	Sb	<0.000050	M	Er	0.0010	M	Lu	0.000040	M	Re	<0.00010	M	Tb	<0.000030
M	As	<0.0010	M	Eu	<0.00030	M	Mg	<0.0030	M	Rh	<0.00010	M	Tl	<0.00010
O	Ba	<0.020	M	Gd	0.039	M	Mn	<0.00040	M	Rb	<0.00010	M	Th	<0.00010
M	Be	<0.000050	M	Ga	<0.00010	O	Hg	<0.030	M	Ru	<0.00020	M	Tm	<0.000040
M	Bi	<0.000040	M	Ge	<0.00060	M	Mo	<0.00020	M	Sm	0.00040	M	Sn	<0.00050
O	B	<0.020	M	Au	<0.00030	M	Nd	0.00020	M	Sc	<0.0010	M	Ti	<0.0050
M	Cd	<0.00030	M	Hf	<0.00020	O	Ni	<0.050	O	Se	<0.40	M	W	<0.0010
O	Ca	<0.010	M	Ho	0.00010	M	Nb	<0.000050	O	Si	<0.020	M	U	<0.00020
i	Ce		O	In	<0.030	n	Os		M	Ag	<0.00020	M	V	<0.00020
n	Cs		M	Ir	<0.00050	M	Pd	<0.00050	O	Na	<0.090	M	Yb	<0.00010
M	Cr	<0.00050	O	Fe	<0.050	O	P	<0.050	M	Sr	<0.000050	M	Y	<0.0040
M	Co	<0.00030	s	La		M	Pt	<0.00020	n	S		M	Zn	<0.0020
M	Cu	<0.00060	M	Pb	<0.00030	n	K		M	Ta	<0.00070	M	Zr	<0.00050

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

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.009 g/mL (over)

QA:KSL Rev.121703DN

Inorganic Ventures, Inc.
195 Lehigh Avenue • Suite 4 • Lakewood, NJ 08701
Orders: 800-669-6799 • FAX (732) 901-1903
Technical Support: 800-569-6799

Quality Assurance Manager

EXPIRES 1 Sep 2004

QUALITY STANDARD DOCUMENTATION

1. ISO 9001:2000 QMI Registered Quality System (Certificate Number 010105)

Members of IQ Net : Argentina (**IRAM**), Australia (**QAS**), Austria (**ÖQS**), Belgium (**Avinter**) , Brazil (**FCAV**), Canada (**QMI**), Hong Kong (**HKQAA**), Columbia (**ICONTEC**), Czech Republic (**CQS**), Denmark (**DS**), Finland (**SFS**), France (**AFAQ**), Germany (**DQS**), Greece (**ELOT**), Hungary (**MSZT**), Ireland (**NSAI**), Israel (**SII**), Italy (**CISQ**), Japan (**JQA**), Korea (**KSA-QA**), Netherlands (**KEMA**), Norway (**NCS**), Poland(**PCBC**), Portugal (**APCER**), Singapore (**PSB**), Slovenia (**SIQ**), Spain (**AENOR**), Switzerland (**SQS**)

2. ISO/IEC Guide 34-2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate 883.02
3. ISO/IEC17025-1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate 883.01
4. MIL-STD-45662A
5. 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licencing of Production and Utilization Facilities
6. 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

Please contact our Quality Assurance Department for further information and copies of documents pertaining to our Quality Standard certifications.

STABILITY/ EXPIRATION DOCUMENTATION

Shelf Life - The length of time that a properly stored and packaged standard will remain within the specified uncertainty. Shelf life is affected by chemical stability and transpiration issues. Inorganic Ventures' Standard Solutions are chemically stable indefinitely. Transpiration loss is linear with time and limits the time a standard can be used with confidence. The smaller the bottle the higher the rate of transpiration. Inorganic Ventures' studies indicate that the shelf life of our 500 mL bottle is 4 years and the shelf life of our 125 mL bottle is 21 months.

Expiration Date - The date after which a standard solution should not be used. A one year expiration date is recommended by most state and federal regulatory agencies. Transpiration issues and repeated use of solutions over a one year period may adversely affect the integrity of the standard.

PACKAGING DOCUMENTATION

Purified acid, 18 megohm double deionized water that has been filtered through a 0.2 μm filter and in-house procedure IV-PACK-001 is used to clean all bottles. Contact us for technical information relating to contamination issues in packaging materials.

GLASSWARE CALIBRATION

In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

BALANCE CALIBRATION

All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 428359B and 454678. The NIST test number is 822/260017-98.

All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-8.

THERMOMETER CALIBRATION

The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

TECHNICAL SUPPORT

All customers are encouraged to contact us for technical support for the proper use of our products.

TEL 1-800-569-6799 INT'L 1-732-901-1900 FAX 1-732-901-1903 E-MAIL IVtech@ivstandards.com

010290

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Palladium in 3.3% (abs) HCL**

Catalog Number:	CGPD1-1 and CGPD1-5
Lot Number:	**W-PD02019**
Starting Material:	Pd(NO3)2
Starting Material Purity (%):	99.999248
Starting Material Lot No	11974A-00
Matrix:	3.3% (abs) HCL

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 03/01/04
DATE EXPIRED: 03/01/2005 YDS
DATE OPENED: 03/01/04
INORG: 4477 PO: E52323

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 994 ± 3 µg/mL

Certified Density: 1.022 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

□ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

□ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **994 ± 3 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3138 Lot Number: 990207

Assay Method #2 **1000 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.00400	M	Dy	< 0.00060	O	Li	< 0.04000	M	Pr	< 0.00003	O	Te	< 0.01300
O	Sb	< 0.00500	M	Er	< 0.00050	M	Lu	< 0.00004	M	Re	< 0.00010	M	Tb	< 0.00003
O	As	< 0.01400	M	Eu	< 0.00030	O	Mg	< 0.01100	O	Rh	< 0.00600	M	Tl	< 0.00010
M	Ba	< 0.00100	M	Gd	< 0.00010	O	Mn	< 0.00650	M	Rb	< 0.00010	M	Th	< 0.00010
O	Be	< 0.00009	M	Ga	< 0.00010	O	Hg	< 0.01100	O	Ru	< 0.00200	M	Tm	< 0.00004
M	Bi	< 0.00004	M	Ge	< 0.00060	M	Mo	< 0.00020	M	Sm	< 0.00010	O	Sn	< 0.00700
O	B	< 0.00090	O	Au	< 0.00300	M	Nd	< 0.00020	O	Sc	< 0.00009	O	Ti	< 0.00100
O	Cd	< 0.00600	M	Hf	< 0.00020	O	Ni	0.01800	M	Se	< 0.00080	M	W	< 0.00100
O	Ca	0.00700	M	Ho	< 0.00005	M	Nb	< 0.00005	O	Si	0.00600	M	U	< 0.00020
M	Ce	< 0.00050	O	In	< 0.03300	n	Os		O	Ag	< 0.00670	M	V	< 0.00020
M	Cs	< 0.00003	M	Ir	< 0.00050	S	Pd		O	Na	0.01500	M	Yb	< 0.00010
O	Cr	0.00450	O	Fe	0.04600	O	P	0.00600	M	Sr	< 0.00005	M	Y	< 0.00400
M	Co	< 0.00030	M	La	< 0.00005	O	Pt	< 0.00600	O	S	< 0.02500	O	Zn	< 0.00060
O	Cu	0.00360	M	Pb	< 0.00030	O	K	< 0.02000	M	Ta	< 0.00070	M	Zr	< 0.00050

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 106.42; +2; 6; $Pd(H_2O)_6^{2+}$
Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, HF, H_3PO_4. Avoid basic media. Stable with most metals and inorganic anions in acidic media. Avoid contact with water soluble organics such as aldehydes since Pd^{2+} is easily reduced.
Stability - 2-100 ppb levels. 2ppb Pd is stable for 1 day in 1% HNO_3 / LDPE container. 10 ppb is stable for 3 days in 1% HNO_3 / LDPE container. 100 ppb is stable for 48 months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.
Pd Containing Samples (Preparation and Solution) - Metal (Soluble in HNO_3 or Aqua Regia); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO_3).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤5ppm conc.)
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	229.691 nm	0.07 / 0.004 µg/mL	1	ion	Co
ICP-MS	105 amu	2 ppt	n/a	M'	$^{89}Al^{16}Cu$, $^{89}Y^{16}O$

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

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: March 14, 2003

Expiration Date:

EXPIRES
01 MAR 2005

INORGANIC LABS/RADCHEM LABS P9-2of2
DATE RECEIVED: 03/01/04
DATE EXPIRED: 03/01/2005 VOID
DATE OPENED: 03/01/04
INORG: 4477 PO: F52323

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010294

inorganic ventures / iv labs

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phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Sulfur in H_2O**

Catalog Number:	CGS1-1 and CGS1-5
Lot Number:	**W-QS01098**
Starting Material:	H2SO4
Starting Material Purity (%):	99.999965
Starting Material Lot No	N38818
Matrix:	H_2O

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/5/03 1 of 2
DATE EXPIRED: 12/1/2004 DR
DATE OPENED: 11/5/03
INORG: 4317 PO: F52258

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1010 ± 2 µg/mL

Certified Density: 1.000 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **998 ± 8 µg/mL**
ICP Assay NIST SRM 3154 Lot Number: 892205

Assay Method #2 **1010 ± 2 µg/mL**
Acidimetric NIST SRM 84k Lot Number: 84k

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.00025	M	Dy	< 0.01197	O	Li	< 0.00016	M	Pr	< 0.00060	M	Te	< 0.05984
M	Sb	< 0.00100	M	Er	< 0.00997	M	Lu	< 0.00080	M	Re	< 0.00200	M	Tb	< 0.00060
M	As	< 0.01995	M	Eu	< 0.00598	O	Mg	< 0.00004	M	Rh	< 0.00200	M	Tl	< 0.00200
M	Ba	< 0.01995	M	Gd	< 0.00200	M	Mn	< 0.00798	M	Rb	< 0.00200	M	Th	< 0.00200
O	Be	< 0.00200	M	Ga	< 0.00200	O	Hg	< 0.01100	M	Ru	< 0.00399	M	Tm	< 0.00080
M	Bi	< 0.00080	M	Ge	< 0.01197	M	Mo	< 0.00399	M	Sm	< 0.00200	M	Sn	< 0.00997
O	B	< 0.00990	M	Au	< 0.00598	M	Nd	< 0.00399	M	Sc	< 0.01995	M	Ti	< 0.09974
M	Cd	< 0.00598	M	Hf	< 0.00399	O	Ni	< 0.00230	O	Se	< 0.00620	M	W	< 0.01995
O	Ca	0.00020	M	Ho	< 0.00100	M	Nb	< 0.00100	O	Si	< 0.00410	M	U	< 0.00399
M	Ce	< 0.00997	M	In	< 0.01995	n	Os		M	Ag	< 0.00399	M	V	< 0.00399
M	Cs	< 0.00060	M	Ir	< 0.00997	M	Pd	< 0.00997	O	Na	< 0.00010	M	Yb	< 0.00200
M	Cr	< 0.00997	O	Fe	0.00015	O	P	< 0.00480	M	Sr	< 0.00100	M	Y	< 0.07979
M	Co	< 0.00598	M	La	< 0.00100	M	Pt	< 0.00399	s	S		O	Zn	0.00125
M	Cu	< 0.01197	M	Pb	< 0.00598	O	K	< 0.00170	M	Ta	< 0.01396	M	Zr	< 0.00997

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 32.068; +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 6-8 times its weight of Na_2CO_3 + 0.5 grams KNO_3. The fuseate is extracted with water. Any $BaSO_4$ present in the sample is transposed by the carbonate fusion to the $BaCO_3$ which is left behind in the water-insoluble residue. If $PbSO_4$ is present the fuseate should be boiled with a sodium carbonate saturated with CO_2 solution for 1 hour or more where the $PbSO_4$ will be transposed to the water insoluble carbonate which can be filtered off. Boiling the fuseate with a saturated carbonate solution is good insurance for samples containing Ba, Sr, and Ca. The Ba, Pb, Sr, Ca, free filtrate can be acidified and measured by ICP.)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique	Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≥100ppm.)
ICP-OES	166.669nm	0.2 / 0.19 µg/mL	1	atom	Si, B
ICP-OES	182.034 nm	0.3 / 0.024 µg/mL	1	atom	
ICP-OES	143.328 nm	0.4 / 0.035 µg/mL	1	atom	
ICP-MS	32 amu	30,000 ppt	n/a	M$^+$	$^{16}O_2$, $^{14}N^{16}O$, $^{15}N^{17}O$, $^{14}N^{17}OH$, $^{15}N^{16}OH$

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)

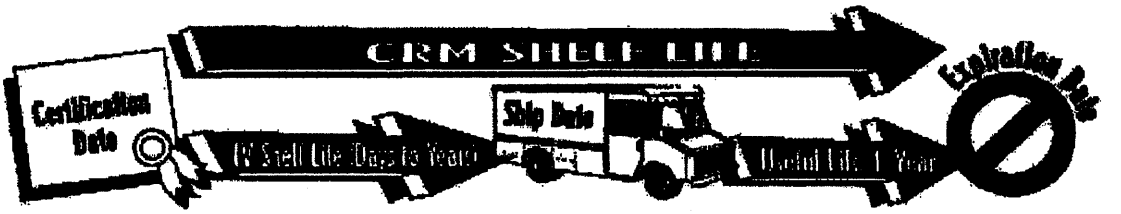
10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance .

10.6 MIL-STD-45662A (Obsolete/Observed)

010297

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/5/03 282
DATE EXPIRED: 12/1/2004 DR
DATE OPENED: 11/5/03
INORG: 4317 PO: F53358

Certification Date: August 27, 2003

Expiration Date: EXPIRES 12/2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

Certificate of Analysis

010298

CUSTOM-GRADE SOLUTION

1000 µg/mL Thorium in 3% HNO_3 (abs)

Catalog Number: CGTH1-1 and CGTH1-5

Lot Number: **T-TH01059**

Starting Material:	Thorium Nitrate
Starting Material Purity:	99.999%
Starting Material Lot No:	C01L32

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 10/08/03
DATE EXPIRED: 11/01/2004 VOS
DATE OPENED: 10/08/03
INORG: 4883 PO: F53840

CERTIFIED CONCENTRATION: 1001 ± 3 µg/mL

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

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

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

Classical Wet Assay: 1001 ± 3 µg/mL
Method: EDTA Titration vs NIST SRM Lead Nitrate.

Instrument Analysis: 1002 ± 4 µg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3159.

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

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

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

O	Al	<0.00090	M	Dy	0.0062	O	Li	<0.000030	M	Pr	0.00037	O	Te	<0.031	
M	Sb	<0.000050	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030	
O	As	<0.014	M	Eu	<0.00030	O	Mg	<0.000060	M	Rh	<0.00010	M	Tl	<0.00010	
M	Ba	0.0050	M	Gd	0.0054	O	Mn	<0.0000030	M	Rb	<0.00010	s	Th		
O	Be	<0.00020	M	Ga	<0.00010	i	Hg		M	Ru	<0.00020	M	Tm	<0.000040	
M	Bi	<0.000040	M	Ge	<0.00060	M	Mo	<0.00020	M	Sm	0.0095	M	Sn	<0.00050	
O	B	<0.00060	M	Au	<0.00030	M	Nd	0.0026	M	Sc	<0.0010	O	Ti	<0.00092	
O	Cd	<0.0045	M	Hf	<0.00020	O	Ni	<0.0023	M	Se	<0.010	M	W	<0.0010	
O	Ca	<0.030	M	Ho	0.00022	M	Nb	<0.000050	O	Si	<0.0034	M	U	0.074	
M	Ce	<0.00050	O	In	<0.0020	n	Os		M	Ag	<0.00020	M	V	<0.00020	
M	Cs	<0.000030	M	Ir	<0.00050	M	Pd	<0.00050	O	Na	<0.00010	M	Yb	<0.00010	
O	Cr	<0.00080	O	Fe	<0.0011	i	P		M	Sr	<0.000050	M	Y	<0.0040	
M	Co	<0.00030	M	La	<0.000050	M	Pt	<0.00020	O	S	<0.072	O	Zn	<0.00058	
M	Cu	<0.00060	M	Pb	<0.00030	O	K	<0.0017	M	Ta	<0.00070	M	Zr	0.0085	

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

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.022 g/mL

QA:KL Rev.050902DN

(over)

Inorganic Ventures, Inc.
195 Lehigh Avenue • Suite 4 • Lakewood, NJ 08701
Orders: 800-669-6799 • FAX (732) 901-1903
Technical Support: 800-569-6799

Paul R. Haines
Quality Assurance Manager

EXPIRES
01 NOV 2004

010299

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

010300

inorganic ventures / iv labs

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certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Uranium in 1% (abs) HNO_3**

Catalog Number:	CGU1-1 and CGU1-5
Lot Number:	**W-U01059**
Starting Material:	UO2(NO3)2.6H2O
Starting Material Purity (%):	99.994419
Starting Material Lot No	RB0018
Matrix:	1% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 VDS
DATE OPENED: 02/25/04
INORG: 4473 PO: F50393

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 997 ± 2 µg/mL

Certified Density: 1.021 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **997 ± 2 µg/mL**
ICP Assay NIST SRM 3164 Lot Number: 891509

Assay Method #2 **1000 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Al	0.05166	M	Dy	< 0.01494	M	Li	< 0.02490	M	Pr	< 0.00075	M	Te	< 0.07470
M	Sb	< 0.00125	M	Er	< 0.01245	M	Lu	< 0.00100	M	Re	< 0.00249	M	Tb	0.00003
M	As	< 0.02490	M	Eu	< 0.00747	M	Mg	< 0.07470	M	Rh	< 0.00249	M	Tl	< 0.00249
M	Ba	< 0.02490	M	Gd	0.00310	M	Mn	0.00083	M	Rb	< 0.00249	M	Th	< 0.00249
M	Be	< 0.00125	M	Ga	< 0.00249	i	Hg		M	Ru	< 0.00498	M	Tm	< 0.00100
M	Bi	< 0.00100	M	Ge	< 0.01494	M	Mo	0.00093	M	Sm	0.00010	O	Sn	< 0.10000
M	B	< 0.17429	M	Au	< 0.00747	M	Nd	< 0.00498	M	Sc	< 0.02490	M	Ti	0.00258
M	Cd	0.00103	M	Hf	< 0.00498	M	Ni	< 0.01992	M	Se	< 0.01992	M	W	< 0.02490
O	Ca	0.05395	M	Ho	0.00052	M	Nb	< 0.00125	i	Si		s	U	
M	Ce	0.00010	M	In	< 0.02490	n	Os		M	Ag	< 0.00498	M	V	< 0.00498
M	Cs	< 0.00075	M	Ir	< 0.01245	M	Pd	< 0.01245	O	Na	0.00664	M	Yb	< 0.00249
M	Cr	< 0.01245	M	Fe	< 0.49798	i	P		M	Sr	< 0.00125	M	Y	0.00062
M	Co	< 0.00747	M	La	0.00145	M	Pt	< 0.00498	i	S		M	Zn	0.00114
M	Cu	0.00072	M	Pb	0.00217	i	K		M	Ta	< 0.01743	M	Zr	< 0.01245

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

010302

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 (Preparation 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 ≤ppms.)
ICP-OES	385.958 nm	0.3 / 0.01 µg/mL	1	ion	Th, Fe
ICP-OES	367.007 nm	0.3 / 0.02 µg/mL	1	ion	Th, Ce
ICP-OES	263.553 nm	0.3 / 0.01 µg/mL	1	ion	Ce, Ir, Th, Rh, W, Zr, Ta, Ti, V, Hf, Fe, Re, Ru
ICP-MS	238 amu	2 ppt	n/a	M+	$^{206}Pb^{16}O_2$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

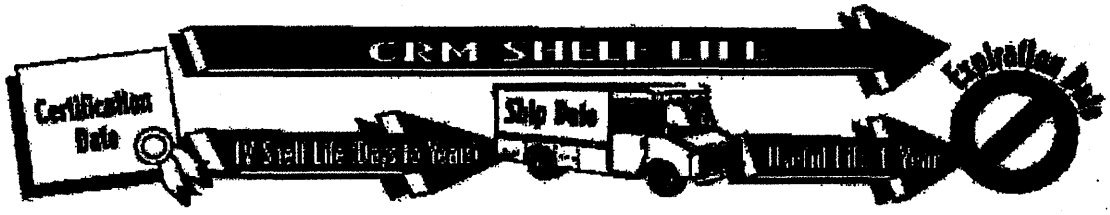
10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg 2 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 VOO
DATE OPENED: 02/25/04
INORG: 4473 PO: F52323

*NOTICE TO ICP-MS USERS: The ^{235}U in this standard is depleted. The certified abundances in Atom % are as follows:

		Natural Abundance	IV's Certified Abundance
	Isotope	Atom %	Atom %
Uranium	^{238}U	99.3	99.8 ± 0.1
	^{235}U	0.70	0.204 ± 0.002

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: June 10, 2003

Expiration Date:

EXPIRES
1 JUN 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	
Certificate Approved By:	Katalin Le, QC Supervisor	
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	

010304

inorganic ventures / iv labs

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certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** *The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."*

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Tungsten in 1% (abs) HNO_3/1% (abs) HF**

Catalog Number:	CGW1-1 and CGW1-5	INORGANIC LABS/RADCHEM LABS Pg 1 of 2
Lot Number:	**W-W01080**	DATE RECEIVED: 07/31/03
Starting Material:	W Powder	DATE EXPIRED: 08/01/2004 VOS
Starting Material Purity (%):	99.990703	DATE OPENED: 08/01/03
Starting Material Lot No	21418,C31H46,D02J21,E03K06,D11F29	INORG: 4203 PO: E52383
Matrix:	1% (abs) HNO_3/1% (abs) HF	

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1001 ± 2 µg/mL

Certified Density: 1.006 g/mL (measured at 22° C)

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

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

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

$\bar{x}$ = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1001 ± 2 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3163 Lot Number: 990209

Assay Method #2 **1000 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 BALANCE CALIBRATION - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 THERMOMETER CALIBRATION - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 GLASSWARE CALIBRATION - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.01792	M	Dy	< 0.00595	O	Li	< 0.00008	M	Pr	< 0.00030
M	Sb	< 0.00050	M	Er	< 0.00496	M	Lu	< 0.00040	i	Re	
M	As	< 0.00991	M	Eu	< 0.00297	O	Mg	0.00120	M	Rh	< 0.00099
M	Ba	< 0.00991	M	Gd	< 0.00099	M	Mn	< 0.00397	M	Rb	< 0.00099
M	Be	< 0.00050	M	Ga	< 0.00099	O	Hg	< 0.04778	M	Ru	< 0.00198
M	Bi	< 0.00040	M	Ge	< 0.00595	M	Mo	0.00050	M	Sm	< 0.00099
O	B	< 1.19460	M	Au	< 0.00297	M	Nd	< 0.00198	O	Sc	< 0.00036
M	Cd	< 0.00297	M	Hf	< 0.00198	M	Ni	< 0.00793	M	Se	< 0.00793
O	Ca	0.00080	M	Ho	< 0.00050	O	Nb	< 0.06371	O	Si	< 0.01354
M	Ce	< 0.00496	M	In	< 0.00991	n	Os		M	Ag	< 0.00198
M	Cs	< 0.00030	M	Ir	< 0.00496	M	Pd	< 0.00496	O	Na	0.04778
M	Cr	< 0.00496	O	Fe	< 0.03982	n	P		M	Sr	< 0.00050
M	Co	< 0.00297	M	La	< 0.00050	M	Pt	< 0.00198	n	S	
M	Cu	< 0.00595	M	Pb	0.00060	O	K	0.03146	O	Ta	< 0.39820

M	Te	< 0.02974
M	Tb	< 0.00030
M	Tl	< 0.00099
M	Th	< 0.00099
M	Tm	< 0.00040
M	Sn	< 0.00496
M	Tl	0.00198
S	W	
M	U	< 0.00198
M	V	< 0.00198
M	Yb	< 0.00099
M	Y	< 0.03965
M	Zn	< 0.01983
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 ≤5ppm 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 Pg. 2 of 2
DATE RECEIVED: 07/31/03
DATE EXPIRED: 08/01/2004 v05
DATE OPENED: 08/01/03
INORG: 4203 PO: E52383

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010307

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: February 10, 2003

Expiration Date: EXPIRES 1 2 2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: JoAnn Struthers, QA Administrative Assistant

Certificate Approved By: Katalin Le, QC Supervisor

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

010308

inorganic ventures / iv labs

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phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Yttrium in 1.4% (abs) HNO_3**

Catalog Number:	CGY1-1, CGY1-2, and CGY1-5
Lot Number:	**X-QY01101**
Starting Material:	Y_2O_3
Starting Material Purity (%):	99.999727
Starting Material Lot No	9918901OYL
Matrix:	1.4% (abs) HNO_3

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1006 ± 2 µg/mL

Certified Density: 1.010 g/mL (measured at 22° C)

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

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

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** **1004 ± 4 µg/mL**
ICP Assay NIST SRM 3167a Lot Number: 790412

Assay Method #2 **1006 ± 2 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 03/30/04
DATE EXPIRED: 04/01/2005 YOS
DATE OPENED: 03/30/04
INORG: 4513 PO: F53361

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 238090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.00024	M	Dy	< 0.00595	O	Li	< 0.00002	M	Pr	< 0.00030	M	Te	< 0.02976
O	Sb	< 0.01000	M	Er	< 0.00496	M	Lu	< 0.00040	M	Re	< 0.00099	M	Tb	< 0.00030
M	As	< 0.00992	M	Eu	< 0.00298	O	Mg	0.00015	M	Rh	< 0.00099	M	Tl	< 0.00099
M	Ba	< 0.00992	M	Gd	< 0.00099	O	Mn	< 0.00002	M	Rb	< 0.00099	M	Th	< 0.00099
M	Be	< 0.00050	M	Ga	< 0.00099	O	Hg	< 0.02000	M	Ru	< 0.00198	M	Tm	< 0.00040
M	Bi	< 0.00040	M	Ge	< 0.00595	M	Mo	< 0.00198	M	Sm	< 0.00099	M	Sn	< 0.00496
O	B	0.00013	M	Au	< 0.00298	M	Nd	< 0.00198	O	Sc	< 0.00003	M	Ti	< 0.04959
M	Cd	< 0.00298	M	Hf	< 0.00198	M	Ni	< 0.00794	M	Se	< 0.00794	M	W	< 0.00992
O	Ca	0.00100	M	Ho	< 0.00050	M	Nb	< 0.00050	O	Si	0.00170	M	U	< 0.00198
M	Ce	< 0.00496	M	In	< 0.00992	n	Os		O	Ag	< 0.02000	O	V	< 0.00080
M	Cs	< 0.00030	M	Ir	< 0.00496	O	Pd	< 0.10000	O	Na	< 0.05000	M	Yb	< 0.00099
M	Cr	< 0.00496	O	Fe	0.00070	O	P	< 0.07000	O	Sr	< 0.00004	s	Y	
M	Co	< 0.00298	M	La	< 0.00050	M	Pt	< 0.00198	O	S	< 0.04300	O	Zn	0.00025
M	Cu	< 0.00595	M	Pb	< 0.00298	O	K	< 0.10000	M	Ta	< 0.00694	O	Zr	< 0.00070

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 88.9059; +3; 6; $Y(OH)(H_2O)_5^{+2}$
Chemical Compatibility - Soluble in HCl, H_2SO_4 and HNO_3. Avoid HF, H_3PO_4 and neutral to basic media. Stable with most metals and inorganic anions forming an insoluble carbonate, oxide, oxalate, and fluoride. Avoid mixing with elements / solutions containing moderate amounts of fluoride.
Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO_3 / LDPE container.
Y Containing Samples (Preparation and Solution) - Metal (Soluble in acids); Oxide (Dissolve by heating in H_2O/HNO_3); Ores (Carbonate fusion in Pt* followed by HCl dissolution); Organic Matrices (Dry ash and dissolve in 1:1 H_2O /HCl or HNO_3).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤ conc.)
ICP-OES 360.073 nm	0.005 / 0.000036 µg/mL	1	ion	Ce, Th
ICP-OES 371.030 nm	0.004 / 0.00007 µg/mL	1	ion	Ce
ICP-OES 377.433 nm	0.005 / 0.0009 µg/mL	1	ion	Ta, Th
ICP-MS 89 amu	0.8 ppt	n/a	M+	$^{73}Ge^{16}O$, $^{178}Hf^{2+}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg 2 of 2
DATE RECEIVED: 03/30/04
DATE EXPIRED: 04/01/2005 VOID
DATE OPENED: 03/30/04
INORG: 4513 PO: F53361

010311

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: February 24, 2004

Expiration Date:

EXPIRES
1A2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010312

inorganic ventures / iv labs

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e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Zirconium in H_2O tr. HNO_3 tr. HF**

Catalog Number:	CGZR1-1 and CGZR1-5
Lot Number:	**W-ZR01056**
Starting Material:	ZrO2
Starting Material Purity (%):	99.994542
Starting Material Lot No	22855
Matrix:	H_2O tr. HNO_3 tr. HF

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 01/23/04
DATE EXPIRED: 08/01/2005 V03
DATE OPENED: 01/23/04
INORG: 4442 PO: F52306

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1004 ± 2 µg/mL

Certified Density: 0.999 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1004 ± 2 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3169 Lot Number: 990109

Assay Method #2 **1000 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 BALANCE CALIBRATION - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 THERMOMETER CALIBRATION - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 GLASSWARE CALIBRATION - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al 0.01416	M Dy < 0.01188	O Li < 0.00012	M Pr < 0.00059	M Te < 0.05942
M Sb < 0.00099	M Er < 0.00990	M Lu < 0.00079	M Re < 0.00198	M Tb < 0.00059
M As < 0.01981	M Eu < 0.00594	O Mg < 0.00012	M Rh < 0.00198	M Tl < 0.00198
M Ba < 0.01981	M Gd < 0.00198	O Mn < 0.00401	M Rb < 0.00198	M Th < 0.00198
O Be < 0.40048	M Ga < 0.00198	O Hg < 0.04405	M Ru < 0.00396	M Tm < 0.00079
M Bi < 0.00079	M Ge < 0.01188	O Mo < 0.40048	M Sm < 0.00198	M Sn < 0.00990
M B < 0.13864	M Au < 0.00594	M Nd < 0.00396	O Sc < 0.00064	O Ti < 0.16019
O Cd < 0.02123	M Hf 0.04403	O Ni 0.01214	M Se < 0.01585	M W < 0.01981
O Ca 0.00809	M Ho < 0.00099	O Nb < 0.08010	O Si < 0.80096	M U < 0.00396
M Ce < 0.00990	M In < 0.01981	n Os	O Ag < 0.40048	M V < 0.00396
M Cs < 0.00059	M Ir < 0.00990	M Pd < 0.00990	O Na < 0.02803	M Yb < 0.00198
O Cr < 0.00881	O Fe 0.00344	O P < 0.01922	M Sr < 0.00099	O Y < 0.00401
M Co < 0.00594	M La < 0.00099	M Pt < 0.00396	O S < 0.28033	O Zn < 0.04005
M Cu < 0.01188	M Pb < 0.00594	O K < 0.00681	M Ta < 0.01386	s Zr

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL 010314

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 91.224; +4; 6, 7, 8; $Zr(F)_6^{-2}$

Chemical Compatibility - Soluble in concentrated HCl, HF, H_2SO_4 (very hot) and HNO_3. Avoid H_3PO_4 and neutral to basic media. Unstable at ppm levels with metals that would pull F^- away (i.e. Do not mix with Alkaline or Rare Earths or high levels of transition elements unless they are fluorinated). Stable with most inorganic anions but precipitation with phosphate, oxalate, and tartrate with a tendency to hydrolyze forming the hydrated oxide in all dilute acids except HF.

Stability - 2-100 ppb levels stable (alone or mixed with all other metals that are at comparable levels) as the $Zr(F)_6^{-2}$ + $Zr(OH)_2F_2^{-2}$ for months in 1% HNO_3 / LDPE container. 1-10,000 ppm single element solutions as the $Zr(F)_6^{-2}$ chemically stable for years in 2-5% HNO_3 / trace HF in an LDPE container.

Zr Containing Samples (Preparation and Solution) - Metal (Soluble in H_2O / HF / HNO_3); Oxide - unlike TiO_2, the ZrO_2 is best fused in one of the following ways (Na_2O_2 in Ni, Na_2CO_3 in Pt or Borax in Pt); Organic Matrices (Dry ash at 450 °C in Pt and dissolve by fusing with Na_2CO_3 and dissolving in HF / HNO_3 / H_2O).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤ppbcs.)
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 3 of 3
DATE RECEIVED: 01/23/04
DATE EXPIRED: 08/01/2005 V05
DATE OPENED: 01/23/04
INORG: 4442 PO: F52326

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010315

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 02 05

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

010316

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Barium in 0.1% (abs) HNO_3**

Catalog Number:	CGBA1-1, CGBA1-2, and CGBA1-5
Lot Number:	**W-BA02023**
Starting Material:	Ba(NO3)2
Starting Material Purity (%):	99.999730
Starting Material Lot No	21879
Matrix:	0.1% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 V03
DATE OPENED: 02/25/04
INORG: 4465 PO: F52323

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1001 ± 1 µg/mL

Certified Density: 0.999 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **998 ± 4 µg/mL**
ICP Assay NIST SRM 3104a Lot Number: 992907

Assay Method #2 **1001 ± 1 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.00011	M	Dy	< 0.01269	O	Li	< 0.00400	M	Pr	< 0.00063	M	Te	< 0.06343
M	Sb	< 0.00106	M	Er	< 0.01057	M	Lu	< 0.00085	M	Re	< 0.00211	O	Tb	< 0.00390
M	As	< 0.02114	O	Eu	< 0.00040	O	Mg	0.00009	M	Rh	< 0.00211	M	Tl	< 0.00211
s	Ba		O	Gd	< 0.00052	M	Mn	< 0.00846	M	Rb	< 0.00211	M	Th	< 0.00211
M	Be	< 0.00106	M	Ga	< 0.00211	O	Hg	< 0.01200	M	Ru	< 0.00423	M	Tm	< 0.00085
M	Bi	< 0.00085	M	Ge	< 0.01269	M	Mo	< 0.00423	O	Sm	< 0.00071	M	Sn	< 0.01057
M	B	< 0.14800	M	Au	< 0.00634	O	Nd	< 0.00330	M	Sc	< 0.02114	M	Ti	< 0.10571
M	Cd	< 0.00634	M	Hf	< 0.00423	M	Ni	< 0.01691	M	Se	< 0.01691	M	W	< 0.02114
O	Ca	0.00072	M	Ho	< 0.00106	M	Nb	< 0.00106	O	Si	< 0.00340	M	U	< 0.00423
M	Ce	< 0.01057	M	In	< 0.02114	n	Os		M	Ag	< 0.00423	M	V	< 0.00423
M	Cs	< 0.00063	M	Ir	< 0.01057	M	Pd	< 0.01057	M	Na	< 0.21142	M	Yb	< 0.00211
M	Cr	< 0.01057	O	Fe	0.00062	O	P	< 0.00260	O	Sr	0.00379	O	Y	0.00040
M	Co	< 0.00634	M	La	< 0.00106	M	Pt	< 0.00423	O	S	< 0.02500	O	Zn	< 0.00039
M	Cu	< 0.01269	M	Pb	0.00020	O	K	< 0.00180	O	Ta	< 0.00690	M	Zr	< 0.01057

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

010318

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; $Be(H_2O)_6^{+2}$

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.

Be Containing Samples (Preparation and Solution) - Metal(is best dissolved in diluted HNO_3) Ores(Carbonate fusion in Pt* followed by HCl dissolution. If sulfate is present dissolve the fuseate using HCl /tartaric acid to prevent $BaSO_4$ precipitate) Organic Matrices (dry ash and dissolve in dilute HCl.)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤lbncs.)
ICP-OES 455.403 nm	0.002 / 0.0001 µg/mL	1	ion	Zr, U
ICP-OES 233.527 nm	0.004 / 0.0003 µg/mL	1	ion	
ICP-OES 230.424 nm	0.004 / 0.0005 µg/mL	1	ion	Mo, Ir, Co
ICP-MS 138 amu	1 ppt	n/a	M+	$^{122}Sn^{16}O$, $^{122}Te^{16}O$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 WS
DATE OPENED: 02/25/04
INORG: 4465 PO: F52303

010319

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: July 28, 2003

Expiration Date: EXPIRES 1 MAR 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010320

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
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e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Beryllium in 2% (abs) HNO_3**

Catalog Number:	CGBE1-1, CGBE1-2, and CGBE1-5
Lot Number:	**W-BE01104**
Starting Material:	$Be(OOCCH_3)_2$
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 VOS
DATE OPENED: 06/01/04
INORG: 4592 PO: F53393

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1007 ± 4 µg/mL

Certified Density: 1.023 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = 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** **1007 ± 4 µg/mL**
ICP Assay NIST SRM 3105a Lot Number: 892707

Assay Method #2 **1002 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	< 0.00800	M	Dy	< 0.01305	O	Li	< 0.00002	M	Pr	< 0.00065	M	Te	< 0.06525
M	Sb	< 0.00109	M	Er	< 0.01087	M	Lu	< 0.00087	M	Re	< 0.00218	M	Tb	< 0.00065
M	As	< 0.02175	M	Eu	< 0.00652	O	Mg	< 0.00003	M	Rh	< 0.00218	M	Tl	< 0.00218
M	Ba	< 0.02175	M	Gd	< 0.00218	O	Mn	< 0.00002	M	Rb	< 0.00218	M	Th	< 0.00218
s	Be		M	Ga	< 0.00218	O	Hg	< 0.01500	M	Ru	< 0.00435	M	Tm	< 0.00087
M	Bi	< 0.00087	M	Ge	< 0.01305	M	Mo	< 0.00435	M	Sm	< 0.00218	M	Sn	< 0.01087
O	B	< 0.01200	M	Au	< 0.00652	M	Nd	< 0.00435	O	Sc	< 0.00009	M	Ti	< 0.10874
M	Cd	< 0.00652	M	Hf	< 0.00435	M	Ni	< 0.65245	M	Se	< 0.01740	M	W	< 0.02175
O	Ca	0.00164	M	Ho	< 0.00109	M	Nb	< 0.00109	O	Si	0.00649	M	U	< 0.00435
M	Ce	< 0.01087	M	In	< 0.02175	n	Os		M	Ag	< 0.00435	M	V	< 0.00435
M	Cs	< 0.00065	M	Ir	< 0.01087	M	Pd	< 0.01087	O	Na	0.00368	M	Yb	< 0.00218
O	Cr	< 0.00900	O	Fe	0.00268	n	P		M	Sr	< 0.00109	M	Y	< 0.08699
M	Co	< 0.00652	M	La	< 0.00109	M	Pt	< 0.00435	i	S		M	Zn	< 0.04350
M	Cu	< 0.01305	M	Pb	< 0.00652	O	K	< 0.10000	M	Ta	< 0.01522	M	Zr	< 0.01087

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 9.01218; +2; 4; $Be'(H_2O)_4'^2$
Chemical Compatibility - Soluble in HCl, HNO_3, H_2SO_4 and HF aqueous matrices. Stable with all metals and inorganic anions.
Stability - 2-100 ppb levels stable for months in 1 % HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 5-10 % HNO_3 / LDPE container.
Be Containing Samples (Preparation and Solution) - Metal (is best dissolved in diluted H_2SO_4); BeO (boiling nitric, hydrochloric, or sulfuric acids or $KHSO_4$ fusion); Ores (H_2SO_4/HF digestion or carbonate fusion in Pt°); Organic Matrices (sulfuric/peroxide digestion or nitric/sulfuric/perchloric acid decomposition, or dry ash and dissolution according to the BeO procedure above).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤ conc.)
ICP-OES 313.042 nm	0.0003 / 0.00009 µg/mL	1	ion	V, Ce, U
ICP-OES 234.861 nm	0.0003 / 0.00016 µg/mL	1	atom	Fe, Ta, Mo
ICP-OES 313.107 nm	0.0007 / 0.0005 µg/mL	1	ion	Ce, Th, Tm
ICP-MS 9 amu	4 ppt	n/a	M'	

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

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 1/8/2005

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 06/01/04
DATE EXPIRED: 06/01/2005 VOS
DATE OPENED: 06/01/04
INORG: 4592 PO: F53393

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

010323

Certificate Prepared By:	Debbie Newman, Production Manager
Certificate Approved By:	Katalin Le, QC Manager
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director

010324

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 Chromium^{+3} in 1.4% HNO_3 (abs)

Catalog Number: CGCR(3)1-1, CGCR(3)1-2 and CGCR(3)1-5

Lot Number: **W-QCR02033**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/5/03
DATE EXPIRED: 12/1/2004 DK
DATE OPENED: 11/5/03
INORG: 4318 PO: FS2258

Starting Material:	Chromium Metal
Starting Material Purity:	99.995%
Starting Material Lot No:	F16I22

CERTIFIED CONCENTRATION: 995 ± 3 µg/mL

The Certified Value is the instrument analysis value. The following equations are used in the calculation of the certified value and the uncertainty:

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

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

***Instrument Analysis:* 995 ± 3 µg/mL (Avg of 3 runs)**
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3112a.

Calculated Value: 1002 µg/mL
Method: Calculated, based on starting material.

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

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

O	Al	0.0028	M	Dy	<0.00060	M	Li	<0.0010	M	Pr	<0.000030	M	Te	<0.0030
M	Sb	<0.000050	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030
M	As	<0.0010	M	Eu	<0.00030	O	Mg	<0.010	M	Rh	<0.00010	M	Tl	<0.00010
M	Ba	<0.0010	M	Gd	<0.00010	O	Mn	<0.050	M	Rb	0.0066	M	Th	<0.00010
M	Be	<0.000050	M	Ga	0.00070	O	Hg	<0.10	M	Ru	0.017	M	Tm	<0.000040
M	Bi	<0.000040	M	Ge	<0.00060	M	Mo	<0.00020	M	Sm	<0.00010	M	Sn	<0.00050
M	B	<0.0070	M	Au	<0.00030	M	Nd	<0.00020	M	Sc	<0.0010	M	Ti	<0.0050
M	Cd	<0.00030	M	Hf	<0.00020	O	Ni	<0.10	i	Se		M	W	<0.0010
O	Ce	0.0011	M	Ho	<0.000050	M	Nb	<0.000050	O	Si	<0.10	M	U	<0.00020
M	Ce	<0.00050	O	In	<0.10	n	Os		M	Ag	0.00070	i	V	
M	Cs	<0.000030	M	Ir	<0.00050	M	Pd	<0.00050	O	Na	0.016	M	Yb	<0.00010
s	Cr		O	Fe	<0.10	i	P		M	Sr	<0.000050	M	Y	<0.0040
O	Co	<0.10	M	La	<0.000050	M	Pt	<0.00020	n	S		O	Zn	<0.10
M	Cu	<0.00060	M	Pb	0.00039	n	K		M	Ta	<0.00070	M	Zr	<0.00050

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

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.010 g/mL

(over)

QA:KSL Rev.080403JTS

Paul R. Haines
Quality Assurance Manager

Expires: EXPIRES 12/2004

QUALITY STANDARD DOCUMENTATION

1. ISO 9001:2000 QMI Registered Quality System (Certificate Number 010105)

   Members of IQ Net : Argentina (**IRAM**), Australia (**QAS**), Austria (**ÖQS**), Belgium (**Avinter**) , Brazil (**FCAV**), Canada (**QMI**), Hong Kong (**HKQAA**), Columbia (**ICONTEC**), Czech Republic (**CQS**), Denmark (**DS**), Finland (**SFS**), France (**AFAQ**), Germany (**DQS**), Greece (**ELOT**), Hungary (**MSZT**), Ireland (**NSAI**), Israel (**SII**), Italy (**CISQ**), Japan (**JQA**), Korea (**KSA-QA**), Netherlands (**KEMA**), Norway (**NCS**), Poland(**PCBC**), Portugal (**APCER**), Singapore (**PSB**), Slovenia (**SIQ**), Spain (**AENOR**), Switzerland (**SQS**)

2. ISO/IEC Guide 34-2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate 883.02
3. ISO/IEC17025-1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate 883.01
4. MIL-STD-45662A
5. 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licencing of Production and Utilization Facilities
6. 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

Please contact our Quality Assurance Department for further information and copies of documents pertaining to our Quality Standard certifications.

STABILITY/ EXPIRATION DOCUMENTATION

Shelf Life - The length of time that a properly stored and packaged standard will remain within the specified uncertainty. Shelf life is affected by chemical stability and transpiration issues. Inorganic Ventures' Standard Solutions are chemically stable indefinitely. Transpiration loss is linear with time and limits the time a standard can be used with confidence. The smaller the bottle the higher the rate of transpiration. Inorganic Ventures' studies indicate that the shelf life of our 500 mL bottle is 4 years and the shelf life of our 125 mL bottle is 21 months.

Expiration Date - The date after which a standard solution should not be used. A one year expiration date is recommended by most state and federal regulatory agencies. Transpiration issues and repeated use of solutions over a one year period may adversely affect the integrity of the standard.

PACKAGING DOCUMENTATION

Purified acid, 18 megohm double deionized water that has been filtered through a 0.2 μm filter and in-house procedure IV-PACK-001 is used to clean all bottles. Contact us for technical information relating to contamination issues in packaging materials.

GLASSWARE CALIBRATION

In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

BALANCE CALIBRATION

All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 428359B and 454678. The NIST test number is 822/260017-98.

All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-8.

THERMOMETER CALIBRATION

The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

TECHNICAL SUPPORT

All customers are encouraged to contact us for technical support for the proper use of our products.

TEL 1-800-569-6799 INT'L 1-732-901-1900 FAX 1-732-901-1903 E-MAIL IVtech@ivstandards.com

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 Copper in 2% (abs) HNO_3**

Catalog Number:	CGCU1-1, CGCU1-2, and CGCU1-5
Lot Number:	**W-CU02064**
Starting Material:	Cu shot
Starting Material Purity (%):	99.999437
Starting Material Lot No	K09C13
Matrix:	2% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 VOID
DATE OPENED: 02/25/04
INORG: 4469 PO: F52323

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1005 ± 2 µg/mL

Certified Density: 1.014 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_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 3114 Lot Number: 891811

Assay Method #2 **1005 ± 2 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al < 0.00090	M Dy < 0.03027	O Li < 0.00002	M Pr < 0.00151	M Te < 0.15134
M Sb < 0.00252	M Er < 0.02522	M Lu < 0.00202	M Re < 0.00504	M Tb < 0.00151
M As < 0.05045	M Eu < 0.01513	O Mg 0.00001	M Rh < 0.00504	M Tl < 0.00504
M Ba < 0.05045	M Gd < 0.00504	M Mn < 0.02018	M Rb < 0.00504	M Th < 0.00504
M Be < 0.00252	M Ga < 0.00504	O Hg < 0.01500	M Ru < 0.01009	M Tm < 0.00202
M Bi < 0.00202	M Ge < 0.03027	M Mo < 0.01009	M Sm < 0.00504	O Sn 0.00439
M B < 0.35312	M Au < 0.01513	M Nd < 0.01009	M Sc < 0.05045	M Ti < 0.25223
M Cd < 0.01513	M Hf < 0.01009	M Ni < 0.04036	M Se < 0.04036	M W < 0.05045
O Ca 0.00011	M Ho < 0.00252	M Nb < 0.00252	O Si < 0.00340	M U < 0.01009
M Ce < 0.02522	M In < 0.05045	n Os	M Ag < 0.01009	O V < 0.00300
M Cs < 0.00151	M Ir < 0.02522	M Pd < 0.02522	O Na 0.00044	M Yb < 0.00504
M Cr < 0.02522	O Fe 0.00054	O P < 0.00260	M Sr < 0.00252	M Y < 0.20178
M Co < 0.01513	M La < 0.00252	M Pt < 0.01009	n S	M Zn < 0.10089
s Cu	M Pb 0.00050	O K < 0.00180	M Ta < 0.03531	M Zr < 0.02522

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

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 - 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 ≤10ppm 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'	$^{46}Ar^{17}Na$ $^{47}Ti^{16}O$, $^{14}N^{13}C^{35}Cl$, $^{16}O^{12}C^{35}Cl$, $^{44}Ca^{19}O$, $^{23}Na^{40}Ca$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

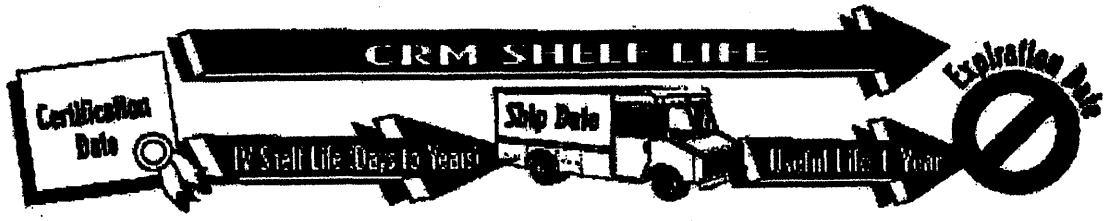
10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg 2 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 V03
DATE OPENED: 02/25/04
INORG: 4469 PO: F52323

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: May 02, 2003

Expiration Date:

EXPIRES
1[illegible]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

010330

inorganic ventures / iv labs

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e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Nickel In 1.4% (abs) HNO_3**

Catalog Number:	CGNI1-1, CGNI1-2, and CGNI1-5
Lot Number:	**W-NI02030**
Starting Material:	Ni pieces
Starting Material Purity (%):	99.999371
Starting Material Lot No	L06L02
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 VDS
DATE OPENED: 02/25/04
INORG: 4472 PO: F52323

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1002 ± 2 µg/mL

Certified Density: 1.011 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **999 ± 5 µg/mL**
ICP Assay NIST SRM 3136 Lot Number: 000612

Assay Method #2 **1002 ± 2 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	< 0.00938	M	Dy	< 0.06577	O	Li	< 0.00006	M	Pr	< 0.00329	M	Te	< 0.32886
M	Sb	< 0.00548	M	Er	< 0.05481	M	Lu	< 0.00439	M	Re	< 0.01096	M	Tb	< 0.00329
O	As	< 0.01689	M	Eu	< 0.03289	O	Mg	0.00002	M	Rh	< 0.01096	M	Tl	< 0.01096
M	Ba	< 0.10962	M	Gd	< 0.01096	M	Mn	< 0.04385	M	Rb	< 0.01096	M	Th	< 0.01096
O	Be	< 0.00626	M	Ga	< 0.01096	O	Hg	< 0.03441	M	Ru	< 0.02192	M	Tm	< 0.00439
M	Bi	< 0.00439	M	Ge	< 0.06577	M	Mo	< 0.02192	M	Sm	< 0.01096	M	Sn	< 0.05481
O	B	< 0.03097	M	Au	< 0.03289	M	Nd	< 0.02192	M	Sc	< 0.10962	M	Ti	< 0.54811
M	Cd	< 0.03289	M	Hf	< 0.02192	S	Ni		O	Se	< 0.01877	M	W	< 0.10962
O	Ca	< 0.01157	M	Ho	< 0.00548	M	Nb	< 0.00548	O	Si	0.00188	M	U	< 0.02192
M	Ce	< 0.05481	M	In	< 0.10962	n	Os		M	Ag	< 0.02192	M	V	< 0.02192
M	Cs	< 0.00329	M	Ir	< 0.05481	M	Pd	< 0.05481	O	Na	0.00102	M	Yb	< 0.01096
M	Cr	< 0.05481	O	Fe	0.00156	O	P	< 0.31280	M	Sr	< 0.00548	M	Y	< 0.43849
O	Co	0.00182	M	La	< 0.00548	M	Pt	< 0.02192	O	S	< 0.07820	M	Zn	0.00189
M	Cu	< 0.06577	M	Pb	< 0.03289	O	K	0.00043	M	Ta	< 0.07674	M	Zr	< 0.05481

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 58.69; +2; 6; $Ni(H_2O)_6^{2+}$
Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, HF, H_3PO_4. Avoid basic media. Stable with most metals and inorganic anions in acidic media.
Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.
Ni Containing Samples (Preparation and Solution) - Metal (Soluble in HNO_3); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO_3).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤50ppm.)
ICP-OES	221.647 nm	0.01 / 0.0009 µg/mL	1	ion	Si
ICP-OES	232.003 nm	0.02 / 0.006 µg/mL	1	atom	Cr, Re, Os, Nb, Ag, Pt, Fe
ICP-OES	231.604 nm	0.02 / 0.002 µg/mL	1	ion	Sb, Ta, Co
ICP-MS	60 amu	100 ppt	n/a	M+	$^{44}Ca^{16}O^{1}H$, $^{44}Ca^{16}O$, $^{23}Na^{37}Cl$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: July 23, 2003

Expiration Date:

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 VOID
DATE OPENED: 02/25/04
INORG: 4472 PO: F52323

EXPIRES
1 MAR 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

010333

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

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inorganic ventures / iv labs

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certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** *The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."*

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Boron in H_2O**

Catalog Number:	CGB1-1, CGB1-2, and CGB1-5
Lot Number:	**W-B02042**
Starting Material:	H3BO3
Starting Material Purity (%):	99.999998
Starting Material Lot No	OV0133
Matrix:	H_2O

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 07/31/03
DATE EXPIRED: 08/01/2004 V05
DATE OPENED: 08/01/03
INORG: 4201 PO: E53383

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 999 ± 2 µg/mL

Certified Density: 1.001 g/mL (measured at 22° C)

The Certified Value is the instrument analysis value. The following equations are used in the calculation of the certified value and the uncertainty:

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

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

$\bar{x}$ = 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 3107 Lot Number: 991907

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al < 0.00090	M Dy < 0.00600	O Li < 0.00002	M Pr < 0.00030	M Te < 0.03000
M Sb < 0.00050	M Er < 0.00500	M Lu < 0.00040	M Re < 0.00100	M Tb < 0.00030
M As < 0.01000	M Eu < 0.00300	O Mg < 0.00006	M Rh < 0.00100	M Tl < 0.00100
O Ba < 0.00010	M Gd < 0.00100	O Mn < 0.00002	M Rb < 0.00100	M Th < 0.00100
O Be < 0.00017	O Ga < 0.00160	O Hg < 0.01500	M Ru < 0.00200	M Tm < 0.00040
M Bi < 0.00040	M Ge < 0.00600	M Mo < 0.00200	M Sm < 0.00100	M Sn < 0.00500
s B	M Au < 0.00300	M Nd < 0.00200	O Sc < 0.00002	M Ti < 0.05000
M Cd < 0.00300	M Hf < 0.00200	O Ni < 0.00230	O Se < 0.00620	M W < 0.01000
O Ca < 0.00007	M Ho < 0.00050	M Nb < 0.00050	O Si 0.00067	M U < 0.00200
O Ce < 0.00300	M In < 0.01000	n Os	M Ag < 0.00200	O V < 0.00083
M Cs < 0.00030	M Ir < 0.00500	M Pd < 0.00500	O Na < 0.00010	M Yb < 0.00100
M Cr < 0.00500	O Fe < 0.00110	O P < 0.00250	M Sr < 0.00050	M Y < 0.04000
O Co < 0.00110	M La < 0.00050	M Pt < 0.00200	O S < 0.10000	O Zn < 0.00019
M Cu < 0.00600	M Pb < 0.00300	O K < 0.00300	M Ta < 0.00700	M Zr < 0.00500

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

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Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 10.811; +3; 4; $B(OH)_3$ and $B(OH)_4^-$
Chemical Compatibility - Moderately soluble in HCl, HNO_3, H_2SO_4 and HF aqueous matrices and very soluble in NH_4OH. Stable with all metals and inorganic anions at low to moderate ppm levels.
Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-1,000 ppm solutions chemically stable for years in 1% HNO_3 / LDPE container. 1000 -10,000 ppm stable for years in dilute NH_4OH / LDPE container.
B Containing Samples (Preparation and Solution) - Metal (Crystalline form is scarcely attacked by acids or alkaline solutions; amorphous form is soluble in conc. HNO_3 or H_2SO_4.); $B(OH)_3$ (water soluble); Ores(avoid acid digestions and use caustic fusions in Pt-); Organic Matrices (dry ash mixed with Na_2CO_3 in Pt-el 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 ≤1ppm.)
ICP-OES 249.773 nm	0.003 / 0.001 µg/mL	1	atom	W, Ce, Co, Th, Ta, Mn, Mo, Fe
ICP-OES 249.678 nm	0.004 / 0.003 µg/mL	1	atom	Os, W, Co, Cr, Hf
ICP-OES 208.959 nm	0.007 / 0.0005 µg/mL	1	atom	Mo
ICP-MS 11 amu	700 ppt	n/a	M+	

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

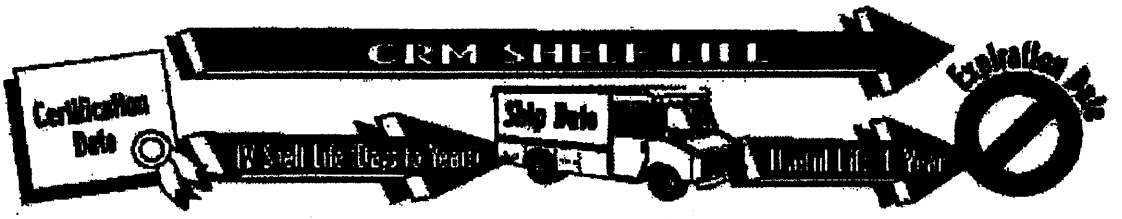
10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 07/31/03
DATE EXPIRED: 08/01/2004 VOS
DATE OPENED: 08/01/03
INORG: 4201 PO: F52383

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010337



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: March 21, 2003

Expiration Date: EXPIRES 1-2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: JoAnn Struthers, QA Administrative Assistant

Certificate Approved By: Katalin Le, QC Supervisor

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

010338

inorganic ventures / iv labs

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phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Molybdenum in H_2O tr. NH_4OH**

Catalog Number:	CGMO1-1, CGMO1-2, and CGMO1-5
Lot Number:	**W-MO01132**
Starting Material:	(NH4)6Mo7O24xH2O
Starting Material Purity (%):	99.995947
Starting Material Lot No	21410
Matrix:	H_2O tr. NH_4OH

INORGANIC LABS/RADCHEM LABS P3.1 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 VOS
DATE OPENED: 02/25/04
INORG: 4471 PO: F52323

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1004 ± 2 µg/mL

Certified Density: 0.998 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_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 3134 Lot Number: 891307

Assay Method #2 **1008 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al < 0.05000	M Dy < 0.01198	O Li < 0.01000	O Pr < 0.10000	i Te
M Sb 0.00939	M Er < 0.00998	M Lu < 0.00080	M Re < 0.00200	M Tb < 0.00060
M As < 0.01997	M Eu < 0.00599	O Mg < 0.05000	M Rh < 0.00200	M Tl < 0.00200
M Ba < 0.01997	M Gd < 0.00200	M Mn < 0.00799	M Rb 0.02445	M Th < 0.00200
M Be < 0.00100	M Ga < 0.00200	i Hg	M Ru < 0.00399	M Tm < 0.00080
M Bi < 0.00080	M Ge < 0.01198	s Mo	M Sm < 0.00200	M Sn < 0.00998
O B < 0.50000	M Au < 0.00599	O Nd < 0.05000	O Sc < 0.05000	O Ti < 0.00500
O Cd < 0.50000	M Hf < 0.00399	M Ni < 0.01597	M Se < 0.01597	M W 0.05576
O Ca 0.00026	M Ho < 0.00100	O Nb < 0.10000	O Si < 0.10000	M U < 0.00399
O Ce < 0.05000	M In 0.00235	n Os	M Ag < 0.00399	M V < 0.00399
M Cs < 0.00060	M Ir < 0.00998	M Pd < 0.00998	O Na < 0.10000	M Yb < 0.00200
M Cr < 0.00998	O Fe < 0.50000	i P	M Sr < 0.00100	M Y < 0.07987
M Co < 0.00599	M La < 0.00100	M Pt < 0.00399	i S	M Zn < 0.03993
M Cu < 0.01198	M Pb < 0.00599	O K 0.00980	M Ta < 0.01398	M Zr < 0.00998

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do 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 et «Bonics.)
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+	$^{40}Ar^{55}K^{16}O$, $^{79}Br^{16}O$, $^{190}Os^{+}$, $^{190}Pt^{+}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg 2 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 v03
DATE OPENED: 02/25/04
INORG: 4471 PO: F52303

010341

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: July 23, 2003

Expiration Date:

EXPIRES
1 MAR 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010342

inorganic ventures / iv labs

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phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

CUSTOM-GRADE SOLUTION 1000 µg/mL 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.010604DH

Paul R. Haines
Quality Assurance Manager

Expires: EXPIRES 1 JUN 2005

QUALITY STANDARD DOCUMENTATION

1. ISO 9001:2000 QMI Registered Quality System (Certificate Number 010105)

   Members of IQ Net : Argentina **(IRAM)**, Australia **(QAS)**, Austria **(ÖQS)**, Belgium **(Avinter)** , Brazil **(FCAV)**, Canada **(QMI)**, Hong Kong **(HKQAA)**, Columbia **(ICONTEC)**, Czech Republic **(CQS)**, Denmark **(DS)**, Finland **(SFS)**, France **(AFAQ)**, Germany **(DQS)**, Greece **(ELOT)**, Hungary **(MSZT)**, Ireland **(NSAI)**, Israel **(SII)**, Italy **(CISQ)**, Japan **(JQA)**, Korea **(KSA-QA)**, Netherlands **(KEMA)**, Norway **(NCS)**, Poland**(PCBC)**, Portugal **(APCER)**, Singapore **(PSB)**, Slovenia **(SIQ)**, Spain **(AENOR)**, Switzerland **(SQS)**

2. ISO/IEC Guide 34-2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate 883.02
3. ISO/IEC17025-1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate 883.01
4. MIL-STD-45662A
5. 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licencing of Production and Utilization Facilities
6. 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

Please contact our Quality Assurance Department for further information and copies of documents pertaining to our Quality Standard certifications.

STABILITY/ EXPIRATION DOCUMENTATION

Shelf Life - The length of time that a properly stored and packaged standard will remain within the specified uncertainty. Shelf life is affected by chemical stability and transpiration issues. Inorganic Ventures' Standard Solutions are chemically stable indefinitely. Transpiration loss is linear with time and limits the time a standard can be used with confidence. The smaller the bottle the higher the rate of transpiration. Inorganic Ventures' studies indicate that the shelf life of our 500 mL bottle is 4 years and the shelf life of our 125 mL bottle is 21 months.

Expiration Date - The date after which a standard solution should not be used. A one year expiration date is recommended by most state and federal regulatory agencies. Transpiration issues and repeated use of solutions over a one year period may adversely affect the integrity of the standard.

PACKAGING DOCUMENTATION

Purified acid, 18 megohm double deionized water that has been filtered through a 0.2 μm filter and in-house procedure IV-PACK-001 is used to clean all bottles. Contact us for technical information relating to contamination issues in packaging materials.

GLASSWARE CALIBRATION

In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

BALANCE CALIBRATION

All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 428359B and 454678. The NIST test number is 822/260017-98.

All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-8.

THERMOMETER CALIBRATION

The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceabl to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

TECHNICAL SUPPORT

All customers are encouraged to contact us for technical support for the proper use of our products.

TEL 1-800-569-6799 INT'L 1-732-901-1900 FAX 1-732-901-1903 E-MAIL IVtech@ivstandards.com

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inorganic ventures / iv labs
195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Silicon in H_2O tr. HNO_3 tr. HF**

Catalog Number:	CGSI1-1, CGSI1-2, and CGSI1-5
Lot Number:	**W-SI02082**
Starting Material:	SiO2
Starting Material Purity (%):	99.996367
Starting Material Lot No	C05310C
Matrix:	H_2O tr. HNO_3 tr. HF

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 01/30/04
DATE EXPIRED: 02/01/2005 VOS
DATE OPENED: 01/30/04
INORG: 4437 PO: F52303

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1000 ± 5 µg/mL

Certified Density: 1.002 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1000 ± 5 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3150 Lot Number: 991108

Assay Method #2 **1001 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al 0.02730	M Dy < 0.01358	O Li < 0.00009	M Pr < 0.00068	M Te < 0.06791
M Sb < 0.00113	M Er < 0.01132	M Lu < 0.00091	M Re < 0.00226	M Tb < 0.00068
M As < 0.02264	M Eu < 0.00679	O Mg < 0.04991	M Rh < 0.00226	M Tl < 0.00226
M Ba < 0.02264	M Gd < 0.00226	M Mn < 0.00906	M Rb < 0.00226	M Th < 0.00226
O Be < 0.00091	M Ga < 0.00226	O Hg < 0.04991	M Ru < 0.00453	M Tm < 0.00091
M Bi < 0.00091	M Ge < 0.01358	M Mo < 0.00453	M Sm < 0.00226	M Sn < 0.01132
O B 0.02409	M Au < 0.00679	M Nd < 0.00453	O Sc < 0.00091	O Ti 0.01325
M Cd < 0.00679	M Hf < 0.00453	O Ni < 0.01044	M Se < 0.01811	M W < 0.02264
O Ca 0.00135	M Ho < 0.00113	M Nb < 0.00113	s Si	M U < 0.00453
M Ce < 0.01132	M In < 0.02264	n Os	M Ag < 0.00453	O V < 0.00408
M Cs < 0.00068	M Ir < 0.01132	M Pd < 0.01132	O Na 0.02008	M Yb < 0.00226
O Cr < 0.00681	O Fe < 0.00499	O P < 0.02269	O Sr < 0.00032	M Y < 0.09055
M Co < 0.00679	M La < 0.00113	M Pt < 0.00453	O S < 0.11342	M Zn < 0.04528
O Cu < 0.00454	M Pb < 0.00679	O K < 0.00771	M Ta 0.00200	M Zr < 0.01132

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 28.0855; +4; 6; $Si(OH)_x(F)_y^{2-}$

Chemical Compatibility - Soluble in HCl, HF, H_3PO_4, H_2SO_4 and HNO_3 as the $Si(OH)_x(F)_y^{2-}$. Avoid neutral to basic media. Unstable at ppm levels with metals that would pull F^- away (i.e. Do not mix with Alkaline or Rare Earths, or high levels of transition elements unless they are fluorinated). Stable with most inorganic anions with a tendency to hydrolyze forming silicic acid (silicic acid is soluble up to ~100 ppm in water) in all dilute acids except HF.

Stability - 2-100 ppb levels - stability unknown - (alone or mixed with all other metals) as the $Si(OH)_x(F)_y^{2-}$. 1-10,000 ppm single element solutions as the $Si(OH)_x(F)_y^{2-}$ chemically stable for years in 2-5 % HNO_3 / trace HF in a LDPE container.

Si Containing Samples (Preparation and Solution) - Metal (Soluble in 1:1:1 H_2O / HF /HNO_3); Oxide - SiO_2, amorphic (Dissolve by heating in 1:1:1 H_2O / HF /HNO_3); Oxide - quartz (Fuse in Pt^0 with Na_2CO_3); Geological Samples (Fuse in Pt^0 with Na_2CO_3 followed by HCl solution of the fuseate); Organic Matrices containing silicates and non volatile silicon compounds (Dry ash at 450°C in Pt^0 and dissolve by gently warming with 1:1:1 H_2O / HF / H_2SO_4 or fuse / ash with Na_2CO_3 and dissolve fuseate with HCl / H_2O); Silicone Oils - dimethyl silicones depolymerize to form volatile monomer units when heated (Measure directly in alcoholic KOH / xylene mixture where sample is treated first with the KOH at 60-100 °C to "unzip" the Si-O-Si polymeric structure or digest with concentrated H_2SO_4/H_2O_2 followed by cooling and dissolution of the dehydrated silica with HF.) Note that the direct analysis of silicone oils in an organic solvent will result in false high results due to high vapor pressure of volatile monomer units like hexamethylcyclotrisiloxane. The KOH forms the $K_2^+Si(CH_3)_2O^-$ salt which is not volatile at room temperature.

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe interferences.)
ICP-OES	251.611 nm	0.012 / 0.003 µg/mL	1	ion	Ta, U, Zn, Th
ICP-OES	212.412 nm	0.02 / 0.01 µg/mL	1	ion	Hf, Os, Mo, Ta
ICP-OES	288.158 nm	0.03 / 0.004 µg/mL	1	ion	Ta, Ce, Cr, Cd, Th
ICP-MS	28 amu	4000 - 8000 ppt	n/a	M+	$^{14}N_2$, $^{12}C^{16}O$

HF Note: This standard should not be prepared or stored in glass.

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"
• Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"
• Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission
- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg 2 of 2
DATE RECEIVED: 01/20/04
DATE EXPIRED: 02/01/2005 V05
DATE OPENED: 01/20/04
INORG: 4437 PO: F52303

010347

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: February 24, 2003

Expiration Date: EXPIRES FEB 2005

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 Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

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inorganic ventures / iv labs

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e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

CUSTOM-GRADE SOLUTION 1000 µg/mL Titanium in 1.4% HNO_3 (abs) tr. HF

Catalog Number: CGTI1-1, CGTI1-2 and CGTI1-5

This standard should **not** be prepared or stored in glass.

Lot Number: **T-TI02039**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/24/03
DATE EXPIRED: 12/01/2004 v05
DATE OPENED: 11/25/03
INORG: 4339 PO: F52979

Starting Material:	Titanium Metal
Starting Material Purity:	99.999%
Starting Material Lot No:	F29I14

CERTIFIED CONCENTRATION: 1010 ± 3 µg/mL

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

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

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

Calculated Value: 1002 µg/mL
Method: Calculated, based on starting material.

Instrument Analysis: 1010 ± 3 µg/mL (Average of 3 runs)
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3162a.

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

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

O	Al	<0.010	M	Dy	<0.00060	M	Li	<0.0010	M	Pr	<0.000030	M	Ta	<0.0030
M	Sb	<0.000050	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030
M	As	<0.0010	M	Eu	<0.00030	O	Mg	< 0.020	M	Rh	<0.00010	M	Tl	<0.00010
M	Ba	<0.0010	M	Gd	<0.00010	M	Mn	0.0020	M	Rb	<0.00010	M	Th	<0.00010
M	Be	<0.000050	M	Ga	<0.00010	O	Hg	<0.050	M	Ru	<0.00020	M	Tm	<0.000040
M	Bi	<0.000040	M	Ge	<0.00060	M	Mo	<0.00020	M	Sm	<0.00010	M	Sn	<0.00050
O	B	<0.050	M	Au	<0.00030	M	Nd	<0.00020	O	Sc	<0.0020	s	Ti	
M	Cd	<0.00030	M	Hf	<0.00020	O	Ni	<0.050	O	Se	<0.40	M	W	<0.0010
O	Ca	<0.010	M	Ho	<0.000050	M	Nb	<0.000050	O	Si	<0.010	M	U	<0.00020
M	Ce	<0.00050	O	In	<0.020	n	Os		M	Ag	<0.00020	M	V	<0.00020
M	Cs	<0.000030	M	Ir	<0.00050	M	Pd	<0.00050	O	Na	0.12	M	Yb	<0.00010
M	Cr	<0.00050	O	Fe	<0.010	i	P		M	Sr	<0.000050	M	Y	<0.0040
M	Co	<0.00030	M	La	<0.000050	M	Pt	<0.00020	i	S		M	Zn	0.19
O	Cu	<0.040	M	Pb	<0.00030	n	K	0.23	M	Ta	<0.00070	M	Zr	<0.00050

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

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.011 g/mL

QA:KL Rev.06050320N

(over)

Paul R. Haines
Quality Assurance Manager

Expires:

EXPIRES 12/2004

QUALITY STANDARD DOCUMENTATION

1. ISO 9001:2000 QMI Registered Quality System (Certificate Number 010105)

   Members of IQ Net : Argentina (**IRAM**), Australia (**QAS**), Austria (**ÖQS**), Belgium (**Avinter**) , Brazil (**FCAV**), Canada (**QMI**), Hong Kong (**HKQAA**), Columbia (**ICONTEC**), Czech Republic (**CQS**), Denmark (**DS**), Finland (**SFS**), France (**AFAQ**), Germany (**DQS**), Greece (**ELOT**), Hungary (**MSZT**), Ireland (**NSAI**), Israel (**SII**), Italy (**CISQ**), Japan (**JQA**), Korea (**KSA-QA**), Netherlands (**KEMA**), Norway (**NCS**), Poland(**PCBC**), Portugal (**APCER**), Singapore (**PSB**), Slovenia (**SIQ**), Spain (**AENOR**), Switzerland (**SQS**)

2. ISO/IEC Guide 34-2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate 883.02
3. ISO/IEC17025-1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate 883.01
4. MIL-STD-45662A
5. 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licencing of Production and Utilization Facilities
6. 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

Please contact our Quality Assurance Department for further information and copies of documents pertaining to our Quality Standard certifications.

STABILITY/ EXPIRATION DOCUMENTATION

Shelf Life - The length of time that a properly stored and packaged standard will remain within the specified uncertainty. Shelf life is affected by chemical stability and transpiration issues. Inorganic Ventures' Standard Solutions are chemically stable indefinitely. Transpiration loss is linear with time and limits the time a standard can be used with confidence. The smaller the bottle the higher the rate of transpiration. Inorganic Ventures' studies indicate that the shelf life of our 500 mL bottle is 4 years and the shelf life of our 125 mL bottle is 21 months.

Expiration Date - The date after which a standard solution should not be used. A one year expiration date is recommended by most state and federal regulatory agencies. Transpiration issues and repeated use of solutions over a one year period may adversely affect the integrity of the standard.

PACKAGING DOCUMENTATION

Purified acid, 18 megohm double deionized water that has been filtered through a 0.2 μm filter and in-house procedure IV-PACK-001 is used to clean all bottles. Contact us for technical information relating to contamination issues in packaging materials.

GLASSWARE CALIBRATION

In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

BALANCE CALIBRATION

All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 428359B and 454678. The NIST test number is 822/260017-98.

All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-8.

THERMOMETER CALIBRATION

The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

TECHNICAL SUPPORT

All customers are encouraged to contact us for technical support for the proper use of our products.

TEL 1-800-569-6799 INT'L 1-732-901-1900 FAX 1-732-901-1903 E-MAIL IVtech@ivstandards.com

010350

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** *The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."*

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Strontium in 0.1% (abs) HNO_3**

Catalog Number:	CGSR1-1, CGSR1-2, and CGSR1-5
Lot Number:	**T-SR01123**
Starting Material:	$SrCO_3$
Starting Material Purity (%):	99.9951
Starting Material Lot No	22593
Matrix:	0.1% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 06/20/03
DATE EXPIRED: 07/01/2004 VOS
DATE OPENED: 06/23/03
INORG: 4154 PO: F52370

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 998 ± 2 µg/mL

Certified Density: 1.000 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
$\sum S$ = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

- "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)
- This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **998 ± 2 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

Assay Method #2 **1002 ± 8 µg/mL**
ICP Assay NIST SRM 3153a Lot Number: 990906

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	< 0.00090	M	Dy	< 0.00600	O	Li	< 0.00003	M	Pr	< 0.00030	O	Te	< 0.10000
M	Sb	< 0.00050	M	Er	< 0.00500	M	Lu	< 0.00040	M	Re	< 0.00100	M	Tb	< 0.00030
O	As	< 0.00500	M	Eu	< 0.00300	O	Mg	0.00037	O	Rh	< 0.00600	M	Tl	< 0.00100
M	Ba	0.04001	M	Gd	< 0.00100	O	Mn	0.00018	I	Rb		M	Th	< 0.00100
O	Be	< 0.00009	M	Ga	< 0.00100	O	Hg	< 0.01500	O	Ru	< 0.00300	M	Tm	< 0.00040
M	Bi	< 0.00040	M	Ge	< 0.00600	M	Mo	< 0.00200	M	Sm	< 0.00100	M	Sn	< 0.00500
O	B	< 0.00060	M	Au	< 0.00300	M	Nd	< 0.00200	M	Sc	< 0.01000	M	Ti	< 0.05001
M	Cd	< 0.00300	M	Hf	< 0.00200	O	Ni	< 0.00300	O	Se	< 0.05000	M	W	< 0.01000
O	Ca	0.03600	M	Ho	< 0.00050	M	Nb	< 0.00050	O	Si	0.00056	M	U	< 0.00200
M	Ce	< 0.00500	O	In	< 0.00200	n	Os		M	Ag	< 0.00200	M	V	< 0.00200
M	Cs	< 0.00030	M	Ir	< 0.00500	O	Pd	< 0.00400	O	Na	0.00520	M	Yb	< 0.00100
O	Cr	< 0.00080	O	Fe	0.00080	O	P	< 0.00480	s	Sr		O	Y	< 0.00004
M	Co	< 0.00300	M	La	< 0.00050	M	Pt	< 0.00200	n	S		M	Zn	< 0.02000
O	Cu	< 0.00140	M	Pb	< 0.00300	O	K	< 0.00170	M	Ta	< 0.00700	M	Zr	< 0.00500

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 87.62; +2; 6; $Sr(H_2O)_6^{+2}$
Chemical Compatibility - Soluble in HCl, and HNO_3. Avoid H_2SO_4, HF and neutral to basic media. Stable with most metals and inorganic anions forming insoluble silicate, carbonate, hydroxide, oxide, fluoride, sulfate, oxalate, chromate, arsenate and tungstate in neutral aqueous media.
Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1 - 3.5% HNO_3 / LDPE container.
Sr Containing Samples (Preparation and Solution) - Metal (Best dissolved in diluted HNO_3); Ores (Carbonate fusion in Pt° followed by HCl dissolution); Organic Matrices (Dry ash and dissolution in dilute HCl).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at = concs.)
ICP-OES	407.771 nm	0.0004 / 0.00006 µg/mL	1	ion	U, Ce
ICP-OES	421.552 nm	0.0008 / 0.00004 µg/mL	1	ion	Rb
ICP-OES	460.733 nm	0.07 / 0.003 µg/mL	1	atom	Ce
ICP-MS	88 amu	1200 ppt	n/a	M+	$^{71}Ge^{16}O$, $^{176}Yb^{+2}$, $^{176}Lu^{+2}$, $^{176}Hf^{+2}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

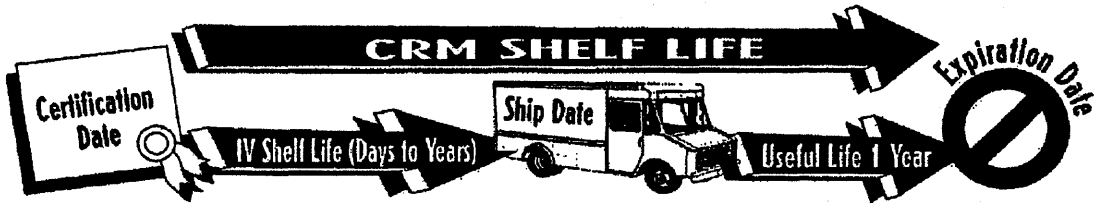
10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: October 31, 2002

Expiration Date: EXPIRES 01 2004

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 06/20/03
DATE EXPIRED: 07/01/2004 YES
DATE OPENED: 06/23/03
INORG: 4154 PO: F52370

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Debbie Newman, QA Administrator

Certificate Approved By: Katalin Le, QC Supervisor

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

010354

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Tin in H_20 tr. HNO_3 tr. HF**

Catalog Number:	CGSN1-1, CGSN1-2, and CGSN1-5
Lot Number:	**X-SN01115**
Starting Material:	Sn Shot
Starting Material Purity (%):	99.999438
Starting Material Lot No	G12M23
Matrix:	H_20 tr. HNO_3 tr. HF

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 995 ± 2 µg/mL

Certified Density: 0.998 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

□ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

□ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **995 ± 2 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3161a Lot Number: 993107

Assay Method #2 **998 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 03/30/04
DATE EXPIRED: 04/01/2005 VOS
DATE OPENED: 03/30/04
INORG: 4512 PO: E53361

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al 0.00050	M Dy < 0.01205	Q 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	Q 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	Q Hg < 0.01500	M Ru < 0.00402	M Tm < 0.00080
M Bi < 0.00080	M Ge < 0.01205	M Mo < 0.00402	M Sm < 0.00201	s Sn
O B < 0.01200	M Au < 0.00603	M Nd < 0.00402	M Sc < 0.02009	M Ti < 0.10043
O Cd 0.00009	M Hf < 0.00402	Q Ni < 0.01000	M Se < 0.01607	M W < 0.02009
O Ca < 0.00150	M Ho < 0.00100	M Nb < 0.00100	Q Si < 0.00340	M U < 0.00402
M Ce < 0.01004	M In < 0.02009	n Os	M Ag < 0.00402	M V < 0.00402
M Cs < 0.00060	M Ir < 0.01004	M Pd < 0.01004	Q Na < 0.00010	M Yb < 0.00201
M Cr < 0.01004	O Fe < 0.00110	Q P < 0.00500	M Sr < 0.00100	M Y < 0.08035
Q 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	Q 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 at ≤ 50 ppm concs.)
ICP-OES 189.989 nm	0.03 / 0.003 µg/mL	1	ion	
ICP-OES 242.949 nm	0.1 / 0.01 µg/mL	1	atom	W, Mo, Rh, Ta, Co
ICP-MS 120 amu	5 ppt	n/a	M⁺	^{240}Te, $^{104}Ru^{16}O$, $^{104}Pd^{16}O$

HF Note: This standard should not be prepared or stored in glass.

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

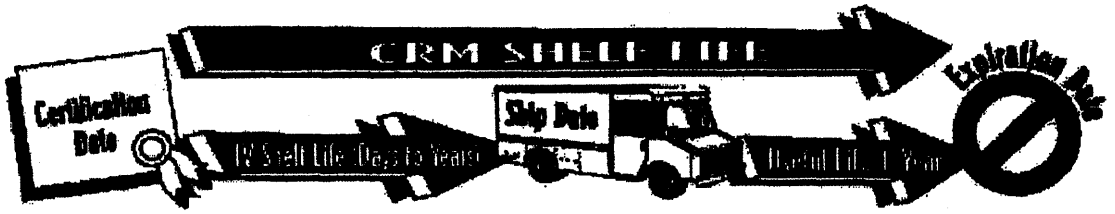
10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg 2 of 2
DATE RECEIVED: 03/30/04
DATE EXPIRED: 04/01/2005 VOS
DATE OPENED: 03/30/04
INORG: 4512 PO: E53361

010357

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: February 11, 2004

Expiration Date: EXPIRES 1 A 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

010358

inorganic ventures / iv labs

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phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Bismuth in 3.5% (abs) HNO_3**

Catalog Number:	CGBI1-1 and CGBI1-5
Lot Number:	**W-BI01089**
Starting Material:	Bi needles
Starting Material Purity (%):	99.999090
Starting Material Lot No	G25L16
Matrix:	3.5% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 07/31/03
DATE EXPIRED: 08/01/2004 VOS
DATE OPENED: 08/01/03
INORG: 4300 PO: F52383

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1002 ± 4 µg/mL

Certified Density: 1.026 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

□ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

□ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1002 ± 4 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3106 Lot Number: 991212

Assay Method #2 **1002 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.00012	M	Dy	< 0.01202	O	Li	< 0.00002	M	Pr	< 0.00060	M	Te	< 0.06008
M	Sb	< 0.00100	M	Er	< 0.01001	M	Lu	< 0.00080	M	Re	< 0.00200	M	Tb	< 0.00060
M	As	< 0.02003	M	Eu	< 0.00601	O	Mg	0.00070	M	Rh	< 0.00200	M	Tl	< 0.00200
M	Ba	< 0.02003	M	Gd	< 0.00200	O	Mn	< 0.00020	M	Rb	< 0.00200	M	Th	< 0.00200
M	Be	< 0.00100	M	Ga	< 0.00200	O	Hg	< 0.01500	M	Ru	< 0.00401	M	Tm	< 0.00080
s	Bi		M	Ge	< 0.01202	M	Mo	< 0.00401	M	Sm	< 0.00200	M	Sn	< 0.01001
M	B	< 0.14018	M	Au	< 0.00601	M	Nd	< 0.00401	M	Sc	< 0.02003	M	Ti	< 0.10013
O	Cd	0.00017	M	Hf	< 0.00401	M	Ni	< 0.01602	M	Se	< 0.01602	M	W	< 0.02003
O	Ca	0.00245	M	Ho	< 0.00100	M	Nb	< 0.00100	O	Si	0.00105	M	U	< 0.00401
M	Ce	< 0.01001	O	In	0.00105	n	Os		M	Ag	< 0.00401	M	V	< 0.00401
M	Cs	< 0.00060	M	Ir	< 0.01001	O	Pd	< 0.00400	O	Na	0.00240	M	Yb	< 0.00200
O	Cr	0.00020	O	Fe	0.00014	O	P	< 0.01000	M	Sr	< 0.00100	M	Y	< 0.08011
M	Co	< 0.00601	M	La	< 0.00100	M	Pt	< 0.00401	O	S	< 0.03000	O	Zn	0.00008
O	Cu	0.00014	O	Pb	0.00135	O	K	0.00039	M	Ta	< 0.01402	M	Zr	< 0.01001

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

010360

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do nd return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 208.9804; +3; 6 ;$Bi(OH_2)_6^{3+}$
Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4 and HF. **Avoid** basic media forming insoluble hydroxide. Stable with most metals and inorganic anions in acidic media. Many salts that are insoluble in water are soluble in HCl, HNO_3 and HF. The major problem with Bi^{3+} is its tendency to hydrolyze at higher concentrations or in dilute acid. Nitric acid solutions should be 5% to hold the Bi in solution in the 100 to 10000 µg/mL concentration range
Stability - 2-100 ppb levels stable for months in 1 % HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 5 - 7% HNO_3 / LDPE container.
Bi Containing Samples (Preparation and Solution) - Metal (soluble in HNO_3); Oxides (Soluble in HNO_3); Alloys (Dissolve in conc. 4:1 HCl /HNO_3. Heating may be required.); Organic based (dry ash at 450°C and dissolve ash in HNO_3 or acid digestion with conc. hot sulfuric acid adding hydrogen peroxide dropwise and carefully until clear.)
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe interfs.)
ICP-OES	223.061 nm	0.04 / 0.005 µg/mL	1	atom	Th, Ir, Tl Cu
ICP-OES	306.772 nm	0.08 / 0.01 µg/mL	1	atom	Th, U, Zr, Hf, Fe
ICP-OES	222.825 nm	0.1 / 0.02 µg/mL	1	atom	Cr, Hf, Ce, Os
ICP-MS	209 amu	2 ppt	n/a	M+	$^{193}Ir^{16}O$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 07/31/03
DATE EXPIRED: 08/01/2004 VOS
DATE OPENED: 08/01/03
INORG: 4200 PO: F52383

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010361

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: March 28, 2003

Expiration Date: EXPIRES 1-2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010362

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040521-6
SRR: 25943
SDG: 245108
CASE: CNWRA
VTSR: May 20, 2004
PROJECT#: 06002.01.141

Pipette Calibrations

Book/Page: 03 031

010363

SwRI – Div. 01, Inorganic Labs' Fixed Volume Pipette Verification Log

(Space provide for Inorganic Laboratories' Fixed Volume Pipette Verification Spreadsheet)

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	1.0088	1.0069	1.0055	1.01	100.71
TMA1	1000	1.0043	1.0018	1.0023	1.00	100.28
TMA2	1000	1.0064	1.005	1.0048	1.01	100.54
TMA3	1000	OUT	OF	SERVICE		
TMA6	1000	NOT	FOUND			
TMB1	900	0.9014	0.9018	0.9005	0.90	100.14
TMC1	800	0.7999	0.8004	0.8014	0.80	100.07
TMDD1	750	0.7543	0.7532	0.7538	0.75	100.50
TMD1	700	0.6974	0.6946	0.6936	0.70	99.31
TMD2	700	0.7059	0.7054	0.7058	0.71	100.81
TME1	600	0.5979	0.5961	0.5948	0.60	99.38
TMF2	500	0.5	~~0.4965~~ 0.4956	0.4969	0.50	~~99.56~~ 99.50 VOS 07/01/04
TMF5	500	0.5039	0.5035	0.5022	0.50	100.64
ICF1	500	0.4974	0.4971	0.4954	0.50	99.33
L30-500	500	0.5038	0.5015	0.501	0.50	100.42
TMG3	400	0.3941	0.3949	0.3953	0.39	98.69
TMH1	300	OUT	OF	SERVICE		
TMH2	300	0.2974	0.2971	0.2959	0.30	98.93
TMJ1	250	0.2484	0.248	0.2481	0.25	99.27
TMJ2	250	0.2487	0.2484	0.2485	0.25	99.41
TMJ3	250	0.2501	0.2495	0.2491	0.25	99.83
TMK2	200	0.2007	0.2007	0.2006	0.20	100.33
TML1	150	0.1487	0.1488	0.1486	0.15	99.13
TMM1	120	0.1206	0.1206	0.1202	0.12	100.39
TMN3	100	0.1001	0.1	0.1	0.10	100.03
ICN1	100	0.1005	0.1005	0.1009	0.10	100.63
TMQ1	80	0.08	0.0797	0.0799	0.08	99.83
TMR1	70	OUT	OF	SERVICE		
TMS1	60	OUT	OF	SERVICE		
LAB-30A	50	NOT	FOUND			
TMU1	40	0.0398	0.0398	0.0403	0.04	99.92
TMU2	40	0.0397	0.0396	0.0395	0.04	99.00
TMV1	30	0.0297	0.0296	0.0297	0.03	98.89
L30-20	20	0.0203	0.0203	0.0202	0.02	101.33
TMW1	25	0.0253	0.0249	0.025	0.03	100.27
TMY1	15	OUT	OF	SERVICE		

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010364

SwRI - Div. 01, Inorganic Labs' Fixed Volume Pipette Verification Log

Balance #: 34 Thermometer #: G011 diH20 Temperature (°C): 21

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
Lab30	1000	1.0086	1.0069	1.0055
TMA1	1000	1.0043	1.0018	1.0023
TMA2	1000	1.0064	1.005	1.0048
TMA3	1000	OUT	OF	SERVICE
TMA6	1000	NOT	FOUND	
TMB1	900	.9014	.9018	.9005
TMC1	800	.7999	.8004	.8014
TMDD1	750	.7543	.7532	.7538
TMD1	700	.6974	.6946	.6936
TMD2	700	.7059	.7054	.7058
TME1	600	.5979	.5961	.5948
TMF2	500	.5000	.4956	.4969
TMF5	500	.5039	.5035	.5022
ICF1	500	.4974	.4971	.4954
L30-500	500	.5038	.5015	.5010
TMG3	400	.3941	.3949	.3953
TMH1	300	OUT	OF	SERVICE
TMH2	300	.2974	.2971	.2959
TMJ1	250	.2484	.2480	.2481
TMJ2	250	.2487	.2484	.2485
TMJ3	250	.2501	.2495	.2491
TMK2	200	.2007	.2007	.2006
TML1	150	.1487	.1486	.1486
TMM1	120	.1206	.1206	.1202
TMN3	100	.1001	.1000	.1000
ICN1	100	.1005	.1005	.1009
TMQ1	80	.0800	.0797	.0799
TMR1	70	OUT	OF	SERVICE
TMS1	60	OUT	OF	SERVICE
LAB-30A	50	NOT	FOUND	
TMU1	40	.0398	.0398	.0403
TMU2	40	.0397	.0394	.0395
TMV1	30	.0297	.0296	.0297
L30-20	20	.0203	.0203	.0202
TMW1	25	.0253	.0249	.0250
TMY1	15	OUT	OF	SERVICE

Analyst: John Wells Date: 5-28-04

Reviewed by: Date: 07/01/04

Book/page:_____

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

6-11-04

010365

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	0.0203	0.0204	0.0201	0.020	101.33
ADJ200-A	100	0.0990	0.0997	0.1001	0.100	99.60
	200	0.1993	0.1991	0.1990	0.199	99.57
	20	0.0202	0.0202	0.0201	0.020	100.83
ADJ200-C	100	0.0991	0.0985	0.0980	0.099	98.53
	200	0.1987	0.1991	0.1991	0.199	99.48
	20	0.0203	0.0202	0.0202	0.020	101.17
ADJ200-D	100	0.0989	0.0996	0.0993	0.099	99.27
	200	0.1989	0.1998	0.1999	0.200	99.77
	20					
ADJ200-G	100					
	200					
	20					
ADJ200-H	100					
	200					
	20					
ADJ200-J	100					
	200					
	20	0.0204	0.0203	0.0200	0.020	101.17
ADJ200-K	100	0.0999	0.0993	0.0998	0.100	99.67
	200	0.2021	0.2001	0.2000	0.201	100.37
	20					
ADJ200	100					
	200					
	20					
ADJ200	100					
	200					

Book/page: _____

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 34 Thermometer #: G011 diH20 Temperature (° C) 21 010366

	Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
20 µL – 200 µL		20	.0203	.0204	.0201
	ADJ200-A	100	.0990	.0997	.1001
		200	.1993	.1991	.1990
		20	.0202	.0202	.0201
	ADJ200-C	100	.0991	.0985	.0980
		200	.1987	.1991	.1991
		20	.0203	.0202	.0202
	ADJ200-D	100	.0989	.0996	.0993
		200	.1989	.1998	.1999
		20			
	ADJ200-G	100			
		200			
		20			
	ADJ200-H	100			
		200		6-11-04	
		20			
	ADJ200-J	100			
		200			
		20	.0204	.0203	.0200
	ADJ200-K	100	.0999	.0993	.0998
		200	.2021	.2001	.2000
		20			
	ADJ200	100		6-11-04	
		200			

Analyst: John Wills Date: 6-11-04

Reviewed by: [signature] Date: 06/30/04

Book/page: 06 033

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010367

Woodrow A. Naegeli 06/11/04

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	20					
ADJ200-A	100					
	200					
	20					
ADJ200-C	100					
	200					
	20					
ADJ200-D	100					
	200					
	20	0.0201	0.0200	0.0198	0.020	99.83
ADJ200-G	100	0.0985	0.0982	0.0988	0.099	98.50
	200	0.1973	0.1975	0.1996	0.198	99.07
	20	0.0203	0.0204	0.0204	0.020	101.83
ADJ200-H	100	0.0996	0.0989	0.0994	0.099	99.30
	200	0.1992	0.2006	0.1999	0.200	99.95
	20	0.0204	0.0203	0.0203	0.020	101.67
ADJ200-J	100	0.0991	0.0991	0.0985	0.099	98.90
	200	0.1984	0.1985	0.1982	0.198	99.18
	20					
ADJ200	100					
	200					
	20					
ADJ200	100					
	200					
	20					
ADJ200-K	100					
	200					

Book/page: 06 034

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: _____ Thermometer #: _____ diH20 Temperature (° C) 010368

20 µL – 200 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	20			
ADJ200-A	100			
	200			
	20			
ADJ200-C	100			
	200			
	20			
ADJ200-D	100			
	200			
	20	0.0201	0.0200	0.0198
ADJ200-G	100	0.0985	0.0982	0.0988
	200	0.1973	0.1975	0.1996
	20	0.0203	0.0204	0.0204
ADJ200-H	100	0.0996	0.0989	0.0994
	200	0.1992	0.2006	0.1999
	20	0.0204	0.0203	0.0203
ADJ200-J	100	0.0991	0.0991	0.0985
	200	0.1984	0.1985	0.1982
	20			
ADJ200-K	100			
	200			
	20			
ADJ200	100			
	200			

WAM 06/11/04

WAM 06/11/04

Analyst: [signature] Date: 06/11/04

Reviewed by: [signature] Date: 6/21/04

Book/page: 06 089

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

6/11/04

010369

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	100	0.1019	0.1020	0.1018	0.102	101.90
ADJ1000-C	500	0.4963	0.4968	0.4985	0.497	99.44
	1000	0.9940	0.9957	0.9951	0.995	99.49
	100	0.1006	0.1004	0.0994	0.100	100.13
ADJ1000-D	500	0.4959	0.4991	0.4962	0.497	99.41
	1000	0.9956	1.0002	0.9989	0.998	99.82
	100	0.0998	0.0999	0.0999	0.100	99.87
ADJ1000-E	500	0.4965	0.4994	0.4956	0.497	99.43
	1000	0.9968	0.9942	0.9949	0.995	99.53
	100	0.1008	0.1009	0.1013	0.101	101.00
ADJ1000-F	500	0.4958	0.4962	0.4973	0.496	99.29
	1000	0.9947	0.9952	0.9958	0.995	99.52
	100					
ADJ1000-G	500					
	1000					
	100					
ADJ1000-H	500					
	1000					
	100					
ADJ1000-J	500					
	1000					
	100	0.1011	0.1012	0.1015	0.101	101.27
ADJ1000-K	500	0.4977	0.4974	0.4960	0.497	99.41
	1000	1.0009	1.0002	0.9993	1.000	100.01
	100					
ADJ1000	500					
	1000					

FRM-247b (Rev 3/Apr 04)

Book/page: 06 090

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log 010370

Balance #: 34 Thermometer #: G011 diH20 Temperature (° C) 21

100 µL – 1000 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	100	.1019	.1020	.1018
ADJ1000-C	500	.4963	.4968	.4985
	1000	.9940	.9957	.9951
	100	.1006	.1004	.0994
ADJ1000-D	500	.4959	.4991	.4962
	1000	.9956	1.0002	.9989
	100	.0998	.0999	.0999
ADJ1000-E	500	.4965	.4994	.4956
	1000	.9968	.9942	.9949
	100	.1008	.1009	.1013
ADJ1000-F	500	.4958	.4962	.4973
	1000	.9947	.9952	.9958
	100			
ADJ1000-G	500			
	1000			
	100			
ADJ1000-H	500			
	1000			
	100			
ADJ1000-J	500			
	1000			
	100	.1011	.1012	.1015
ADJ1000-K	500	.4977	.4974	.4960
	1000	1.0009	1.0002	.9993
	100			
ADJ1000	500			
	1000			

JW 6-11-04

JW 6-11-04

Analyst: John Wills Date: 6-11-04

Reviewed by: [signature] Date: 06/30/04

Book/page: 06 093

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010371

Jordan A. Naegeli 06/11/04

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	100					
ADJ1000-C	500					
	1000					
	100					
ADJ1000-D	500					
	1000					
	100					
ADJ1000-E	500					
	1000					
	100					
ADJ1000-F	500					
	1000					
	100	0.1019	0.1011	0.1020	0.102	101.67
ADJ1000-G	500	0.4943	0.4978	0.5000	0.497	99.47
	1000	1.0098	1.0072	1.0066	1.008	100.79
	100	0.0998	0.1000	0.0992	0.100	99.67
ADJ1000-H	500	0.4918	0.4936	0.4959	0.494	98.75
	1000	0.9820	0.9863	0.9876	0.985	98.53
	100	0.0991	0.1001	0.1003	0.100	99.83
ADJ1000-J	500	0.4967	0.4955	0.4965	0.496	99.25
	1000	0.9927	0.9936	0.9923	0.993	99.29
	100					
ADJ1000	500					
	1000					
	100					
ADJ1000-K	500					
	1000					

FRM-247b (Rev 2/Oct 03)

Book/page: 06 094

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: _____ Thermometer #: _____ diH2O Temperature (° C) 010372

100 µL – 1000 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	100	WAN 06/11/04		
ADJ1000-C	500			
	1000			
	100			
ADJ1000-D	500			
	1000			
	100			
ADJ1000-E	500			
	1000			
	100			
ADJ1000-F	500			
	1000			
	100	0.1019	0.1011	0.1020
ADJ1000-G	500	0.4943	0.4978	0.5000
	1000	1.0098	1.0072	1.0066
	100	0.0998	0.1000	0.0992
ADJ1000-H	500	0.4918	0.4936	0.4959
	1000	0.9820	0.9863	0.9876
	100	0.0991	0.1001	0.1003
ADJ1000-J	500	0.4967	0.4955	0.4965
	1000	0.9927	0.9936	0.9923
	100			
ADJ1000-K	500			
	1000			
	100		WAN 06/11/04	
ADJ1000	500			
	1000			

Analyst: Victoria A. Maggelli Date: 06/11/04

Reviewed by: [signature] Date: 6/21/04

Book/page: 06 151

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

6-11-04

010373

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	0.4941	0.4940	0.4928	0.494	98.73
ADJ5000-C	2500	2.5032	2.5028	2.5024	2.503	100.11
	5000	5.0334	5.0356	5.0234	5.031	100.62
	500					
ADJ5000-G	2500	OUT	OF	SERVICE		
	5000					
	500					
ADJ5000-H	2500	OUT	OF	SERVICE		
	5000					
	500	0.5089	0.5091	0.5088	0.509	101.79
ADJ5000-I	2500	2.5011	2.5089	2.5092	2.506	100.26
	5000	5.0180	5.0258	5.0274	5.024	100.47
	500					
ADJ5000-J	2500					
	5000					
	500					
ADJ5000-K	2500					
	5000					
	500					
ADJ5000-L	2500					
	5000					
	500	0.5022	0.4980	0.5022	0.501	100.16
ADJ5000-M	2500	2.4911	2.4930	2.4936	2.493	99.70
	5000	5.0187	5.0189	4.9959	5.011	100.22
	500	0.5050	0.5037	0.5028	0.504	100.77
ADJ5000-N	2500	2.5066	2.5033	2.5089	2.506	100.25
	5000	5.0232	5.0266	5.0249	5.025	100.50
	500					
ADJ5000	2500					
	5000					
	500					
ADJ5000	2500					
	5000					

FRM-247c (Rev 3/Apr 04)

Book/page: 06 152

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 34 Thermometer #: G011 diH20 Temperature (° C) 2010374

500 µL – 5000 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	500	.4941	.4940	.4928
ADJ5000-C	2500	2.5032	2.5028	6-11-04 2.5024
	5000	5.0334	5.0356	5.0234
	500			
ADJ5000-G	2500	OUT	OF	SERVICE
	5000			
	500			
ADJ5000-H	2500	OUT	OF	SERVICE
	5000			
	500	.5089	.5091	.5088
ADJ5000-I	2500	2.5011	2.5089	2.5092
	5000	5.0180	5.0258	5.0274
	500			
ADJ5000-J	2500			
	5000			
	500			
ADJ5000-K	2500			
	5000		6-11-04	
	500			
ADJ5000-L	2500			
	5000			
	500	.5022	.4980	.5022
ADJ5000-M	2500	2.4911	2.4930	2.4936
	5000	5.0187	5.0189	4.9959
	500	.5050	.5037	.5028
ADJ5000-N	2500	2.5066	2.5033	2.5089
	5000	5.0232	5.0266	5.0249
	500			
ADJ5000	2500			
	5000			
	500		6-11-04	
ADJ5000	2500			
	5000			

Analyst: [signature] Date: 6-11-04

Reviewed by: [signature] Date: 06/30/04

Book/page: 06 153

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010375

Waaran A. Naegeli Dec 1/11/04

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	500					
ADJ5000-C	2500					
	5000					
	500					
ADJ5000-G	2500					
	5000					
	500					
ADJ5000-H	2500					
	5000					
	500					
ADJ5000-I	2500					
	5000					
	500	0.5006	0.5040	0.5058	0.503	100.69
ADJ5000-J	2500	2.4968	2.4974	2.4999	2.498	99.92
	5000	4.9870	4.9977	4.9976	4.994	99.88
	500	0.4948	0.4954	0.4962	0.495	99.09
ADJ5000-K	2500	2.4969	2.4949	2.4960	2.496	99.84
	5000	5.0356	5.0067	5.0094	5.017	100.34
	500	0.5017	0.5005	0.5019	0.501	100.27
ADJ5000-L	2500	2.4897	2.4897	2.4894	2.490	99.58
	5000	4.9800	4.9833	4.9877	4.984	99.67
	500					
ADJ5000	2500					
	5000					
	500					
ADJ5000	2500					
	5000					
	500					
ADJ5000	2500					
	5000					
	500					
ADJ5000-M	2500					
	5000					

FRM-247c (Rev 2/Mar 03)

Book/page: 06 154

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: _____ Thermometer #: _____ diH20 Temperature (° C) 010376

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	0.5006	0.5040	0.5058
ADJ5000-J	2500	2.4968	2.4974	2.4999
	5000	4.9870	4.9977	4.9976
	500	0.4948	0.4954	0.4962
ADJ5000-K	2500	2.4969	2.4949	2.4960
	5000	5.0356	5.0067	5.0094
	500	0.5017	0.5005	0.5019
ADJ5000-L	2500	2.4897	2.4897	2.4894
	5000	4.9800	4.9833	4.9877
	500			
ADJ5000-M	2500			
	5000			
	500			
ADJ5000-N	2500			
	5000			
	500			
ADJ5000	2500			
	5000			
	500			
ADJ5000	2500			
	5000			

Analyst: Kathleen A. Maggelli Date: 06/11/04

Reviewed by: _____ Date: 6/21/04

010377

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040521-6
SRR: 25943
SDG: 245108
CASE: CNWRA
VTSR: May 20, 2004
PROJECT#: 06002.01.141

Balance Calibrations

Southwest Research Institute®
Division 01

BALANCE VERIFICATION LOG

BALANCE #:	LOCATION:	SERIAL #:	TOLERANCE:	COMMENTS:
12	Bldg. 70 Lab 27	1122510787	±0.0005	
Date	**Std Wt (g)**	**Recorded Wt (g)**	**Operator**	
6-3-04	2.0000	2.0000	KE	SN: 99-J50526-15
6-4-04	2.0000	2.0000	KE	"
6-7-04	2.0000	2.0001	KE	"
6-8-04	2.0000	2.0000	KE	"
6-9-04	2.0000	2.0000	KE	"
6-10-04	2.0000	2.0001	KE	"
6-11-04	2.0000	2.0001	KE	"
6-14-04	2.0000	1.9999	[signature]	"
6-15-04	2.0000	2.0000	[signature]	"
6-16-04	2.0000	2.0000	KE	"

If balance is out of limits, clean the balance and re-calibrate using Class "S" weights.
If balance is still out of limits, place a "DO NOT USE" sign on it and call (DQA) for service.

Southwest Research Institute
Division 01

BALANCE VERIFICATION LOG

BALANCE #	LAB #:	SERIAL #:	TOLERANCE:	COMMENTS:
19	27	0068597	±0.05	
Date	Std Wt (g)	Recorded Wt (g)	Operator	
6-2-04	10.00	10.00	JW	SN:99-J50624-S
6-3-04	10.00	10.00	KE	"
6-4-04	10.00	10.00	KE	"
6-7-04	10.00	10.00	KE	"
6-8-04	10.00	10.00	KE	"
6-9-04	10.00	10.00	KE	"
6-10-04	10.00	10.00	KE	"
6-11-04	10.00	10.01	KE	"
6-14-04	10.00	10.00	JW	—
6-15-04	10.00	10.01	JW	—

If balance is out of limits, clean the balance and re-calibrate using Class "S" weights.
If balance is still out of limits, place a "DO NOT USE" sign on it and call (x5896) for service.

FRM-112 (Rev 1/Dec 99)

Southwest Research Institute
Division 01

BALANCE VERIFICATION LOG

BALANCE #:	LOCATION:	SERIAL #:	TOLERANCE:	COMMENTS:
34	Bldg. 70 Lab 27	1116031935	±0.0005	
Date	**Std Wt (g)**	**Recorded Wt (g)**	**Operator**	SN: 99-J50526-15
6-10-04	2.0000	2.0000	KE	"
6-11-04	2.0000	2.0000	KE	"
6-14-04	2.0000	1.9999	JW	"
6-15-04	2.0000	2.0001	JW	"
6-16-04	2.0000	2.0000	KE	"
6-17-04	2.0000	2.0000	KE	"
6-18-04	2.0000	2.0000	KE	"
6-21-04	2.0000	2.0000	KE	"
6-22-04	2.0000	2.0000	KE	"
6-23-04	2.0000	2.0000	KE	"

If balance is out of limits, clean the balance and re-calibrate using Class "S" weights.
If balance is still out of limits, place a "DO NOT USE" sign on it and call (DQA) for service.

010381

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040521-6
SRR: 25943
SDG: 245108
CASE: CNWRA
VTSR: May 20, 2004
PROJECT#: 06002.01.141

DI Water Verification

D.I. WATER SYSTEM NOTEBOOK
SOUTHWEST RESEARCH INSTITUTE
BUILDING 70

C40006

Contact U.S. Filter (1-800-466-7873) for repairs/exchanges. (Make sure to have a P.O.)

010382

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
5/24/04 6:00pm	DR	18.04	✓	✓	✓	1903.8	ALL OK ✓
5/25/04 6:49pm	DR	18.04	✓	✓	✓	1946.3	✓
5/26/04 6:41pm	DR	18.04	✓	✓	✓	1974.6	✓
5/27/04 8:56pm	DR	18.04	✓	✓	✓	1992.2	✓
6/1/04 6:49pm	DR	18.04	✓	✓	✓	2012.0	✓
6/2/04 6:16pm	DR	18.04	✓	✓	✓	2029.5	✓
6/3/04 6:20pm	DR	18.04	✓	✓	✓	2044.4	✓
6/4/04 5:43pm	DR	18.04	✓	✓	✓	2054.7	✓
6/7/04 5:53pm	DR	18.05	✓	✓	✓	2072.0	✓
6/8/04 7:54pm	DR	18.05	✓	✓	✓	2086.5	✓
6/9/04 7:10pm	DR	18.04	✓	✓	✓	2123.7	✓
6/10/04 7:30pm	DR	18.05	✓	✓	✓	2136.8	✓
6/11/04 6:18pm	DR	18.04	✓	✓	✓	2145.4	✓
6/14/04 6:20pm	DR	18.05	✓	✓	✓	2156.2	✓
6/15/04 5:18pm	DR	18.04	✓	✓	✓	2170.2	✓
6/16/04 7pm	DR	18.05	✓	✓	✓	2187.0	✓

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
5/24/04 6:00pm	DR	✓ (14.5)	✓	910.2	ALL OK ✓
5/25/04 6:49pm	DR	✓ (15.0)	✓	911.6	✓
5/26/04 6:41pm	DR	✓ (15.0)	✓	912.1	✓
5/27/04 8:56pm	DR	✓ (15.0)	✓	912.3	✓
6/1/04 6:49pm	DR	✓ (15.0)	✓	912.9	✓
6/2/04 6:16pm	DR	✓ (16.0)	✓	913.7	✓
6/3/04 6:20pm	DR	✓ (16.5)	✓	913.9	✓
6/4/04 5:43pm	DR	✓ (16.5)	✓	914.0	✓
6/7/04 5:53pm	DR	✓ (18.0)	✓	914.0	✓
6/8/04 7:54pm	DR	X (18.0)	✓	914.5	need to call USFilter for P.O.
6/9/04 7:10pm	DR	X	(17.5) ✓	915.0	need P.O.
6/10/04 7:30pm	DR	X	(17.5) ✓	915.1	P.O. received. USFilter called
6/11/04 6:18pm	DR	X	(17.5) ✓	917.3	need P.O.
6/14/04 6:20pm	DR	✓	(14.0) ✓	920.5	tank, Filter & Exchange. ALL OK.
6/15/04 5:18pm	DR	✓	(15.0) ✓	921.7	✓
6/16/04 7pm	DR	✓	(15.5) ✓	923.2	✓

Legend: Check = Green (OK); X = Red (call for service)