



Cover Page

Order ID : O1232

Project ID : NYCDDC Phase II SCI Arthur Kill Road CEQR

Client : Louis Berger U.S., Inc., A WSP Company

Lab Sample Number

O1232-01
O1232-02
O1232-03
O1232-04
O1232-05
O1232-06
O1232-07
O1232-08
O1232-09
O1232-10

Client Sample Number

B-P-17A
B-P-17B
WC-17
B-P-18A
B-P-18B
B-P-19A
B-P-19B
B-P-35A
B-P-35B
DUP01

I certify that the data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package has been authorized by the laboratory manager or his designee, as verified by the following signature.

Signature : _____

Date: 1/31/2023

NYDOH CERTIFICATION NO - 11376

NJDEP CERTIFICATION NO - 20012

DATA REPORTING QUALIFIERS- INORGANIC

For reporting results, the following " Results Qualifiers" are used:

J	Indicates the reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL), but greater than or equal to the Instrument Detection Limit (IDL).
U	Indicates the analyte was analyzed for, but not detected.
ND	Indicates the analyte was analyzed for, but not detected
E	Indicates the reported value is estimated because of the presence of interference
M	Indicates Duplicate injection precision not met.
N	Indicates the spiked sample recovery is not within control limits.
S	Indicates the reported value was determined by the Method of Standard Addition (MSA).
*	Indicates that the duplicate analysis is not within control limits.
+	Indicates the correlation coefficient for the MSA is less than 0.995.
D	Indicates the reported value is from a secondary analysis with a dilution factor. The original analysis exceeded the calibration range.
M	Method qualifiers "P" for ICP instrument "PM" for ICP when Microwave Digestion is used "CV" for Manual Cold Vapor AA "AV" for automated Cold Vapor AA "CA" for MIDI-Distillation Spectrophotometric "AS" for Semi -Automated Spectrophotometric "C" for Manual Spectrophotometric "T" for Titrimetric "NR" for analyte not required to be analyzed
OR	Indicates the analyte's concentration exceeds the calibrated range of the instrument for that specific analysis.
Q	Indicates the LCS did not meet the control limits requirements
H	Sample Analysis Out Of Hold Time

APPENDIX A**QA REVIEW GENERAL DOCUMENTATION**

Project #: 01232

Completed

For thorough review, the report must have the following:

GENERAL:

Are all original paperwork present (chain of custody, record of communication,airbill, sample management lab chronicle, login page)

☒

Check chain-of-custody for proper relinquish/return of samples

☒

Is the chain of custody signed and complete

☒

Check internal chain-of-custody for proper relinquish/return of samples /sample extracts

☒

Collect information for each project id from server. Were all requirements followed

☒**COVER PAGE:**

Do numbers of samples correspond to the number of samples in the Chain of Custody on login page

☒

Do lab numbers and client Ids on cover page agree with the Chain of Custody

☒**CHAIN OF CUSTODY:**

Do requested analyses on Chain of Custody agree with form I results

☒

Do requested analyses on Chain of Custody agree with the log-in page

☒

Were the correct method log-in for analysis according to the Analytical Request and Chain of Castody

☒

Were the samples received within hold time

☒

Were any problems found with the samples at arrival recorded in the Sample Management Laboratory Chronicle

☒**ANALYTICAL:**

Was method requirement followed?

☒

Was client requirement followed?

☒

Does the case narrative summarize all QC failure?

☒

All runlogs and manual integration are reviewed for requirements

☒

All manual calculations and /or hand notations verified

☒

1st Level QA Review Signature: KETAN PATEL

Date: 01/31/2023

2nd Level QA Review Signature: _____

Date: _____



284 Sheffield Street, Mountainside, New Jersey - 07092

Phone: (908) 789 8900 Fax: (908) 789 8922

LAB CHRONICLE

OrderID: O1232	OrderDate: 1/19/2023 1:44:00 PM
Client: Louis Berger U.S., Inc., A WSP Company	Project: NYCDDC Phase II SCI Arthur Kill Road CEQR
Contact: Jonathan Ganz	Location: N11,VOA Ref. #2 Soil

LabID	ClientID	Matrix	Test	Method	Sample Date	Prep Date	Anal Date	Received
01232-01	B-P-17A	SOIL	Mercury	7471B	01/18/23	01/20/23	01/23/23	01/19/23
			Metals ICP-TAL	6010D		01/20/23	01/20/23	
01232-02	B-P-17B	SOIL	Mercury	7471B	01/18/23	01/20/23	01/23/23	01/19/23
			Metals ICP-TAL	6010D		01/20/23	01/20/23	
01232-03	WC-17	TCLP	TCLP ICP Metals	6010D	01/18/23	01/24/23	01/25/23	01/19/23
			TCLP Mercury	7470A		01/23/23	01/24/23	
01232-04	B-P-18A	SOIL	Mercury	7471B	01/18/23	01/20/23	01/23/23	01/19/23
			Metals ICP-TAL	6010D		01/20/23	01/20/23	
01232-05	B-P-18B	SOIL	Mercury	7471B	01/18/23	01/20/23	01/23/23	01/19/23
			Metals ICP-TAL	6010D		01/20/23	01/20/23	
01232-06	B-P-19A	SOIL	Mercury	7471B	01/18/23	01/20/23	01/23/23	01/19/23
			Metals ICP-TAL	6010D		01/20/23	01/20/23	
01232-07	B-P-19B	SOIL	Mercury	7471B	01/18/23	01/20/23	01/23/23	01/19/23
			Metals ICP-TAL	6010D		01/20/23	01/24/23	
01232-08	B-P-35A	SOIL	Mercury	7471B	01/18/23	01/20/23	01/23/23	01/19/23
			Metals ICP-TAL	6010D		01/20/23	01/24/23	
01232-09	B-P-35B	SOIL	Mercury	7471B	01/18/23	01/20/23	01/23/23	01/19/23
			Mercury	7471B		01/20/23	01/23/23	



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LAB CHRONICLE

O1232-10	DUP01	SOIL	Metals ICP-TAL	6010D		01/20/23	01/24/23	
					01/18/23			01/19/23
			Mercury	7471B		01/20/23	01/23/23	
			Metals ICP-TAL	6010D		01/20/23	01/24/23	



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Hit Summary Sheet
SW-846

SDG No.: O1232

Order ID: O1232

Client: Louis Berger U.S., Inc., A WSP Company

Project ID: NYCDDC Phase II SCI Arthur Kill Road C

Sample ID	Client ID	Matrix	Parameter	Concentration	C	MDL	RDL	Units
Client ID :	WC-17							
O1232-03	WC-17	TCLP	Barium	3210		77.9	500	ug/L

SAMPLE DATA



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Report of Analysis

Client:	Louis Berger U.S., Inc., A WSP Company	Date Collected:	01/18/23
Project:	NYCDDC Phase II SCI Arthur Kill Road CEQR	Date Received:	01/19/23
Client Sample ID:	WC-17	SDG No.:	O1232
Lab Sample ID:	O1232-03	Matrix:	TCLP
Level (low/med):	low	% Solid:	0

Cas	Parameter	Conc.	Qua.	DF	MDL	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.	Prep Met.
7440-38-2	Arsenic	30.8	U	1	30.8	100	ug/L	01/24/23 14:00	01/25/23 15:55	SW6010	SW3050
7440-39-3	Barium	3210		1	77.9	500	ug/L	01/24/23 14:00	01/25/23 15:55	SW6010	SW3050
7440-43-9	Cadmium	2.60	U	1	2.60	30.0	ug/L	01/24/23 14:00	01/25/23 15:55	SW6010	SW3050
7440-47-3	Chromium	10.4	U	1	10.4	50.0	ug/L	01/24/23 14:00	01/25/23 15:55	SW6010	SW3050
7439-92-1	Lead	19.4	U	1	19.4	60.0	ug/L	01/24/23 14:00	01/25/23 15:55	SW6010	SW3050
7439-97-6	Mercury	0.70	U	1	0.70	2.00	ug/L	01/23/23 14:15	01/24/23 11:13	SW7470A	
7782-49-2	Selenium	35.3	U	1	35.3	100	ug/L	01/24/23 14:00	01/25/23 15:55	SW6010	SW3050
7440-22-4	Silver	8.20	U	1	8.20	50.0	ug/L	01/24/23 14:00	01/25/23 15:55	SW6010	SW3050

Color Before:	Colorless	Clarity Before:	Clear	Texture:
Color After:	Colorless	Clarity After:	Clear	Artifacts:
Comments:	TCLP METALS			

U = Not Detected
LOQ = Limit of Quantitation
MDL = Method Detection Limit
LOD = Limit of Detection
D = Dilution
Q = indicates LCS control criteria did not meet requirements

J = Estimated Value
B = Analyte Found in Associated Method Blank
* = indicates the duplicate analysis is not within control limits.
E = Indicates the reported value is estimated because of the presence of interference.
OR = Over Range
N = Spiked sample recovery not within control limits

METAL
CALIBRATION
DATA



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Metals

- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Louis Berger U.S., Inc., A WSP Company

SDG No.: O1232

Contract: louie01

Lab Code: CHEM

Case No.: O1232

SAS No.: O1232

Initial Calibration Source: EPA

Continuing Calibration Source: PLASMA-PURE

Sample ID	Analyte	Result ug/L	True Value	% Recovery	Acceptance Window (%R)	M	Analysis Date	Analysis Time	Run Number
ICV15	Mercury	4.01	4.0	100	90 - 110	CV	01/24/2023	10:47	LB123775



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Metals

- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Louis Berger U.S., Inc., A WSP Company

SDG No.: O1232

Contract: loui01

Lab Code: CHEM

Case No.: O1232

SAS No.: O1232

Initial Calibration Source: EPA

Continuing Calibration Source: PLASMA-PURE

Sample ID	Analyte	Result ug/L	True Value	% Recovery	Acceptance Window (%R)	M	Analysis Date	Analysis Time	Run Number
CCV08	Mercury	4.98	5.0	100	90 - 110	CV	01/24/2023	10:52	LB123775
CCV09	Mercury	5.02	5.0	100	90 - 110	CV	01/24/2023	11:24	LB123775
CCV10	Mercury	4.83	5.0	97	90 - 110	CV	01/24/2023	11:51	LB123775
CCV11	Mercury	5.00	5.0	100	90 - 110	CV	01/24/2023	12:19	LB123775
CCV12	Mercury	5.04	5.0	101	90 - 110	CV	01/24/2023	12:46	LB123775



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Metals

- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Louis Berger U.S., Inc., A WSP Company

SDG No.: O1232

Contract: lou01

Lab Code: CHEM

Case No.: O1232

SAS No.: O1232

Initial Calibration Source: EPA

Continuing Calibration Source: Inorganic Ventures

Sample ID	Analyte	Result ug/L	True Value	% Recovery	Acceptance Window (%R)	M	Analysis Date	Analysis Time	Run Number
ICV01	Arsenic	1040	1000	104	90 - 110	P	01/25/2023	12:15	LB123806
	Barium	498	520	96	90 - 110	P	01/25/2023	12:15	LB123806
	Cadmium	507	510	99	90 - 110	P	01/25/2023	12:15	LB123806
	Chromium	530	520	102	90 - 110	P	01/25/2023	12:15	LB123806
	Lead	1010	1000	101	90 - 110	P	01/25/2023	12:15	LB123806
	Selenium	1040	1000	104	90 - 110	P	01/25/2023	12:15	LB123806
	Silver	257	250	103	90 - 110	P	01/25/2023	12:15	LB123806



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Metals

- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Louis Berger U.S., Inc., A WSP Company

SDG No.: O1232

Contract: louie01

Lab Code: CHEM

Case No.: O1232

SAS No.: O1232

Initial Calibration Source: EPA

Continuing Calibration Source: Inorganic Ventures

Sample ID	Analyte	Result ug/L	True Value	% Recovery	Acceptance Window (%R)	M	Analysis Date	Analysis Time	Run Number
CCV01	Arsenic	4970	5000	100	90 - 110	P	01/25/2023	12:57	LB123806
	Barium	9770	10000	98	90 - 110	P	01/25/2023	12:57	LB123806
	Cadmium	2490	2500	100	90 - 110	P	01/25/2023	12:57	LB123806
	Chromium	1040	1000	104	90 - 110	P	01/25/2023	12:57	LB123806
	Lead	4960	5000	99	90 - 110	P	01/25/2023	12:57	LB123806
	Selenium	4960	5000	99	90 - 110	P	01/25/2023	12:57	LB123806
	Silver	1280	1250	102	90 - 110	P	01/25/2023	12:57	LB123806



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Metals

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INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Louis Berger U.S., Inc., A WSP Company

SDG No.: O1232

Contract: loui01

Lab Code: CHEM

Case No.: O1232

SAS No.: O1232

Initial Calibration Source: EPA

Continuing Calibration Source: Inorganic Ventures

Sample ID	Analyte	Result ug/L	True Value	% Recovery	Acceptance Window (%R)	M	Analysis Date	Analysis Time	Run Number
LLCCV01	Arsenic	22.9	20.0	115	80 - 120	P	01/25/2023	13:00	LB123806
	Barium	106	100	106	80 - 120	P	01/25/2023	13:00	LB123806
	Cadmium	6.48	6.0	108	80 - 120	P	01/25/2023	13:00	LB123806
	Chromium	10.9	10.0	109	80 - 120	P	01/25/2023	13:00	LB123806
	Lead	13.2	12.0	110	80 - 120	P	01/25/2023	13:00	LB123806
	Selenium	17.8	20.0	89	80 - 120	P	01/25/2023	13:00	LB123806
	Silver	10.7	10.0	107	80 - 120	P	01/25/2023	13:00	LB123806



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Metals

- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Louis Berger U.S., Inc., A WSP Company **SDG No.:** O1232
Contract: louie01 **Lab Code:** CHEM **Case No.:** O1232 **SAS No.:** O1232
Initial Calibration Source: EPA
Continuing Calibration Source: Inorganic Ventures

Sample ID	Analyte	Result ug/L	True Value	% Recovery	Acceptance Window (%R)	M	Analysis Date	Analysis Time	Run Number
CCV02	Arsenic	4830	5000	96	90 - 110	P	01/25/2023	13:48	LB123806
	Barium	9480	10000	95	90 - 110	P	01/25/2023	13:48	LB123806
	Cadmium	2400	2500	96	90 - 110	P	01/25/2023	13:48	LB123806
	Chromium	995	1000	100	90 - 110	P	01/25/2023	13:48	LB123806
	Lead	4770	5000	95	90 - 110	P	01/25/2023	13:48	LB123806
	Selenium	4810	5000	96	90 - 110	P	01/25/2023	13:48	LB123806
	Silver	1220	1250	97	90 - 110	P	01/25/2023	13:48	LB123806
CCV03	Arsenic	4920	5000	98	90 - 110	P	01/25/2023	14:39	LB123806
	Barium	9600	10000	96	90 - 110	P	01/25/2023	14:39	LB123806
	Cadmium	2420	2500	97	90 - 110	P	01/25/2023	14:39	LB123806
	Chromium	978	1000	98	90 - 110	P	01/25/2023	14:39	LB123806
	Lead	4800	5000	96	90 - 110	P	01/25/2023	14:39	LB123806
	Selenium	4910	5000	98	90 - 110	P	01/25/2023	14:39	LB123806
	Silver	1200	1250	96	90 - 110	P	01/25/2023	14:39	LB123806
CCV04	Arsenic	5120	5000	102	90 - 110	P	01/25/2023	15:32	LB123806
	Barium	10100	10000	101	90 - 110	P	01/25/2023	15:32	LB123806
	Cadmium	2530	2500	101	90 - 110	P	01/25/2023	15:32	LB123806
	Chromium	1040	1000	104	90 - 110	P	01/25/2023	15:32	LB123806
	Lead	4990	5000	100	90 - 110	P	01/25/2023	15:32	LB123806
	Selenium	5080	5000	102	90 - 110	P	01/25/2023	15:32	LB123806
	Silver	1310	1250	105	90 - 110	P	01/25/2023	15:32	LB123806
CCV05	Arsenic	5150	5000	103	90 - 110	P	01/25/2023	16:20	LB123806
	Barium	10300	10000	103	90 - 110	P	01/25/2023	16:20	LB123806
	Cadmium	2560	2500	102	90 - 110	P	01/25/2023	16:20	LB123806
	Chromium	1020	1000	102	90 - 110	P	01/25/2023	16:20	LB123806
	Lead	4990	5000	100	90 - 110	P	01/25/2023	16:20	LB123806
	Selenium	5070	5000	101	90 - 110	P	01/25/2023	16:20	LB123806
	Silver	1260	1250	101	90 - 110	P	01/25/2023	16:20	LB123806
CCV06	Arsenic	4870	5000	98	90 - 110	P	01/25/2023	17:19	LB123806
	Barium	9950	10000	100	90 - 110	P	01/25/2023	17:19	LB123806
	Cadmium	2430	2500	97	90 - 110	P	01/25/2023	17:19	LB123806
	Chromium	958	1000	96	90 - 110	P	01/25/2023	17:19	LB123806
	Lead	4680	5000	94	90 - 110	P	01/25/2023	17:19	LB123806
	Selenium	4740	5000	95	90 - 110	P	01/25/2023	17:19	LB123806



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Metals

- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Louis Berger U.S., Inc., A WSP Company **SDG No.:** O1232
Contract: louie01 **Lab Code:** CHEM **Case No.:** O1232 **SAS No.:** O1232
Initial Calibration Source: EPA
Continuing Calibration Source: Inorganic Ventures

Sample ID	Analyte	Result ug/L	True Value	% Recovery	Acceptance Window (%R)	M	Analysis Date	Analysis Time	Run Number
CCV06	Silver	1170	1250	94	90 - 110	P	01/25/2023	17:19	LB123806
CCV07	Arsenic	4890	5000	98	90 - 110	P	01/25/2023	18:09	LB123806
	Barium	9710	10000	97	90 - 110	P	01/25/2023	18:09	LB123806
	Cadmium	2430	2500	97	90 - 110	P	01/25/2023	18:09	LB123806
	Chromium	968	1000	97	90 - 110	P	01/25/2023	18:09	LB123806
	Lead	4690	5000	94	90 - 110	P	01/25/2023	18:09	LB123806
	Selenium	4760	5000	95	90 - 110	P	01/25/2023	18:09	LB123806
	Silver	1190	1250	95	90 - 110	P	01/25/2023	18:09	LB123806
CCV08	Arsenic	4900	5000	98	90 - 110	P	01/25/2023	18:44	LB123806
	Barium	9630	10000	96	90 - 110	P	01/25/2023	18:44	LB123806
	Cadmium	2450	2500	98	90 - 110	P	01/25/2023	18:44	LB123806
	Chromium	963	1000	96	90 - 110	P	01/25/2023	18:44	LB123806
	Lead	4670	5000	93	90 - 110	P	01/25/2023	18:44	LB123806
	Selenium	4730	5000	95	90 - 110	P	01/25/2023	18:44	LB123806
	Silver	1190	1250	95	90 - 110	P	01/25/2023	18:44	LB123806



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Metals

- 2b -

CRDL STANDARD FOR AA & ICP

Client: Louis Berger U.S., Inc., A WSP Company

SDG No.: O1232

Contract: loui01

Lab Code: CHEM

Case No.: O1232

SAS No.: O1232

Initial Calibration Source: _____

Continuing Calibration Source: _____

Sample ID	Analyte	Result ug/L	True Value ug/L	% Recovery	Acceptance Window (%R)	M	Analysis Date	Analysis Time	Run Number
CRA	Mercury	0.18	0.2	89	40 - 160	CV	01/24/2023	10:59	LB123775
CRI01	Arsenic	22.1	20.0	110	40 - 160	P	01/25/2023	12:24	LB123806
	Barium	109	100	109	40 - 160	P	01/25/2023	12:24	LB123806
	Cadmium	6.67	6.0	111	40 - 160	P	01/25/2023	12:24	LB123806
	Chromium	11.4	10.0	114	40 - 160	P	01/25/2023	12:24	LB123806
	Lead	12.3	12.0	102	40 - 160	P	01/25/2023	12:24	LB123806
	Selenium	20.5	20.0	103	40 - 160	P	01/25/2023	12:24	LB123806
	Silver	11.0	10.0	110	40 - 160	P	01/25/2023	12:24	LB123806



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Metals

- 3a -

INITIAL AND CONTINUING CALIBRATION BLANK SUMMARY

Client: Louis Berger U.S., Inc., A WSP Company

SDG No.: O1232

Contract: loui01

Lab Code: CHEM

Case No.: O1232

SAS No.: O1232

Sample ID	Analyte	Result ug/L	Acceptance Limit	Conc Qual	CRQL	M	Analysis Date	Analysis Time	Run Number
ICB15	Mercury	0.20	+/-0.20	U	0.20	CV	01/24/2023	10:49	LB123775



Metals

- 3a -

INITIAL AND CONTINUING CALIBRATION BLANK SUMMARY

Client: Louis Berger U.S., Inc., A WSP Company

SDG No.: O1232

Contract: lou01

Lab Code: CHEM

Case No.: O1232

SAS No.: O1232

Sample ID	Analyte	Result ug/L	Acceptance Limit	Conc Qual	CRQL	M	Analysis Date	Analysis Time	Run Number
CCB08	Mercury	0.20	+/-0.20	U	0.20	CV	01/24/2023	10:54	LB123775
CCB09	Mercury	0.20	+/-0.20	U	0.20	CV	01/24/2023	11:26	LB123775
CCB10	Mercury	0.20	+/-0.20	U	0.20	CV	01/24/2023	11:54	LB123775
CCB11	Mercury	0.20	+/-0.20	U	0.20	CV	01/24/2023	12:21	LB123775
CCB12	Mercury	0.20	+/-0.20	U	0.20	CV	01/24/2023	12:48	LB123775



Metals

- 3a -

INITIAL AND CONTINUING CALIBRATION BLANK SUMMARY

Client: Louis Berger U.S., Inc., A WSP Company

SDG No.: O1232

Contract: loui01

Lab Code: CHEM

Case No.: O1232

SAS No.: O1232

Sample ID	Analyte	Result ug/L	Acceptance Limit	Conc Qual	CRQL	M	Analysis Date	Analysis Time	Run Number
ICB01	Arsenic	20.0	+/-20.0	U	20.0	P	01/25/2023	12:20	LB123806
	Barium	100	+/-100	U	100	P	01/25/2023	12:20	LB123806
	Cadmium	6.00	+/-6.00	U	6.00	P	01/25/2023	12:20	LB123806
	Chromium	10.0	+/-10.0	U	10.0	P	01/25/2023	12:20	LB123806
	Lead	12.0	+/-12.0	U	12.0	P	01/25/2023	12:20	LB123806
	Selenium	20.0	+/-20.0	U	20.0	P	01/25/2023	12:20	LB123806
	Silver	10.0	+/-10.0	U	10.0	P	01/25/2023	12:20	LB123806



Metals

- 3a -

INITIAL AND CONTINUING CALIBRATION BLANK SUMMARY

Client: Louis Berger U.S., Inc., A WSP Company

SDG No.: O1232

Contract: loui01

Lab Code: CHEM

Case No.: O1232

SAS No.: O1232

Sample ID	Analyte	Result ug/L	Acceptance Limit	Conc Qual	CRQL	M	Analysis Date	Analysis Time	Run Number
CCB01	Arsenic	20.0	+/-20.0	U	20.0	P	01/25/2023	13:04	LB123806
	Barium	100	+/-100	U	100	P	01/25/2023	13:04	LB123806
	Cadmium	6.00	+/-6.00	U	6.00	P	01/25/2023	13:04	LB123806
	Chromium	10.0	+/-10.0	U	10.0	P	01/25/2023	13:04	LB123806
	Lead	12.0	+/-12.0	U	12.0	P	01/25/2023	13:04	LB123806
	Selenium	20.0	+/-20.0	U	20.0	P	01/25/2023	13:04	LB123806
	Silver	10.0	+/-10.0	U	10.0	P	01/25/2023	13:04	LB123806
CCB02	Arsenic	20.0	+/-20.0	U	20.0	P	01/25/2023	13:52	LB123806
	Barium	100	+/-100	U	100	P	01/25/2023	13:52	LB123806
	Cadmium	6.00	+/-6.00	U	6.00	P	01/25/2023	13:52	LB123806
	Chromium	10.0	+/-10.0	U	10.0	P	01/25/2023	13:52	LB123806
	Lead	12.0	+/-12.0	U	12.0	P	01/25/2023	13:52	LB123806
	Selenium	20.0	+/-20.0	U	20.0	P	01/25/2023	13:52	LB123806
	Silver	10.0	+/-10.0	U	10.0	P	01/25/2023	13:52	LB123806
CCB03	Arsenic	20.0	+/-20.0	U	20.0	P	01/25/2023	14:43	LB123806
	Barium	100	+/-100	U	100	P	01/25/2023	14:43	LB123806
	Cadmium	6.00	+/-6.00	U	6.00	P	01/25/2023	14:43	LB123806
	Chromium	10.0	+/-10.0	U	10.0	P	01/25/2023	14:43	LB123806
	Lead	12.0	+/-12.0	U	12.0	P	01/25/2023	14:43	LB123806
	Selenium	20.0	+/-20.0	U	20.0	P	01/25/2023	14:43	LB123806
	Silver	10.0	+/-10.0	U	10.0	P	01/25/2023	14:43	LB123806
CCB04	Arsenic	20.0	+/-20.0	U	20.0	P	01/25/2023	15:36	LB123806
	Barium	100	+/-100	U	100	P	01/25/2023	15:36	LB123806
	Cadmium	6.00	+/-6.00	U	6.00	P	01/25/2023	15:36	LB123806
	Chromium	10.0	+/-10.0	U	10.0	P	01/25/2023	15:36	LB123806
	Lead	12.0	+/-12.0	U	12.0	P	01/25/2023	15:36	LB123806
	Selenium	20.0	+/-20.0	U	20.0	P	01/25/2023	15:36	LB123806
	Silver	10.0	+/-10.0	U	10.0	P	01/25/2023	15:36	LB123806
CCB05	Arsenic	20.0	+/-20.0	U	20.0	P	01/25/2023	16:24	LB123806
	Barium	100	+/-100	U	100	P	01/25/2023	16:24	LB123806
	Cadmium	6.00	+/-6.00	U	6.00	P	01/25/2023	16:24	LB123806
	Chromium	10.0	+/-10.0	U	10.0	P	01/25/2023	16:24	LB123806
	Lead	12.0	+/-12.0	U	12.0	P	01/25/2023	16:24	LB123806
	Selenium	20.0	+/-20.0	U	20.0	P	01/25/2023	16:24	LB123806
	Silver	10.0	+/-10.0	U	10.0	P	01/25/2023	16:24	LB123806
CCB06	Arsenic	20.0	+/-20.0	U	20.0	P	01/25/2023	17:23	LB123806
	Barium	100	+/-100	U	100	P	01/25/2023	17:23	LB123806
	Cadmium	6.00	+/-6.00	U	6.00	P	01/25/2023	17:23	LB123806
	Chromium	10.0	+/-10.0	U	10.0	P	01/25/2023	17:23	LB123806
	Lead	12.0	+/-12.0	U	12.0	P	01/25/2023	17:23	LB123806

**Metals****- 3a -****INITIAL AND CONTINUING CALIBRATION BLANK SUMMARY****Client:** Louis Berger U.S., Inc., A WSP Company**SDG No.:** O1232**Contract:** loui01**Lab Code:** CHEM**Case No.:** O1232**SAS No.:** O1232

Sample ID	Analyte	Result ug/L	Acceptance Limit	Conc Qual	CRQL	M	Analysis Date	Analysis Time	Run Number
CCB06	Selenium	20.0	+/-20.0	U	20.0	P	01/25/2023	17:23	LB123806
	Silver	10.0	+/-10.0	U	10.0	P	01/25/2023	17:23	LB123806
CCB07	Arsenic	20.0	+/-20.0	U	20.0	P	01/25/2023	18:13	LB123806
	Barium	100	+/-100	U	100	P	01/25/2023	18:13	LB123806
	Cadmium	6.00	+/-6.00	U	6.00	P	01/25/2023	18:13	LB123806
	Chromium	10.0	+/-10.0	U	10.0	P	01/25/2023	18:13	LB123806
	Lead	12.0	+/-12.0	U	12.0	P	01/25/2023	18:13	LB123806
	Selenium	20.0	+/-20.0	U	20.0	P	01/25/2023	18:13	LB123806
	Silver	10.0	+/-10.0	U	10.0	P	01/25/2023	18:13	LB123806
CCB08	Arsenic	20.0	+/-20.0	U	20.0	P	01/25/2023	18:48	LB123806
	Barium	100	+/-100	U	100	P	01/25/2023	18:48	LB123806
	Cadmium	6.00	+/-6.00	U	6.00	P	01/25/2023	18:48	LB123806
	Chromium	10.0	+/-10.0	U	10.0	P	01/25/2023	18:48	LB123806
	Lead	12.0	+/-12.0	U	12.0	P	01/25/2023	18:48	LB123806
	Selenium	20.0	+/-20.0	U	20.0	P	01/25/2023	18:48	LB123806
	Silver	10.0	+/-10.0	U	10.0	P	01/25/2023	18:48	LB123806



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Metals
- 3b -
PREPARATION BLANK SUMMARY

Client: Louis Berger U.S., Inc., A WSP Company

SDG No.: O1232

Instrument: CV1

Sample ID	Analyte	Result (ug/L)	Acceptance Limit	Conc Qual	CRQL ug/L	M	Analysis Date	Analysis Time	Run
PB150368TB	WATER		Batch Number:		PB150390	Prep Date:		01/23/2023	
	Mercury	2.00	<2.00	U	2.00	CV	01/24/2023	12:32	LB123775
Sample ID	Analyte	Result (ug/L)	Acceptance Limit	Conc Qual	CRQL ug/L	M	Analysis Date	Analysis Time	Run
PB150390BL	WATER		Batch Number:		PB150390	Prep Date:		01/23/2023	
	Mercury	0.20	<0.20	U	0.20	CV	01/24/2023	11:06	LB123775



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Metals
- 3b -
PREPARATION BLANK SUMMARY

Client: Louis Berger U.S., Inc., A WSP Company

SDG No.: O1232

Instrument: P4

Sample ID	Analyte	Result (ug/L)	Acceptance Limit	Conc Qual	CRQL ug/L	M	Analysis Date	Analysis Time	Run
PB150368TB		WATER		Batch Number:	PB150432		Prep Date:	01/24/2023	
	Arsenic	100	<100	U	100	P	01/25/2023	14:11	LB123806
	Barium	500	<500	U	500	P	01/25/2023	14:11	LB123806
	Cadmium	30.0	<30.0	U	30.0	P	01/25/2023	14:11	LB123806
	Chromium	14.3	<50.0	J	50.0	P	01/25/2023	14:11	LB123806
	Lead	60.0	<60.0	U	60.0	P	01/25/2023	14:11	LB123806
	Selenium	100	<100	U	100	P	01/25/2023	14:11	LB123806
	Silver	50.0	<50.0	U	50.0	P	01/25/2023	14:11	LB123806
Sample ID	Analyte	Result (ug/L)	Acceptance Limit	Conc Qual	CRQL ug/L	M	Analysis Date	Analysis Time	Run
PB150432BL		WATER		Batch Number:	PB150432		Prep Date:	01/24/2023	
	Arsenic	100	<100	U	100	P	01/25/2023	14:03	LB123806
	Barium	500	<500	U	500	P	01/25/2023	14:03	LB123806
	Cadmium	30.0	<30.0	U	30.0	P	01/25/2023	14:03	LB123806
	Chromium	50.0	<50.0	U	50.0	P	01/25/2023	14:03	LB123806
	Lead	60.0	<60.0	U	60.0	P	01/25/2023	14:03	LB123806
	Selenium	100	<100	U	100	P	01/25/2023	14:03	LB123806
	Silver	50.0	<50.0	U	50.0	P	01/25/2023	14:03	LB123806



Metals

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INTERFERENCE CHECK SAMPLE

Client: Louis Berger U.S., Inc., A WSP CompanySDG No.: O1232Contract: loui01Lab Code: CHEMCase No.: O1232SAS No.: O1232ICS Source: EPAInstrument ID: P4

Sample ID	Analyte	Result ug/L	True Value ug/L	% Recovery	Low Limit (ug/L)	High Limit (ug/L)	Analysis Date	Analysis Time	Run Number
ICSA01	Arsenic	1.24			-20	20	01/25/2023	12:33	LB123806
	Barium	11.4	6.0	190	-94	106	01/25/2023	12:33	LB123806
	Cadmium	2.75	1.0	275	-5	7	01/25/2023	12:33	LB123806
	Chromium	56.5	52.0	109	42	62	01/25/2023	12:33	LB123806
	Lead	4.10			-12	12	01/25/2023	12:33	LB123806
	Selenium	1.75			-20	20	01/25/2023	12:33	LB123806
	Silver	-0.64			-10	10	01/25/2023	12:33	LB123806
ICSAB01	Arsenic	107	100	107	85	120	01/25/2023	12:37	LB123806
	Barium	483	540	89	440	640	01/25/2023	12:37	LB123806
	Cadmium	1010	970	104	820	1100	01/25/2023	12:37	LB123806
	Chromium	565	540	105	460	620	01/25/2023	12:37	LB123806
	Lead	50.7	49.0	104	37	61	01/25/2023	12:37	LB123806
	Selenium	51.2	46.0	111	26	66	01/25/2023	12:37	LB123806
	Silver	210	200	105	170	230	01/25/2023	12:37	LB123806

METAL
QC
DATA



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metals
- 5a -
MATRIX SPIKE SUMMARY

client: Louis Berger U.S., Inc., A WSP Company level: low sdg no.: O1232
contract: loui01 lab code: CHEM case no.: O1232 sas no.: O1232
matrix: Water sample id: O1255-02 client id: BORING-1MS
Percent Solids for Sample: NA Spiked ID: O1255-02MS Percent Solids for Spike Sample: NA

Analyte	Units	Acceptance Limit %R	Spiked Result	C	Sample Result	C	Spike Added	% Recovery	Qual	M
Arsenic	ug/L	75 - 125	3850		100	U	4000	96		P
Barium	ug/L	75 - 125	1360		447	J	1000	91		P
Cadmium	ug/L	75 - 125	970		30.0	U	1000	97		P
Chromium	ug/L	75 - 125	1990		16.7	J	2000	98		P
Lead	ug/L	75 - 125	4750		60.0	U	5000	95		P
Mercury	ug/L	75 - 125	42.9		2.00	U	40.0	107		CV
Selenium	ug/L	75 - 125	9460		100	U	10000	95		P
Silver	ug/L	75 - 125	353		50.0	U	380	93		P



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metals
- 5a -
MATRIX SPIKE DUPLICATE SUMMARY

client: Louis Berger U.S., Inc., A WSP Company level: low sdg no.: O1232
contract: loui01 lab code: CHEM case no.: O1232 sas no.: O1232
matrix: Water sample id: O1255-02 client id: BORING-1MSD
Percent Solids for Sample: NA Spiked ID: O1255-02MSD Percent Solids for Spike Sample: NA

Analyte	Units	Acceptance Limit %R	MSD Result	C	Sample Result	C	Spike Added	% Recovery	Qual	M
Arsenic	ug/L	75 - 125	3860		100	U	4000	96		P
Barium	ug/L	75 - 125	1310		447	J	1000	86		P
Cadmium	ug/L	75 - 125	965		30.0	U	1000	96		P
Chromium	ug/L	75 - 125	1950		16.7	J	2000	97		P
Lead	ug/L	75 - 125	4720		60.0	U	5000	94		P
Mercury	ug/L	75 - 125	42.9		2.00	U	40.0	107		CV
Selenium	ug/L	75 - 125	9440		100	U	10000	94		P
Silver	ug/L	75 - 125	349		50.0	U	380	92		P



Metals
- 5b -

Client: Louis Berger U.S., Inc., A WSP Company

SDG No.: O1232

Contract: loui01

Lab Code: CHEM

Case No.: O1232

SAS No.: O1232

Matrix:

Level: LOW

Client ID:

Sample ID:

Spiked ID:

Analyte	Units	Acceptance Limit %R	C	Sample Result	C	Spike Added	% Recovery	Qual	M
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Metals

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DUPLICATE SAMPLE SUMMARY

Client: Louis Berger U.S., Inc., A WSP Company **Level:** LOW **SDG No.:** O1232
Contract: lou01 **Lab Code:** CHEM **Case No.:** O1232 **SAS No.:** O1232
Matrix: Water **Sample ID:** O1255-02 **Client ID:** BORING-1DUP
Percent Solids for Sample: NA **Duplicate ID** O1255-02DUP **Percent Solids for Spike Sample:** NA

Analyte	Units	Acceptance Limit	Sample Result	C	Duplicate Result	C	RPD	Qual	M
Arsenic	ug/L	20	100	U	100	U			P
Barium	ug/L	20	447	J	435	J	3		P
Cadmium	ug/L	20	30.0	U	30.0	U			P
Chromium	ug/L	20	16.7	J	15.1	J	10		P
Lead	ug/L	20	60.0	U	60.0	U			P
Mercury	ug/L	20	2.00	U	2.00	U			CV
Selenium	ug/L	20	100	U	100	U			P
Silver	ug/L	20	50.0	U	50.0	U			P



Metals

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DUPLICATE SAMPLE SUMMARY

Client: Louis Berger U.S., Inc., A WSP Company **Level:** LOW **SDG No.:** O1232
Contract: lou01 **Lab Code:** CHEM **Case No.:** O1232 **SAS No.:** O1232
Matrix: Water **Sample ID:** O1255-02MS **Client ID:** BORING-1MSD
Percent Solids for Sample: NA **Duplicate ID** O1255-02MSD **Percent Solids for Spike Sample:** NA

Analyte	Units	Acceptance Limit	Sample Result	C	Duplicate Result	C	RPD	Qual	M
Arsenic	ug/L	20	3850		3860		0		P
Barium	ug/L	20	1360		1310		4		P
Cadmium	ug/L	20	970		965		1		P
Chromium	ug/L	20	1990		1950		2		P
Lead	ug/L	20	4750		4720		1		P
Mercury	ug/L	20	42.9		42.9		0		CV
Selenium	ug/L	20	9460		9440		0		P
Silver	ug/L	20	353		349		1		P



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Client:	<u>Louis Berger U.S., Inc., A WSP Company</u>	SDG No.:	<u>01232</u>				
Contract:	loui01	Lab Code:	CHEM	Case No.:	01232	SAS No.:	01232

Analyte	Units	True Value	Result	C	% Recovery	Acceptance Limits	M
PB150390BS							
Mercury	ug/L	4.0	3.88		97	80 - 120	CV



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Metals

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LABORATORY CONTROL SAMPLE SUMMARY

Client: Louis Berger U.S., Inc., A WSP Company

SDG No.: O1232

Contract: lou01

Lab Code: CHEM

Case No.: O1232

SAS No.: O1232

Analyte	Units	True Value	Result	C	% Recovery	Acceptance Limits	M
PB150432BS							
Arsenic	ug/L	4000	3980		100	80 - 120	P
Barium	ug/L	1000	981		98	80 - 120	P
Cadmium	ug/L	1000	971		97	80 - 120	P
Chromium	ug/L	2000	2050		102	80 - 120	P
Lead	ug/L	5000	4870		97	80 - 120	P
Selenium	ug/L	10000	10100		101	80 - 120	P
Silver	ug/L	380	379		100	80 - 120	P



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Metals
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ICP SERIAL DILUTIONS

SAMPLE NO.

BORING-1L

Lab Name: Chemtech Consulting Group

Contract: loui01

Lab Code: CHEM **Lb No.:** lb123806

Lab Sample ID : O1255-02L **SDG No.:** O1232

Matrix (soil/water): Water

Level (low/med): LOW

Concentration Units: ug/L

Analyte	Initial Sample Result (I)		Serial Dilution Result (S)		% Differ- ence	Q	M
		C		C			
Arsenic	100	U	500	U			P
Barium	447	J	546	J	22		P
Cadmium	30.0	U	150	U			P
Chromium	16.7	J	250	U	100.0		P
Lead	60.0	U	300	U			P
Mercury	2.00	U	10.0	U			CV
Selenium	100	U	500	U			P
Silver	50.0	U	250	U			P

METAL
PREPARATION &
INSTRUMENT
DATA



Metals

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ICP INTERELEMENT CORRECTION FACTORS

Client: Louis Berger U.S., Inc., A WSP Company

SDG No.: O1232

Contract: lou01

Lab Code: CHEM

Case No.: O1232

SAS No.: O1232

Instrument ID: _____

Date: _____

Interelement Correction Factors (apparent ppb analyte/ppm interferent)

Analyte	Wave- Length (nm)	ICP Interelement Correction Factors For:				
		Al	Ca	Fe	Mg	Ag
Arsenic	193.759	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Barium	493.409	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cadmium	226.502	0.0000000	0.0000000	0.0001380	0.0000000	0.0000000
Chromium	267.716	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lead	220.353	-0.0000890	0.0000000	0.0000460	0.0000000	0.0000000
Selenium	196.090	0.0000000	0.0000000	-0.0001960	0.0000000	0.0000000
Silver	328.068	0.0000000	0.0000000	-0.0001430	0.0000000	0.0000000



Metals

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ICP INTERELEMENT CORRECTION FACTORS

Client: Louis Berger U.S., Inc., A WSP Company

SDG No.: O1232

Contract: loui01

Lab Code: CHEM

Case No.: O1232

SAS No.: O1232

Instrument ID: _____

Date: _____

Interelement Correction Factors (apparent ppb analyte/ppm interferent)

Analyte	Wave- Length (nm)	ICP Interelement Correction Factors For:				
		As	Ba	Be	Cd	Co
Arsenic	193.759	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Barium	493.409	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cadmium	226.502	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Chromium	267.716	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lead	220.353	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Selenium	196.090	0.0000000	0.0000000	0.0000000	0.0000000	-0.0005750
Silver	328.068	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000



Metals

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ICP INTERELEMENT CORRECTION FACTORS

Client: Louis Berger U.S., Inc., A WSP Company

SDG No.: O1232

Contract: lou01

Lab Code: CHEM

Case No.: O1232

SAS No.: O1232

Instrument ID: _____

Date: _____

Interelement Correction Factors (apparent ppb analyte/ppm interferent)

Analyte	Wave- Length (nm)	ICP Interelement Correction Factors For:				
		Cr	Cu	K	Mn	Mo
Arsenic	193.759	-0.0019440	0.0000000	0.0000000	0.0000000	0.0003800
Barium	493.409	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cadmium	226.502	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Chromium	267.716	0.0000000	0.0000000	0.0000000	0.0002110	0.0000000
Lead	220.353	0.0000000	0.0000000	0.0000000	0.0000700	-0.0014440
Selenium	196.090	0.0000000	0.0000000	0.0000000	0.0004280	0.0000000
Silver	328.068	0.0000000	0.0000000	0.0000000	0.0001890	0.0000000



Metals

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ICP INTERELEMENT CORRECTION FACTORS

Client: Louis Berger U.S., Inc., A WSP Company

SDG No.: O1232

Contract: lou01

Lab Code: CHEM

Case No.: O1232

SAS No.: O1232

Instrument ID: _____

Date: _____

Interement Correction Factors (apparent ppb analyte/ppm interferent)

Analyte	Wave- Length (nm)	ICP Interement Correction Factors For:				
		Na	Ni	Pb	Sb	Se
Arsenic	193.759	0.0000000	0.0002020	0.0000000	0.0000000	0.0000000
Barium	493.409	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cadmium	226.502	0.0000000	-0.0001570	0.0000000	0.0000000	0.0000000
Chromium	267.716	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lead	220.353	0.0000000	0.0001070	0.0000000	0.0000000	0.0000000
Selenium	196.090	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silver	328.068	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000



Metals

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ICP INTERELEMENT CORRECTION FACTORS

Client: Louis Berger U.S., Inc., A WSP Company

SDG No.: O1232

Contract: loui01

Lab Code: CHEM

Case No.: O1232

SAS No.: O1232

Instrument ID: _____

Date: _____

Interelement Correction Factors (apparent ppb analyte/ppm interferent)

Analyte	Wave- Length (nm)	ICP Interelement Correction Factors For:				
		Sn	Ti	Tl	V	Zn
Arsenic	193.759	0.0000000	0.0000000	0.0000000	0.0001560	-0.0003220
Barium	493.409	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cadmium	226.502	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Chromium	267.716	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lead	220.353	0.0000000	0.0000000	0.0000000	0.0000000	0.0001090
Selenium	196.090	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silver	328.068	0.0000000	-0.0001700	0.0000000	-0.0007490	0.0000000

METAL
PREPARATION &
ANALYICAL
SUMMARY



284 Sheffield Street, Mountainside, NJ 07092 Phone: 908 789 8900 Fax: 908 789 8922

Metals

- 13 -

SAMPLE PREPARATION SUMMARY

Client: Louis Berger U.S., Inc., A WSP Company

SDG No.: O1232

Contract: lou01

Lab Code: CHEM

Method:

Case No.: O1232 **SAS No.:** O1232

Sample ID	Client ID	Sample Type	Matrix	Prep Date	Initial Sample Size(mL)	Final Sample Volume (mL)	Percent Solids
Batch Number: PB150390							
O1232-03	WC-17	SAM	WATER	01/23/2023	3.0	30.0	
O1255-02DUP	BORING-1DUP	DUP	WATER	01/23/2023	3.0	30.0	
O1255-02MS	BORING-1MS	MS	WATER	01/23/2023	3.0	30.0	
O1255-02MSD	BORING-1MSD	MSD	WATER	01/23/2023	3.0	30.0	
PB150368TB	PB150368TB	MB	WATER	01/23/2023	3.0	30.0	
PB150390BL	PB150390BL	MB	WATER	01/23/2023	30.0	30.0	
PB150390BS	PB150390BS	LCS	WATER	01/23/2023	30.0	30.0	



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Metals

- 13 -

SAMPLE PREPARATION SUMMARY

Client: Louis Berger U.S., Inc., A WSP Company

SDG No.: O1232

Contract: lou01

Lab Code: CHEM

Method:

Case No.: O1232 **SAS No.:** O1232

Sample ID	Client ID	Sample Type	Matrix	Prep Date	Initial Sample Size(mL)	Final Sample Volume (mL)	Percent Solids
Batch Number: PB150432							
O1232-03	WC-17	SAM	WATER	01/24/2023	5.0	25.0	
O1255-02DUP	BORING-1DUP	DUP	WATER	01/24/2023	5.0	25.0	
O1255-02MS	BORING-1MS	MS	WATER	01/24/2023	5.0	25.0	
O1255-02MSD	BORING-1MSD	MSD	WATER	01/24/2023	5.0	25.0	
PB150368TB	PB150368TB	MB	WATER	01/24/2023	5.0	25.0	
PB150432BL	PB150432BL	MB	WATER	01/24/2023	5.0	25.0	
PB150432BS	PB150432BS	LCS	WATER	01/24/2023	5.0	25.0	



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metals

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ANALYSIS RUN LOG

Client: Louis Berger U.S., Inc., A WSP Company

Contract: loui01

Lab code: CHEM Case no.: O1232 Sas no.: O1232

Sdg no.: O1232

Instrument id number: Method:

Run number: LB123775

Start date: 01/24/2023 End date: 01/24/2023

Lab sample id.	Client Sample Id	d/f	Time	Parameter list
S0	S0	1	1025	HG
S0.2	S0.2	1	1027	HG
S2.5	S2.5	1	1030	HG
S5	S5	1	1035	HG
S7.5	S7.5	1	1037	HG
S10	S10	1	1042	HG
ICV15	ICV15	1	1047	HG
ICB15	ICB15	1	1049	HG
CCV08	CCV08	1	1052	HG
CCB08	CCB08	1	1054	HG
CRA	CRA	1	1059	HG
PB150390BL	PB150390BL	1	1106	HG
PB150390BS	PB150390BS	1	1110	HG
O1232-03	WC-17	1	1113	HG
CCV09	CCV09	1	1124	HG
CCB09	CCB09	1	1126	HG
O1255-02DUP	BORING-1DUP	1	1147	HG
O1255-02MS	BORING-1MS	1	1149	HG
CCV10	CCV10	1	1151	HG
CCB10	CCB10	1	1154	HG
O1255-02MSD	BORING-1MSD	1	1156	HG
CCV11	CCV11	1	1219	HG
CCB11	CCB11	1	1221	HG
PB150368TB	PB150368TB	1	1232	HG
O1255-02L	BORING-1L	5	1237	HG
CCV12	CCV12	1	1246	HG
CCB12	CCB12	1	1248	HG



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metals
- 14 -
ANALYSIS RUN LOG

Client: Louis Berger U.S., Inc., A WSP Company

Contract: loui01

Lab code: CHEM

Case no.: O1232

Sas no.: O1232

Sdg no.: O1232

Instrument id number: _____

Method: _____

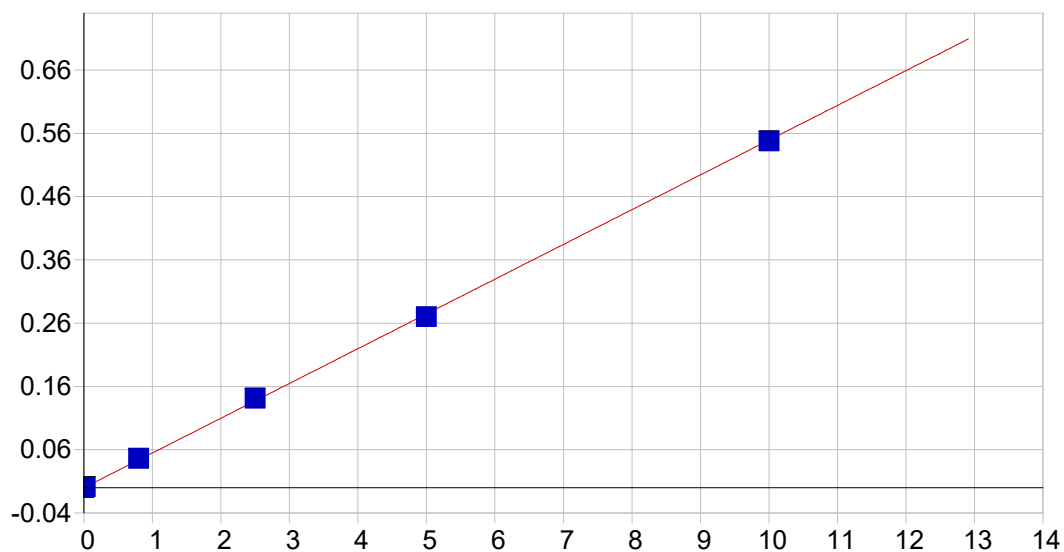
Run number: LB123806

Start date: 01/25/2023

End date: 01/25/2023

Lab sample id.	Client Sample Id	d/f	Time	Parameter list
S0	S0	1	1152	Ag,As,Ba,Cd,Cr,Pb,Se
S1	S1	1	1156	Ag,As,Ba,Cd,Cr,Pb,Se
S2	S2	1	1200	Ag,As,Ba,Cd,Cr,Pb,Se
S3	S3	1	1204	Ag,As,Ba,Cd,Cr,Pb,Se
S4	S4	1	1208	Ag,As,Ba,Cd,Cr,Pb,Se
S5	S5	1	1212	Ag,As,Ba,Cd,Cr,Pb,Se
ICV01	ICV01	1	1215	Ag,As,Ba,Cd,Cr,Pb,Se
ICB01	ICB01	1	1220	Ag,As,Ba,Cd,Cr,Pb,Se
CRI01	CRI01	1	1224	Ag,As,Ba,Cd,Cr,Pb,Se
ICSA01	ICSA01	1	1233	Ag,As,Ba,Cd,Cr,Pb,Se
ICSAB01	ICSAB01	1	1237	Ag,As,Ba,Cd,Cr,Pb,Se
CCV01	CCV01	1	1257	Ag,As,Ba,Cd,Cr,Pb,Se
LLCCV01	LLCCV01	1	1300	Ag,As,Ba,Cd,Cr,Pb,Se
CCB01	CCB01	1	1304	Ag,As,Ba,Cd,Cr,Pb,Se
O1255-02DUP	BORING-1DUP	1	1328	Ag,As,Ba,Cd,Cr,Pb,Se
O1255-02L	BORING-1L	5	1332	Ag,As,Ba,Cd,Cr,Pb,Se
O1255-02MS	BORING-1MS	1	1336	Ag,As,Ba,Cd,Cr,Pb,Se
O1255-02MSD	BORING-1MSD	1	1340	Ag,As,Ba,Cd,Cr,Pb,Se
CCV02	CCV02	1	1348	Ag,As,Ba,Cd,Cr,Pb,Se
CCB02	CCB02	1	1352	Ag,As,Ba,Cd,Cr,Pb,Se
PB150432BL	PB150432BL	1	1403	Ag,As,Ba,Cd,Cr,Pb,Se
PB150432BS	PB150432BS	1	1407	Ag,As,Ba,Cd,Cr,Pb,Se
PB150368TB	PB150368TB	1	1411	Ag,As,Ba,Cd,Cr,Pb,Se
CCV03	CCV03	1	1439	Ag,As,Ba,Cd,Cr,Pb,Se
CCB03	CCB03	1	1443	Ag,As,Ba,Cd,Cr,Pb,Se
CCV04	CCV04	1	1532	Ag,As,Ba,Cd,Cr,Pb,Se
CCB04	CCB04	1	1536	Ag,As,Ba,Cd,Cr,Pb,Se
O1232-03	WC-17	1	1555	Ag,As,Ba,Cd,Cr,Pb,Se
CCV05	CCV05	1	1620	Ag,As,Ba,Cd,Cr,Pb,Se
CCB05	CCB05	1	1624	Ag,As,Ba,Cd,Cr,Pb,Se
CCV06	CCV06	1	1719	Ag,As,Ba,Cd,Cr,Pb,Se
CCB06	CCB06	1	1723	Ag,As,Ba,Cd,Cr,Pb,Se
CCV07	CCV07	1	1809	Ag,As,Ba,Cd,Cr,Pb,Se
CCB07	CCB07	1	1813	Ag,As,Ba,Cd,Cr,Pb,Se
CCV08	CCV08	1	1844	Ag,As,Ba,Cd,Cr,Pb,Se
CCB08	CCB08	1	1848	Ag,As,Ba,Cd,Cr,Pb,Se

METAL
RAW DATA

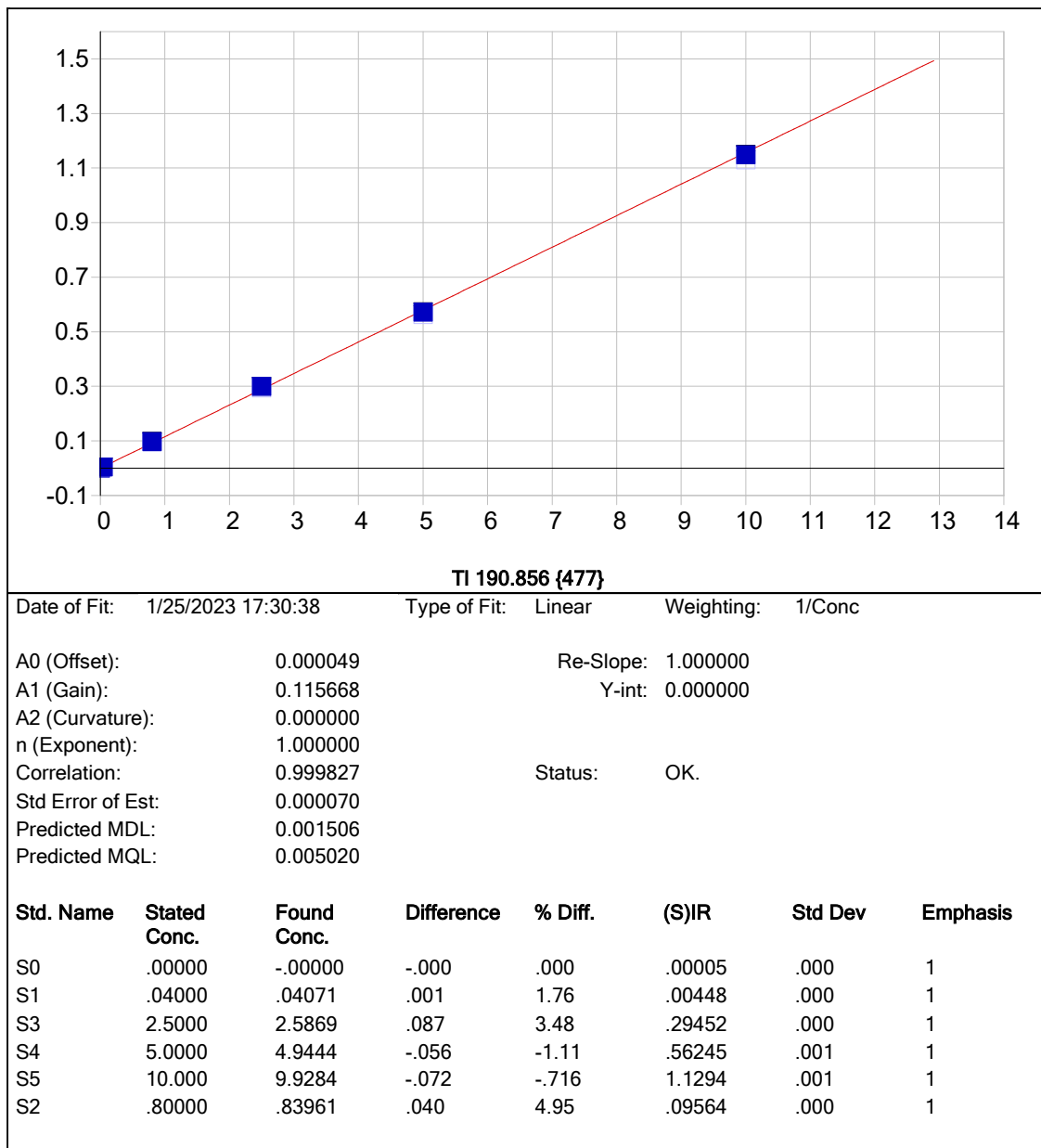


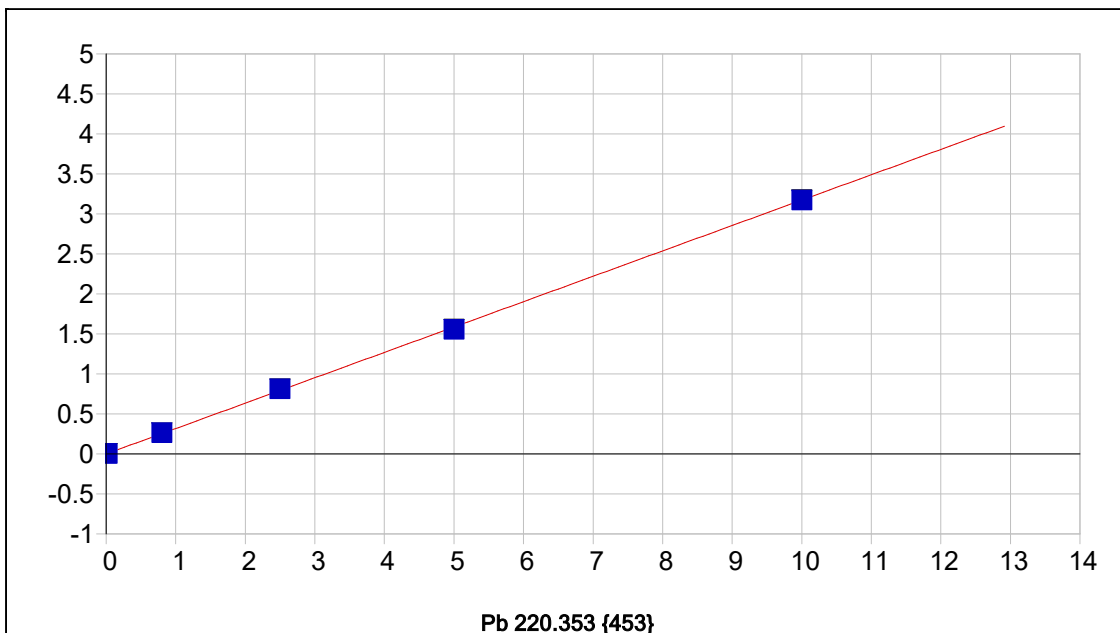
As 189.042 {479}

Date of Fit: 1/25/2023 17:30:38 Type of Fit: Linear Weighting: 1/Conc

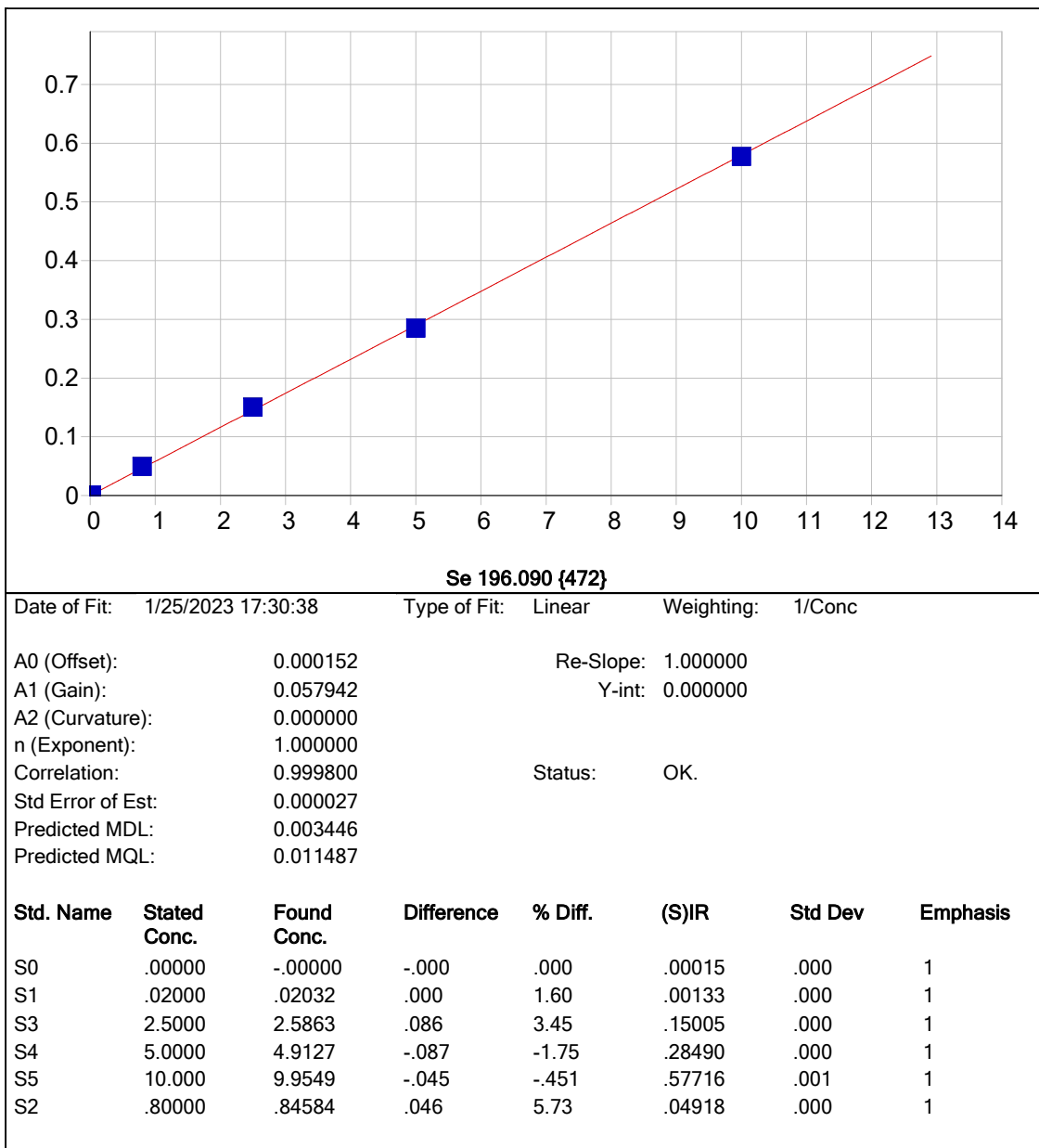
A0 (Offset): -0.000061 Re-Slope: 1.000000
A1 (Gain): 0.054933 Y-int: 0.000000
A2 (Curvature): 0.000000
n (Exponent): 1.000000
Correlation: 0.999842 Status: OK.
Std Error of Est: 0.000023
Predicted MDL: 0.002797
Predicted MQL: 0.009325

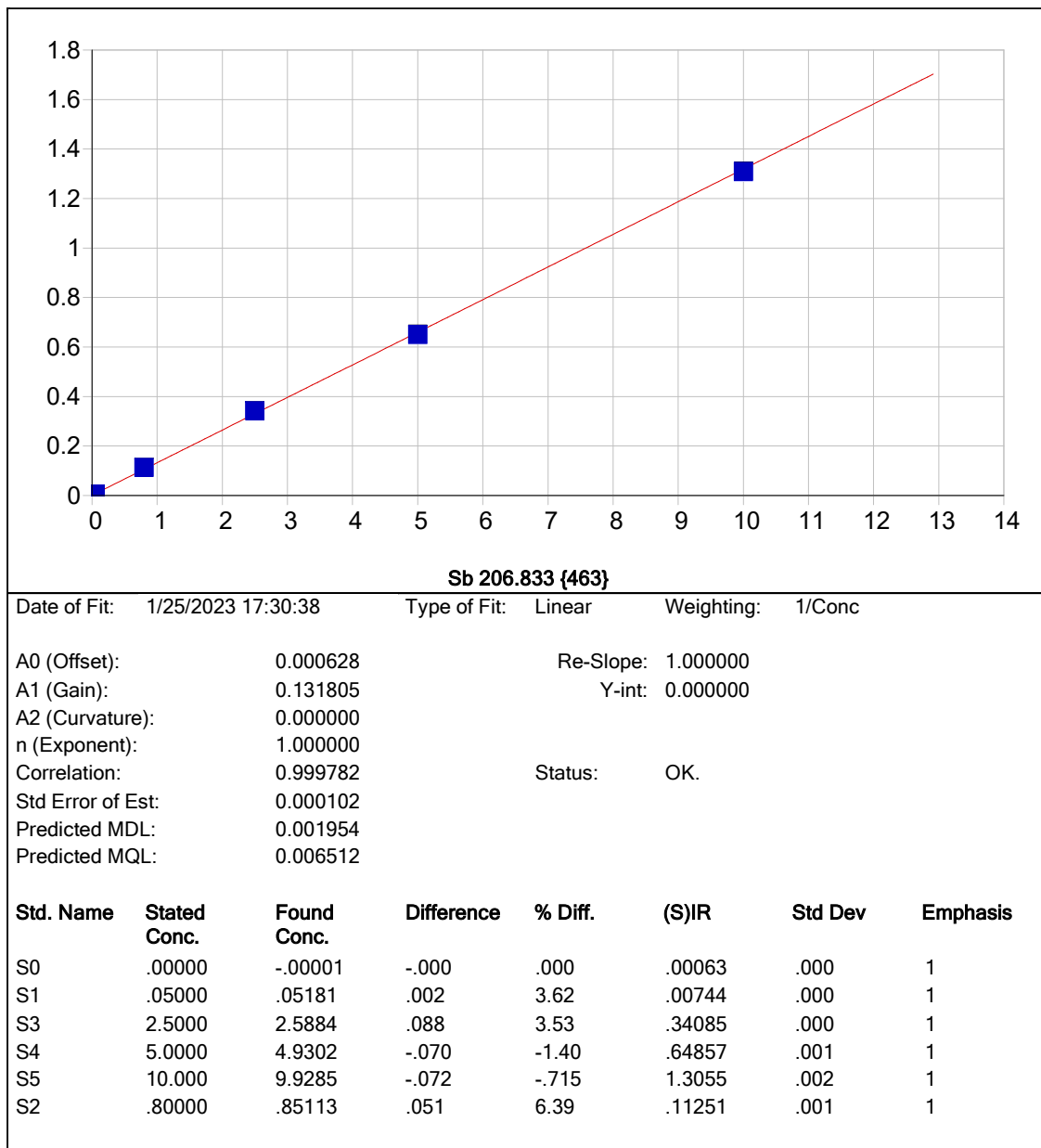
Std. Name	Stated Conc.	Found Conc.	Difference	% Diff.	(S)IR	Std Dev	Emphasis
S0	.00000	-.00000	-.000	.000	-.00006	.000	1
S1	.02000	.02292	.003	14.6	.00120	.000	1
S3	2.5000	2.5680	.068	2.72	.14099	.000	1
S4	5.0000	4.9150	-.085	-1.70	.26989	.000	1
S5	10.000	9.9741	-.026	-.259	.54777	.001	1
S2	.80000	.83997	.040	5.00	.04607	.000	1

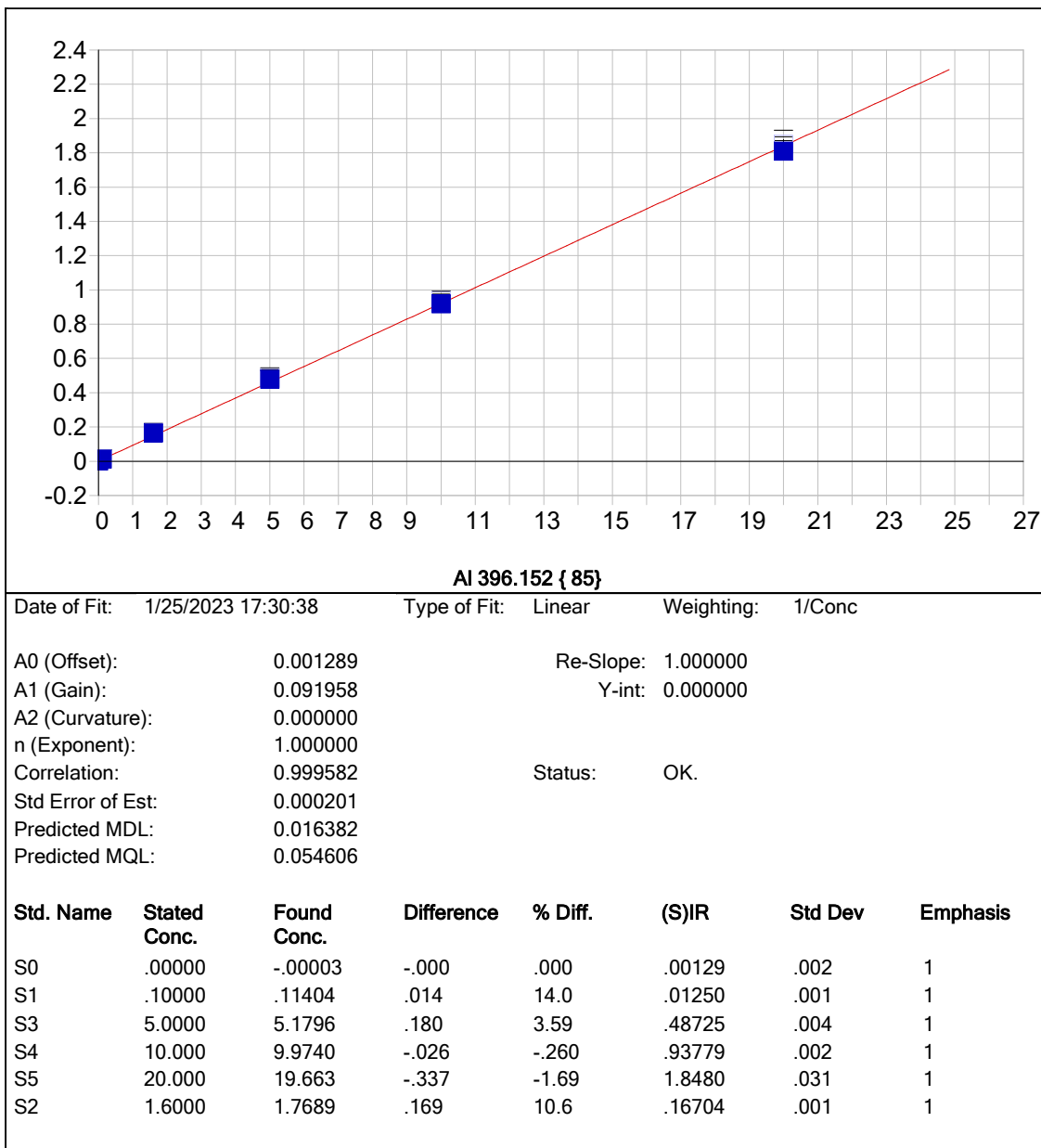


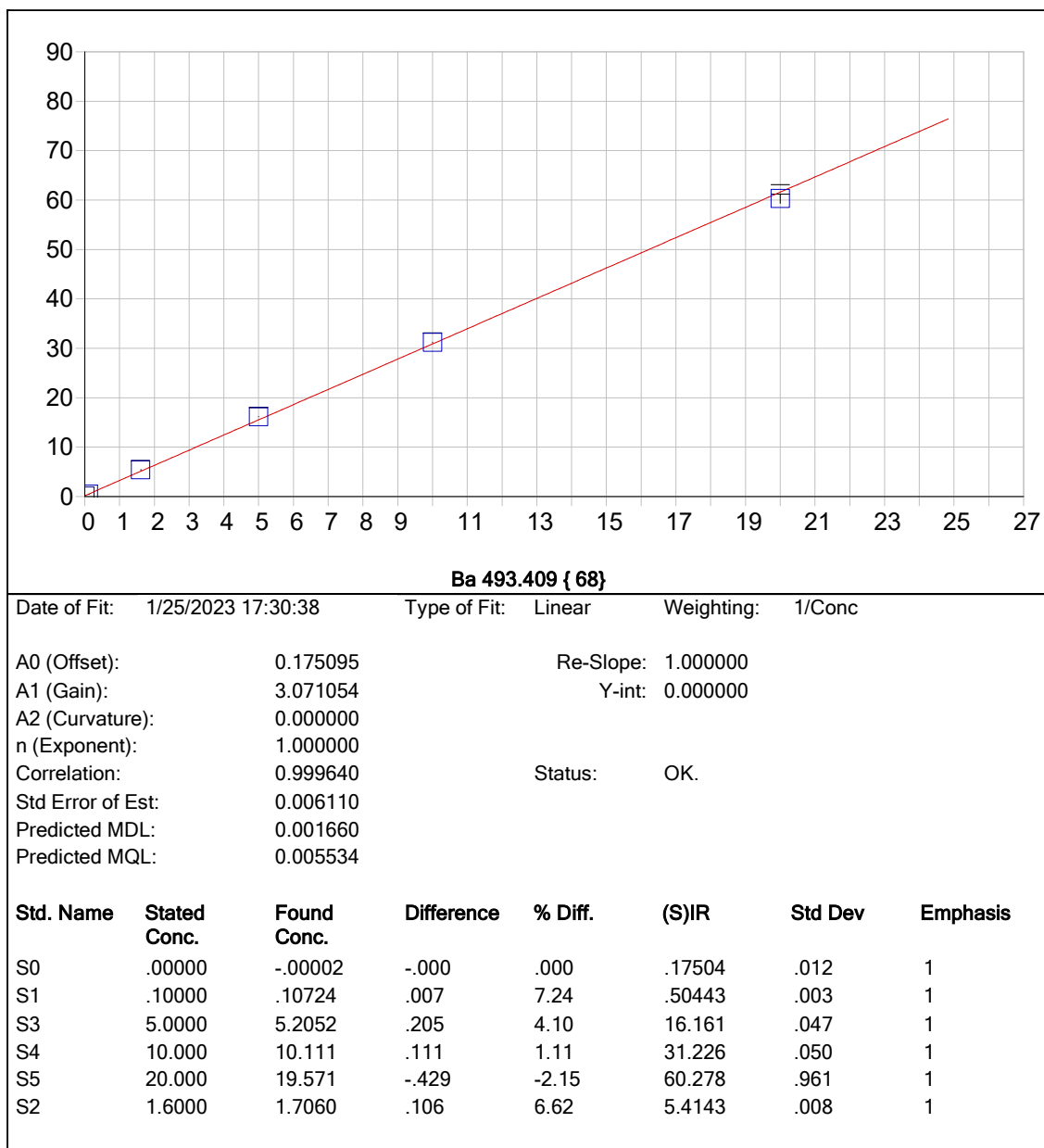


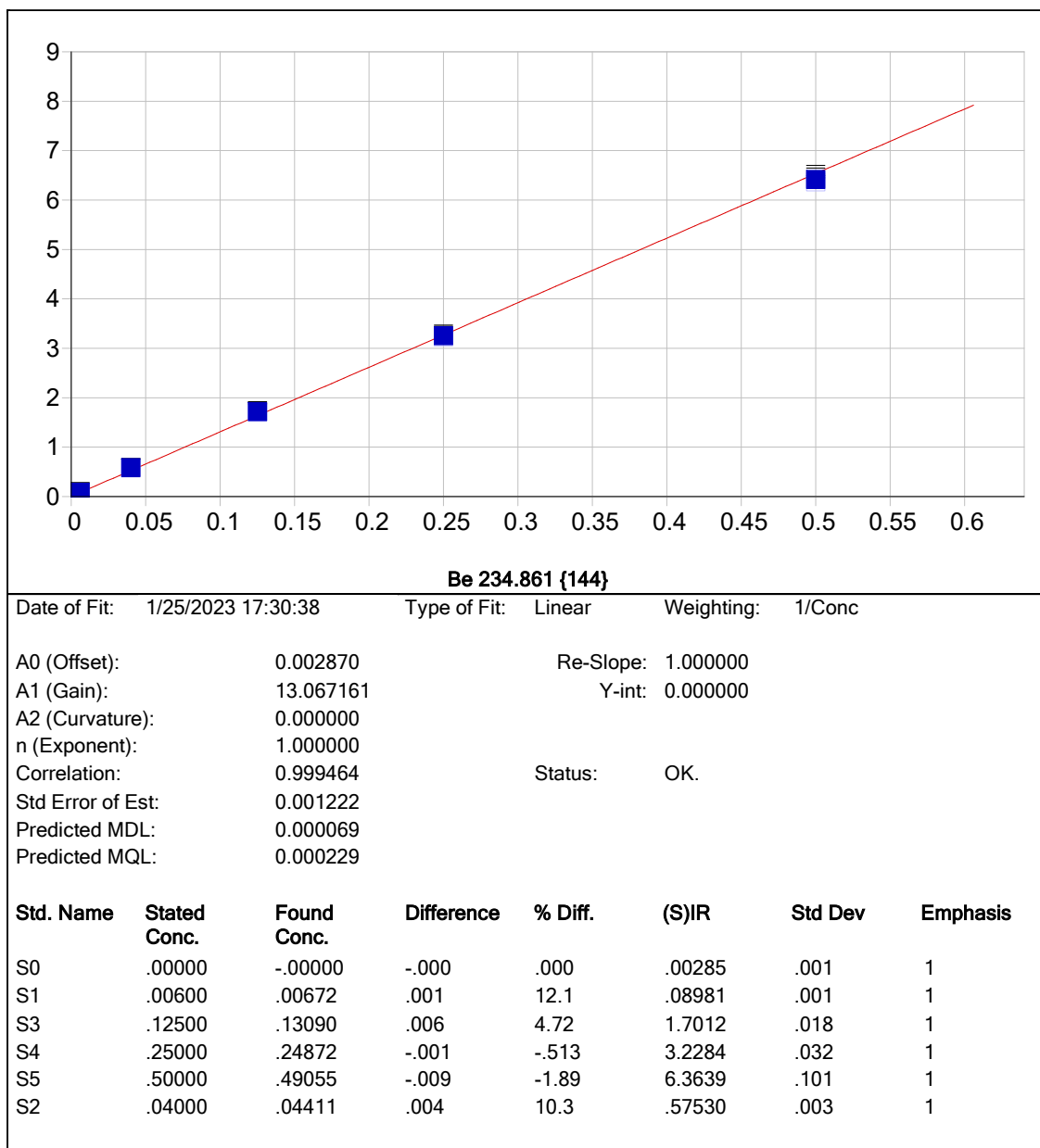
Date of Fit: 1/25/2023 17:30:38		Type of Fit: Linear		Weighting: 1/Conc			
A0 (Offset): 0.000039		Re-Slope: 1.000000					
A1 (Gain): 0.317210		Y-int: 0.000000					
A2 (Curvature): 0.000000							
n (Exponent): 1.000000							
Correlation: 0.999883		Status: OK.					
Std Error of Est: 0.000088							
Predicted MDL: 0.001360							
Predicted MQL: 0.004534							
Std. Name	Stated Conc.	Found Conc.	Difference	% Diff.	(S)IR	Std Dev	Emphasis
S0	.00000	-.00000	-.000	.000	.00004	.000	1
S1	.01200	.01268	.001	5.67	.00402	.001	1
S3	2.5000	2.5597	.060	2.39	.81183	.000	1
S4	5.0000	4.9107	-.089	-1.79	1.5574	.000	1
S5	10.000	9.9976	-.002	-.024	3.1707	.005	1
S2	.80000	.83138	.031	3.92	.26371	.001	1

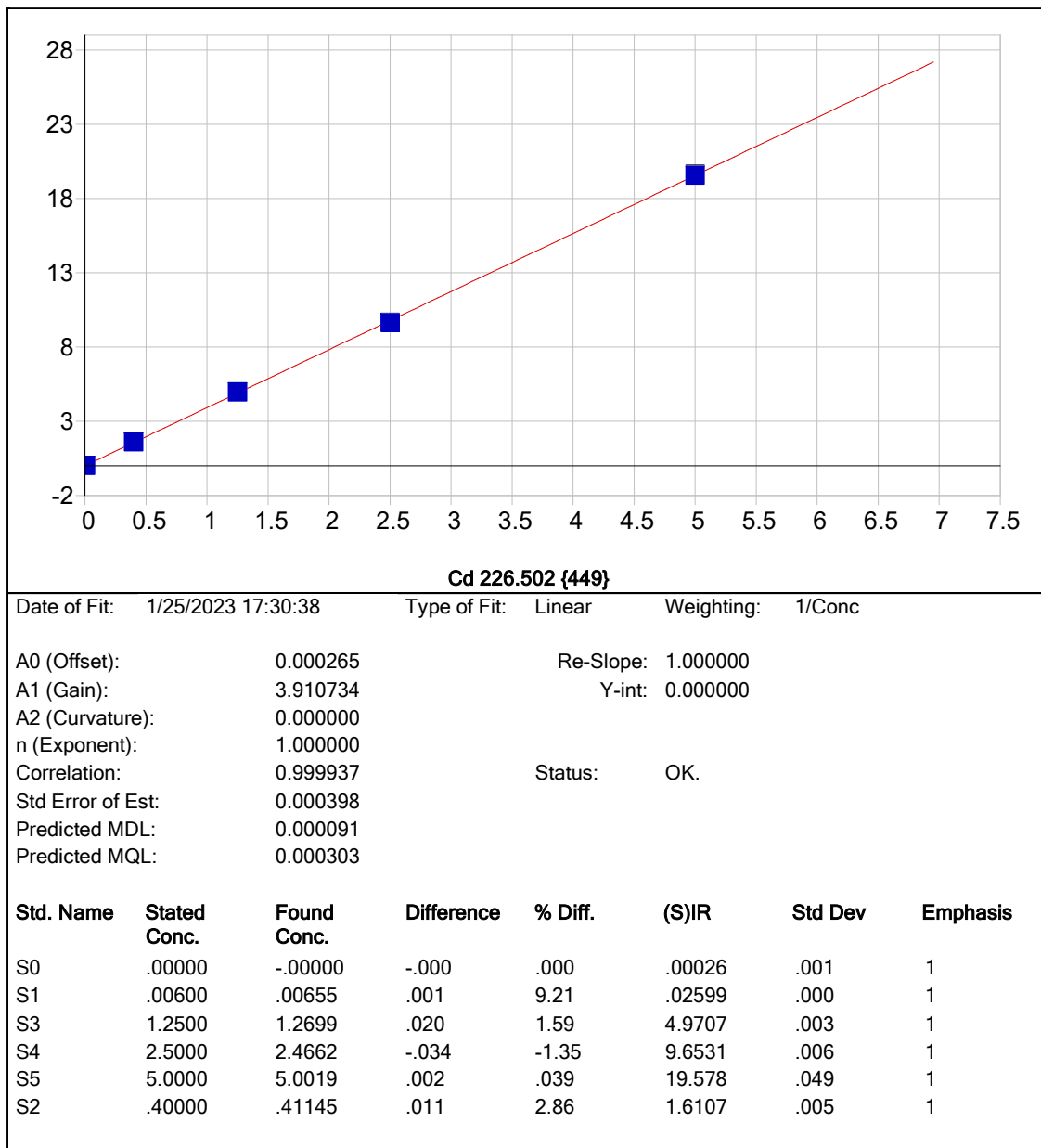


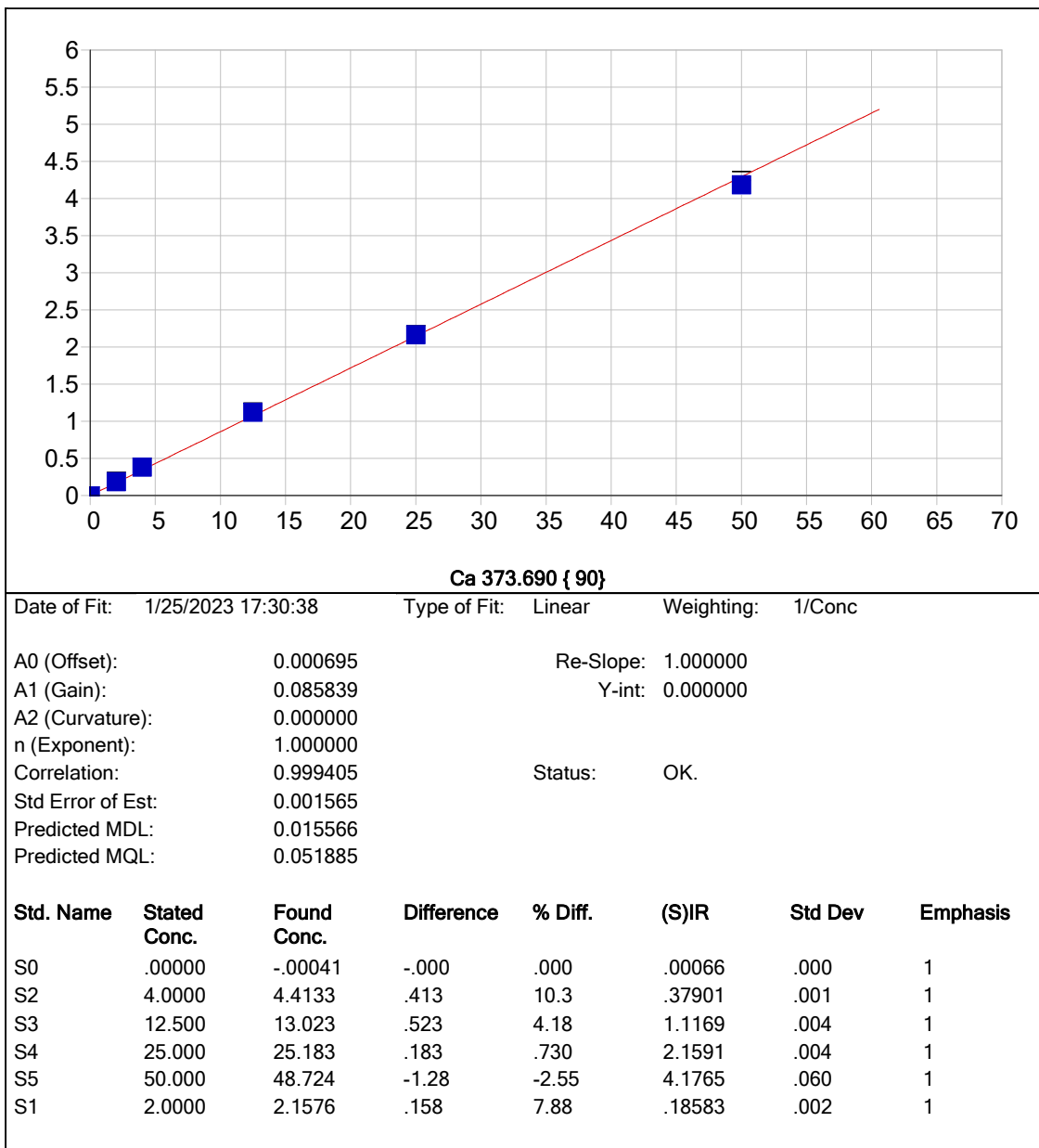


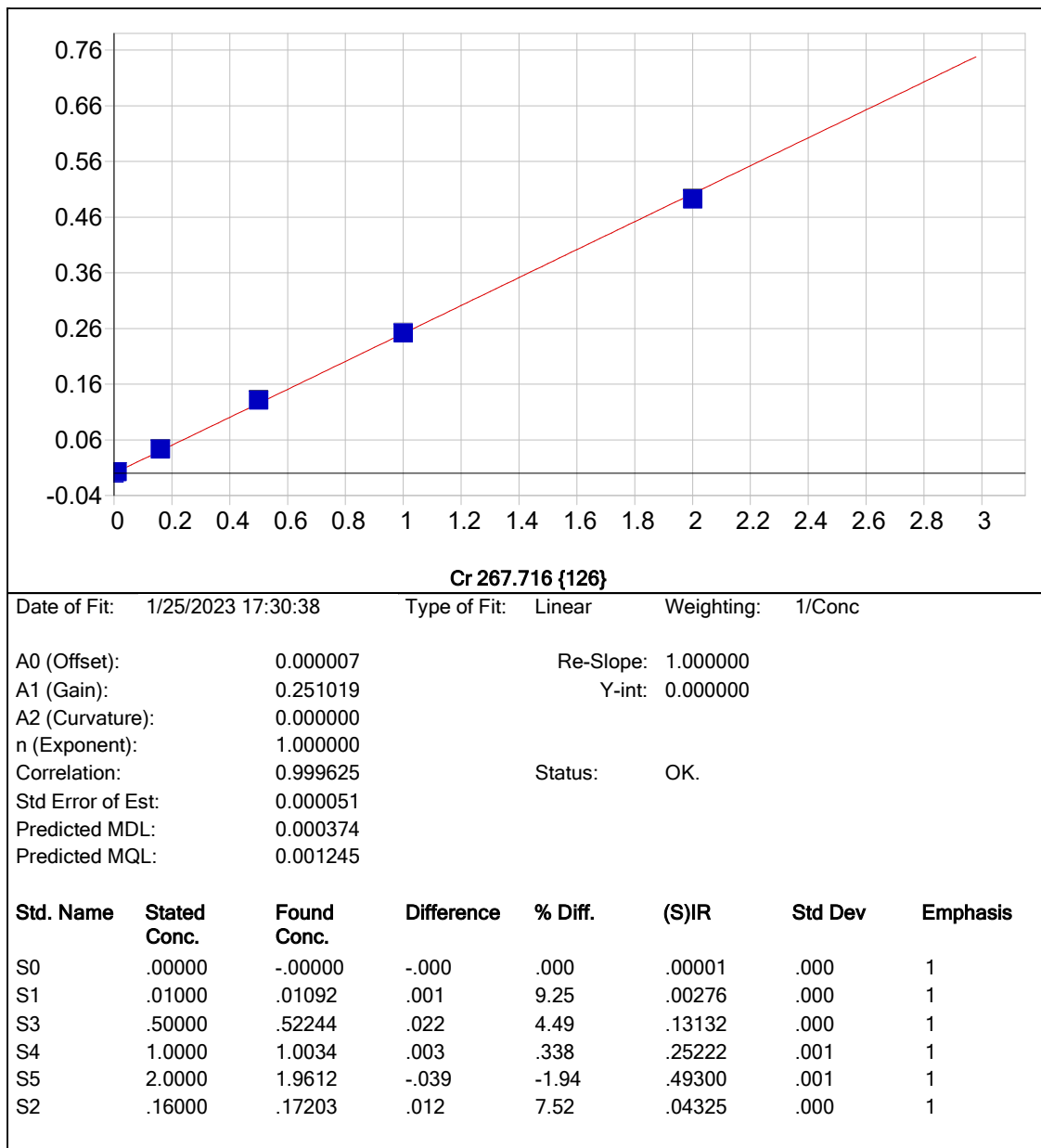


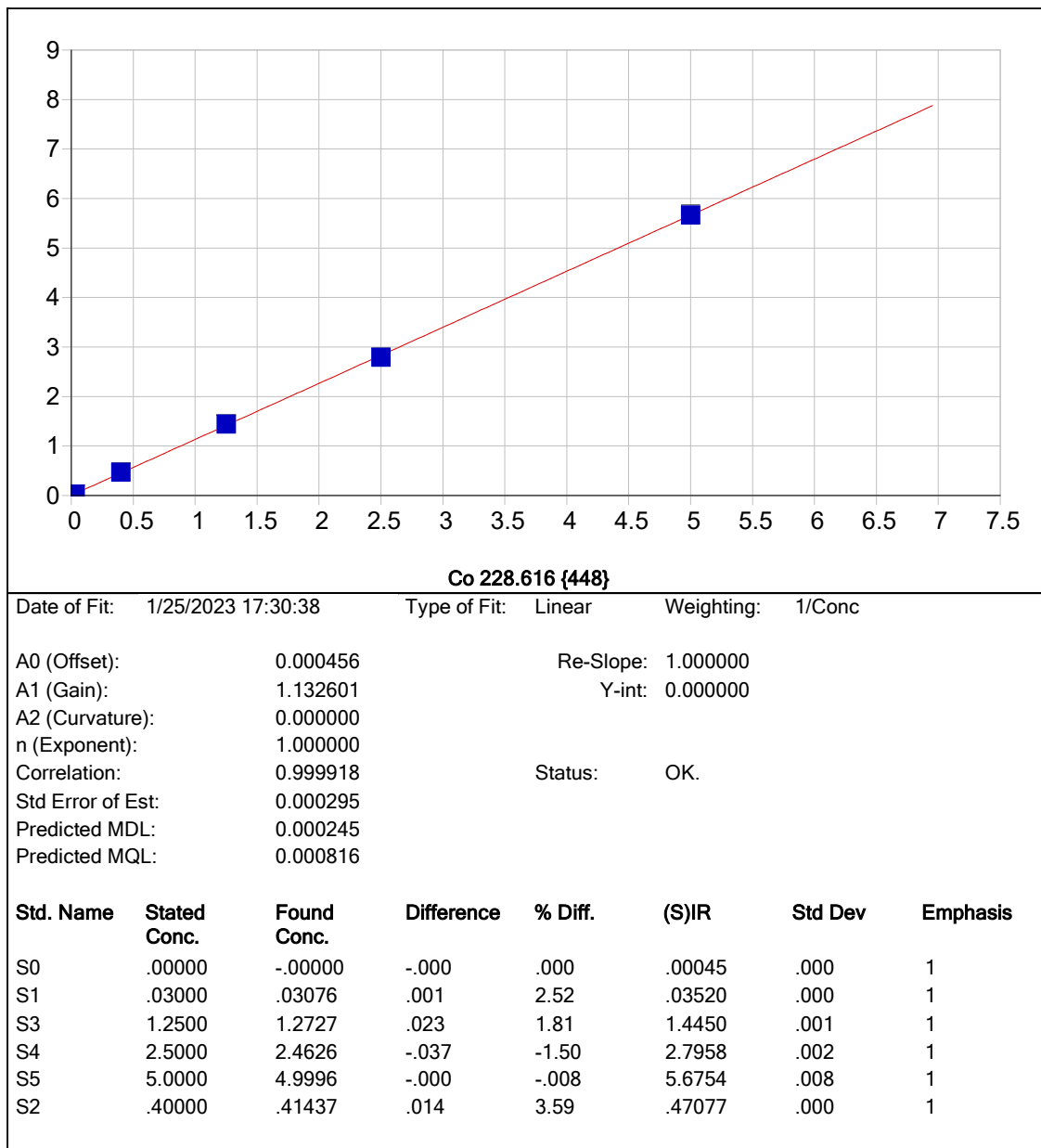


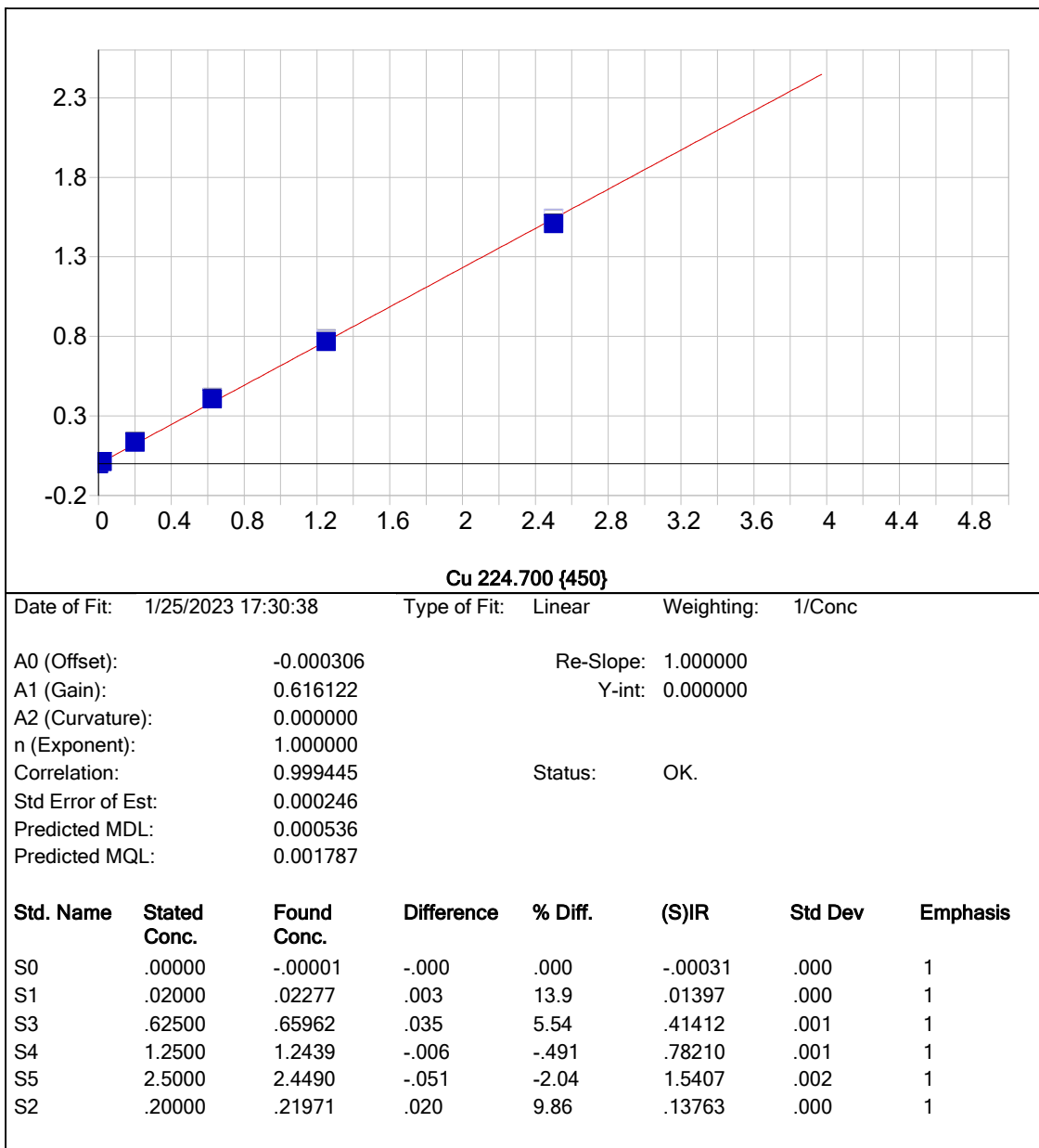


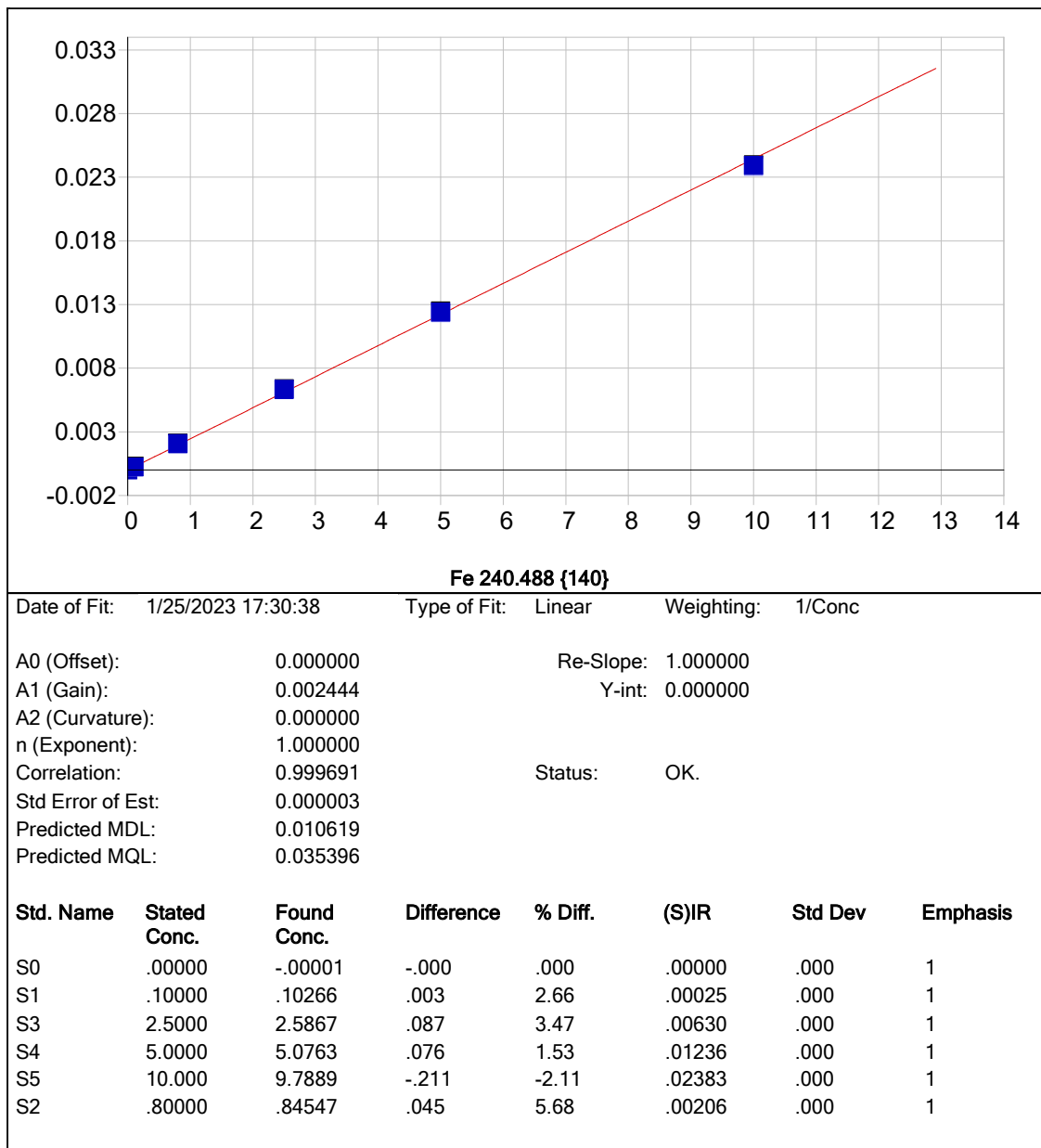


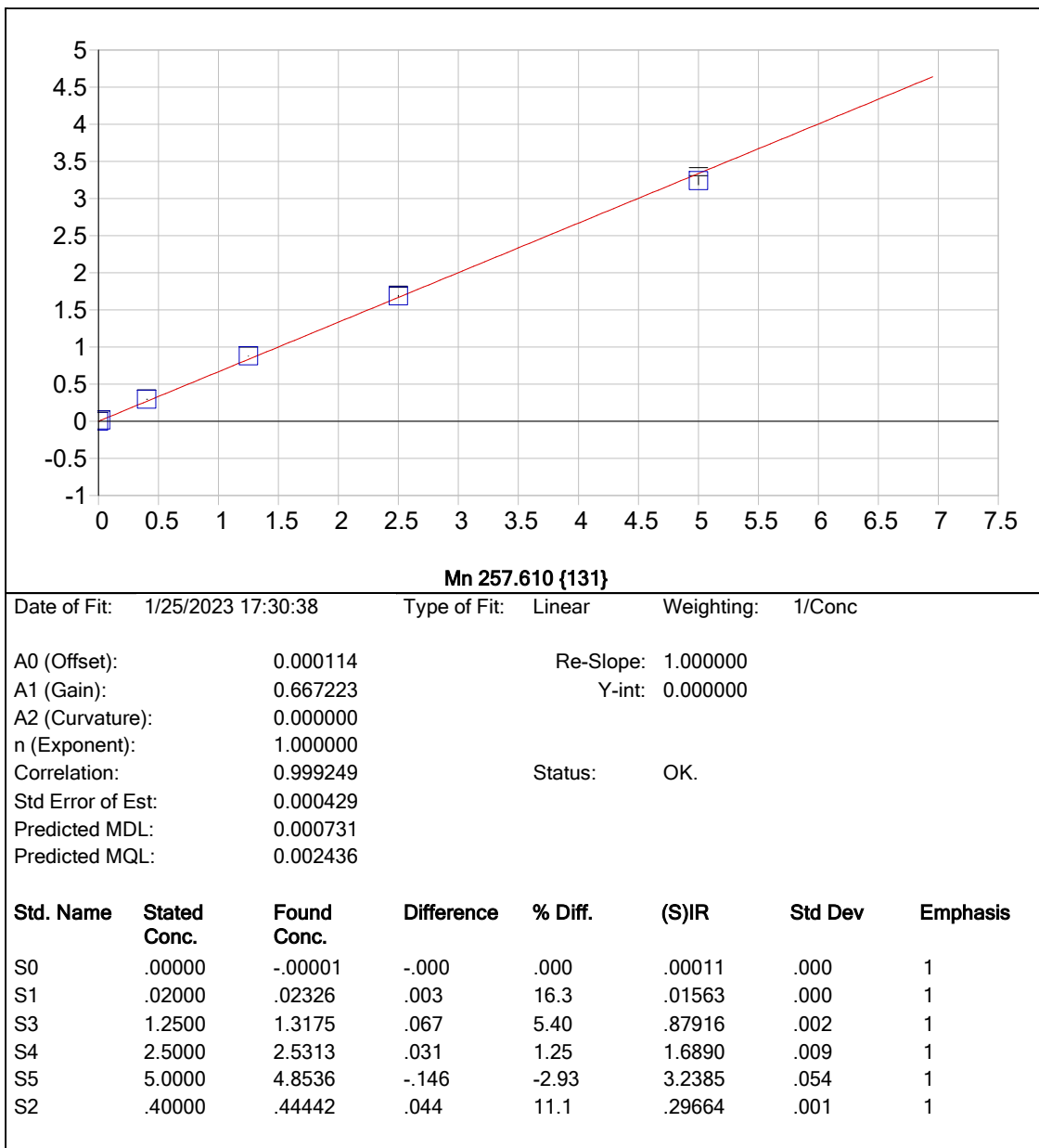


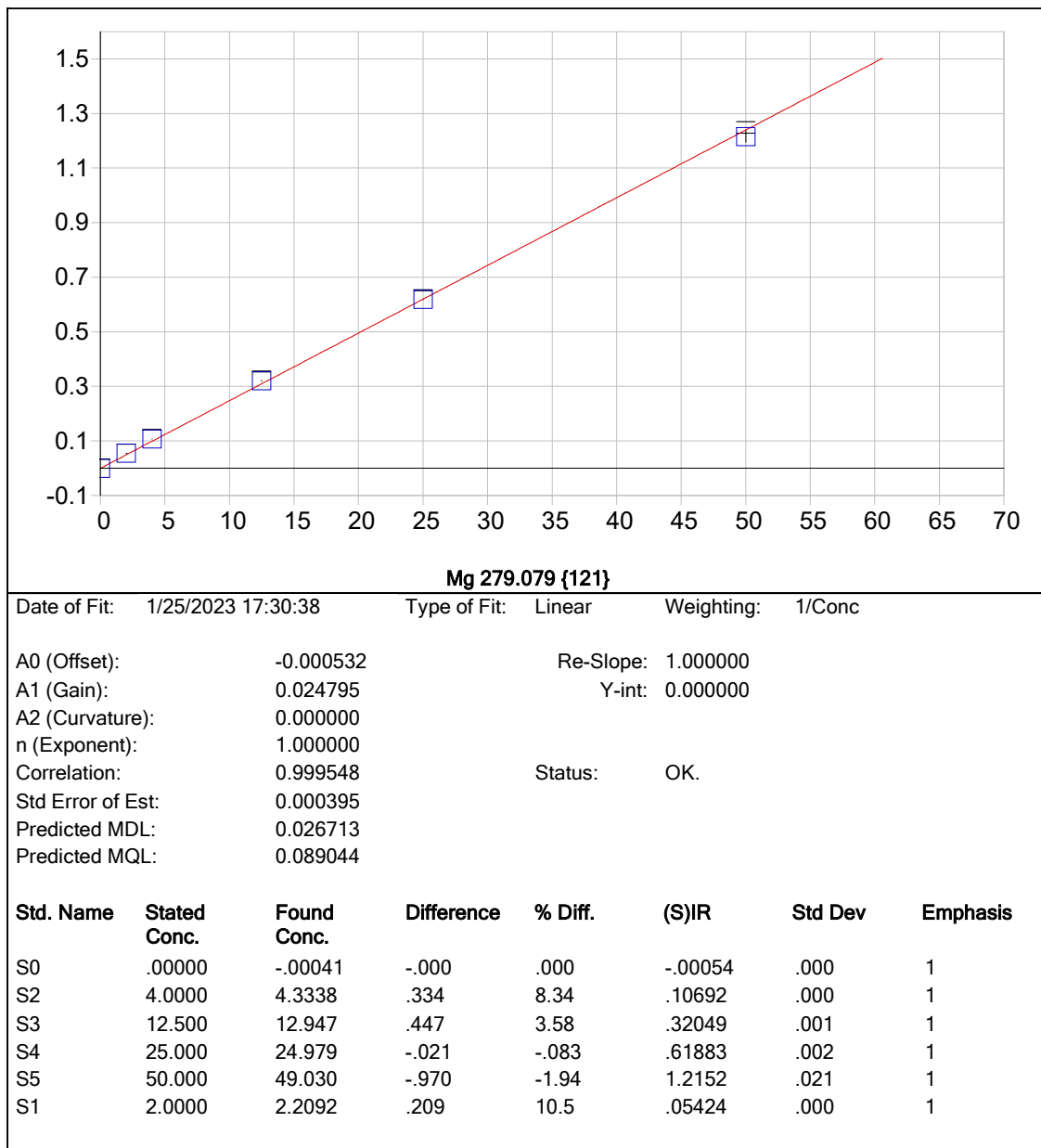


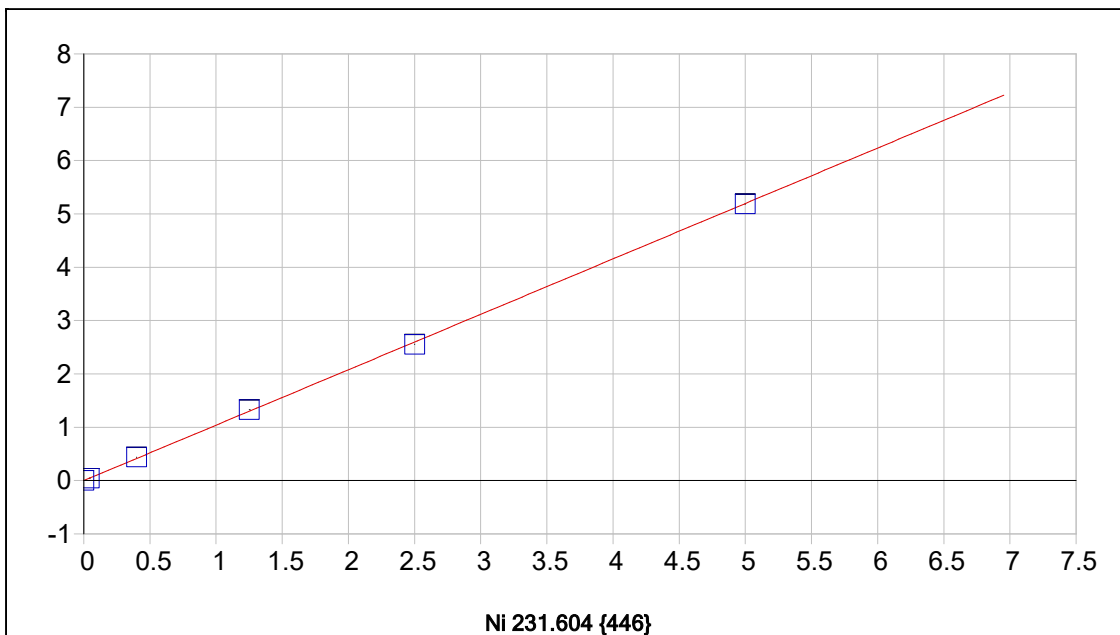






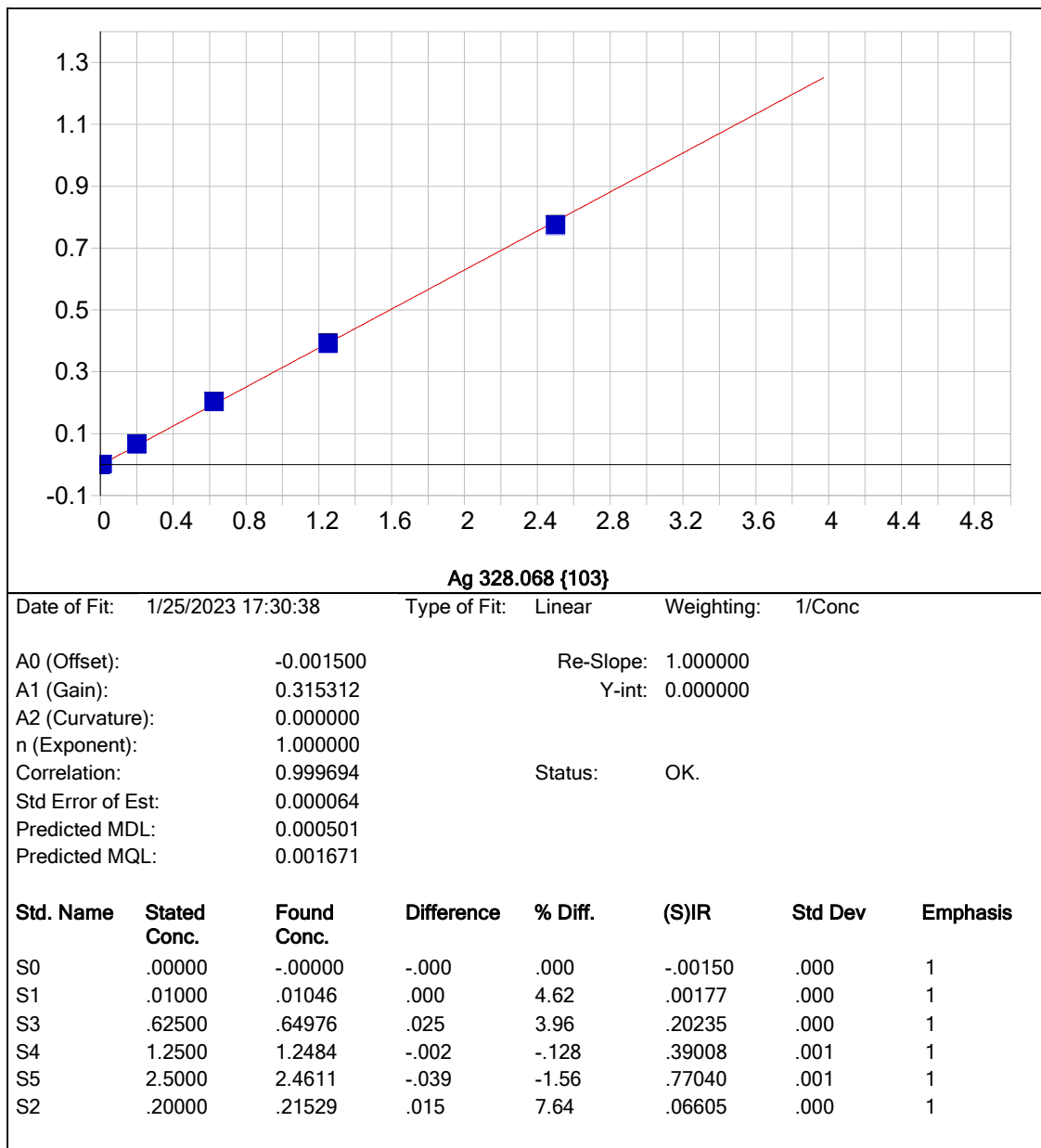


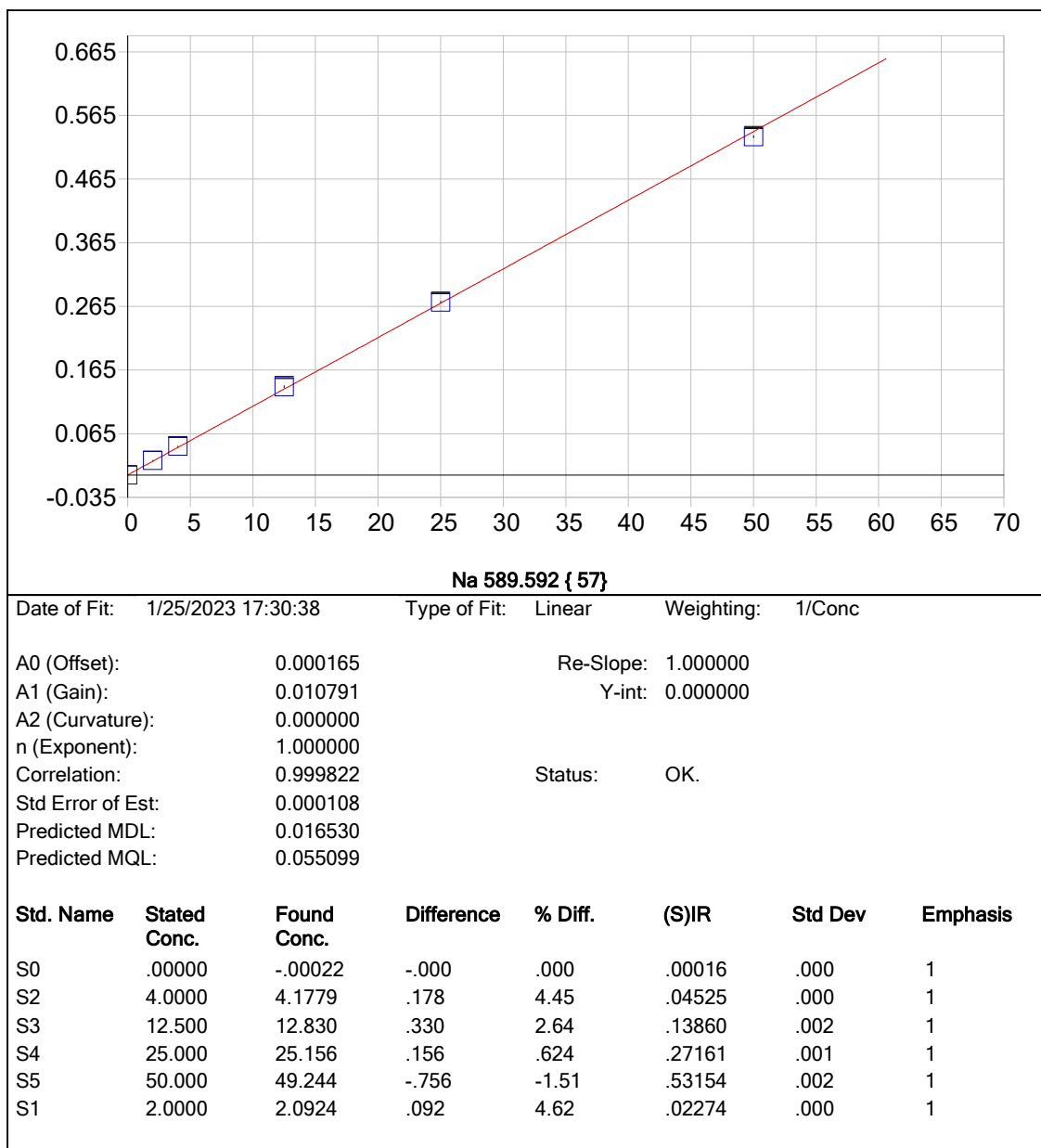


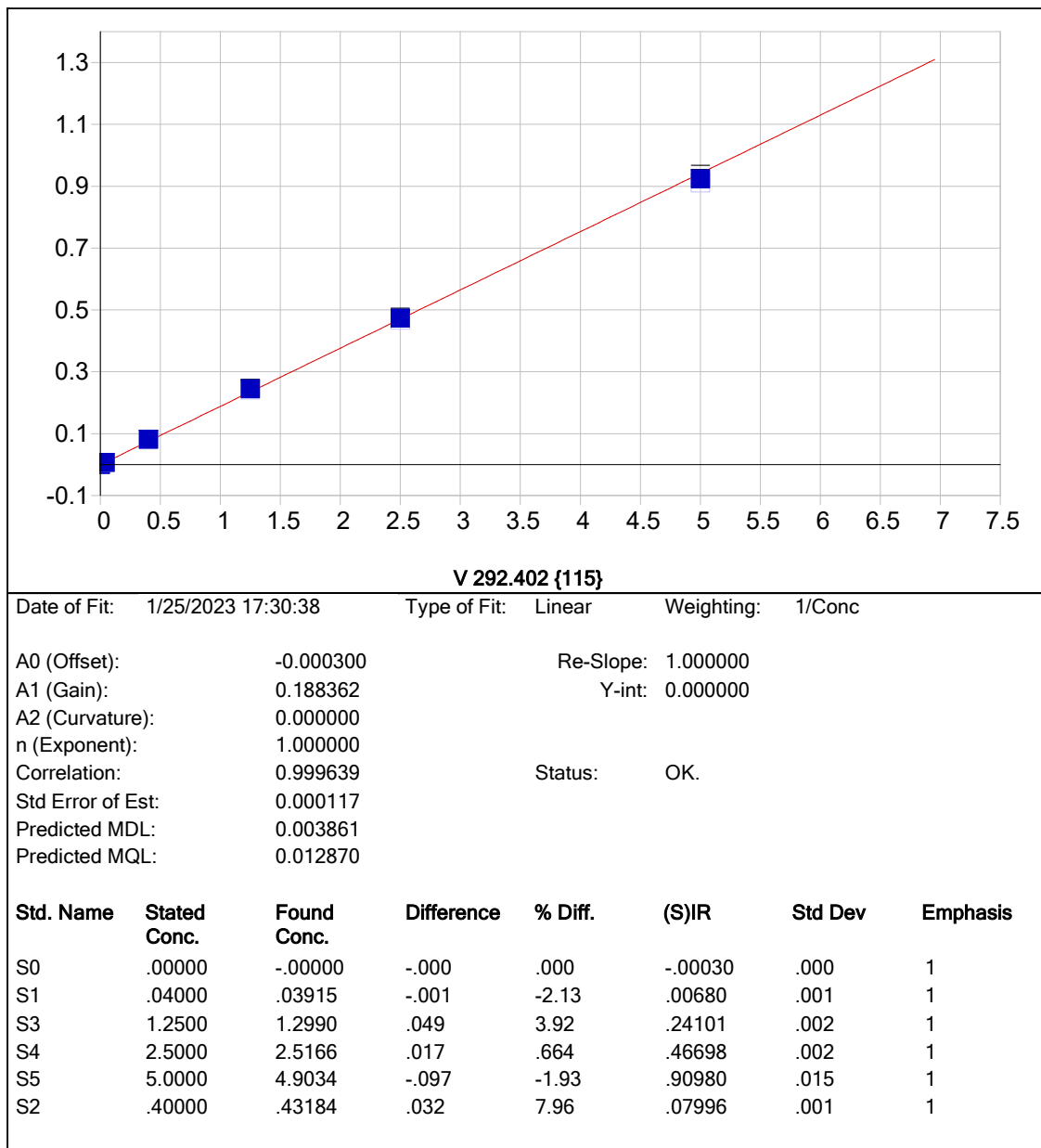


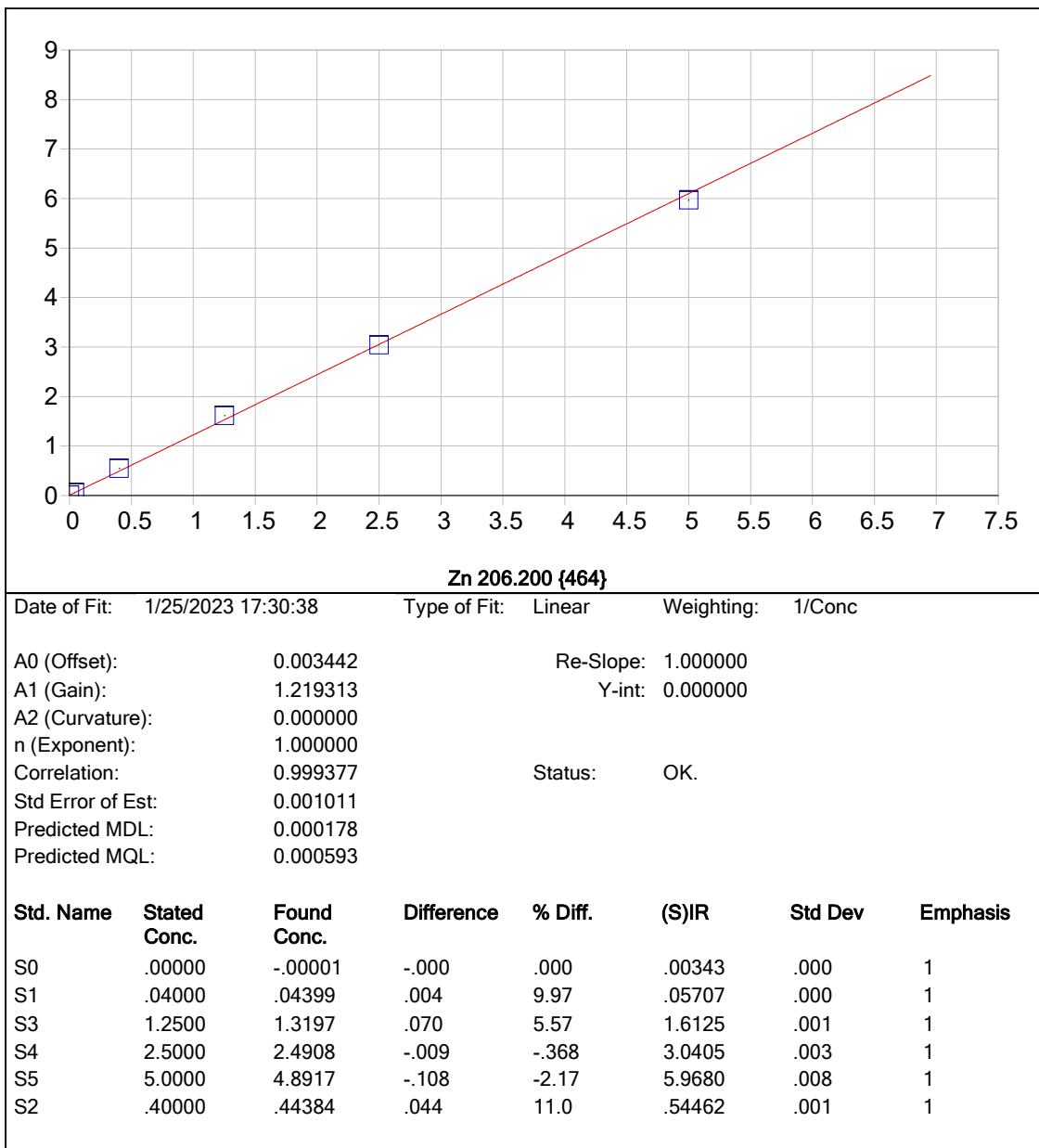
Date of Fit:	1/25/2023 17:30:38	Type of Fit:	Linear	Weighting:	1/Conc
A0 (Offset):	-0.000337	Re-Slope:	1.000000		
A1 (Gain):	1.039186	Y-int:	0.000000		
A2 (Curvature):	0.000000				
n (Exponent):	1.000000				
Correlation:	0.999866	Status:	OK.		
Std Error of Est:	0.000400				
Predicted MDL:	0.000338				
Predicted MQL:	0.001128				

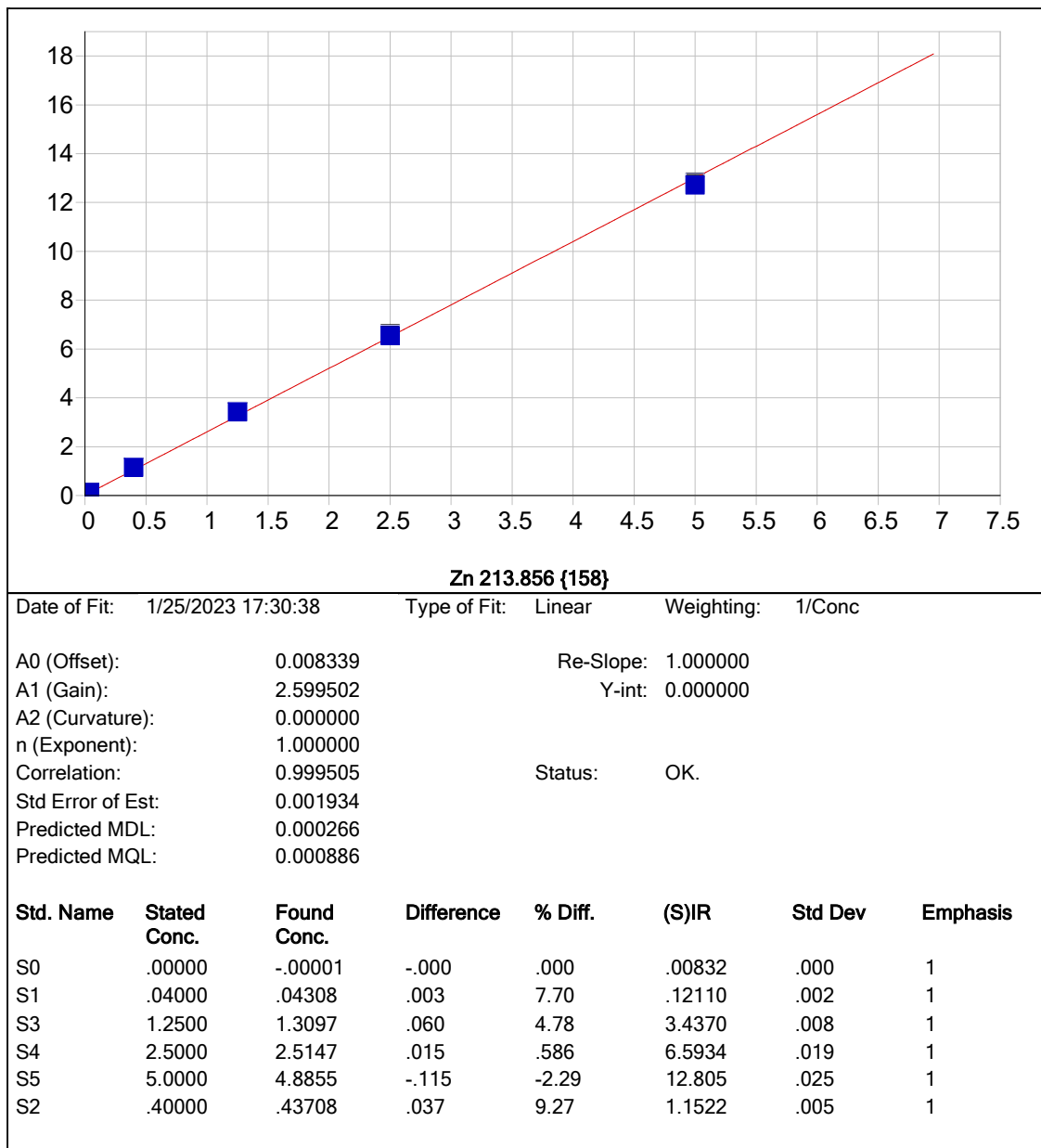
Std. Name	Stated Conc.	Found Conc.	Difference	% Diff.	(S)IR	Std Dev	Emphasis
S0	.00000	-.00000	-.000	.000	-.00034	.000	1
S1	.04000	.04094	.001	2.35	.04221	.000	1
S3	1.2500	1.2781	.028	2.25	1.3279	.003	1
S4	2.5000	2.4585	-.041	-1.66	2.5545	.001	1
S5	5.0000	4.9913	-.009	-.174	5.1866	.007	1
S2	.40000	.42110	.021	5.28	.43727	.001	1

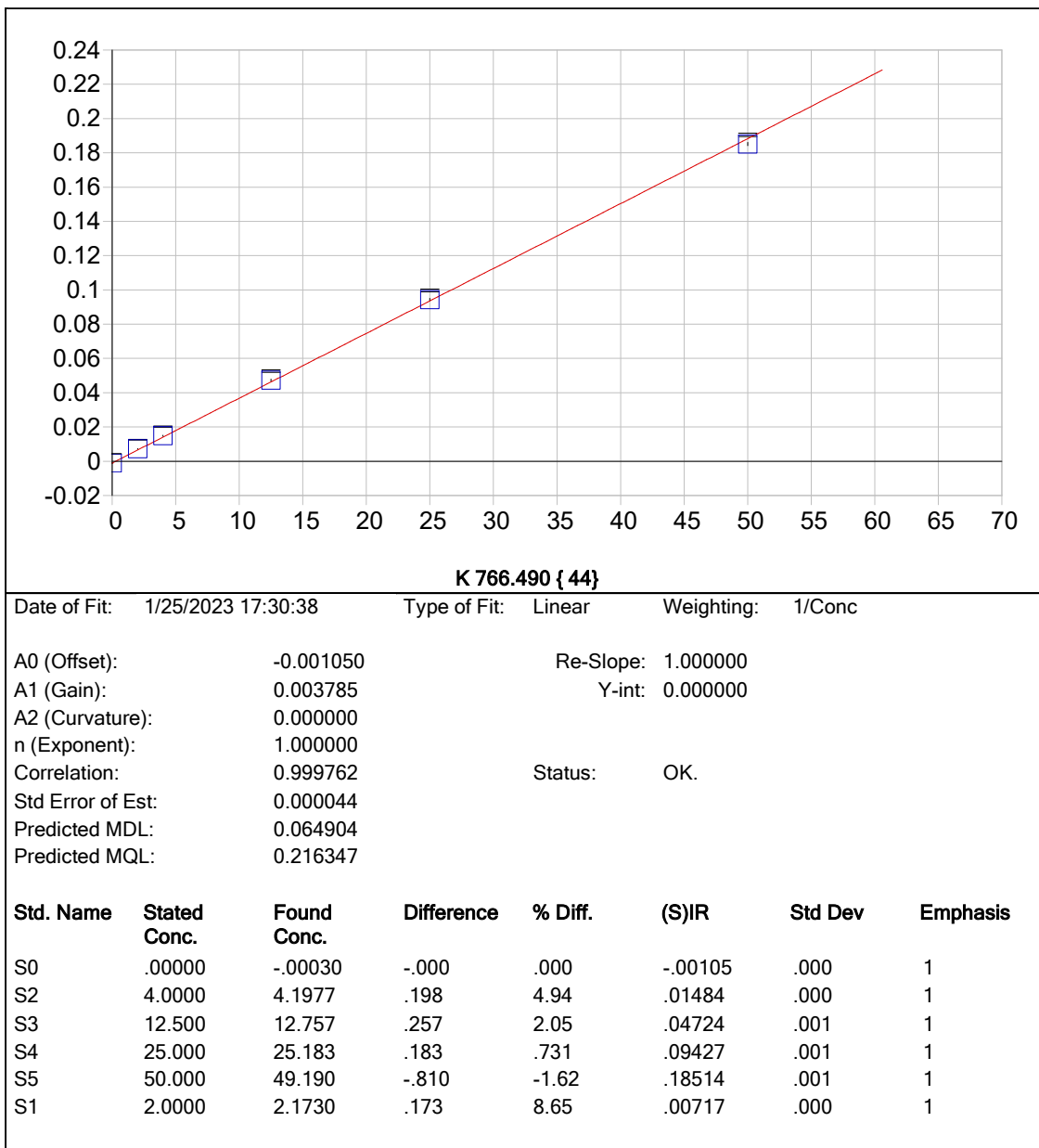


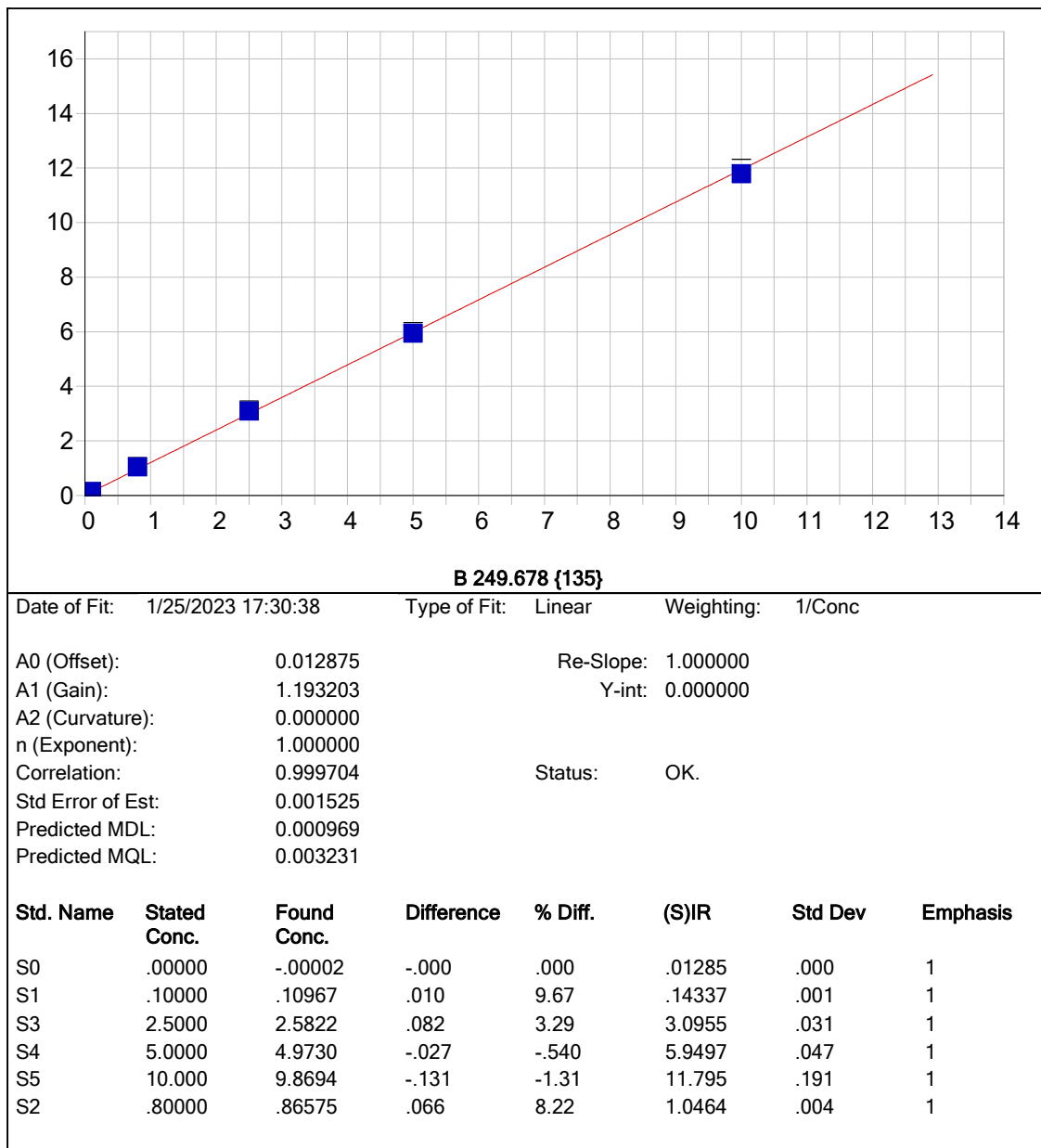


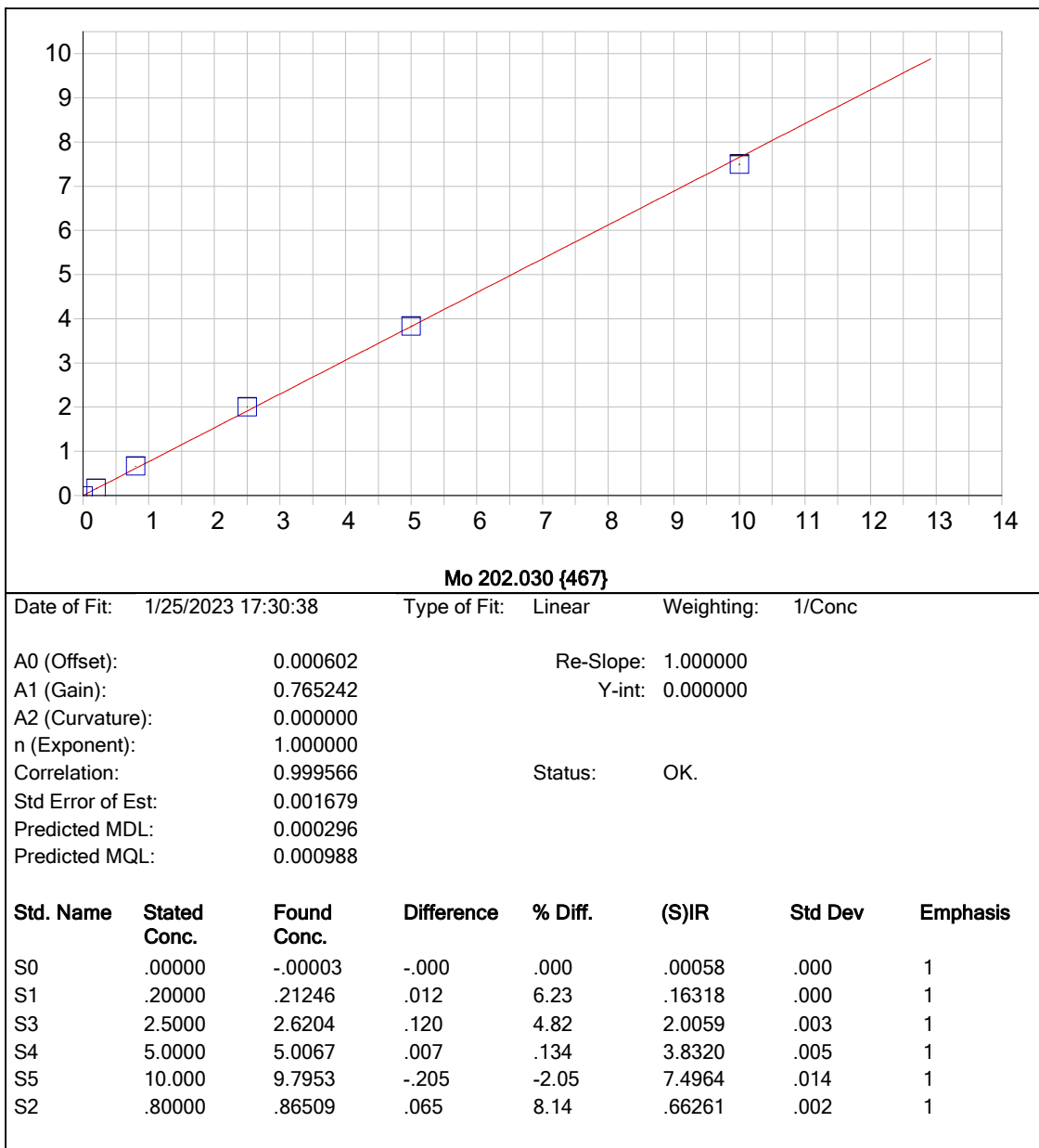


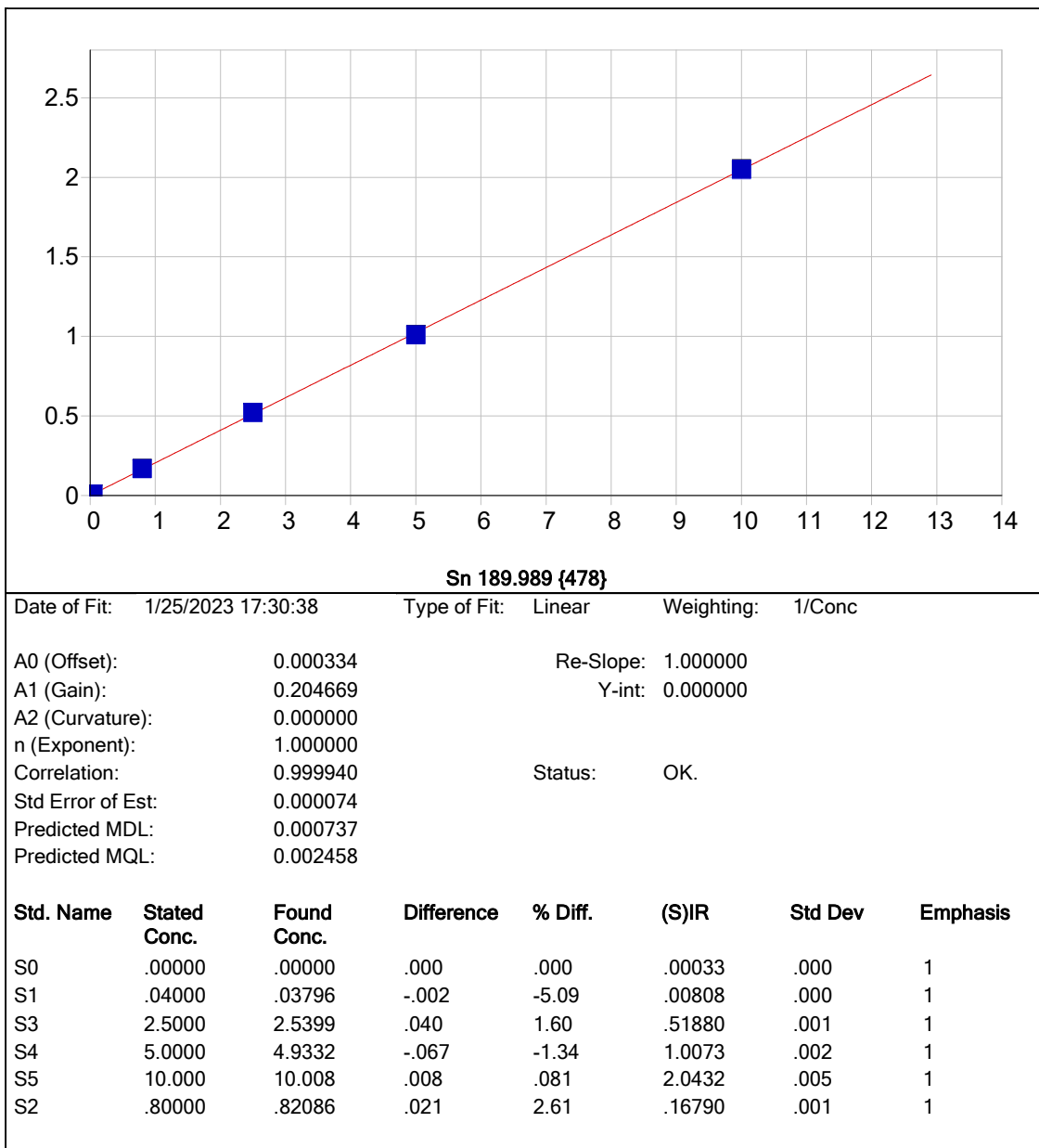


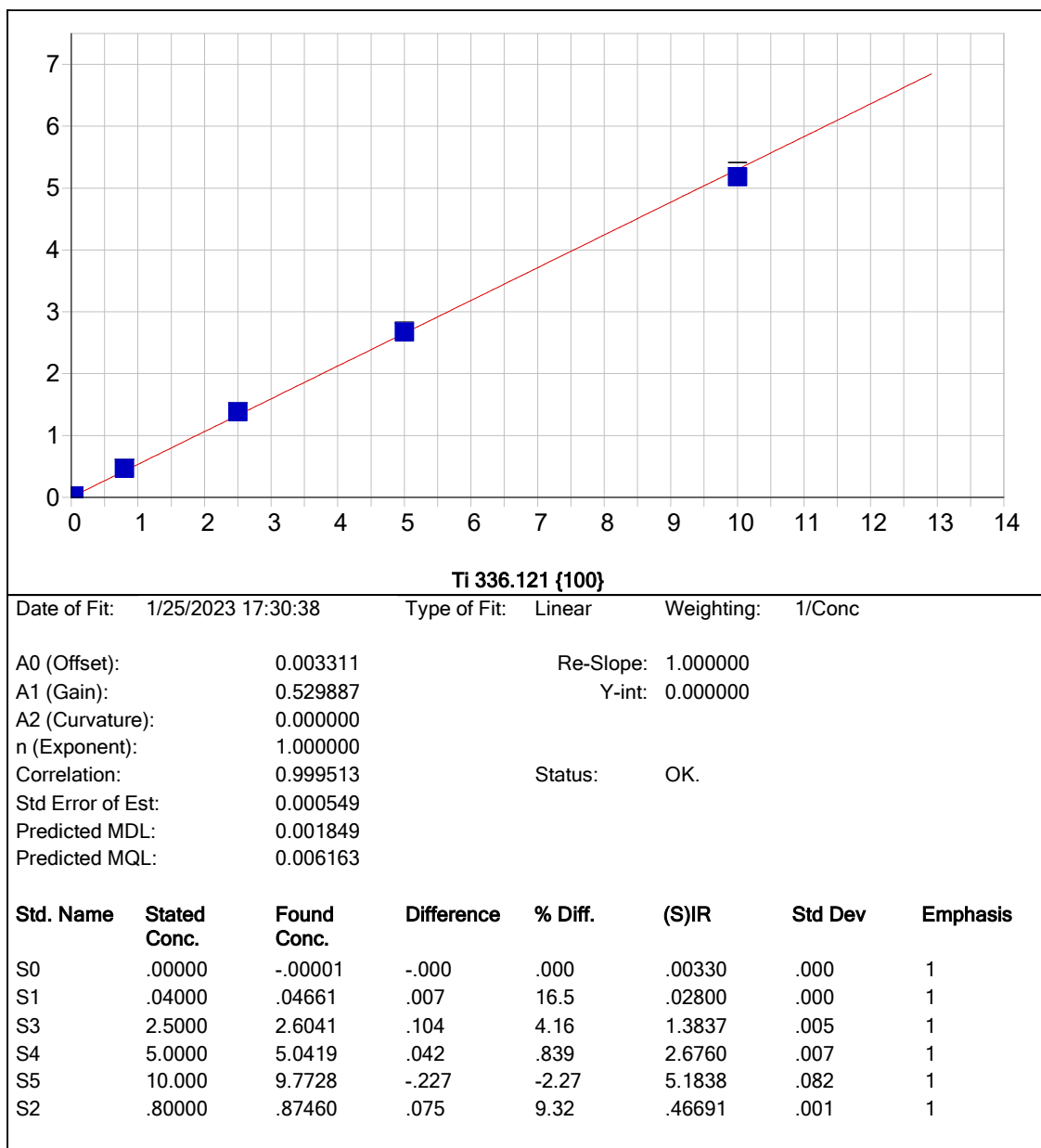


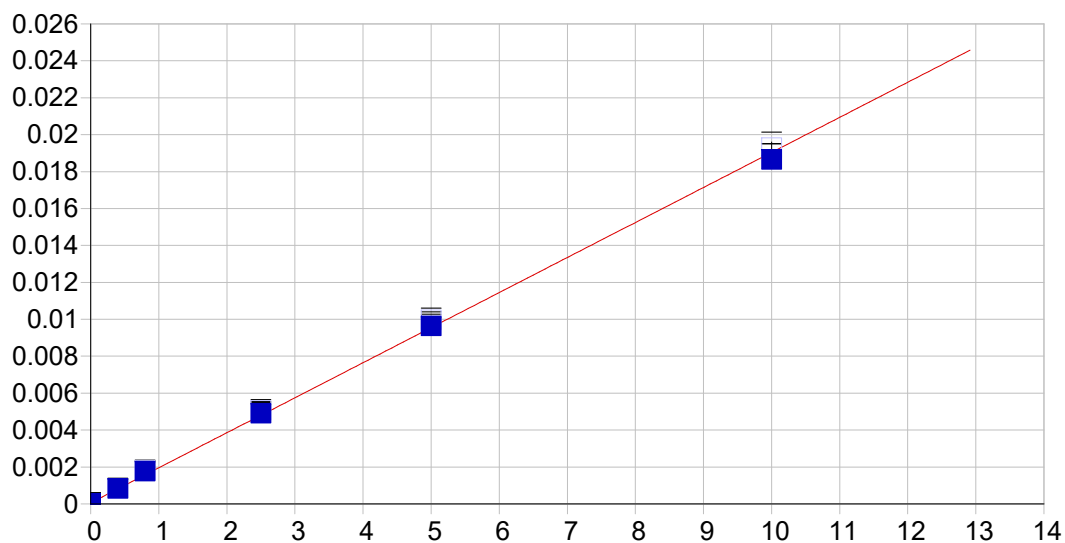










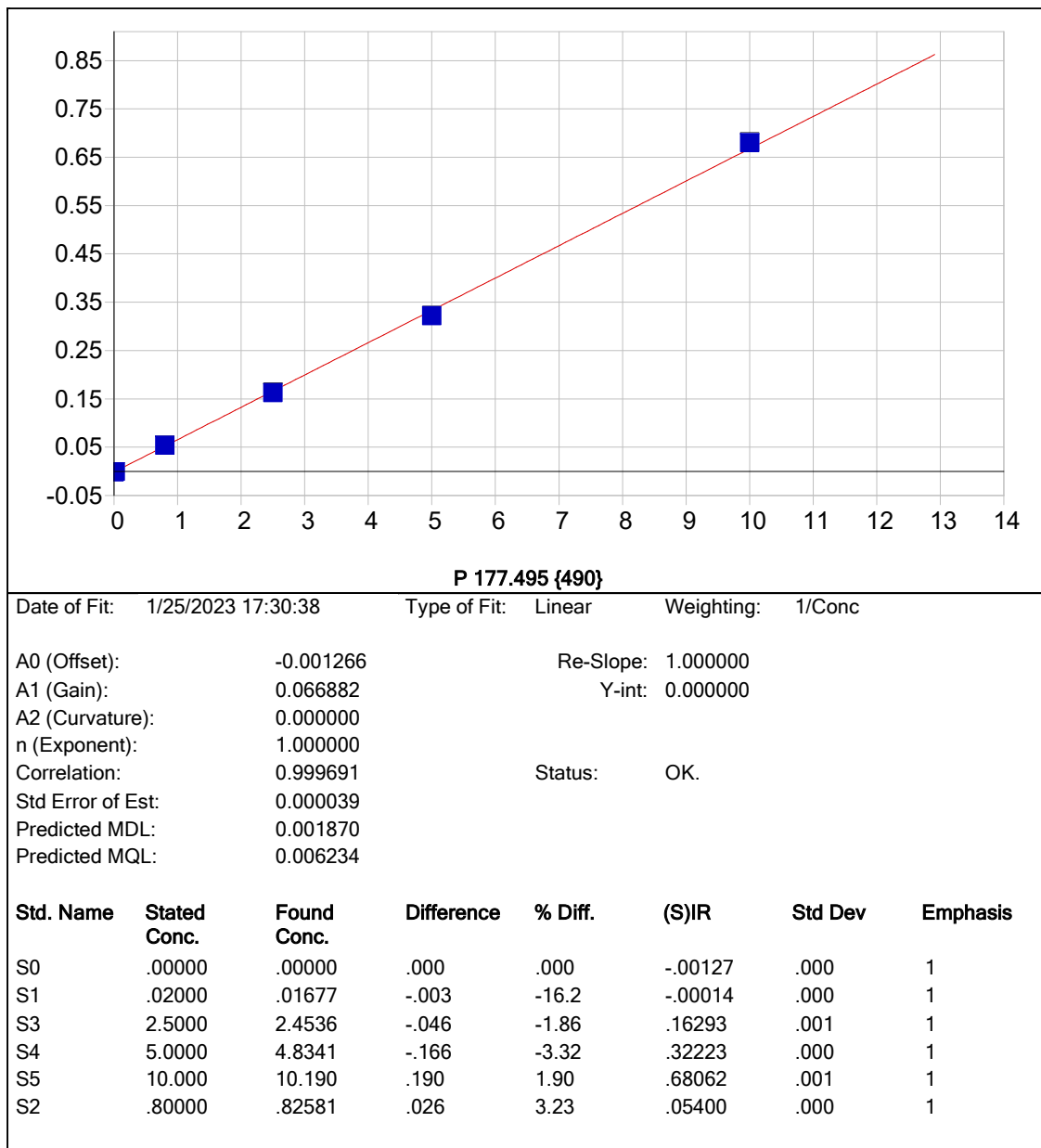


Si 288.158 {117}

Date of Fit: 1/25/2023 17:30:38 Type of Fit: Linear Weighting: 1/Conc

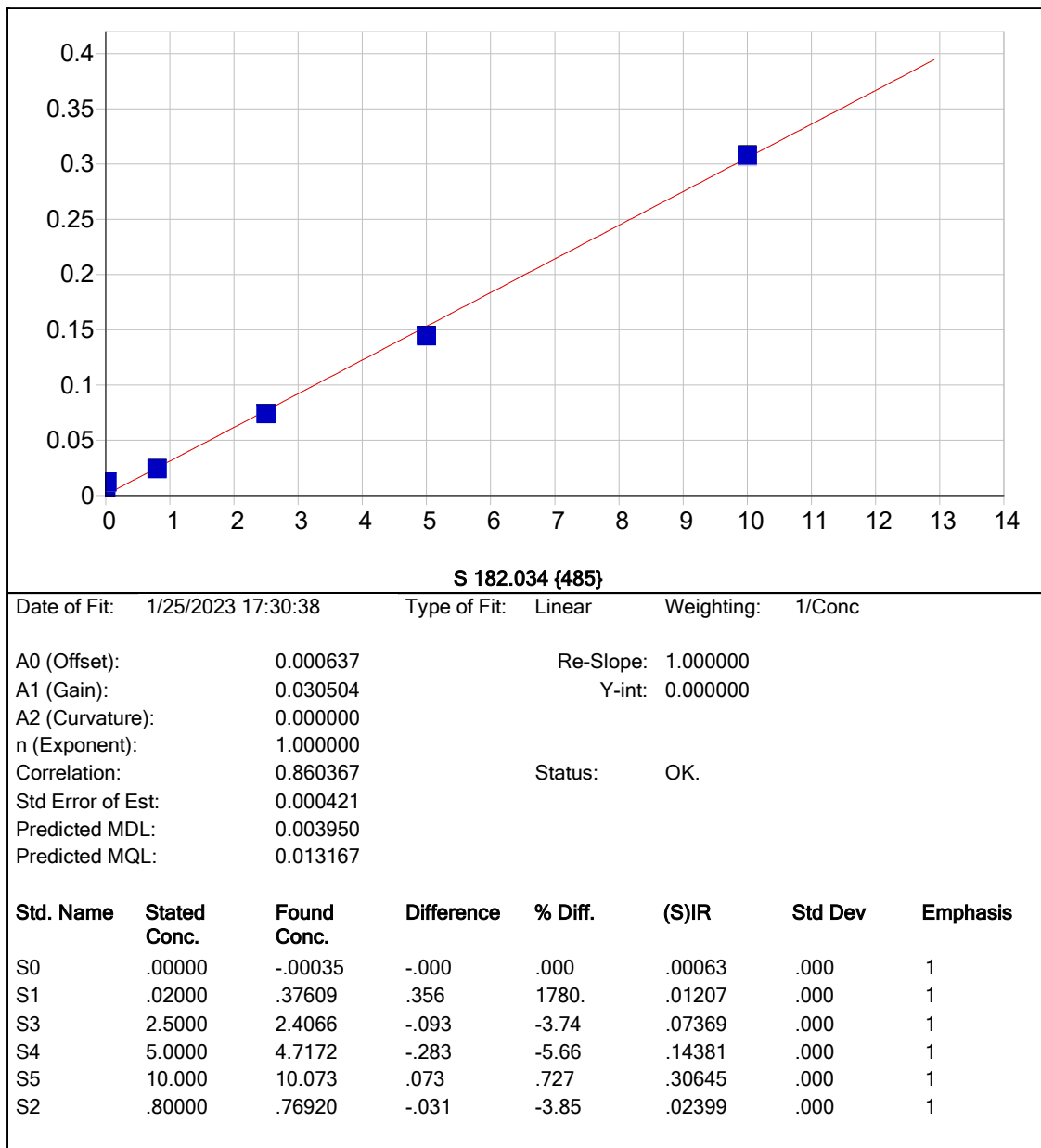
A0 (Offset): 0.000055 Re-Slope: 1.000000
A1 (Gain): 0.001898 Y-int: 0.000000
A2 (Curvature): 0.000000
n (Exponent): 1.000000
Correlation: 0.999547 Status: OK.
Std Error of Est: 0.000006
Predicted MDL: 0.022204
Predicted MQL: 0.074013

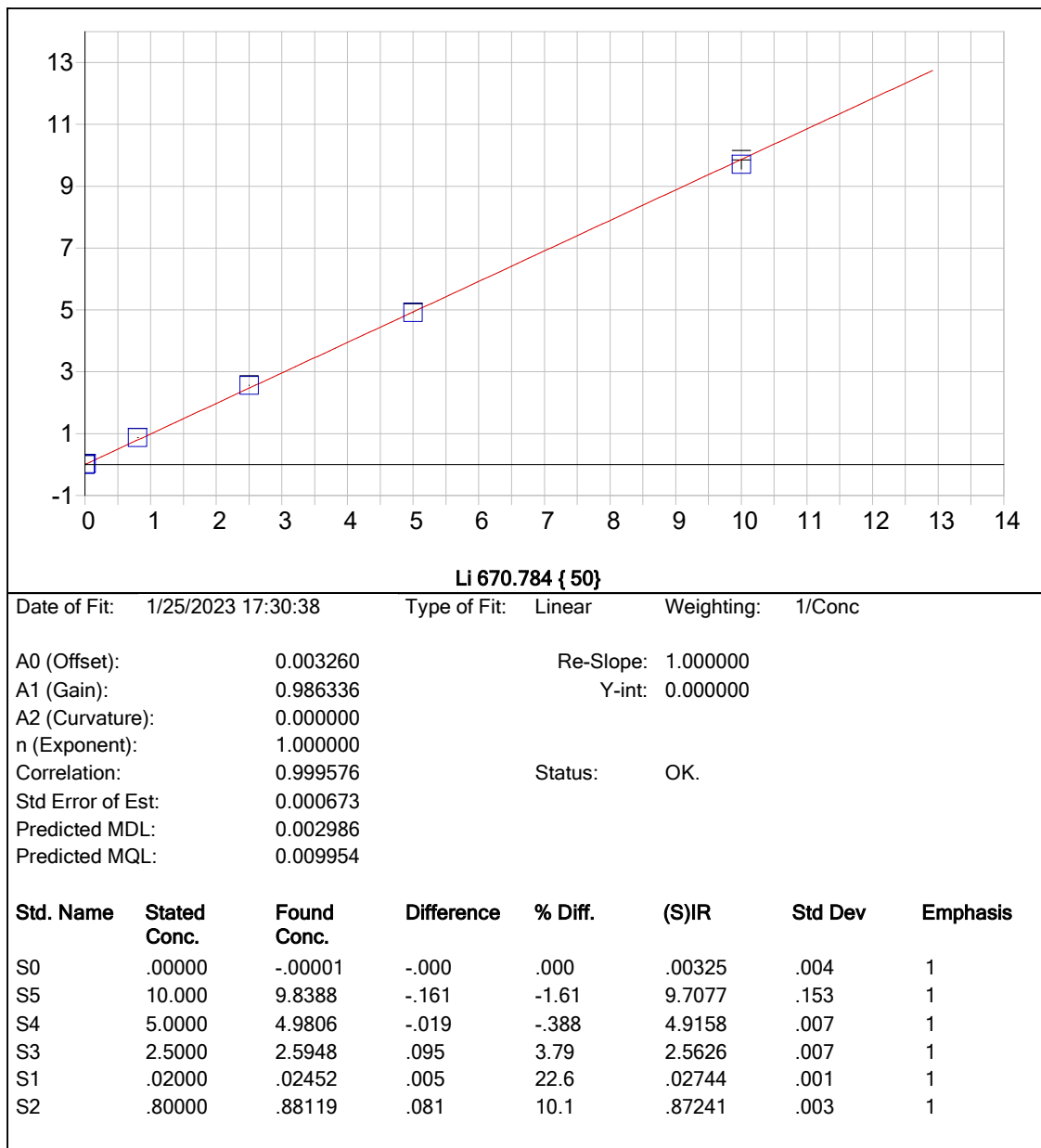
Std. Name	Stated Conc.	Found Conc.	Difference	% Diff.	(S)IR	Std Dev	Emphasis
S0	.00000	-.00006	-.000	.000	.00006	.000	1
S1	.40000	.40641	.006	1.60	.00083	.000	1
S3	2.5000	2.5520	.052	2.08	.00506	.000	1
S4	5.0000	5.0517	.052	1.03	.00997	.000	1
S5	10.000	9.7921	-.208	-2.08	.01929	.000	1
S2	.80000	.89809	.098	12.3	.00181	.000	1

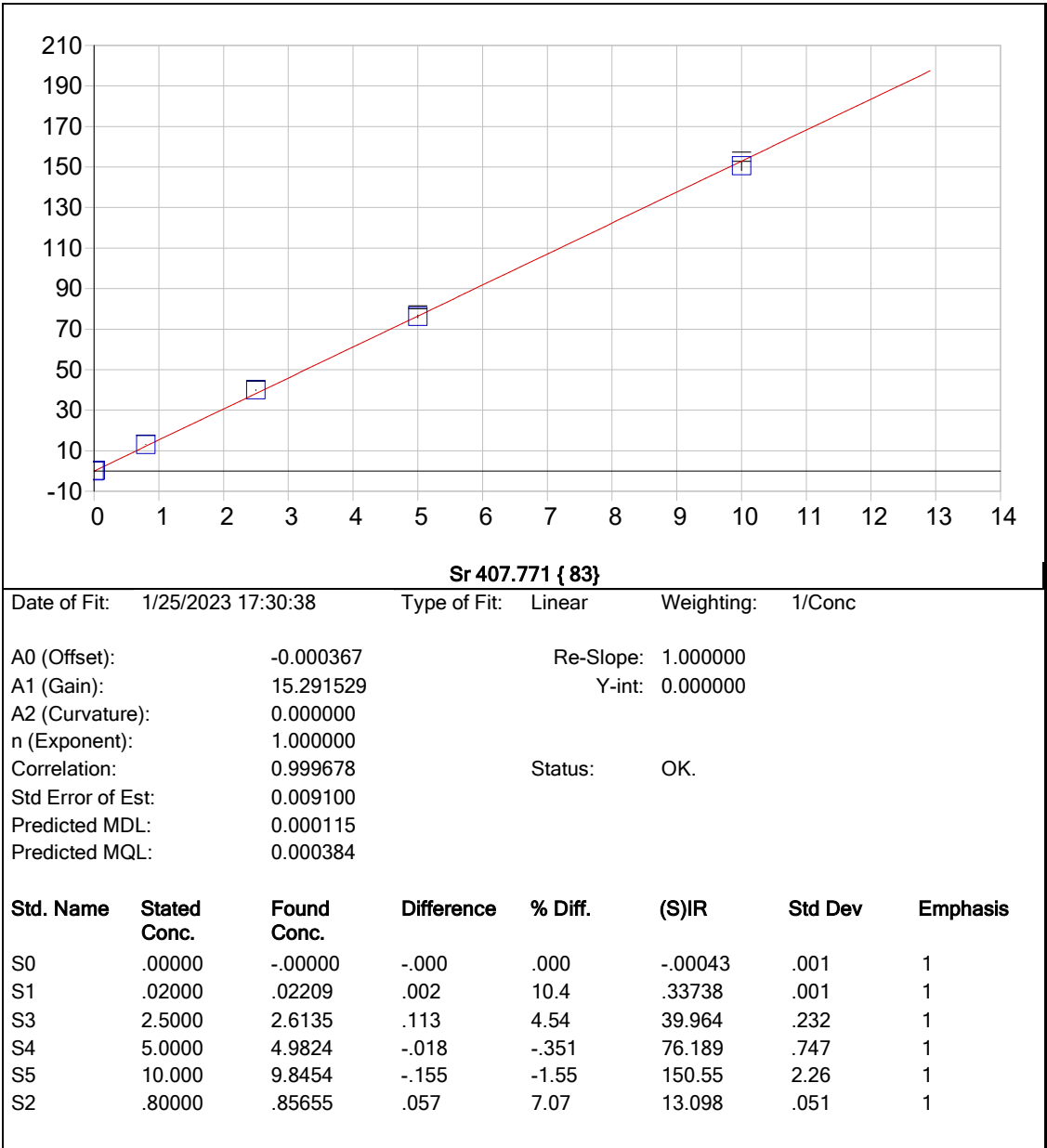


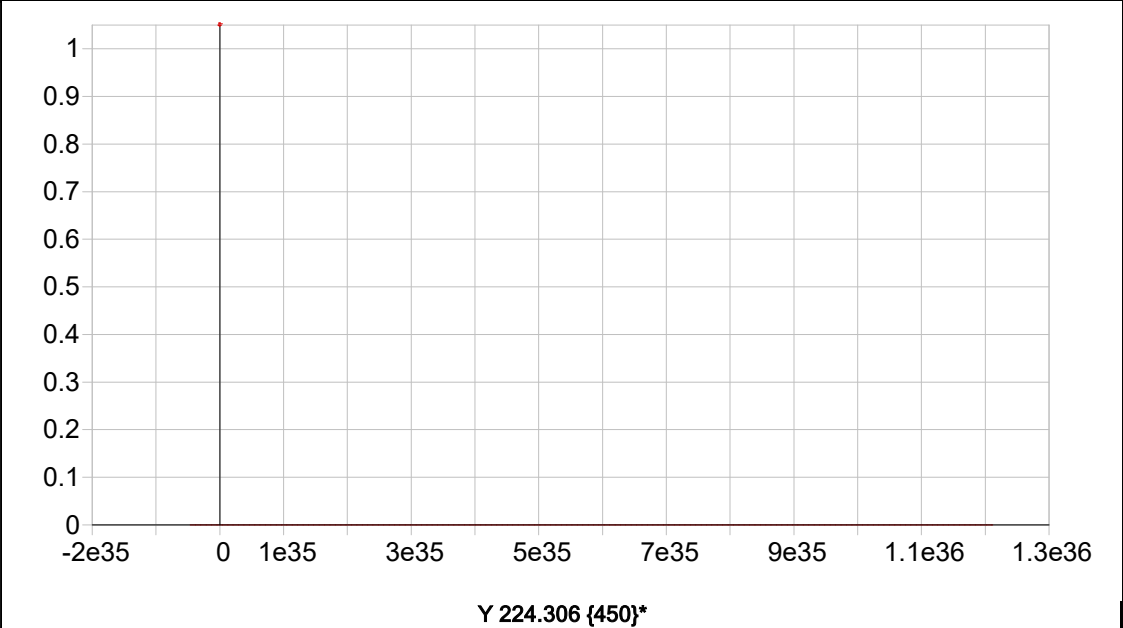
Date of Fit: 1/25/2023 17:30:38 Type of Fit: Linear Weighting: 1/Conc

A0 (Offset): -0.001266 Re-Slope: 1.000000
A1 (Gain): 0.066882 Y-int: 0.000000
A2 (Curvature): 0.000000
n (Exponent): 1.000000
Correlation: 0.999691 Status: OK.
Std Error of Est: 0.000039
Predicted MDL: 0.001870
Predicted MQL: 0.006234





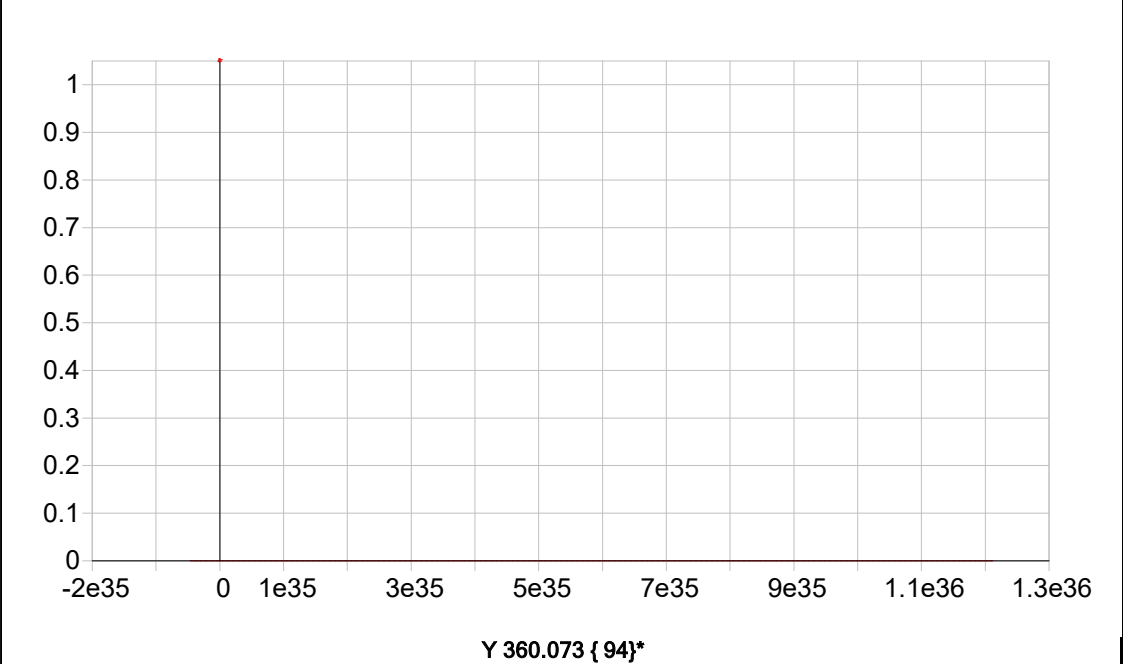




Date of Fit: 1/25/2023 17:30:38 Type of Fit: Linear Weighting: 1/Conc

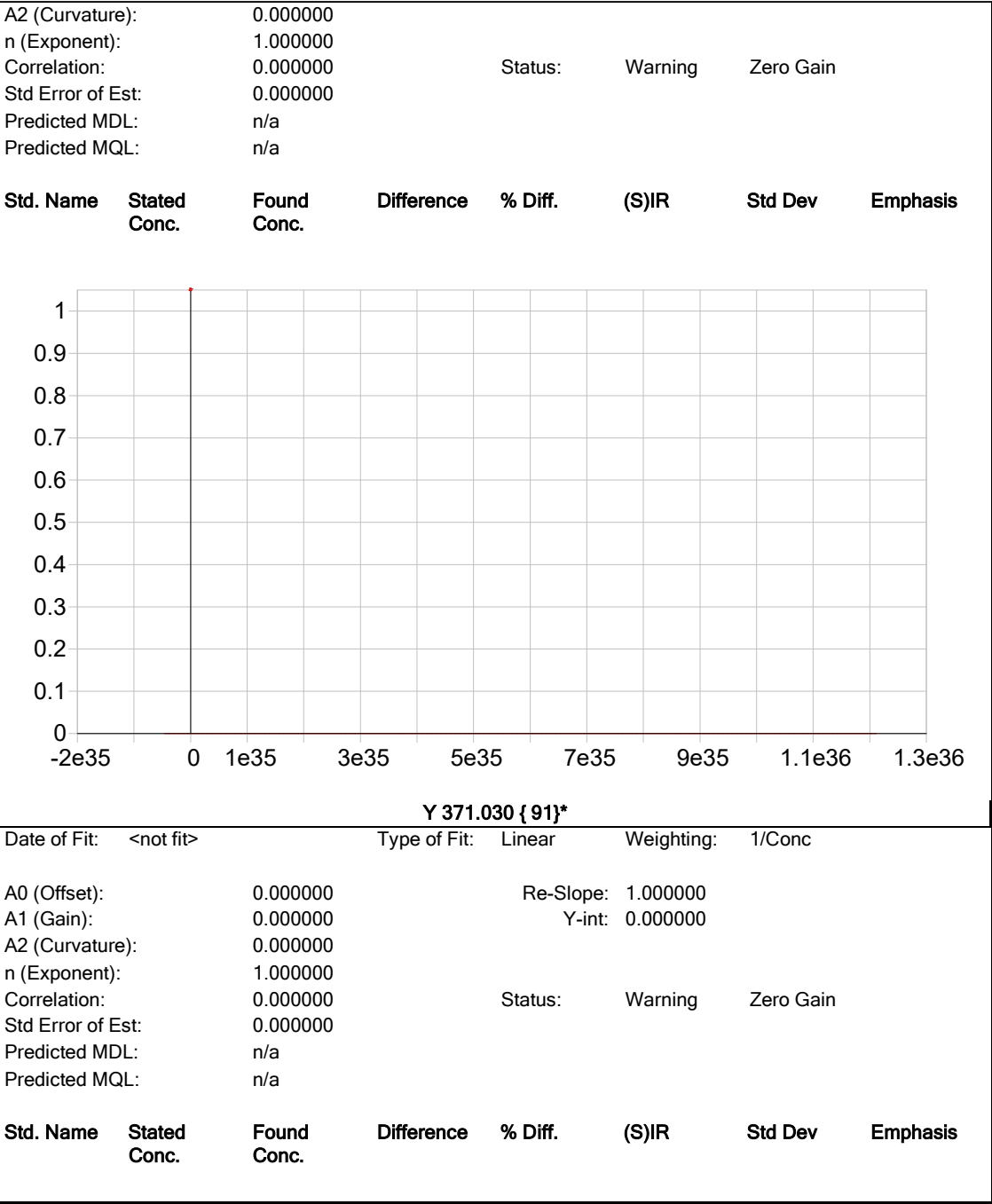
A0 (Offset):	0.000000	Re-Slope:	1.000000
A1 (Gain):	0.000000	Y-int:	0.000000
A2 (Curvature):	0.000000		
n (Exponent):	1.000000		
Correlation:	0.000000	Status:	Warning Zero Gain
Std Error of Est:	0.000000		
Predicted MDL:	n/a		
Predicted MQL:	n/a		

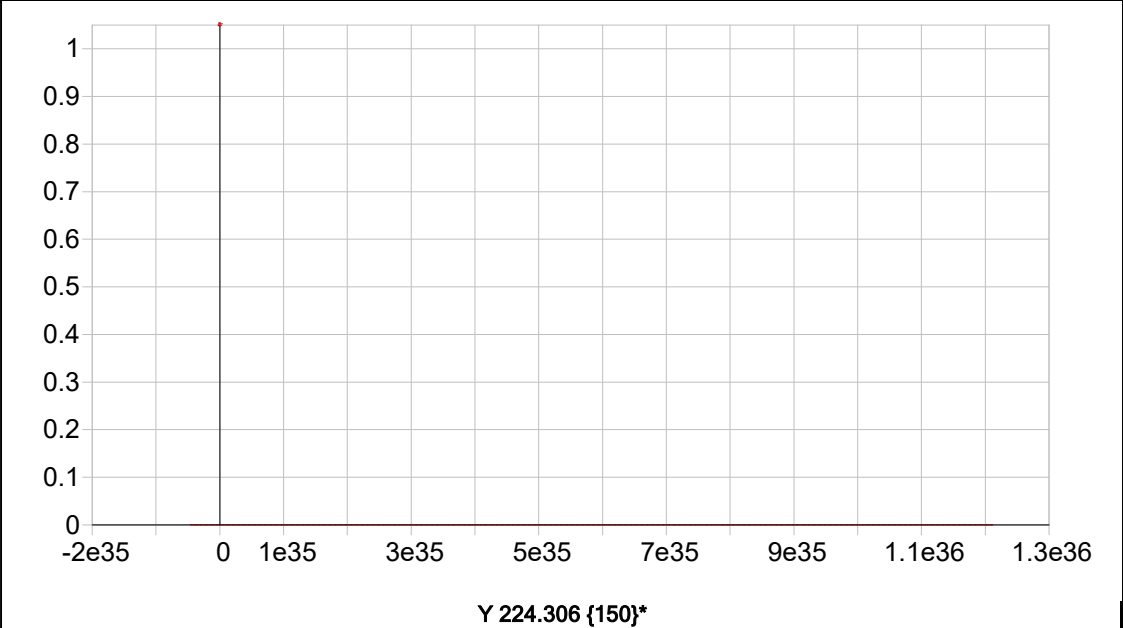
Std. Name	Stated Conc.	Found Conc.	Difference	% Diff.	(S)IR	Std Dev	Emphasis
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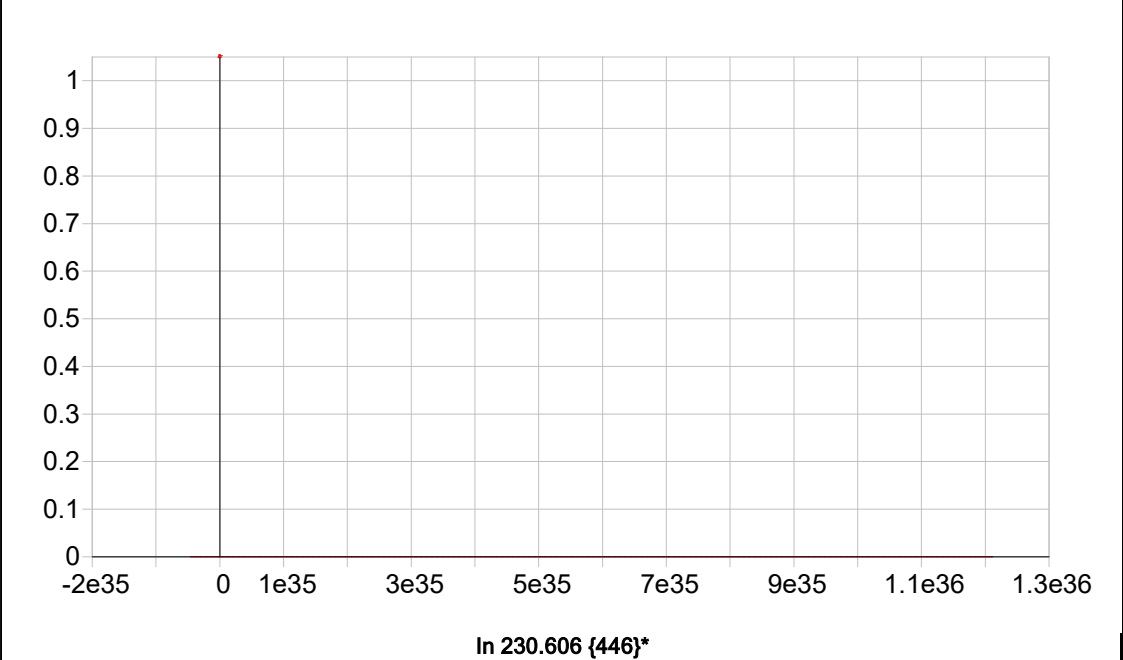
Date of Fit: <not fit> Type of Fit: Linear Weighting: 1/Conc

A0 (Offset):	0.000000	Re-Slope:	1.000000
A1 (Gain):	0.000000	Y-int:	0.000000





Date of Fit:	<not fit>		Type of Fit:	Linear	Weighting:	1/Conc	
A0 (Offset):	0.000000		Re-Slope:	1.000000			
A1 (Gain):	0.000000		Y-int:	0.000000			
A2 (Curvature):	0.000000						
n (Exponent):	1.000000						
Correlation:	0.000000		Status:	Warning	Zero Gain		
Std Error of Est:	0.000000						
Predicted MDL:	n/a						
Predicted MQL:	n/a						
Std. Name	Stated Conc.	Found Conc.	Difference	% Diff.	(S)IR	Std Dev	Emphasis



Date of Fit:	<not fit>		Type of Fit:	Linear	Weighting:	1/Conc	
A0 (Offset):	0.000000		Re-Slope:	1.000000			
A1 (Gain):	0.000000		Y-int:	0.000000			

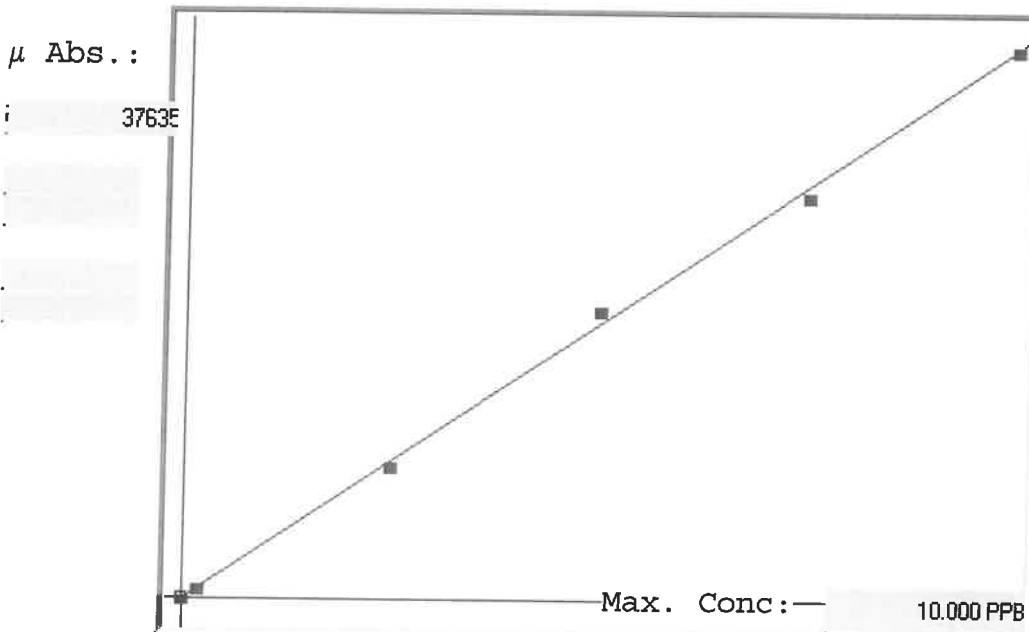
A2 (Curvature):		0.000000		Status:	Warning	Zero Gain	
n (Exponent):		1.000000					
Correlation:		0.000000					
Std Error of Est:		0.000000					
Predicted MDL:		n/a					
Predicted MQL:		n/a					
Std. Name	Stated Conc.	Found Conc.	Difference	% Diff.	(S)IR	Std Dev	Emphasis

7470A

LB123775

INSTRUMENT ID: CV1

Linear



A= 0.0000e+000

B= 2.6569e-004

C= 1.1532e-002

Rho= 0.9993269

Accept=Accepted

Std ID	Conc.	Calc.	Dev.	Mean	SD or %RSD	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	%D
0.0	0.000	0.008	0.008	-13	0.000	-13					
0.2	0.200	0.185	-0.015	652	0.0 %	652					-8
2.5	2.500	2.405	-0.095	9008	0.0 %	9008					-4
5.0	5.000	5.265	0.265	19774	0.0 %	19774					5
7.5	7.500	7.326	-0.174	27532	0.0 %	27532					2
10.0	10.000	10.011	0.011	37635	0.0 %	37635					0

LB123775 INSTRUMENT ID : CV1

Method: 7470A

Operator: Admin

Date of Analysis: 24 Jan 2023 10:15:05

Sample ID	Extended ID	μ Abs.	Conc.	Std Conc	Method	Units	Date	Type	Type
0.0 - 1	50	-13	-	0.0000	7470A	PPB	24 Jan 2023 10:25:37	S	Std
0.2 - 1	50.2	652	-	0.2000	7470A	PPB	24 Jan 2023 10:27:55	S	Std
2.5 - 1	52.5	9008	-	2.5000	7470A	PPB	24 Jan 2023 10:30:12	S	Std
5.0 - 1	55	19774	-	5.0000	7470A	PPB	24 Jan 2023 10:35:02	S	Std
7.5 - 1	57.5	27532	-	7.5000	7470A	PPB	24 Jan 2023 10:37:18	S	Std
10.0 - 1	510	37635	-	10.0000	7470A	PPB	24 Jan 2023 10:42:09	S	Std
ICV15 - 1	ICV15	15040	4.0075	-	7470A	PPB	24 Jan 2023 10:47:45	U	SMPL
ICB15 - 1	ICB15	-6	0.0099	-	7470A	PPB	24 Jan 2023 10:49:59	U	SMPL
CCV08 - 1	CCV08	18707	4.9817	-	7470A	PPB	24 Jan 2023 10:52:15	U	SMPL
CCB08 - 1	CCB08	-57	-0.0036	-	7470A	PPB	24 Jan 2023 10:54:30	U	SMPL
CRA - 1	CRA	629	0.1786	-	7470A	PPB	24 Jan 2023 10:59:19	U	SMPL
HighStd - 1	HighStd	35578	9.4641	-	7470A	PPB	24 Jan 2023 11:01:34	U	SMPL
ChkStd - 1	ChkStd	23526	6.2621	-	7470A	PPB	24 Jan 2023 11:03:50	U	SMPL
PB150390BL - 1	PBW	-138	-0.0251	-	7470A	PPB	24 Jan 2023 11:06:06	U	SMPL
PB150390BS - 1	LCSW	14544	3.8757	-	7470A	PPB	24 Jan 2023 11:10:59	U	SMPL
O1232-03 - 1	WC-17	-75	-0.0084	-	7470A	PPB	24 Jan 2023 11:13:15	U	SMPL
O1233-10 - 1	WC-38	-46	-0.0007	-	7470A	PPB	24 Jan 2023 11:15:32	U	SMPL
O1235-04 - 1	12X52	-37	0.0017	-	7470A	PPB	24 Jan 2023 11:17:49	U	SMPL
O1235-05 - 1	12X53	23	0.0176	-	7470A	PPB	24 Jan 2023 11:20:06	U	SMPL
O1235-06 - 1	12X54	7	0.0134	-	7470A	PPB	24 Jan 2023 11:22:22	U	SMPL
CCV09 - 1	CCV09	18854	5.0208	-	7470A	PPB	24 Jan 2023 11:24:37	U	SMPL
CCB09 - 1	CCB09	-73	-0.0079	-	7470A	PPB	24 Jan 2023 11:26:53	U	SMPL
O1235-07 - 1	12X55	-4	0.0105	-	7470A	PPB	24 Jan 2023 11:29:08	U	SMPL
O1237-04 - 1	COMP-1-2-3A	-1	0.0113	-	7470A	PPB	24 Jan 2023 11:31:23	U	SMPL
O1238-02 - 1	RBRB22281-OILY-DEBRIS	-1	0.0113	-	7470A	PPB	24 Jan 2023 11:33:38	U	SMPL
O1239-02 - 1	BORING-3	-2	0.0110	-	7470A	PPB	24 Jan 2023 11:35:54	U	SMPL
O1251-02 - 1	COMP-1	13	0.0150	-	7470A	PPB	24 Jan 2023 11:38:11	U	SMPL
O1251-08 - 1	COMP-2	4	0.0126	-	7470A	PPB	24 Jan 2023 11:40:27	U	SMPL
O1252-03 - 1	MH-9	3	0.0123	-	7470A	PPB	24 Jan 2023 11:42:44	U	SMPL
O1255-02 - 1	BORING-1	4	0.0126	-	7470A	PPB	24 Jan 2023 11:45:01	U	SMPL
O1255-02DUP - 1	BORING-1DUP	4	0.0126	-	7470A	PPB	24 Jan 2023 11:47:18	U	SMPL
O1255-02MS - 1	BORING-1MS	16089	4.2862	-	7470A	PPB	24 Jan 2023 11:49:34	U	SMPL
CCV10 - 1	CCV10	18133	4.8292	-	7470A	PPB	24 Jan 2023 11:51:49	U	SMPL
CCB10 - 1	CCB10	-50	-0.0018	-	7470A	PPB	24 Jan 2023 11:54:05	U	SMPL
O1255-02MSD - 1	BORING-1MSD	16108	4.2912	-	7470A	PPB	24 Jan 2023 11:56:20	U	SMPL
PB150391BL - 1	PBW	-19	0.0065	-	7470A	PPB	24 Jan 2023 11:58:36	U	SMPL
PB150391BS - 1	LCSW	14840	3.9543	-	7470A	PPB	24 Jan 2023 12:00:51	U	SMPL
O1235-01 - 1	12X49	-21	0.0060	-	7470A	PPB	24 Jan 2023 12:03:07	U	SMPL
O1235-02 - 1	12X50	10	0.0142	-	7470A	PPB	24 Jan 2023 12:05:23	U	SMPL
O1235-03 - 1	12X51	14	0.0153	-	7470A	PPB	24 Jan 2023 12:07:39	U	SMPL
O1235-08 - 1	12X56	34	0.0206	-	7470A	PPB	24 Jan 2023 12:09:56	U	SMPL
O1235-09 - 1	12X57	38	0.0216	-	7470A	PPB	24 Jan 2023 12:12:13	U	SMPL
O1235-10 - 1	12X58	27	0.0187	-	7470A	PPB	24 Jan 2023 12:14:30	U	SMPL
O1235-13 - 1	12X59	-21	0.0060	-	7470A	PPB	24 Jan 2023 12:16:46	U	SMPL
CCV11 - 1	CCV11	18787	5.0030	-	7470A	PPB	24 Jan 2023 12:19:02	U	SMPL
CCB11 - 1	CCB11	-49	-0.0015	-	7470A	PPB	24 Jan 2023 12:21:17	U	SMPL
O1235-14 - 1	12X48	-2	0.0110	-	7470A	PPB	24 Jan 2023 12:23:33	U	SMPL
O1235-14DUP - 1	12X48DUP	13	0.0150	-	7470A	PPB	24 Jan 2023 12:25:49	U	SMPL
O1235-14MS - 1	12X48MS	16662	4.4384	-	7470A	PPB	24 Jan 2023 12:28:04	U	SMPL
O1235-14MSD - 1	12X48MSD	16741	4.4594	-	7470A	PPB	24 Jan 2023 12:30:20	U	SMPL
PB150368TB - 1	PB150368TB	-40	0.0009	-	7470A	PPB	24 Jan 2023 12:32:36	U	SMPL
PB150371TB - 1	PB150371TB	7	0.0134	-	7470A	PPB	24 Jan 2023 12:34:52	U	SMPL
O1255-02LX5 - 1		7	0.0134	-	7470A	PPB	24 Jan 2023 12:37:09	U	SMPL
O1255-02A - 1		16118	4.2939	-	7470A	PPB	24 Jan 2023 12:39:26	U	SMPL
O1235-14LX5 - 1		-59	-0.0041	-	7470A	PPB	24 Jan 2023 12:41:42	U	SMPL
O1235-14A - 1		16333	4.3510	-	7470A	PPB	24 Jan 2023 12:43:58	U	SMPL
CCV12 - 1	CCV12	18933	5.0418	-	7470A	PPB	24 Jan 2023 12:46:14	U	SMPL
CCB12 - 1	CCB12	-86	-0.0113	-	7470A	PPB	24 Jan 2023 12:48:29	U	SMPL

SOP ID : M3010A-Digestion-16

SDG No : N/A

Matrix : WATER

Pipette ID: ICP A

Balance ID : N/A

Filter paper ID : N/A

pH Strip ID : M4909

Hood ID : #3

Block ID: 1. HOT BLOCK#1 2. N/A

Temp : 1. 96°C 2. N/A

Start Digest Date: 01/24/2023 Time : 14:00 Temp : 96 °C

End Digest Date: 01/24/2023 Time : 16:15 Temp : 96 °C

Digestion tube ID: M5287

Block thermometer ID: MET-DIG. #1

Dig Technician Signature: *AL*

Supervisor Signature: *BH*

Standard Name	MLS USED	STD REF. # FROM LOG
LFS-1	0.25	M5317
LFS-2	0.25	M5322
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A

Chemical Used	ML/SAMPLE USED	Lot Number
Conc. HNO3	3.00	M5426
1:1 HCL	5.00	MP71535
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A

Extraction Conformance/Non-Conformance Comments:

N/A

Date / Time	Prepped Sample Relinquished By/Location	Received By/Location
1/24/23 16:30	AL/Dig Lab	BH/Metals Lab
	Preparation Group	Analysis Group

Lab Sample ID	Client Sample ID	pH	Initial Vol (ml)	Final Vol (ml)	Color Before	Color After	Clarity Before	Clarity After	Comment	Prep Pos
O1141-06	SOUTH-WALL	<2	5	25	Colorless	Colorless	Clear	Clear	N/A	1-1
O1232-03	WC-17	<2	5	25	Colorless	Colorless	Clear	Clear	N/A	2
O1233-10	WC-38	<2	5	25	Colorless	Colorless	Clear	Clear	N/A	3
O1235-04	12X52	<2	5	25	Yellow	Colorless	Clear	Clear	N/A	4
O1235-05	12X53	<2	5	25	Yellow	Colorless	Clear	Clear	N/A	5
O1235-06	12X54	<2	5	25	Yellow	Colorless	Clear	Clear	N/A	6
O1235-07	12X55	<2	5	25	Yellow	Colorless	Clear	Clear	N/A	7
O1237-04	COMP-1-2-3A	<2	5	25	Colorless	Colorless	Clear	Clear	N/A	8
O1238-02	RBRB22281-OILY-DEBRIS	<2	5	25	Colorless	Colorless	Clear	Clear	N/A	9
O1239-02	BORING-3	<2	5	25	Colorless	Colorless	Clear	Clear	N/A	10
O1251-02	COMP-1	<2	5	25	Colorless	Colorless	Clear	Clear	N/A	11
O1251-08	COMP-2	<2	5	25	Colorless	Colorless	Clear	Clear	N/A	12
O1252-03	MH-9	<2	5	25	Colorless	Colorless	Clear	Clear	N/A	13
O1255-02	BORING-1	<2	5	25	Colorless	Colorless	Clear	Clear	N/A	14
O1255-02DUP	BORING-1DUP	<2	5	25	Colorless	Colorless	Clear	Clear	N/A	15
O1255-02MS	BORING-1MS	<2	5	25	Colorless	Colorless	Clear	Clear	M5317,M5322	16
O1255-02MSD	BORING-1MSD	<2	5	25	Colorless	Colorless	Clear	Clear	M5317,M5322	17
PB150368TB	PB150368TB	<2	5	25	Colorless	Colorless	Clear	Clear	N/A	18
PB150432BL	PBW432	<2	5	25	Colorless	Colorless	Clear	Clear	N/A	19
PB150432BS	LCS432	<2	5	25	Colorless	Colorless	Clear	Clear	M5317,M5322	20

SOP ID : M1311-TCLP-13

SDG No : N/A

Welgh By : JP

Balance ID : WC SC-4

pH Meter ID : WC PH METER-1

Extraction By : JP

Filter By : JP

Pipette ID : WC

Tumbler ID : T-1 / T-2

TCLP Filter ID : 113075

Start Prep Date : 01/20/2023 Time : 16:30

End Prep Date : 01/21/2023 Time : 09:00

Combination Ratio : 20

ZHE Cleaning Batch : N/A

Initial Room Temperature: 23 °C

Final Room Temperature: 21 °C

TCLP Technician Signature : JP

Supervisor By : 12

Standard Name	MLS USED	STD REF. # FROM LOG
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A

Chemical Used	ML/SAMPLE U	Lot Number
TCLP-FLUID-1	N/A	WP100664
HCL-TCLP,1N	N/A	WP100666
HNO3-TCLP,1N	N/A	WP100667
pH Strips	N/A	W1931,W1934,W2350,W2755
pH Strips	N/A	W1937,W1938,W1939,W1940,W1941,W1942
1 Liter Amber	N/A	21050
120ml Plastic bottle	N/A	220603
1:1 HNO3	N/A	N/A

Extraction Conformance/Non-Conformance Comments:

Matrix spikes are added after filtration and before preservation. Tumbler T-1 / T-2 CHECKED,30 RPM. 01255-02 IS USED FOR MS-MSD.

Date / Time	Prepped Sample Relinquished By/Location	Received By/Location
01/23/22 08:00	JP / ECH Room	JP / Ext
	Preparation Group	Analysis Group

SOP ID : M7470A-Mercury-18

SDG No : NA

Matrix : WATER

Pipette ID: HG A

Balance ID : N/A

Filter paper ID : NA

pH Strip ID : NA

Hood ID : #1

Block ID: 1. HG HOT BLOCK#3 2. N/A

Temp : 1. 95°C 2. N/A

Start Digest Date: 01/23/2023 Time : 14:15 Temp : 95 °C

End Digest Date: 01/23/2023 Time : 16:15 Temp : 94 °C

Digestion tube ID: M5287

Block thermometer ID: HG-DIG#3

Dig Technician Signature: *MB*Supervisor Signature: *BH*

Standard Name	MLS USED	STD REF. # FROM LOG
ICV	30mL	MP73430
CCV	30mL	MP73432
CRA	30mL	MP73434
Blank Spike	0.48mL	MP73423
Matrix Spike	0.48mL	MP73423

Chemical Used	ML/SAMPLE USED	Lot Number
HNO3/H2SO4(1:2)	2.5mL	MP73234
KMnO4	4.5mL	MP73235
K2S2O8	2.5mL	MP73375
Hydroxylamine HCL	2.0mL	MP73236
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A

LAB SAMPLE ID	CLIENT SAMPLE ID	Wt(g)/Vol(ml)	Comment
0.0 ppb	S0	30mL	MP73424
0.05 ppb	S0.05	N/A	N/A
0.2 ppb	S0.2	30mL	MP73425
2.5 ppb	S2.5	30mL	MP73426
5.0 ppb	S5.0	30mL	MP73427
7.5 ppb	S7.5	30mL	MP73428
10.0 ppb	S10.0	30mL	MP73429
ICV	ICV	30mL	MP73430
ICB	ICB	30mL	MP73431
CCV	CCV	30mL	MP73432
CCB	CCB	30mL	MP73433
CRI	CRI	30mL	MP73434
CHK STD	CHK STD	30mL	MP73435

Extraction Conformance/Non-Conformance Comments:

N/A

Date / Time	Prepped Sample Relinquished By/Location	Received By/Location
1/23/23 @ 16:15	<i>MB - Dig. Lab</i>	<i>MB - Dig. Lab</i>
	Preparation Group	Analysis Group

Lab Sample ID	Client Sample ID	Initial Vol (ml)	Final Vol (ml)	pH	Comment	Prep Pos
O1232-03	WC-17	3	30	<2	N/A	3-1
O1233-10	WC-38	3	30	<2	N/A	2
O1235-04	12X52	3	30	<2	N/A	3
O1235-05	12X53	3	30	<2	N/A	4
O1235-06	12X54	3	30	<2	N/A	5
O1235-07	12X55	3	30	<2	N/A	6
O1237-04	COMP-1-2-3A	3	30	<2	N/A	7
O1238-02	RBRB22281-OILY-DEBRIS	3	30	<2	N/A	8
O1239-02	BORING-3	3	30	<2	N/A	9
O1251-02	COMP-1	3	30	<2	N/A	10
O1251-08	COMP-2	3	30	<2	N/A	11
O1252-03	MH-9	3	30	<2	N/A	12
O1255-02	BORING-1	3	30	<2	N/A	13
O1255-02DUP	BORING-1DUP	3	30	<2	N/A	14
O1255-02MS	BORING-1MS	3	30	<2	MP73423	15
O1255-02MSD	BORING-1MSD	3	30	<2	MP73423	16
PB150368TB	PB150368TB	3	30	<2	N/A	17
PB150390BL	PBW390	30	30	<2	N/A	18
PB150390BS	LCS390	30	30	<2	MP73423	19

SOP ID : M1311-TCLP-13

SDG No : N/A

Welgh By : JP

Balance ID : WC SC-4

pH Meter ID : WC PH METER-1

Extraction By : JP

Filter By : JP

Pipette ID : WC

Tumbler ID : T-1 / T-2

TCLP Filter ID : 113075

Start Prep Date : 01/20/2023 Time : 16:30

End Prep Date : 01/21/2023 Time : 09:00

Combination Ratio : 20

ZHE Cleaning Batch : N/A

Initial Room Temperature: 23 °C

Final Room Temperature: 21 °C

TCLP Technician Signature : JP

Supervisor By : 12

Standardized Name	MLS USED	STD REF. # FROM LOG
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A

Chemical Used	ML/SAMPLE U	Lot Number
TCLP-FLUID-1	N/A	WP100664
HCL-TCLP,1N	N/A	WP100666
HNO3-TCLP,1N	N/A	WP100667
pH Strips	N/A	W1931,W1934,W2350,W2755
pH Strips	N/A	W1937,W1938,W1939,W1940,W1941,W1942
1 Liter Amber	N/A	21050
120ml Plastic bottle	N/A	220603
1:1 HNO3	N/A	N/A

Extraction Conformance/Non-Conformance Comments:

Matrix spikes are added after filtration and before preservation. Tumbler T-1 / T-2 CHECKED,30 RPM. 01255-02 IS USED FOR MS-MSD.

Date / Time	Prepped Sample Relinquished By/Location	Received By/Location
01/23/22 08:00	JP / ECU Room	JP / Ext
	Preparation Group	Analysis Group



284 Sheffield Street, Mountainside, NJ 07092 Phone: 908 789 8900 Fax: 908 789 8922

Instrument ID: CV1

Daily Analysis Runlog For Sequence/QC Batch ID # LB123775

Review By	jaswal	Review On	1/24/2023 10:30:06 PM
Supervise By	bin	Supervise On	1/24/2023 10:31:09 PM

STD. NAME	STD REF.#
ICAL Standard	MP73424,MP73425,MP73426,MP73427,MP73428,MP73429
ICV Standard	MP73430
CCV Standard	MP73432
ICSA Standard	
CRI Standard	MP73434
LCS Standard	
Chk Standard	MP73431,MP73433,MP73435,MP73437

Sr#	SampleId	ClientID	QcType	Date	Comment	Operator	Status
1	S0	S0	CAL1	01/24/23 10:25		mohan	OK
2	S0.2	S0.2	CAL2	01/24/23 10:27		mohan	OK
3	S2.5	S2.5	CAL3	01/24/23 10:30		mohan	OK
4	S5	S5	CAL4	01/24/23 10:35		mohan	OK
5	S7.5	S7.5	CAL5	01/24/23 10:37		mohan	OK
6	S10	S10	CAL6	01/24/23 10:42		mohan	OK
7	ICV15	ICV15	ICV	01/24/23 10:47		mohan	OK
8	ICB15	ICB15	ICB	01/24/23 10:49		mohan	OK
9	CCV08	CCV08	CCV	01/24/23 10:52		mohan	OK
10	CCB08	CCB08	CCB	01/24/23 10:54		mohan	OK
11	CRA	CRA	CRDL	01/24/23 10:59		mohan	OK
12	HighStd	HighStd	HIGH STD	01/24/23 11:01		mohan	OK
13	ChkStd	ChkStd	SAM	01/24/23 11:03		mohan	OK
14	PB150390BL	PB150390BL	MB	01/24/23 11:06		mohan	OK
15	PB150390BS	PB150390BS	LCS	01/24/23 11:10		mohan	OK
16	O1232-03	WC-17	SAM	01/24/23 11:13		mohan	OK
17	O1233-10	WC-38	SAM	01/24/23 11:15		mohan	OK
18	O1235-04	12X52	SAM	01/24/23 11:17		mohan	OK
19	O1235-05	12X53	SAM	01/24/23 11:20		mohan	OK
20	O1235-06	12X54	SAM	01/24/23 11:22		mohan	OK



284 Sheffield Street, Mountainside, NJ 07092 Phone: 908 789 8900 Fax: 908 789 8922

Instrument ID: CV1

Daily Analysis Runlog For Sequence/QC Batch ID # LB123775

Review By	jaswal	Review On	1/24/2023 10:30:06 PM
Supervise By	bin	Supervise On	1/24/2023 10:31:09 PM

STD. NAME	STD REF.#
ICAL Standard	MP73424,MP73425,MP73426,MP73427,MP73428,MP73429
ICV Standard	MP73430
CCV Standard	MP73432
ICSA Standard	
CRI Standard	MP73434
LCS Standard	
Chk Standard	MP73431,MP73433,MP73435,MP73437

21	CCV09	CCV09	CCV	01/24/23 11:24		mohan	OK
22	CCB09	CCB09	CCB	01/24/23 11:26		mohan	OK
23	O1235-07	12X55	SAM	01/24/23 11:29		mohan	OK
24	O1237-04	COMP-1-2-3A	SAM	01/24/23 11:31		mohan	OK
25	O1238-02	RBRB22281-OILY-DE	SAM	01/24/23 11:33		mohan	OK
26	O1239-02	BORING-3	SAM	01/24/23 11:35		mohan	OK
27	O1251-02	COMP-1	SAM	01/24/23 11:38		mohan	OK
28	O1251-08	COMP-2	SAM	01/24/23 11:40		mohan	OK
29	O1252-03	MH-9	SAM	01/24/23 11:42		mohan	OK
30	O1255-02	BORING-1	SAM	01/24/23 11:45		mohan	OK
31	O1255-02DUP	BORING-1DUP	DUP	01/24/23 11:47		mohan	OK
32	O1255-02MS	BORING-1MS	MS	01/24/23 11:49		mohan	OK
33	CCV10	CCV10	CCV	01/24/23 11:51		mohan	OK
34	CCB10	CCB10	CCB	01/24/23 11:54		mohan	OK
35	O1255-02MSD	BORING-1MSD	MSD	01/24/23 11:56		mohan	OK
36	PB150391BL	PB150391BL	MB	01/24/23 11:58		mohan	OK
37	PB150391BS	PB150391BS	LCS	01/24/23 12:00		mohan	OK
38	O1235-01	12X49	SAM	01/24/23 12:03		mohan	OK
39	O1235-02	12X50	SAM	01/24/23 12:05		mohan	OK
40	O1235-03	12X51	SAM	01/24/23 12:07		mohan	OK
41	O1235-08	12X56	SAM	01/24/23 12:09		mohan	OK



284 Sheffield Street, Mountainside, NJ 07092 Phone: 908 789 8900 Fax: 908 789 8922

Instrument ID: CV1

Daily Analysis Runlog For Sequence/QC Batch ID # LB123775

Review By	jaswal	Review On	1/24/2023 10:30:06 PM
Supervise By	bin	Supervise On	1/24/2023 10:31:09 PM

STD. NAME	STD REF.#
ICAL Standard	MP73424,MP73425,MP73426,MP73427,MP73428,MP73429
ICV Standard	MP73430
CCV Standard	MP73432
ICSA Standard	
CRI Standard	MP73434
LCS Standard	
Chk Standard	MP73431,MP73433,MP73435,MP73437

42	O1235-09	12X57	SAM	01/24/23 12:12		mohan	OK
43	O1235-10	12X58	SAM	01/24/23 12:14		mohan	OK
44	O1235-13	12X59	SAM	01/24/23 12:16		mohan	OK
45	CCV11	CCV11	CCV	01/24/23 12:19		mohan	OK
46	CCB11	CCB11	CCB	01/24/23 12:21		mohan	OK
47	O1235-14	12X48	SAM	01/24/23 12:23		mohan	OK
48	O1235-14DUP	12X48DUP	DUP	01/24/23 12:25		mohan	OK
49	O1235-14MS	12X48MS	MS	01/24/23 12:28		mohan	OK
50	O1235-14MSD	12X48MSD	MSD	01/24/23 12:30		mohan	OK
51	PB150368TB	PB150368TB	MB	01/24/23 12:32		mohan	OK
52	PB150371TB	PB150371TB	MB	01/24/23 12:34		mohan	OK
53	O1255-02L	BORING-1L	SD	01/24/23 12:37		mohan	OK
54	O1255-02A	BORING-1A	PS	01/24/23 12:39		mohan	OK
55	O1235-14L	12X48L	SD	01/24/23 12:41		mohan	OK
56	O1235-14A	12X48A	PS	01/24/23 12:43		mohan	OK
57	CCV12	CCV12	CCV	01/24/23 12:46		mohan	OK
58	CCB12	CCB12	CCB	01/24/23 12:48		mohan	OK



284 Sheffield Street, Mountainside, NJ 07092 Phone: 908 789 8900 Fax: 908 789 8922

Instrument ID: P4

Daily Analysis Runlog For Sequence/QC Batch ID # LB123806

Review By	bin	Review On	1/26/2023 11:02:20 AM
Supervise By	jaswal	Supervise On	1/26/2023 11:22:37 AM

STD. NAME	STD REF.#
ICAL Standard	MP73406,MP73484,MP73480,MP73479,MP73478,MP73477
ICV Standard	MP73485,MP73484
CCV Standard	MP73481
ICSA Standard	MP73475,MP73476
CRI Standard	
LCS Standard	
Chk Standard	MP73474,MP73188,MP73482,MP73483

Sr#	SampleID	ClientID	QcType	Date	Comment	Operator	Status
1	S0	S0	CAL1	01/25/23 11:52		Bin	OK
2	S1	S1	CAL2	01/25/23 11:56		Bin	OK
3	S2	S2	CAL3	01/25/23 12:00		Bin	OK
4	S3	S3	CAL4	01/25/23 12:04		Bin	OK
5	S4	S4	CAL5	01/25/23 12:08		Bin	OK
6	S5	S5	CAL6	01/25/23 12:12		Bin	OK
7	ICV01	ICV01	ICV	01/25/23 12:15		Bin	OK
8	ICB01	ICB01	ICB	01/25/23 12:20		Bin	OK
9	CRI01	CRI01	CRDL	01/25/23 12:24		Bin	OK
10	ICSA01	ICSA01	ICSA	01/25/23 12:33		Bin	OK
11	ICSAB01	ICSAB01	ICSAB	01/25/23 12:37		Bin	OK
12	ICSADL	ICSADL	ICSA	01/25/23 12:41		Bin	OK
13	ICSABDL	ICSABDL	ICSAB	01/25/23 12:45		Bin	OK
14	CCV01	CCV01	CCV	01/25/23 12:57		Bin	OK
15	LLCCV01	LLCCV01	LLCCV	01/25/23 13:00		Bin	OK
16	CCB01	CCB01	CCB	01/25/23 13:04		Bin	OK
17	O1095-01	CELL-A-POOL-WATE	SAM	01/25/23 13:08		Bin	OK
18	O1095-04	CONTROL	SAM	01/25/23 13:12		Bin	OK
19	O1096-01	WATER	SAM	01/25/23 13:16		Bin	OK
20	O1125-01	B-04-SB01	SAM	01/25/23 13:20		Bin	OK

Instrument ID: P4

Daily Analysis Runlog For Sequence/QC Batch ID # LB123806

Review By	bin	Review On	1/26/2023 11:02:20 AM
Supervise By	jaswal	Supervise On	1/26/2023 11:22:37 AM

STD. NAME	STD REF.#
ICAL Standard	MP73406,MP73484,MP73480,MP73479,MP73478,MP73477
ICV Standard	MP73485,MP73484
CCV Standard	MP73481
ICSA Standard	MP73475,MP73476
CRI Standard	
LCS Standard	
Chk Standard	MP73474,MP73188,MP73482,MP73483

21	O1255-02	BORING-1	SAM	01/25/23 13:24		Bin	OK
22	O1255-02DUP	BORING-1DUP	DUP	01/25/23 13:28		Bin	OK
23	O1255-02L	BORING-1L	SD	01/25/23 13:32		Bin	OK
24	O1255-02MS	BORING-1MS	MS	01/25/23 13:36		Bin	OK
25	O1255-02MSD	BORING-1MSD	MSD	01/25/23 13:40		Bin	OK
26	O1255-02A	BORING-1A	PS	01/25/23 13:44	0.1 ml of LFS-1(M5317) and LF	Bin	OK
27	CCV02	CCV02	CCV	01/25/23 13:48		Bin	OK
28	CCB02	CCB02	CCB	01/25/23 13:52		Bin	OK
29	O1244-01	VNJ-223	SAM	01/25/23 13:56		Bin	OK
30	O1252-01	MH-9	SAM	01/25/23 14:00		Bin	OK
31	PB150432BL	PB150432BL	MB	01/25/23 14:03		Bin	OK
32	PB150432BS	PB150432BS	LCS	01/25/23 14:07		Bin	OK
33	PB150368TB	PB150368TB	MB	01/25/23 14:11		Bin	OK
34	PB150428BL	PB150428BL	MB	01/25/23 14:15		Bin	OK
35	PB150428BS	PB150428BS	LCS	01/25/23 14:19		Bin	OK
36	O1243-02	TJRC-11823-B4-0-10	SAM	01/25/23 14:23		Bin	OK
37	O1243-04	TJRC-11823-B4-10-20	SAM	01/25/23 14:27		Bin	OK
38	O1243-06	TJRC-011923-B4-20-30	SAM	01/25/23 14:30		Bin	OK
39	CCV03	CCV03	CCV	01/25/23 14:39		Bin	OK
40	CCB03	CCB03	CCB	01/25/23 14:43		Bin	OK
41	O1243-08	TJRC-011923-B4-30-40	SAM	01/25/23 14:47		Bin	OK



Instrument ID: P4

Daily Analysis Runlog For Sequence/QC Batch ID # LB123806

Review By	bin	Review On	1/26/2023 11:02:20 AM
Supervise By	jaswal	Supervise On	1/26/2023 11:22:37 AM

STD. NAME	STD REF.#
ICAL Standard	MP73406,MP73484,MP73480,MP73479,MP73478,MP73477
ICV Standard	MP73485,MP73484
CCV Standard	MP73481
ICSA Standard	MP73475,MP73476
CRI Standard	
LCS Standard	
Chk Standard	MP73474,MP73188,MP73482,MP73483

42	O1254-01	HR-04-012023	SAM	01/25/23 14:51		Bin	OK
43	O1260-01	TP-21	SAM	01/25/23 14:55		Bin	OK
44	O1260-04	TP-22	SAM	01/25/23 14:58	Ca high	Bin	Dilution
45	O1260-07	TP-23	SAM	01/25/23 15:02	Ca high	Bin	Dilution
46	O1260-10	TP-24	SAM	01/25/23 15:07	Ca high	Bin	Dilution
47	O1260-13	TP-25	SAM	01/25/23 15:11	As,Ca high	Bin	Dilution
48	O1260-16	TP-26	SAM	01/25/23 15:15	Ca high	Bin	Dilution
49	LR CHECK 1	LR CHECK 1	HIGH STD	01/25/23 15:19		Bin	OK
50	LR CHECK 2	LR CHECK 2	HIGH STD	01/25/23 15:23		Bin	OK
51	CCV04	CCV04	CCV	01/25/23 15:32		Bin	OK
52	CCB04	CCB04	CCB	01/25/23 15:36		Bin	OK
53	O1260-19	TP-27	SAM	01/25/23 15:40	Ca high	Bin	Dilution
54	O1260-22	TP-28	SAM	01/25/23 15:44	Ca high	Bin	Dilution
55	O1266-01	VNJ-219	SAM	01/25/23 15:48		Bin	OK
56	O1268-01	TR-06-012323	SAM	01/25/23 15:52		Bin	OK
57	O1232-03	WC-17	SAM	01/25/23 15:55		Bin	OK
58	O1233-10	WC-38	SAM	01/25/23 15:59		Bin	OK
59	O1260-02	TP-21	SAM	01/25/23 16:03		Bin	OK
60	O1260-05	TP-22	SAM	01/25/23 16:08		Bin	OK
61	O1260-08	TP-23	SAM	01/25/23 16:12		Bin	OK
62	O1260-11	TP-24	SAM	01/25/23 16:16		Bin	OK



Instrument ID: P4

Daily Analysis Runlog For Sequence/QC Batch ID # LB123806

Review By	bin	Review On	1/26/2023 11:02:20 AM
Supervise By	jaswal	Supervise On	1/26/2023 11:22:37 AM

STD. NAME	STD REF.#
ICAL Standard	MP73406,MP73484,MP73480,MP73479,MP73478,MP73477
ICV Standard	MP73485,MP73484
CCV Standard	MP73481
ICSA Standard	MP73475,MP73476
CRI Standard	
LCS Standard	
Chk Standard	MP73474,MP73188,MP73482,MP73483

63	CCV05	CCV05	CCV	01/25/23 16:20		Bin	OK
64	CCB05	CCB05	CCB	01/25/23 16:24		Bin	OK
65	O1260-14	TP-25	SAM	01/25/23 16:28		Bin	OK
66	O1260-17	TP-26	SAM	01/25/23 16:32		Bin	OK
67	O1260-20	TP-27	SAM	01/25/23 16:36		Bin	OK
68	O1260-23	TP-28	SAM	01/25/23 16:40		Bin	OK
69	O1266-02	VNJ-219	SAM	01/25/23 16:44		Bin	OK
70	O1266-02DUP	VNJ-219DUP	DUP	01/25/23 16:48		Bin	OK
71	O1266-02L	VNJ-219L	SD	01/25/23 17:03		Bin	OK
72	O1266-02MS	VNJ-219MS	MS	01/25/23 17:07		Bin	OK
73	O1266-02MSD	VNJ-219MSD	MSD	01/25/23 17:11		Bin	OK
74	O1266-02A	VNJ-219A	PS	01/25/23 17:15	0.1 ml of LFS-1(M5317) and LF	Bin	OK
75	CCV06	CCV06	CCV	01/25/23 17:19		Bin	OK
76	CCB06	CCB06	CCB	01/25/23 17:23		Bin	OK
77	O1235-04	12X52	SAM	01/25/23 17:27		Bin	OK
78	O1235-05	12X53	SAM	01/25/23 17:37		Bin	OK
79	O1235-06	12X54	SAM	01/25/23 17:41		Bin	OK
80	O1235-07	12X55	SAM	01/25/23 17:45		Bin	OK
81	O1239-02	BORING-3	SAM	01/25/23 17:49		Bin	OK
82	O1252-03	MH-9	SAM	01/25/23 17:53		Bin	OK
83	O1235-01	12X49	SAM	01/25/23 17:57		Bin	OK



Instrument ID: P4

Daily Analysis Runlog For Sequence/QC Batch ID # LB123806

Review By	bin	Review On	1/26/2023 11:02:20 AM
Supervise By	jaswal	Supervise On	1/26/2023 11:22:37 AM

STD. NAME	STD REF.#
ICAL Standard	MP73406,MP73484,MP73480,MP73479,MP73478,MP73477
ICV Standard	MP73485,MP73484
CCV Standard	MP73481
ICSA Standard	MP73475,MP73476
CRI Standard	
LCS Standard	
Chk Standard	MP73474,MP73188,MP73482,MP73483

84	O1235-02	12X50	SAM	01/25/23 18:01		Bin	OK
85	O1235-03	12X51	SAM	01/25/23 18:05		Bin	OK
86	CCV07	CCV07	CCV	01/25/23 18:09		Bin	OK
87	CCB07	CCB07	CCB	01/25/23 18:13		Bin	OK
88	O1260-04DL	TP-22DL	SAM	01/25/23 18:17	10x for Ca	Bin	Confirms
89	O1260-07DL	TP-23DL	SAM	01/25/23 18:21	10x for Ca	Bin	Confirms
90	O1260-10DL	TP-24DL	SAM	01/25/23 18:25	10x for Ca	Bin	Confirms
91	O1260-13DL	TP-25DL	SAM	01/25/23 18:29	10x for As,Ca	Bin	Confirms
92	O1260-16DL	TP-26DL	SAM	01/25/23 18:33	10x for Ca	Bin	Confirms
93	O1260-19DL	TP-27DL	SAM	01/25/23 18:36	10x for Ca	Bin	Confirms
94	O1260-22DL	TP-28DL	SAM	01/25/23 18:40	10x for Ca	Bin	Confirms
95	CCV08	CCV08	CCV	01/25/23 18:44	CCV fail for Mn	Bin	OK
96	CCB08	CCB08	CCB	01/25/23 18:48		Bin	OK

SOP ID : M1311-TCLP-13
SDG No : N/A
Weigh By : JP
Balance ID : WC SC-4
pH Meter ID : WC PH METER-1
Extraction By : JP
Filter By : JP
Pipette ID : WC
Tumbler ID : T-1 /T-2
TCLP Filter ID : 113075

Start Prep Date : 01/20/2023 **Time :** 16:30
End Prep Date : 01/21/2023 **Time :** 09:00
Combination Ratio : 20
ZHE Cleaning Batch : N/A
Initial Room Temperature: 23 °C
Final Room Temperature: 21 °C
TCLP Technician Signature : JP
Supervisor By : 12

Standardized Name	MLS USED	STD REF. # FROM LOG
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A

Chemical Used	ML/SAMPLE U	Lot Number
TCLP-FLUID-1	N/A	WP100664
HCL-TCLP,1N	N/A	WP100666
HNO3-TCLP,1N	N/A	WP100667
pH Strips	N/A	W1931,W1934,W2350,W2755
pH Strips	N/A	W1937,W1938,W1939,W1940,W1941,W1942
1 Liter Amber	N/A	21050
120ml Plastic bottle	N/A	220603
1:1 HNO3	N/A	N/A

Extraction Conformance/Non-Conformance Comments:

Matrix spikes are added after filtration and before preservation. Tumbler T-1 / T-2 CHECKED,30 RPM. O1255-02 IS USED FOR MS-MSD.

Date / Time	Prepped Sample Relinquished By/Location	Received By/Location
01/23/22 08:00	JP / ECU Room	JP / EXT
	Preparation Group	Analysis Group

Sample ID	ClientID	TCLP Vessel ID	Sample Wt (g)	Volume Extraction Fluid #1 (mL)	Multi phasic	Phase Miscible	Phases Combined	Final Leachate PH	Metals Leachate Adj. PH	Prep Pos
O1141-06	SOUTH-WALL	01	100.03	2000	N/A	N/A	N/A	10.5	1.5	T-1
O1232-03	WC-17	02	100.02	2000	N/A	N/A	N/A	5.6	1.0	T-1
O1233-10	WC-38	03	100.01	2000	N/A	N/A	N/A	5.5	1.5	T-1
O1235-04	12X52	04	100.03	2000	N/A	N/A	N/A	3.5	1.0	T-1
O1235-05	12X53	05	100.02	2000	N/A	N/A	N/A	3.0	1.5	T-1
O1235-06	12X54	06	100.03	2000	N/A	N/A	N/A	3.5	1.0	T-1
O1235-07	12X55	07	100.01	2000	N/A	N/A	N/A	3.5	1.5	T-1
O1237-04	COMP-1-2-3A	08	100.03	2000	N/A	N/A	N/A	3.5	1.0	T-1
O1238-02	RBRB22281-OILY-DEBRIS	09	100.00	2000	N/A	N/A	N/A	3.0	1.5	T-1
O1239-02	BORING-3	10	100.02	2000	N/A	N/A	N/A	5.0	1.0	T-1
O1251-02	COMP-1	11	100.03	2000	N/A	N/A	N/A	6.0	1.5	T-2
O1251-08	COMP-2	12	100.04	2000	N/A	N/A	N/A	6.2	1.0	T-2
O1252-03	MH-9	13	100.02	2000	N/A	N/A	N/A	5.6	1.5	T-2
O1255-02	BORING-1	14	100.03	2000	N/A	N/A	N/A	4.0	1.0	T-2
PB150368TB	LEB368	15	N/A	2000	N/A	N/A	N/A	4.94	1.5	T-2

SampleID	ClientID	Sample Weight (g)	Filter Weight (g)	Filtrate (mL)	Filter + Solid (After 100°C)	% solids	% Dry Solids
O1141-06	SOUTH-WALL	N/A	N/A	N/A	N/A	100	N/A
O1232-03	WC-17	N/A	N/A	N/A	N/A	100	N/A
O1233-10	WC-38	N/A	N/A	N/A	N/A	100	N/A
O1235-04	12X52	N/A	N/A	N/A	N/A	100	N/A
O1235-05	12X53	N/A	N/A	N/A	N/A	100	N/A
O1235-06	12X54	N/A	N/A	N/A	N/A	100	N/A
O1235-07	12X55	N/A	N/A	N/A	N/A	100	N/A
O1237-04	COMP-1-2-3A	N/A	N/A	N/A	N/A	100	N/A
O1238-02	RBRB22281-OILY-DEBRIS	N/A	N/A	N/A	N/A	100	N/A
O1239-02	BORING-3	N/A	N/A	N/A	N/A	100	N/A
O1251-02	COMP-1	N/A	N/A	N/A	N/A	100	N/A
O1251-08	COMP-2	N/A	N/A	N/A	N/A	100	N/A
O1252-03	MH-9	N/A	N/A	N/A	N/A	100	N/A
O1255-02	BORING-1	N/A	N/A	N/A	N/A	100	N/A
PB150368TB	LEB368	N/A	N/A	N/A	N/A	N/A	N/A

Hot Block ID : WC S-1/ WC S-2

Thermometer ID : FLASHPOINT

SampleID	ClientID	Sample Weight (g)	Volume DI Water (mL)	PH after 5 min stir	PH after 10 min stir	Extraction Fluid 1 or 2	pH Extraction Fluid
O1141-06	SOUTH-WALL	5.02	96.5	11.0	4.0	#1	4.94
O1232-03	WC-17	5.01	96.5	8.4	3.0	#1	4.94
O1233-10	WC-38	5.03	96.5	7.6	2.5	#1	4.94
O1235-04	12X52	5.04	96.5	6.0	2.0	#1	4.94
O1235-05	12X53	5.02	96.5	7.0	2.0	#1	4.94
O1235-06	12X54	5.03	96.5	6.0	1.5	#1	4.94
O1235-07	12X55	5.01	96.5	6.2	1.5	#1	4.94
O1237-04	COMP-1-2-3A	5.03	96.5	6.2	2.0	#1	4.94
O1238-02	RBRB22281-OILY-DEBRIS	5.04	96.5	6.2	1.5	#1	4.94
O1239-02	BORING-3	5.03	96.5	7.2	2.0	#1	4.94
O1251-02	COMP-1	5.02	96.5	8.6	3.0	#1	4.94
O1251-08	COMP-2	5.03	96.5	9.0	4.0	#1	4.94
O1252-03	MH-9	5.04	96.5	8.6	3.0	#1	4.94
O1255-02	BORING-1	5.03	96.5	6.8	2.5	#1	4.94
PB150368TB	LEB368	N/A	N/A	N/A	N/A	#1	4.94



Prep Standard - Chemical Standard Summary

Order ID : O1232

Test : TCLP ICP Metals, TCLP Mercury

Prepbatch ID : PB150390, PB150432,

Sequence ID/Qc Batch ID: LB123775, LB123806, LB123806,

Standard ID :

MP71535, MP73163, MP73188, MP73192, MP73234, MP73235, MP73236, MP73375, MP73406, MP73423, MP73424, MP73425, MP73426, MP73427, MP73428, MP73429, MP73430, MP73431, MP73432, MP73433, MP73434, MP73435, MP73437, MP73473, MP73474, MP73475, MP73476, MP73477, MP73478, MP73479, MP73480, MP73481, MP73482, MP73483, MP73484, MP73485,

Chemical ID :

M4371, M4459, M4465, M4589, M4657, M4768, M4794, M4825, M4844, M4874, M4876, M4877, M4878, M4880, M4881, M4882, M4883, M4884, M4885, M4886, M4888, M4889, M4891, M4894, M4901, M4902, M4916, M4920, M4939, M4960, M4961, M5019, M5020, M5062, M5100, M5108, M5127, M5184, M5193, M5200, M5201, M5211, M5218, M5220, M5224, M5226, M5227, M5228, M5280, M5289, M5290, M5291, M5317, M5322, M5387, M5393, M5408, M5411, M5412, M5418, M5425, M5426, W2606,

CHEMTECH

284, Sheffield Street, Mountainside NJ 07092 (908) 789 - 8900

Metals STANDARD PREPARATION LOG

<u>Recipe ID</u>	<u>NAME</u>	<u>NO.</u>	<u>Prep Date</u>	<u>Expiration Date</u>	<u>Prepared By</u>	<u>ScaleID</u>	<u>PipetteID</u>	<u>Supervised By</u>
170	1:1HCL	MP71535	09/19/2022	03/03/2023	Bin He	None	None	Sarabjit Jaswal
09/20/2022								

FROM 1250.00000ml of M5280 + 1250.00000ml of W2606 = Final Quantity: 2500.000 ml

<u>Recipe ID</u>	<u>NAME</u>	<u>NO.</u>	<u>Prep Date</u>	<u>Expiration Date</u>	<u>Prepared By</u>	<u>ScaleID</u>	<u>PipetteID</u>	<u>Supervised By</u>
902	ICP AES CAL BLK (SO/ICB/CCB)	MP73163	01/02/2023	02/28/2023	Bin He	None	METALS_PIPETTE_3 (A)	Sarabjit Jaswal
01/03/2023								

FROM 125.00000ml of M5408 + 2350.00000ml of W2606 + 25.00000ml of M5412 = Final Quantity: 2500.000 ml

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Metals STANDARD PREPARATION LOG

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919	ICP AES INTERNAL STD	MP73188	01/03/2023	02/28/2023	Bin He	None	METALS_PIPETTE_3 (A)	Sarabjit Jaswal 01/05/2023
<u>FROM</u>	1.00000ml of M4961 + 10.00000ml of M4960 + 1969.00000ml of W2606 + 20.00000ml of M5412 = Final Quantity: 2000.000 ml							

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Metals STANDARD PREPARATION LOG

<u>Recipe ID</u>	<u>NAME</u>	<u>NO.</u>	<u>Prep Date</u>	<u>Expiration Date</u>	<u>Prepared By</u>	<u>ScaleID</u>	<u>PipetteID</u>	<u>Supervised By</u>
3965	2:1 H2SO4 : HNO3	MP73234	01/06/2023	06/27/2023	Mohan Bera	None	None	Sarabjit Jaswal
01/06/2023								

FROM 1600.00000ml of M5211 + 800.00000ml of M5411 = Final Quantity: 3200.000 ml

<u>Recipe ID</u>	<u>NAME</u>	<u>NO.</u>	<u>Prep Date</u>	<u>Expiration Date</u>	<u>Prepared By</u>	<u>ScaleID</u>	<u>PipetteID</u>	<u>Supervised By</u>
65	POTASSIUM PERMANGANATE SOLUTION 5 %	MP73235	01/06/2023	07/06/2023	Mohan Bera	METALS_SCALE_3 (M SC-3)	None	Sarabjit Jaswal
01/06/2023								

FROM 100.00000gram of M4916 + 2000.00000ml of W2606 = Final Quantity: 2000.000 ml

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67	SODIUM CHLORIDE - HYDROXYL- CHLORIDE SOLUTION	MP73236	01/06/2023	07/06/2023	Mohan Bera	METALS_SCALE_3 (M SC-3)	None	Sarabjit Jaswal 01/06/2023
<u>FROM</u>	2000.00000ml of W2606 + 240.00000gram of M4371 + 240.00000gram of M4459 = Final Quantity: 2000.000 ml							

<u>Recipe ID</u>	<u>NAME</u>	<u>NO.</u>	<u>Prep Date</u>	<u>Expiration Date</u>	<u>Prepared By</u>	<u>ScaleID</u>	<u>PipetteID</u>	<u>Supervised By</u>
66	POTASSIUM PERSULFATE SOLUTION 5 %	MP73375	01/17/2023	07/17/2023	Mohan Bera	METALS_SCALE_3 (M SC-3)	None	Sarabjit Jaswal 01/17/2023
<u>FROM</u> 100.00000ml of M4465 + 2000.00000ml of W2606 = Final Quantity: 2000.000 ml								

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Metals STANDARD PREPARATION LOG

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902	ICP AES CAL BLK (SO/ICB/CCB)	MP73406	01/19/2023	01/25/2023	Bin He	None	METALS_PIPETTE_3 (A)	Sarabjit Jaswal 01/20/2023

FROM 125.00000ml of M5418 + 2350.00000ml of W2606 + 25.00000ml of M5425 = Final Quantity: 2500.000 ml

<u>Recipe ID</u>	<u>NAME</u>	<u>NO.</u>	<u>Prep Date</u>	<u>Expiration Date</u>	<u>Prepared By</u>	<u>ScaleID</u>	<u>PipetteID</u>	<u>Supervised By</u>
871	MERCURY INTERMEDIATE B 250PPB WORKING STD.	MP73423	01/23/2023	01/24/2023	Mohan Bera	None	METALS_PIPETTE_5 (HGA)	Sarabjit Jaswal 01/23/2023

FROM 1.00000ml of M5425 + 2.50000ml of M5062 + 96.50000ml of W2606 = Final Quantity: 100.000 ml

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<u>Recipe ID</u>	<u>NAME</u>	<u>NO.</u>	<u>Prep Date</u>	<u>Expiration Date</u>	<u>Prepared By</u>	<u>ScaleID</u>	<u>PipetteID</u>	<u>Supervised By</u>
1340	Hg 0.00 PPB STD	MP73424	01/23/2023	01/24/2023	Mohan Bera	None	METALS_PIPETTE_5 (HG A)	Sarabjit Jaswal 01/23/2023
<u>FROM</u>	2.50000ml of M5425 + 247.50000ml of W2606 = Final Quantity: 250.000 ml							

<u>Recipe ID</u>	<u>NAME</u>	<u>NO.</u>	<u>Prep Date</u>	<u>Expiration Date</u>	<u>Prepared By</u>	<u>ScaleID</u>	<u>PipetteID</u>	<u>Supervised By</u>
1341	Hg 0.2 PPB STD	MP73425	01/23/2023	01/24/2023	Mohan Bera	None	METALS_PIPETTE_5 (HGA)	Sarabjit Jaswal 01/23/2023
<u>FROM</u>	2.50000ml of M5425 + 247.30000ml of W2606 + 0.20000ml of MP73423 = Final Quantity: 250.000 ml							

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<u>Recipe ID</u>	<u>NAME</u>	<u>NO.</u>	<u>Prep Date</u>	<u>Expiration Date</u>	<u>Prepared By</u>	<u>ScaleID</u>	<u>PipetteID</u>	<u>Supervised By</u>
1342	Hg 2.5 PPB STD	MP73426	01/23/2023	01/24/2023	Mohan Bera	None	METALS_PIPETTE_5 (HGA)	Sarabjit Jaswal 01/23/2023
<u>FROM</u>	2.50000ml of M5425 + 245.00000ml of W2606 + 2.50000ml of MP73423 = Final Quantity: 250.000 ml							

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[illegible]

<u>Recipe ID</u>	<u>NAME</u>	<u>NO.</u>	<u>Prep Date</u>	<u>Expiration Date</u>	<u>Prepared By</u>	<u>ScaleID</u>	<u>PipetteID</u>	<u>Supervised By</u>
1345	Hg 10.0 PPB STD	MP73429	01/23/2023	01/24/2023	Mohan Bera	None	METALS_PIPETTE_5 (HGA)	Sarabjit Jaswal 01/23/2023
<u>FROM</u>	2.50000ml of M5425 + 237.50000ml of W2606 + 10.00000ml of MP73423 = Final Quantity: 250.000 ml							

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<u>Recipe ID</u>	<u>NAME</u>	<u>NO.</u>	<u>Prep Date</u>	<u>Expiration Date</u>	<u>Prepared By</u>	<u>ScaleID</u>	<u>PipetteID</u>	<u>Supervised By</u>
1346	Hg ICV SOLUTION	MP73430	01/23/2023	01/24/2023	Mohan Bera	None	METALS_PIPETTE_5 (HG A)	Sarabjit Jaswal 01/23/2023
<u>FROM</u>	2.50000ml of M4794 + 2.50000ml of M5425 + 245.00000ml of W2606 = Final Quantity: 250.000 ml							

<u>Recipe ID</u>	<u>NAME</u>	<u>NO.</u>	<u>Prep Date</u>	<u>Expiration Date</u>	<u>Prepared By</u>	<u>ScaleID</u>	<u>PipetteID</u>	<u>Supervised By</u>
1351	ICB (Hg 0.00 PPB SOLUTION)	MP73431	01/23/2023	01/24/2023	Mohan Bera	None	METALS_PIPETTE_5 (HGA)	Sarabjit Jaswal 01/23/2023
<u>FROM</u>	2.50000ml of M5425 + 247.50000ml of W2606 = Final Quantity: 250.000 ml							

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<u>Recipe ID</u>	<u>NAME</u>	<u>NO.</u>	<u>Prep Date</u>	<u>Expiration Date</u>	<u>Prepared By</u>	<u>ScaleID</u>	<u>PipetteID</u>	<u>Supervised By</u>
1358	CCV (Hg 5.0 PPB SOLUTION)	MP73432	01/23/2023	01/24/2023	Mohan Bera	None	METALS_PIPETTE_5 (HG A)	Sarabjit Jaswal 01/23/2023
FROM 485.00000ml of W2606 + 5.00000ml of M5425 + 10.00000ml of MP73423 = Final Quantity: 500.000 ml								

<u>Recipe ID</u>	<u>NAME</u>	<u>NO.</u>	<u>Prep Date</u>	<u>Expiration Date</u>	<u>Prepared By</u>	<u>ScaleID</u>	<u>PipetteID</u>	<u>Supervised By</u>
1352	CCB (Hg 0.00 PPB SOLUTION)	MP73433	01/23/2023	01/24/2023	Mohan Bera	None	METALS_PIPETTE_5 (HGA)	Sarabjit Jaswal 01/23/2023
<u>FROM</u> 495.00000ml of W2606 + 5.00000ml of M5425 = Final Quantity: 500.000 ml								

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<u>Recipe ID</u>	<u>NAME</u>	<u>NO.</u>	<u>Prep Date</u>	<u>Expiration Date</u>	<u>Prepared By</u>	<u>ScaleID</u>	<u>PipetteID</u>	<u>Supervised By</u>
1349	CRA/CRI (Hg 0.2 PPB SOLUTION)	MP73434	01/23/2023	01/24/2023	Mohan Bera	None	METALS_PIPETTE_5 (HG A)	Sarabjit Jaswal 01/23/2023
<u>FROM</u>	2.50000ml of M5425 + 247.30000ml of W2606 + 0.20000ml of MP73423 = Final Quantity: 250.000 ml							

<u>Recipe ID</u>	<u>NAME</u>	<u>NO.</u>	<u>Prep Date</u>	<u>Expiration Date</u>	<u>Prepared By</u>	<u>ScaleID</u>	<u>PipetteID</u>	<u>Supervised By</u>
1350	CHK STD (Hg 7.0 PPB SOLUTION)	MP73435	01/23/2023	01/24/2023	Mohan Bera	None	METALS_PIPETTE_5 (HGA)	Sarabjit Jaswal 01/23/2023
<u>FROM</u>	2.50000ml of M5425 + 240.50000ml of W2606 + 7.00000ml of MP73423 = Final Quantity: 250.000 ml							

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68	STANNOUS CHLORIDE SOLUTION	MP73437	01/23/2023	01/24/2023	Mohan Bera	METALS_SCALE_3 (M SC-3)	None	Sarabjit Jaswal
01/23/2023								

FROM 450.00000ml of W2606 + 50.00000gram of M4920 + 50.00000ml of M5418 = Final Quantity: 500.000 ml

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902	ICP AES CAL BLK (SO/ICB/CCB)	MP73473	01/24/2023	02/05/2023	Bin He	None	METALS_PIPETTE_3 (A)	Sarabjit Jaswal
01/27/2023								

FROM 125.00000ml of M5418 + 2350.00000ml of W2606 + 25.00000ml of M5425 = Final Quantity: 2500.000 ml

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903	ICP AES RINSE SOLN	MP73474	01/24/2023	02/05/2023	Bin He	None	METALS_PIPETTE_3 (A)	Sarabjit Jaswal 01/27/2023

FROM 200.00000ml of M5425 + 9800.00000ml of W2606 = Final Quantity: 10000.000 ml

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904	ICP AES ICSA SOLN	MP73475	01/24/2023	02/05/2023	Bin He	None	METALS_PIPETTE_3 (A)	Sarabjit Jaswal 01/27/2023

FROM 10.00000ml of M5127 + 90.00000ml of MP73473 = Final Quantity: 100.000 ml

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3494	ICP AES ICSAB SOLN-1	MP73476	01/24/2023	02/05/2023	Bin He	None	METALS_PIPETTE_3 (A)	Sarabjit Jaswal 01/27/2023
<u>FROM</u>	0.10000ml of M4880 + 0.10000ml of M4882 + 0.10000ml of M4939 + 0.10000ml of M5228 + 0.10100ml of M4589 + 10.00000ml of M5127 + 10.00000ml of M5220 + 79.50000ml of MP73473 = Final Quantity: 100.000 ml							

<u>Recipe ID</u>	<u>NAME</u>	<u>NO.</u>	<u>Prep Date</u>	<u>Expiration Date</u>	<u>Prepared By</u>	<u>ScaleID</u>	<u>PipetteID</u>	<u>Supervised By</u>
907	ICP AES STD S (S5)	MP73477	01/24/2023	02/05/2023	Bin He	None	METALS_PIPETTE_3 (A)	Sarabjit Jaswal 01/27/2023
<u>FROM</u>	5.00000ml of M4589 + 5.00000ml of M4880 + 5.00000ml of M4882 + 5.00000ml of M4939 + 5.00000ml of M5100 + 5.00000ml of M5224 + 5.00000ml of M5228 + 5.00000ml of M5393 + 460.00000ml of MP73473 = Final Quantity: 500.000 ml							

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Metals STANDARD PREPARATION LOG

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910	ICP AES STD S4	MP73478	01/24/2023	02/05/2023	Bin He	None	METALS_PIPETTE_3 (A)	Sarabjit Jaswal 01/27/2023

FROM 100.00000ml of MP73473 + 100.00000ml of MP73477 = Final Quantity: 200.000 ml

<u>Recipe ID</u>	<u>NAME</u>	<u>NO.</u>	<u>Prep Date</u>	<u>Expiration Date</u>	<u>Prepared By</u>	<u>ScaleID</u>	<u>PipetteID</u>	<u>Supervised By</u>
909	ICP AES STD S3	MP73479	01/24/2023	02/05/2023	Bin He	None	METALS_PIPETTE_3 (A)	Sarabjit Jaswal 01/27/2023

FROM 150.00000ml of MP73473 + 50.00000ml of MP73477 = Final Quantity: 200.000 ml

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3913	ICP AES STD S2	MP73480	01/24/2023	02/05/2023	Bin He	None	METALS_PIPETTE_3 (A)	Sarabjit Jaswal 01/27/2023

FROM 16.00000ml of MP73477 + 184.00000ml of MP73473 = Final Quantity: 200.000 ml

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911	ICP AES CCV SOLN	MP73481	01/24/2023	02/05/2023	Bin He	None	METALS_PIPETTE_3 (A)	Sarabjit Jaswal 01/27/2023

FROM 100.00000ml of MP73473 + 100.00000ml of MP73477 = Final Quantity: 200.000 ml

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3651	LR CHECK 1	MP73482	01/24/2023	02/05/2023	Bin He	None	METALS_PIPETTE_3 (A)	Sarabjit Jaswal 01/27/2023
<u>FROM</u> 10.00000ml of M5201 + 18.00000ml of M5193 + 18.00000ml of M5200 + 18.00000ml of M5290 + 20.00000ml of M5289 + 9.00000ml of M4894 + 7.00000ml of MP73473 = Final Quantity: 100.000 ml								

<u>Recipe ID</u>	<u>NAME</u>	<u>NO.</u>	<u>Prep Date</u>	<u>Expiration Date</u>	<u>Prepared By</u>	<u>ScaleID</u>	<u>PipetteID</u>	<u>Supervised By</u>
3652	LR CHECK2	MP73483	01/24/2023	02/05/2023	Bin He	None	METALS_PIPETTE_3 (A)	Sarabjit Jaswal 01/27/2023
<u>FROM</u>	10.00000ml of M5387 + 2.50000ml of M4844 + 25.00000ml of M5226 + 3.50000ml of M4891 + 4.50000ml of M5184 + 5.00000ml of M4768 + 54.50000ml of MP73473 = Final Quantity: 100.000 ml							

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2951	ICP AES S1/CRI WORK STD	MP73484	01/24/2023	02/05/2023	Bin He	None	METALS_PIPETTE_3 (A)	Sarabjit Jaswal 01/27/2023

FROM 196.00000ml of MP73473 + 4.00000ml of MP73192 = Final Quantity: 200.000 ml

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912	ICP AES ICV SOLN	MP73485	01/24/2023	02/05/2023	Bin He	None	METALS_PIPETTE_3 (A)	Sarabjit Jaswal 01/27/2023

FROM 0.02500ml of M5019 + 0.02500ml of M5020 + 0.25000ml of M5218 + 0.25000ml of M5228 + 10.00000ml of M5291 + 89.87500ml of MP73473 = Final Quantity: 100.000 ml

CHEMICAL RECEIPT LOG BOOK

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-2196-01 / Hydroxylamine Hydrochloride, Crystal (cs/4x500g)	0000215387	06/25/2025	07/01/2019 / RICHARD	06/07/2019 / RICHARD	M4371

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-3624-05 / Sodium Chloride, Crystal (cs/4x2.5kg)	0000237721	04/13/2026	10/03/2022 / Ankita	10/30/2019 / AMANDEEP	M4459

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-3238-05 / Potassium Persulfate (2.5kg)	0000234156	08/06/2025	07/23/2019 /	07/25/2019 / manojkumar	M4465

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	Z9651Q / CHEM-CLP-4/.25L	R2-MEB694243	06/29/2024	07/13/2020 / bin	07/02/2020 / bin	M4589

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58024 / Chromium, Cr, 500 ml, 1000 PPM	082620	08/26/2023	11/11/2020 / bin	10/28/2020 / bin	M4657

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	/ Nickel (Ni) 1000PPM	072420	07/24/2023	02/26/2021 / BIN	10/28/2020 / BIN	M4768

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Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
EPA	ICV-5 / ICV (HG) STOCK SOLN	ICV5-0415	04/30/2023	11/25/2022 / mohan	04/20/2021 / mohan	M4794

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57027 / CO, 1000 PPM, 125 ml	020821	02/08/2024	05/23/2021 / jaswal	05/18/2021 / jaswal	M4825

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57182 / Pb, 10000 PPM, 125 ml	032321	03/23/2024	08/09/2021 / bin	05/06/2021 / jaswal	M4844

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	/ Arsenic (As)	012521	01/25/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4874

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57004 / Be, 1000 PPM, 125 ml	030221	03/02/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4876

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57048 / Cd, 1000 PPM, 125 ml	072821	07/28/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4877

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Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57042 / Mo, 1000 PPM, 125 ml	072821	07/28/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4878

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57015 / P, 1000 PPM, 125 ml	051121	05/11/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4880

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57082 / Pb, 1000 PPM, 125 ml	062221	06/22/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4881

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57016 / S, 1000 PPM, 125 ml	051721	05/17/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4882

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57034 / Se, 1000 PPM, 125 ml	070221	07/02/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4883

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57014 / Si, 1000 PPM, 125 ml	030921	03/09/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4884

CHEMICAL RECEIPT LOG BOOK

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57047 / Ag, 1000 PPM, 125 ml	072921	07/29/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4885

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57050 / Sn, 1000 PPM, 125 ml	021121	02/11/2024	08/05/2021 / jaswal	08/05/2021 / jaswal	M4886

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57022 / Ti, 1000 PPM, 125 ml	070721	07/07/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4888

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57081 / TI, 1000 PPM, 125 ml	073021	07/30/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4889

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58030 / Zinc, Zn, 500 ml, 1000 PPM	031921	03/19/2024	08/25/2021 / bin	08/05/2021 / jaswal	M4891

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58126 / Fe, 10000 PPM, 500 ml	061021	06/10/2024	07/26/2021 / bin	06/25/2021 / jaswal	M4894

CHEMICAL RECEIPT LOG BOOK

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57005 / B, 1000 PPM, 125 ml	031921	03/19/2024	08/06/2021 / jaswal	08/06/2021 / jaswal	M4901

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58029 / Cu, 1000 PPM, 500 ml	080321	08/03/2024	08/06/2021 / jaswal	08/06/2021 / jaswal	M4902

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-3227-05 / Potassium Permanganate (2.5kg)	210800	03/31/2026	11/30/2022 / mohan	07/28/2021 / mohan	M4916

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-3980-01 / Stannous Chloride (cs/4x500g)	210800	03/31/2026	05/28/2022 / mohan	07/28/2021 / mohan	M4920

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57003 / Li, 1000 PPM, 125 ml	030221	03/02/2024	09/23/2021 / bin	09/22/2021 / bin	M4939

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CGIN10-5 / INDIUM 1 x 500 ml	100721	10/07/2024	10/09/2021 / jaswal	10/08/2021 / jaswal	M4960

CHEMICAL RECEIPT LOG BOOK

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58139 / Y, 10000 PPM, 500 ml	052521	05/25/2024	10/09/2021 / jaswal	01/25/2019 / jaswal	M4961

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57116 / S, 10000 PPM, 125 ml	011421	01/14/2024	12/13/2021 / bin	12/09/2021 / bin	M5019

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57115 / P, 10000 PPM, 125 ml	032921	03/29/2024	12/13/2021 / bin	12/09/2021 / bin	M5020

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	MSHG-10PPM / MERCURY HCl 125mL 10ug/mL	S2-HG709270	09/22/2026	05/28/2022 / mohan	01/27/2022 / mohan	M5062

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CLPP-CAL-1 / CLP CAL SOLUTION #1, 125mL	R2-MEB689870	02/14/2024	03/14/2022 / bin	04/29/2020 / bin	M5100

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58120 / Ca, 10000 PPM, 500 ml	082021	08/20/2024	12/05/2021 / bin	10/05/2021 / bin	M5108

CHEMICAL RECEIPT LOG BOOK

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
EPA	PART A / ICSA (ICP) STOCK SOLN	ICSA-1211	04/26/2023	10/26/2022 /	04/20/2021 / bin	M5127

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58025 / Mn, 1000 PPM, 500 ml	060122	06/01/2025	07/01/2022 / bin	06/02/2022 / jaswal	M5184

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58120 / Ca, 10000 PPM, 500 ml	082021	08/20/2024	06/23/2022 / bin	09/25/2021 / bin	M5193

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58111 / Na, 10000 PPM, 500 ml	092121	09/21/2024	06/23/2022 / bin	10/05/2021 / bin	M5200

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57119 / Potassium (K) 10,000PPM	062321	06/23/2024	06/23/2022 / bin	10/05/2021 / bin	M5201

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-9673-33 / Sulfuric Acid, Instra-Analyzed (cs/6c2.5L)	22D0862014	01/20/2025	08/22/2022 /	04/26/2022 / mohan	M5211

CHEMICAL RECEIPT LOG BOOK

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CHEM-QC-4 / CHEM-QC-4, Second Source, 1000 ug/ml, B, Mo, Si, Sn, Ti	S2-MEB711674	07/01/2024	07/01/2022 / bin	09/10/2021 / bin	M5218

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
EPA	PART B / ICSAB (ICP) STOCK SOLN	ICSB-0710	04/26/2023	10/26/2022 /	04/20/2021 / bin	M5220

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57051 / Sb, 1000 PPM, 125 ml	101521	10/15/2024	06/29/2022 / bin	10/18/2021 / bin	M5224

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58029 / Cu, 1000 PPM, 500 ml	022822	02/28/2025	06/15/2022 / bin	03/30/2022 / bin	M5226

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57023 / V, 1000 PPM, 125 ml	100121	10/01/2024	07/01/2022 / bin	10/18/2021 / bin	M5227

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57038 / Sr, 1000 PPM, 125 ml	073021	07/30/2024	11/27/2022 / jaswal	07/05/2022 / bin	M5228

CHEMICAL RECEIPT LOG BOOK

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-9530-33 / Hydrochloric Acid, Instra-Analyzed (cs/6x2.5L)	22E1662006	03/03/2023	09/12/2022 / Al-Terek	04/11/2022 / Al-Terek	M5280

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58113 / Aluminum (Al) 10,000PPM	070622	07/06/2025	09/02/2022 / jaswal	07/12/2022 / jaswal	M5289

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58112 / Mg, 10000 PPM, 500 ml	071222	07/12/2025	09/02/2022 / jaswal	07/21/2022 / jaswal	M5290

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
EPA	ICV-1 / ICV (ICP/ICPMS) STOCK SOLN	ICV-1014	03/12/2023	09/12/2022 / bin	02/20/2020 / bin	M5291

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	WW-LFS-1 / Laboratory Fortified Stock Solution 1, 125 ml	S2-MEB710999	10/18/2025	11/24/2022 / bin	08/11/2022 / bin	M5317

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	WW-LFS-2 / Laboratory Fortified Stock Solution 2, 125 ml	R2-MEB693161	05/20/2024	11/24/2022 / bin	08/11/2022 / bin	M5322

CHEMICAL RECEIPT LOG BOOK

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57056 / Ba, 1000 PPM, 125 ml	072122	07/21/2025	11/01/2022 / jaswal	09/18/2022 / jaswal	M5387

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CLPP-CAL-3 / CLP CAL SOLUTION #3, 125mL	T2-MEB714159	12/12/2023	10/12/2022 / bin	09/19/2022 / bin	M5393

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-9530-33 / Hydrochloric Acid, Instra-Analyzed (cs/6x2.5L)	22E1662006	06/22/2023	12/23/2022 / Al-Terek	04/11/2022 / Al-Terek	M5408

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L)	22B0862001	06/27/2023	12/28/2022 / Al-Terek	01/28/2022 / Al-Terek	M5411

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L)	22B0862001	06/27/2023	01/02/2023 / bin	01/28/2022 / Al-Terek	M5412

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-9530-33 / Hydrochloric Acid, Instra-Analyzed (cs/6x2.5L)	22D1462006	07/05/2023	01/17/2023 / Al-Terek	02/24/2022 / Al-Terek	M5418



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CHEMICAL RECEIPT LOG BOOK

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L)	22C0462001	07/11/2023	01/18/2023 / Al-Terek	02/11/2022 / Al-Terek	M5425

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L)	22C0462001	07/11/2023	/	02/11/2022 / Al-Terek	M5426

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	DIW / DI Water	Daily Lab-Certified	10/24/2024	10/24/2019 / apatel	10/24/2019 / apatel	W2606

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code:	Multi Analyte Custom Grade Solution	
Catalog Number:	CLPP-CAL-1	
Lot Number:	R2-MEB689870	
Matrix:	5% (v/v) HNO ₃	
Value / Analyte(s):	5 000 µg/mL ea:	Potassium, Sodium,
	Calcium, Magnesium,	
	2 000 µg/mL ea:	Barium,
	Aluminum,	
	1 000 µg/mL ea:	
	Iron,	
	500 µg/mL ea:	Vanadium, Cobalt,
	Nickel, Zinc, Manganese,	
	250 µg/mL ea:	Copper,
	Silver,	
	200 µg/mL ea:	
	Chromium,	
	50 µg/mL ea:	
	Beryllium	

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE	CERTIFIED VALUE	ANALYTE	CERTIFIED VALUE
Aluminum, Al	2 000 ± 7 µg/mL	Barium, Ba	2 000 ± 9 µg/mL
Beryllium, Be	50.00 ± 0.24 µg/mL	Calcium, Ca	5 000 ± 20 µg/mL
Chromium, Cr	200.0 ± 1.2 µg/mL	Cobalt, Co	500.0 ± 2.4 µg/mL
Copper, Cu	250.0 ± 1.0 µg/mL	Iron, Fe	1 000 ± 4 µg/mL
Magnesium, Mg	5 000 ± 20 µg/mL	Manganese, Mn	500.0 ± 1.9 µg/mL
Nickel, Ni	500.0 ± 2.2 µg/mL	Potassium, K	5 000 ± 18 µg/mL
Silver, Ag	250.0 ± 1.1 µg/mL	Sodium, Na	5 000 ± 18 µg/mL
Vanadium, V	500.0 ± 2.2 µg/mL	Zinc, Zn	500.0 ± 2.1 µg/mL

Density: 1.116 g/mL (measured at 20 ± 4 °C)

Assay Information:

ANALYTE	METHOD	NIST SRM#	SRM LOT#
Ag	ICP Assay	3151	160729
Ag	Volhard	999c	999c
Al	ICP Assay	3101a	140903
Al	EDTA	928	928
Ba	ICP Assay	3104a	140909
Ba	Gravimetric		See Sec. 4.2
Be	ICP Assay	3105a	090514
Be	Calculated		See Sec. 4.2
Ca	ICP Assay	3109a	130213
Ca	EDTA	928	928
Co	EDTA	928	928
Co	ICP Assay	traceable to 3113	M2-CO661665
Cr	ICP Assay	3112a	170630
Cr	Calculated		See Sec. 4.2
Cu	ICP Assay	3114	121207
Cu	EDTA	928	928
Fe	ICP Assay	3126a	140812
Fe	EDTA	928	928
K	ICP Assay	3141a	140813
K	Gravimetric		See Sec. 4.2
Mg	ICP Assay	3131a	140110
Mg	EDTA	928	928
Mn	ICP Assay	3132	050429
Mn	EDTA	928	928
Na	ICP Assay	3152a	120715
Na	Gravimetric		See Sec. 4.2
Ni	ICP Assay	3136	120619
Ni	EDTA	928	928
V	ICP Assay	3165	160906
V	EDTA	928	928
Zn	ICP Assay	3168a	120629
Zn	EDTA	928	928

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{\text{CRM/RM}}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{\text{CRM/RM}} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{\text{char } i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{\text{char } i}^2) / (\sum(1/u_{\text{char } i}^2))$$

$$\text{CRM/RM Expanded Uncertainty } (\pm) = U_{\text{CRM/RM}} = k (u_{\text{char}}^2 + u_{\text{bb}}^2 + u_{\text{Its}}^2 + u_{\text{ts}}^2)^{1/2}$$

k = coverage factor = 2

$u_{\text{char}} = [\sum(w_i)^2 (u_{\text{char } i}^2)]^{1/2}$ where $u_{\text{char } i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{\text{CRM/RM}}$, where one method of characterization is used is the mean of individual results:

$$X_{\text{CRM/RM}} = (X_a)(u_{\text{char } a})$$

X_a = mean of Assay Method A with

$u_{\text{char } a}$ = the standard uncertainty of characterization Method A

$$\text{CRM/RM Expanded Uncertainty } (\pm) = U_{\text{CRM/RM}} = k (u_{\text{char } a}^2 + u_{\text{bb}}^2 + u_{\text{Its}}^2 + u_{\text{ts}}^2)^{1/2}$$

k = coverage factor = 2

$u_{\text{char } a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

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

N/A

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

February 14, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **February 14, 2024**

- The date after which this CRM/RM should not be used.
- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director





Refine your results. Redefine your industry.

Certificate of Analysis

300 Technology Drive
Christiansburg, VA 24073 USA
inorganicventures.com

P: 800-669-6799/540-585-3030
F: 540-585-3012
info@inorganicventures.com

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Multi Analyte Custom Grade Solution
Catalog Number: CLPP-CAL-3
Lot Number: T2-MEB714159
Matrix: 7% (v/v) HNO₃
Value / Analyte(s):
1 000 µg/mL ea:
Arsenic, Lead,
Selenium, Thallium,
500 µg/mL ea:
Cadmium

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE	CERTIFIED VALUE	ANALYTE	CERTIFIED VALUE
Arsenic, As	1 000 ± 8 µg/mL	Cadmium, Cd	500.0 ± 2.1 µg/mL
Lead, Pb	1 000 ± 5 µg/mL	Selenium, Se	1 000 ± 8 µg/mL
Thallium, Tl	1 000 ± 7 µg/mL		

Density: 1.043 g/mL (measured at 20 ± 4 °C)

Assay Information:

ANALYTE	METHOD	NIST SRM#	SRM LOT#
As	ICP Assay	3103a	100818
Cd	ICP Assay	3108	130116
Cd	EDTA	928	928
Pb	ICP Assay	3128	101026
Pb	EDTA	928	928
Se	ICP Assay	3149	100901
Tl	ICP Assay	3158	151215

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{\text{CRM/RM}}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{\text{CRM/RM}} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{\text{char } i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{\text{char } i}^2) / (\sum(1/u_{\text{char } i}^2))$$

$$\text{CRM/RM Expanded Uncertainty } (\pm) = U_{\text{CRM/RM}} = k (u_{\text{char}}^2 + u_{\text{bb}}^2 + u_{\text{Its}}^2 + u_{\text{ts}}^2)^{1/2}$$

k = coverage factor = 2

$u_{\text{char}} = [\sum(w_i)^2 (u_{\text{char } i}^2)]^{1/2}$ where $u_{\text{char } i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{\text{CRM/RM}}$, where one method of characterization is used is the mean of individual results:

$$X_{\text{CRM/RM}} = (X_a)(u_{\text{char } a})$$

X_a = mean of Assay Method A with

$u_{\text{char } a}$ = the standard uncertainty of characterization Method A

$$\text{CRM/RM Expanded Uncertainty } (\pm) = U_{\text{CRM/RM}} = k (u_{\text{char } a}^2 + u_{\text{bb}}^2 + u_{\text{Its}}^2 + u_{\text{ts}}^2)^{1/2}$$

k = coverage factor = 2

$u_{\text{char } a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

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

N/A

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

January 13, 2022

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **January 13, 2027**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski
Manager, Quality Control



Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director



Sodium Chloride, Crystal
BAKER ANALYZED® A.C.S. Reagent



From M4452 to M4459

Received on : 10/30/2019

Received by : AK

Material No.: 3624-05

Batch No.: 0000237721

Manufactured Date: 2019/04/15

Retest Date: 2026/04/13

Revision No: 1

Certificate of Analysis

Meets ACS Reagent Chemical Requirements,

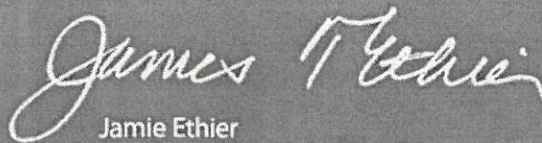
Test	Specification	Result
Assay (NaCl) (by Ag titrn)	$\geq 99.0 \%$	100.3
pH of 5% Solution at 25°C	5.0 – 9.0	6.0
ACS – Insoluble Matter	$\leq 0.005 \%$	< 0.001
Iodide (I)	$\leq 0.002 \%$	< 0.002
Bromide (Br)	$\leq 0.01 \%$	< 0.01
Chlorate and Nitrate (as NO_3)	$\leq 0.003 \%$	< 0.001
ACS – Phosphate (PO_4)	$\leq 5 \text{ ppm}$	< 5
Sulfate (SO_4)	$\leq 0.004 \%$	< 0.004
Barium (Ba)	Passes Test	PT
ACS – Heavy Metals (as Pb)	$\leq 5 \text{ ppm}$	< 5
Iron (Fe)	$\leq 2 \text{ ppm}$	< 2
Calcium (Ca)	$\leq 0.002 \%$	< 0.001
Magnesium (Mg)	$\leq 0.001 \%$	< 0.001
Potassium (K)	$\leq 0.005 \%$	0.002

For Laboratory, Research or Manufacturing Use

Meets Reagent Specifications for testing USP/NF monographs

Country of Origin: US

Packaging Site: Paris Mfg Ctr & DC


Jamie Ethier
Vice President Global Quality

For questions on this Certificate of Analysis please contact Technical Services at 855.282.6867 or +1.610.386.1700

Avantor Performance Materials, LLC

100 Matsonford Rd, Suite 200, Radnor, PA 19087. U.S.A. Phone: 610.386.1700

M4371

Hydroxylamine Hydrochloride, Crystal
BAKER ANALYZED® A.C.S. Reagent
Suitable for Mercury Determination
(hydroxylammonium chloride)

Rec - 06.07.19



Material No.: 2196-01
Batch No.: 0000215387
Manufactured Date: 2018/06/27
Retest Date: 2025/06/25
Revision No: 1

Certificate of Analysis

Meets ACS Reagent Chemical Requirements,

Test	Specification	Result
Assay (NH ₂ OH · HCl) (by KMnO ₄ titrn)	>= 96.0 %	99.1
Clarity of Alcohol Solution	Passes Test	PT
Residue after Ignition	<= 0.050 %	0.017
Titrate Free Acid (meq/g)	<= 0.25	0.19
Ammonium (NH ₄)	Passes Test	PT
Sulfur Compounds (as SO ₄)	<= 0.005 %	< 0.003
Trace Impurities - ACS - Heavy Metals (as Pb)	<= 5 ppm	4
Trace Impurities - Iron (Fe)	<= 5 ppm	< 3
Trace Impurities - Mercury (Hg)	<= 0.050 ppm	< 0.005

For Laboratory, Research or Manufacturing Use

Country of Origin: CN
Packaging Site: Paris Mfg Ctr & DC



Phillipsburg, NJ 9001:2015, FSSC22000
Paris, KY 9001:2008
Mexico City, Mexico 9001:2008
Gliwice, Poland 9001:2015, 13485:2012
Selangor, Malaysia 9001:2008
Dehradun, India, 9001:2008, 14001:2004, 13485:2003
Mumbai, India, 9001:2015, 17025:2005
Panoli, India 9001:2015

James Ethier

Jamie Ethier
Vice President Global Quality

For questions on this Certificate of Analysis please contact Technical Services at 855.282.6867 or +1.610.386.1700

Avantor Performance Materials, LLC

100 Matsonford Rd, Suite 200, Radnor, PA 19087, U.S.A. Phone: 610.386.1700

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Multi Analyte Custom Grade Solution
Catalog Number: CHEM-CLP-4
Lot Number: R2-MEB694243
Matrix: 3% (v/v) HNO₃
3% (v/v) HF
Value / Analyte(s): 1 000 µg/mL ea:
Boron, Molybdenum,
Silicon, Tin,
Titanium

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE	CERTIFIED VALUE	ANALYTE	CERTIFIED VALUE
Boron, B	1 000 ± 7 µg/mL	Molybdenum, Mo	1 000 ± 5 µg/mL
Silicon, Si	1 000 ± 7 µg/mL	Tin, Sn	1 000 ± 5 µg/mL
Titanium, Ti	1 000 ± 7 µg/mL		

Density: 1.031 g/mL (measured at 20 ± 4 °C)

Assay Information:

ANALYTE	METHOD	NIST SRM#	SRM LOT#
B	ICP Assay	3107	110830
Mo	ICP Assay	3134	130418
Si	ICP Assay	3150	130912
Sn	ICP Assay	3161a	140917
Ti	ICP Assay	3162a	130925

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{\text{CRM/RM}}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{\text{CRM/RM}} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{\text{char } i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{\text{char } i}^2) / (\sum(1/u_{\text{char } i}^2))$$

$$\text{CRM/RM Expanded Uncertainty } (\pm) = U_{\text{CRM/RM}} = k(u_{\text{char}}^2 + u_{\text{bb}}^2 + u_{\text{Its}}^2 + u_{\text{ts}}^2)^{1/2}$$

k = coverage factor = 2

$u_{\text{char}} = [\sum(w_i)^2(u_{\text{char } i}^2)]^{1/2}$ where $u_{\text{char } i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{\text{CRM/RM}}$, where one method of characterization is used is the mean of individual results:

$$X_{\text{CRM/RM}} = (X_a)(u_{\text{char } a})$$

X_a = mean of Assay Method A with

$u_{\text{char } a}$ = the standard uncertainty of characterization Method A

$$\text{CRM/RM Expanded Uncertainty } (\pm) = U_{\text{CRM/RM}} = k(u_{\text{char } a}^2 + u_{\text{bb}}^2 + u_{\text{Its}}^2 + u_{\text{ts}}^2)^{1/2}$$

k = coverage factor = 2

$u_{\text{char } a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

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

N/A

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

HF Note: This standard should not be prepared or stored in glass.

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

June 29, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- June 29, 2024

- The date after which this CRM/RM should not be used.
- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Director, Quality Control



Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director





CERTIFIED WEIGHT REPORT:

Part Number: **58024**
 Lot Number: **082620**
 Description: **Chromium (Cr)**

Lot # 19410105
 Solvent: Nitric Acid

2.0% 40.0
 (mL) Nitric Acid

Expiration Date: 082623
 Recommended Storage: Ambient (20 °C)
 Nominal Concentration (µg/mL): **1000**

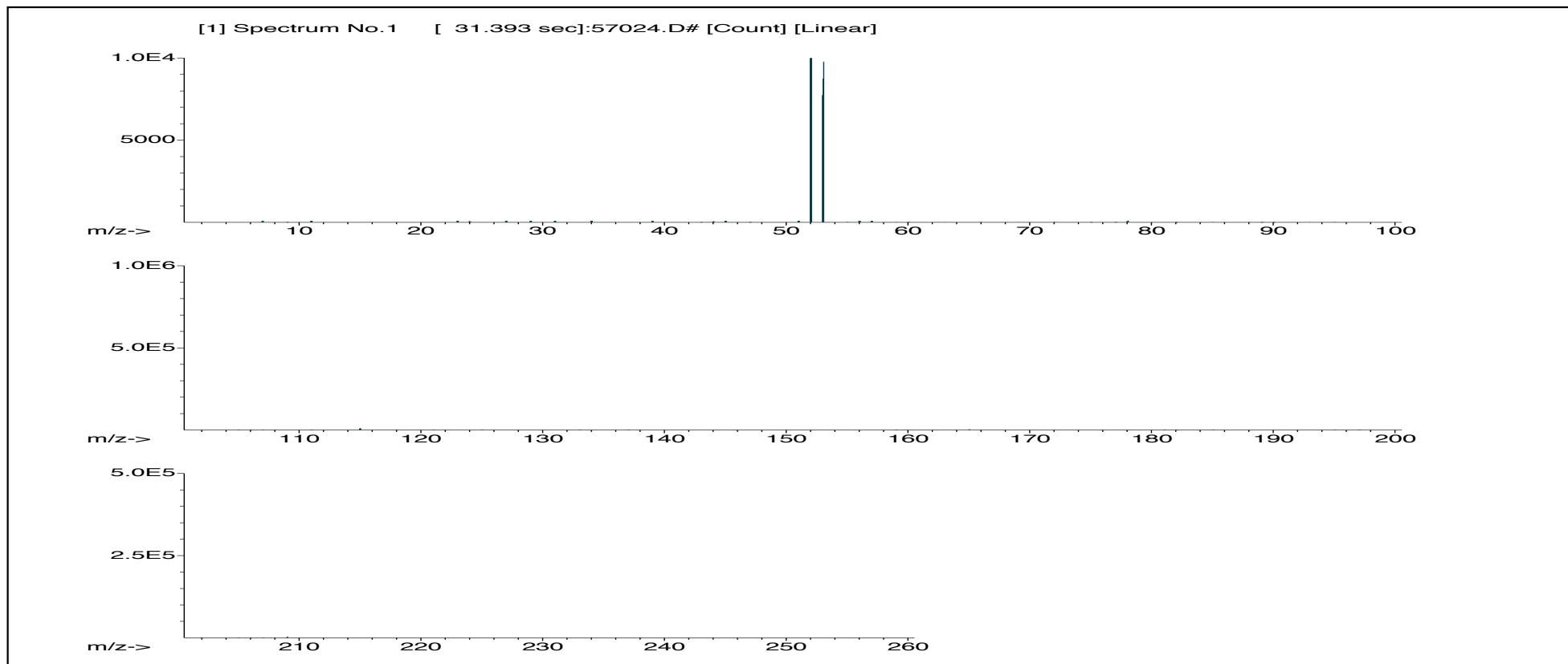
NIST Test Number: 23060

5E-05 Balance Uncertainty

Volume shown below was diluted to (mL): 2000.02 0.058 Flask Uncertainty

Formulated By:	Lawrence Barry	082620
Reviewed By:	Pedro L. Rentas	082620

Compound	Part Number	Lot Number	Dilution Factor	Initial Vol. (mL)	Uncertainty Pipette	Nominal Conc. (µg/mL)	Initial Conc. (µg/mL)	Final Conc. (µg/mL)	Expanded Uncertainty +/- (µg/mL)	SDS Information (Solvent Safety Info. On Attached pg.)			NIST SRM
										CAS#	OSHA PEL (TWA)	LD50	
1. Chromium (III) nitrate nonahydrate (Cr)	58124	121619	0.1000	200.0	0.084	1000	10000.2	1000.0	2.2	7789-02-8	0.5 mg(Cr)/m3	ori-rat 3250 mg/kg	3112a





Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):

Trace Metals Verification by ICP-MS ($\mu\text{g/mL}$)

Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Ho	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	U	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	Tl	<0.02	V	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	T	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
B	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02

(T)= Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- * All standard containers are meticulously cleaned prior to use.
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.
- * All standards should be stored with caps tight and under appropriate laboratory conditions.
- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).



M4768

R: 10/28/2020
Certified Reference Material CRM



ANAB ISO 17034 Accredited
AR-1539 Certificate Number
https://absolutestandards.com

CERTIFIED WEIGHT REPORT:

Part Number: 57028
Lot Number: 072420
Description: Nickel (Ni)

Lot # 19410105
Solvent: Nitric Acid

Expiration Date: 072423

2.0%

Recommended Storage: Ambient (20 °C)

40.0 (mL) Nitric Acid

Nominal Concentration (µg/mL): 1000

NIST Test Number: 23060

5E-05 Balance Uncertainty

Volume shown below was diluted to (mL): 2000.02

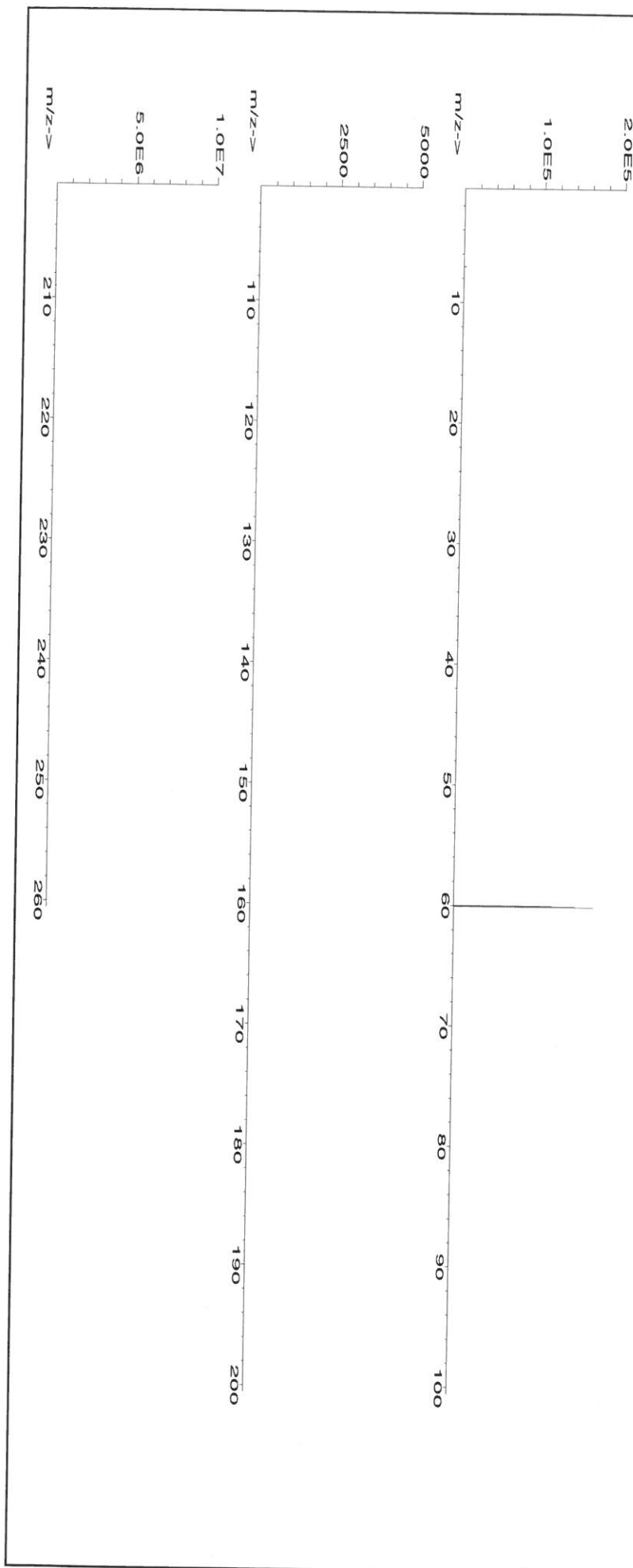
0.058 Flask Uncertainty

<i>Lawrence Barry</i>	
Formulated By:	Lawrence Barry
	072420
<i>Pedro L. Ruelas</i>	
Reviewed By:	Pedro L. Ruelas
	072420

Compound	Part Number	Lot Number	Dilution Factor	Initial Vol. (mL)	Uncertainty Pipette (mL)	Nominal Conc. (µg/mL)	Initial Conc. (µg/mL)	Final Conc. (µg/mL)	Expanded Uncertainty +/- (µg/mL)	CAS#	OSHA PEL (TWA)	LD50	NIST SRM

1. Nickel (II) nitrate Hexahydrate (Ni)	58128	082719	0.1000	200.0	0.013	1000	10000.5	1000.0	2.0	13478-00-7	1 mg/m3	orl-rat 1620 mg/kg	3136
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[1] Spectrum No. 1 [9.135 sec]:58028.D# [Count] [Linear]





Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):

Trace Metals Verification by ICP-MS (µg/mL)

Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	T	Pr	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Ho	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Tc	<0.02	U	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	Tl	<0.02	V	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
B	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02

(T)= Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
 - * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
 - * All standard containers are meticulously cleaned prior to use.
 - * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
 - * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.
 - * All Standards should be stored with caps tight and under appropriate laboratory conditions.
- Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).



QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY
"An ISO 9001:2015 Certified Program"

R: 04/20/21
52

Instructions for QATS Reference Material: *Inorganic ICV Solutions*

**QATS LABORATORY INORGANIC REFERENCE MATERIAL
INITIAL CALIBRATION VERIFICATION SOLUTIONS
(ICV1, ICV5, AND ICV6)**

NOTE: These instructions are for advisory purposes only. If any apparent conflict exists between these instructions and the analytical protocol or your contract, disregard these instructions.

APPLICATION: For use with the CLP SFAM01.0 SOW and revisions.

CAUTION: Read instructions carefully before opening bottle(s) and proceeding with the analyses.



M4791
M4792
M4793
M4794
M4795
NB (A)

(A) SAMPLE DESCRIPTION

Enclosed is a set of one (1) or more Aqueous Inorganic Reference Materials containing various analyte concentrations. ICV1 and ICV5 are in a matrix of dilute nitric acid. ICV6 is in a matrix of dilute basic solution. **For the reference material source in reporting ICVs use "USEPA". For the reference material lot number for the ICV1, ICV5, and ICV6 solutions use "ICV1-1014", "ICV5-0415", and "ICV6-0400", respectively.**

(B) BREAKAGE OR MISSING ITEMS

Check the contents of the shipment carefully for any broken, leaking, or missing items. Check that the seal is intact on each bottle. Refer to the enclosed chain of custody record. Report any problems to Mr. Keith Strout, APTIM Federal Services, LLC, at (702) 895-8722. If requested, return the chain-of-custody record with appropriate annotations and signatures to the address provided below.

QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY
APTIM Federal Services, LLC
2700 Chandler Avenue - Building C
Las Vegas, NV 89120

(C) ANALYSIS OF SAMPLES

The Initial Calibration Verification Solutions (ICVs) are to be used to evaluate the accuracy of the initial calibrations of ICP, AA, and Cyanide colorimetric instruments, and are to be used with the CLP SOWs and revisions. The values for each element in the ICVs are listed below in µg/L (ppb) for the resulting solution(s) after the dilution of the concentrate(s) according to the following instructions. Use Class 'A' glassware to prepare the solution(s).

ICV1-1014 For ICP-AES analysis, use a 10-fold dilution by pipetting 10 mL of the ICV1 concentrate into a 100 mL volumetric flask and dilute to volume with 2% (v/v) nitric acid.





R:04/20/21
60

Instructions for QATS Reference Material: *Inorganic ICV Solutions*

ICV1-1014

For ICP-MS analysis, use a 50-fold dilution by pipetting 2 mL of the ICV1 concentrate into a 100 mL volumetric flask and dilute to volume with 1% (v/v) nitric acid.

ICV5-0415

For the cold vapor analysis of mercury by AA, use a 100-fold dilution by pipetting 1 mL of the ICV5 concentrate into a 100 mL volumetric flask and dilute to volume with 2% (v/v) nitric acid. The ICV5 concentrate is prepared in 0.05% (w/v) $K_2Cr_2O_7$ and 5% (v/v) nitric acid.

ICV6-0400

For the analysis of cyanide, use a 100-fold dilution by pipetting 1 mL of the ICV6 concentrate into a 100 mL volumetric flask and dilute to volume with Type II water. Distill this solution along with the samples before analysis. The cyanide concentrate is prepared from $K_3Fe(CN)_6$, Type II water, and 0.1 % sodium hydroxide, and will decompose rapidly if exposed to light.

NOTE: USE TYPE II WATER AND HIGH-PURITY ACIDS FOR ALL DILUTIONS.

(D) CERTIFIED CONCENTRATIONS OF QATS ICV1, ICV5, AND ICV6 SOLUTIONS

ICV1-1014		
Element	Concentration (µg/L) (after 10-fold dilution)	Concentration (µg/L) (after 50-fold dilution)
Al	2500	500
Sb	1000	200
As	1000	200
Ba	520	100
Be	510	100
Cd	510	100
Ca	10000	2000
Cr	520	100
Co	520	100
Cu	510	100
Fe	10000	2000
Pb	1000	200
Mg	6000	1200
Mn	520	100
Ni	530	110
K	9900	2000
Se	1000	200
Ag	250	50
Na	10000	2000
Tl	1000	210
V	500	100
Zn	1000	200

ICV5-0415		ICV6-0400	
Element	Concentration (µg/L) (after 100-fold dilution)	Analyte	Concentration (µg/L) (after 100-fold dilution)
Hg	4.0	CN ⁻	99



CERTIFIED WEIGHT REPORT:

Part Number: **57027**
 Lot Number: **020821**
 Description: **Cobalt (Co)**

Lot # 19410105
 Solvent: Nitric Acid

2.0% 40.0
 (mL) Nitric Acid

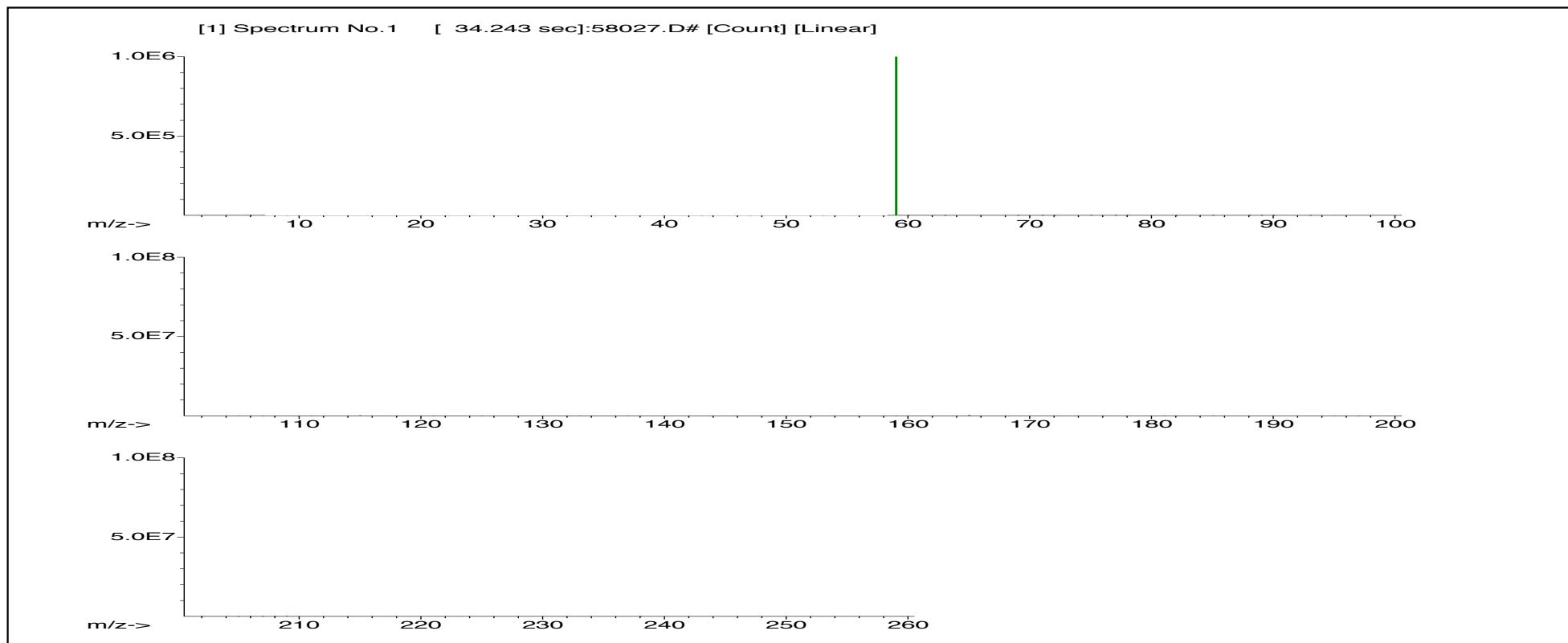
Expiration Date: 020824
 Recommended Storage: Ambient (20 °C)
 Nominal Concentration (µg/mL): **1000**

NIST Test Number: 23060 5E-05 Balance Uncertainty

Volume shown below was diluted to (mL): 1999.78 0.265 Flask Uncertainty

Formulated By:	Lawrence Barry	020821
Reviewed By:	Pedro L. Rentas	020821

Compound	Part Number	Lot Number	Dilution Factor	Initial Vol. (mL)	Uncertainty Pipette (mL)	Nominal Conc. (µg/mL)	Initial Conc. (µg/mL)	Final Conc. (µg/mL)	Expanded	SDS Information			NIST SRM
									Uncertainty	(Solvent Safety Info. On Attached pg.)			
									+/- (µg/mL)	CAS#	OSHA PEL (TWA)	LD50	
Cobalt nitrate hexahydrate (Co)	58127	062320	0.1000	200.0	0.084	1000	10000.1	1000.0	2.2	10026-22-9	5 mg/m3	orl-rat 694 mg/kg	3113



**Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):****Trace Metals Verification by ICP-MS ($\mu\text{g/mL}$)**

Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Ho	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	U	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	Tl	<0.02	V	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	T	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
B	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02

(T)= Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- * All standard containers are meticulously cleaned prior to use.
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.
- * All standards should be stored with caps tight and under appropriate laboratory conditions.
- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).



CERTIFIED WEIGHT REPORT:

Part Number: **57182**
Lot Number: **032321**
Description: **Lead (Pb)**

Lot #
Solvent: 20370011 Nitric Acid

2% 40.0 Nitric Acid
(mL)

Expiration Date: 032324

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): **10000**

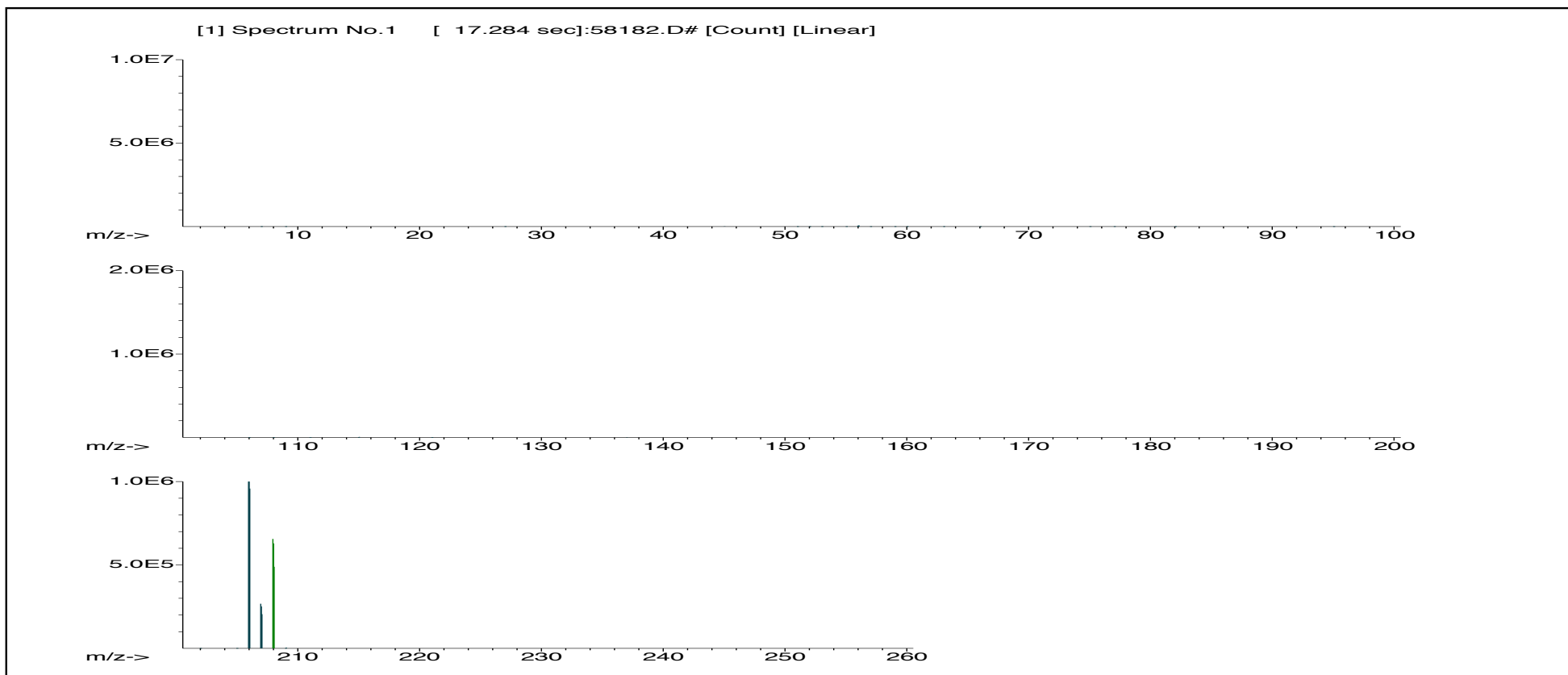
NIST Test Number: 6UTB

5E-05 Balance Uncertainty

Weight shown below was diluted to (mL): 2000.02 0.058 Flask Uncertainty

Formulated By:	Lawrence Barry	032321
Reviewed By:	Pedro L. Rentas	032321

Compound	RM#	Lot Number	Nominal Conc. (µg/mL)	Purity (%)	Uncertainty Purity (%)	Assay (%)	Target Weight (g)	Actual Weight (g)	Actual Conc. (µg/mL)	Expanded Uncertainty +/- (µg/mL)	SDS Information (Solvent Safety Info. On Attached pg.)			NIST SRM
											CAS#	OSHA PEL (TWA)	LD50	
1. Lead (II) Nitrate (Pb)	IN029	PBD122016A1	10000.0	99.999	0.10	62.5	32.0006	32.0010	10000.1	20.0	10099-74-8	0.05 mg/m3	intrvns-rat 93 mg/kg	3128





Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):

Trace Metals Verification by ICP-MS ($\mu\text{g/mL}$)

Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Ho	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	U	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	Tl	<0.02	V	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
B	<0.02	Cu	<0.02	Au	<0.02	Pb	T	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02

(T)= Target analyte

Physical Characterization:

Certified by:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- * All standard containers are meticulously cleaned prior to use.
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.
- * All Standards should be stored with caps tight and under appropriate laboratory conditions.
- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).



CERTIFIED WEIGHT REPORT:

Part Number: **57033**
Lot Number: **012521**
Description: **Arsenic (As)**

Lot # 19410105
Solvent: Nitric Acid

2.0% 40.0
(mL) Nitric Acid

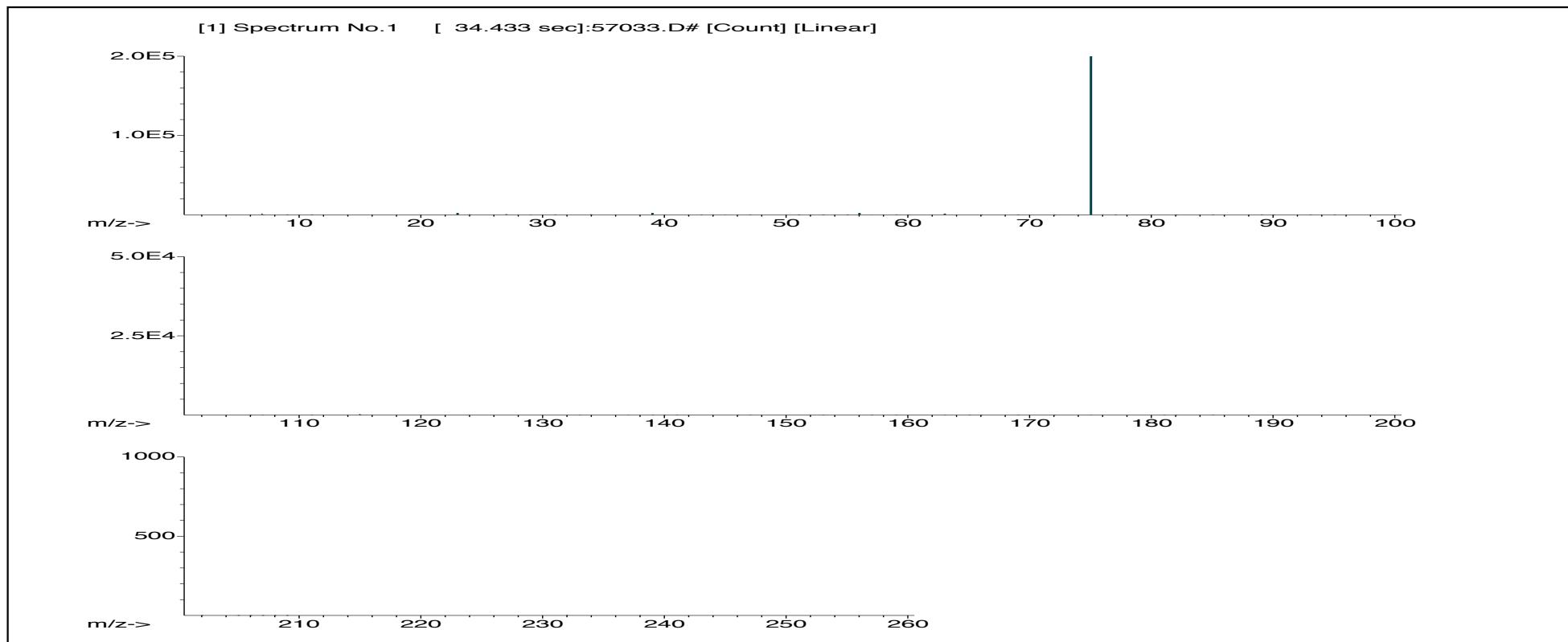
Expiration Date: 012524
Recommended Storage: Ambient (20 °C)
Nominal Concentration (µg/mL): **1000**

NIST Test Number: 23060 5E-05 Balance Uncertainty

Volume shown below was diluted to (mL): 2000.02 0.058 Flask Uncertainty

Formulated By:	Lawrence Barry	012521
Reviewed By:	Pedro L. Rentas	012521

Compound	Part Number	Lot Number	Dilution Factor	Initial Vol. (mL)	Uncertainty Pipette (mL)	Nominal Conc. (µg/mL)	Initial Conc. (µg/mL)	Final Conc. (µg/mL)	Expanded Uncertainty +/- (µg/mL)	SDS Information (Solvent Safety Info. On Attached pg.)			NIST SRM
										CAS#	OSHA PEL (TWA)	LD50	
1. Arsenic (As)	58133	092220	0.1000	200.0	0.084	1000	10001.0	1000.0	2.2	7440-38-2	0.2 mg/m3	ori-rat 763 mg/kg	3103a





Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):

Trace Metals Verification by ICP-MS ($\mu\text{g/mL}$)

Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Ho	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	U	<0.02
As	T	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	Tl	<0.02	V	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
B	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02

(T)= Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- * All standard containers are meticulously cleaned prior to use.
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.
- * All standards should be stored with caps tight and under appropriate laboratory conditions.
- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).



CERTIFIED WEIGHT REPORT:

Part Number: **57004**
 Lot Number: **030221**
 Description: **Beryllium (Be)**

Lot # 19410105
 Solvent: Nitric Acid

2.0% 40.0
 (mL) Nitric Acid

Expiration Date: 030224
 Recommended Storage: Ambient (20 °C)
 Nominal Concentration (µg/mL): **1000**

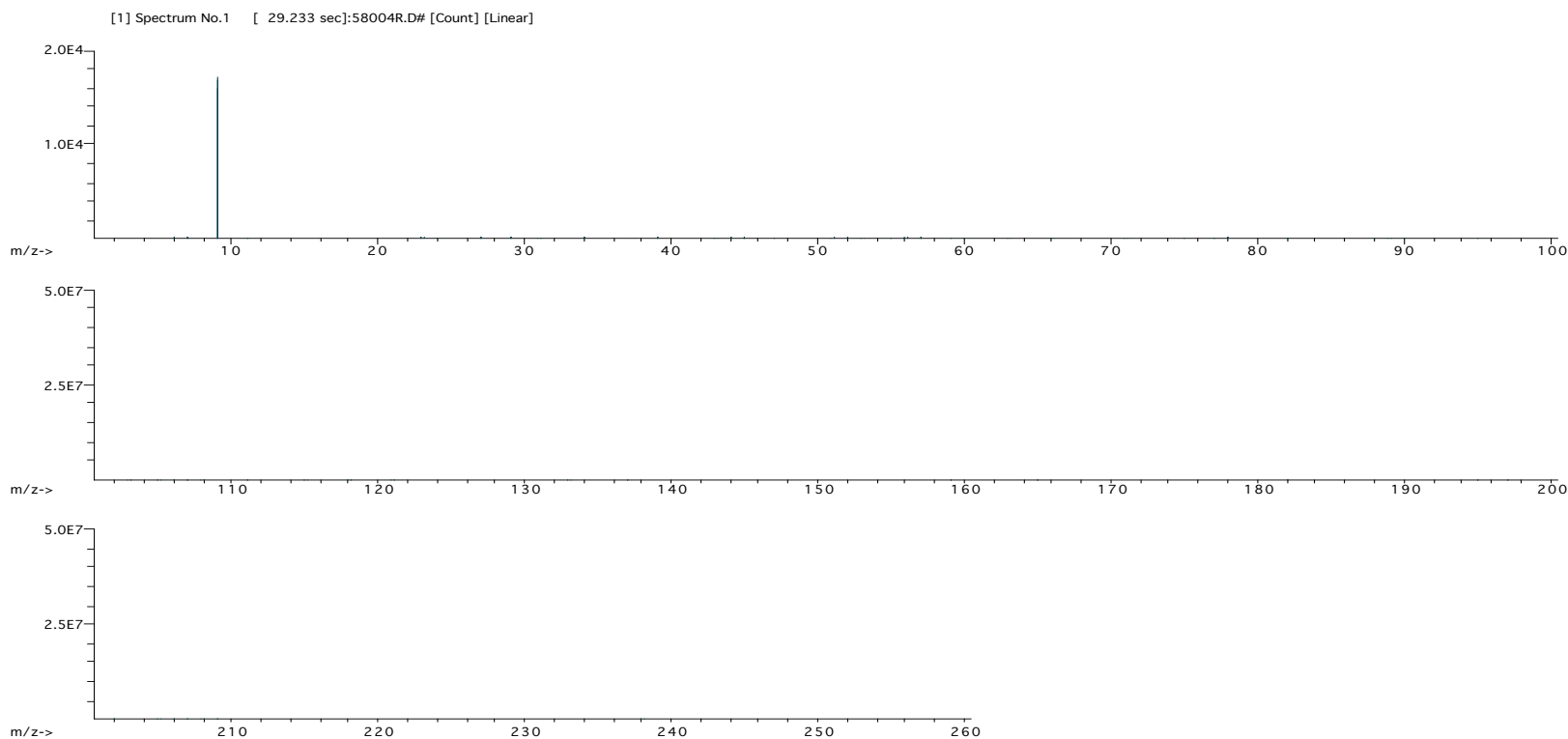
NIST Test Number: 23060

5E-05 Balance Uncertainty

Volume shown below was diluted to (mL): 2000.02 0.058 Flask Uncertainty

Formulated By:	Lawrence Barry	030221
Reviewed By:	Pedro L. Rentas	030221

Compound	Part Number	Lot Number	Dilution Factor	Initial Vol. (mL)	Uncertainty Pipette	Nominal Conc. (µg/mL)	Initial Conc. (µg/mL)	Final Conc. (µg/mL)	Expanded Uncertainty +/- (µg/mL)	SDS Information			NIST SRM
										(Solvent Safety Info. On Attached pg.)			
										CAS#	OSHA PEL (TWA)	LD50	
Beryllium acetate basic (Be)	58104	063020	0.1000	200.0	0.084	1000	10000.1	1000.0	2.2	19049-40-2	0.002 mg/m3	orl-rat 28 mg/kg	3105a





Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):

Trace Metals Verification by ICP-MS ($\mu\text{g/mL}$)

Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Ho	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	U	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	Tl	<0.02	V	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Be	T	Cr	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
B	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02

(T)= Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- * All standard containers are meticulously cleaned prior to use.
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.
- * All Standards should be stored with caps tight and under appropriate laboratory conditions.
- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).



CERTIFIED WEIGHT REPORT:

Part Number: **57048**
 Lot Number: **072821**
 Description: **Cadmium (Cd)**

Lot # 20370011
 Solvent: Nitric Acid

2.0% 40.0 Nitric Acid
 (mL)

Expiration Date: 072824

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): **1000**

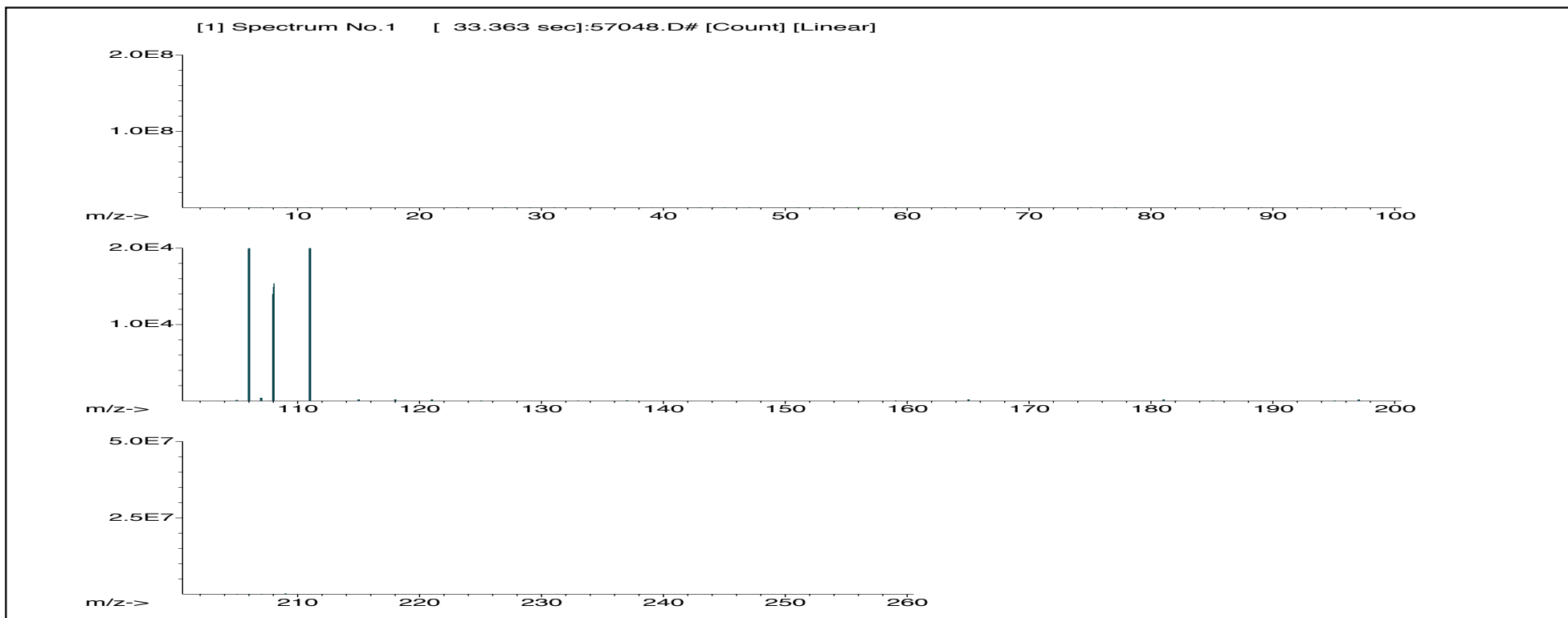
NIST Test Number: 6UTB

5E-05 Balance Uncertainty

Volume shown below was diluted to (mL): 2000.02 0.058 Flask Uncertainty

<i>Giovanni Esposito</i>		
Formulated By:	Giovanni Esposito	072821
<i>Pedro L. Rentas</i>		
Reviewed By:	Pedro L. Rentas	072821

Compound	Part Number	Lot Number	Dilution Factor	Initial Vol. (mL)	Uncertainty Pipette (mL)	Nominal Conc. (µg/mL)	Initial Conc. (µg/mL)	Final Conc. (µg/mL)	Expanded Uncertainty +/- (µg/mL)	SDS Information (Solvent Safety Info. On Attached pg.)			NIST SRM
										CAS#	OSHA PEL (TWA)	LD50	
1. Cadmium nitrate tetrahydrate (Cd)	58148	010920	0.1000	200.0	0.084	1000	10000.5	1000.0	2.2	10022-68-1	0.2 mg/m3	ori-rat 300 mg/kg	3108





Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):

Trace Metals Verification by ICP-MS ($\mu\text{g/mL}$)

Al	<0.02	Cd	T	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Ho	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	U	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	Tl	<0.02	V	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
B	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02

(T)= Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- * All standard containers are meticulously cleaned prior to use.
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.
- * All standards should be stored with caps tight and under appropriate laboratory conditions.
- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).



CERTIFIED WEIGHT REPORT:

Part Number: 57042
Lot Number: 072821
Description: Molybdenum (Mo)

Lot # M4838 R.18/5121
Solvent: MKBQ8597V Ammonium hydroxide

Expiration Date: 072824

0.5%

10.0 (mL) Ammonium hydroxide

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): 1000

<i>Giovanni Esposito</i> Formulated By: Giovanni Esposito 072821	
<i>Pedro L. Rendas</i> Reviewed By: Pedro L. Rendas 072821	SDS Information (Solvent Safety Info. On Attached pg.) CAS# OSHA PEL (TWA) LD50 SRM

NIST Test Number: 6UTB

SE-05 Balance Uncertainty

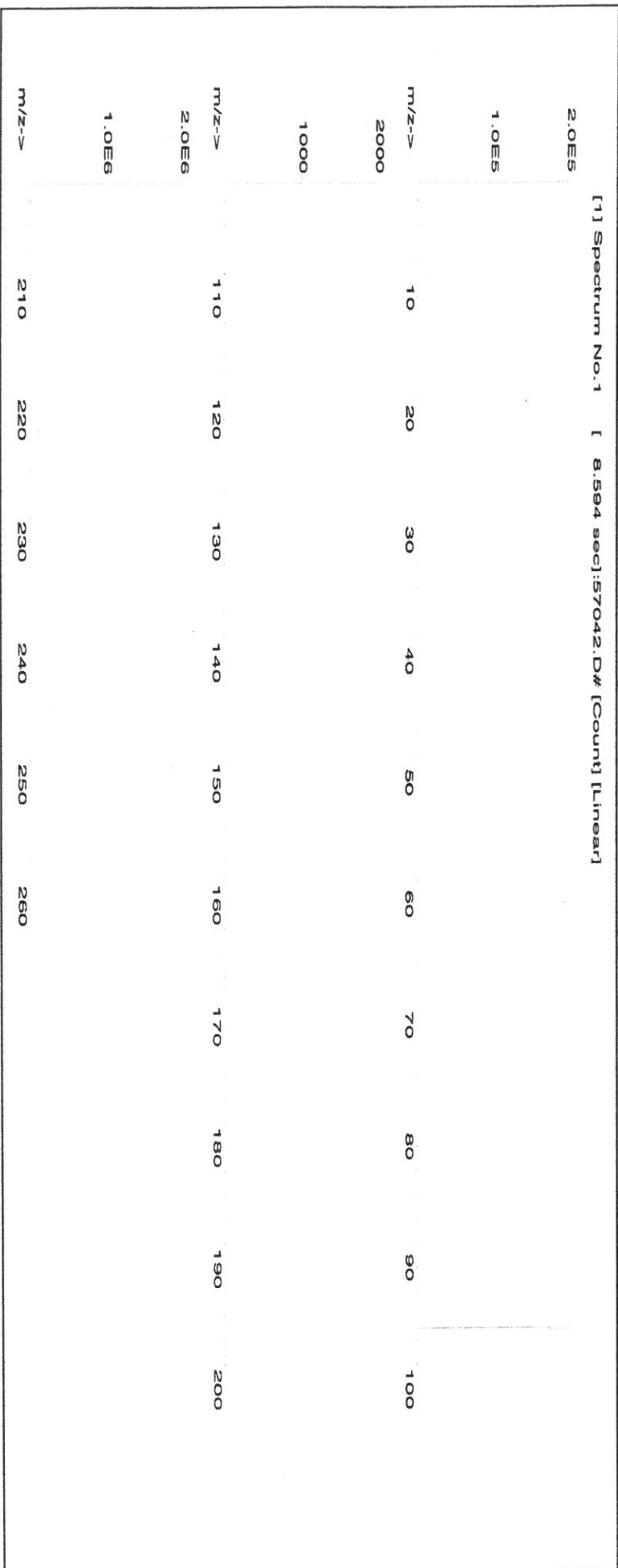
Volume shown below was diluted to (mL): 2000.02

0.058 Flask Uncertainty

Compound	Part Number	Lot Number	Dilution Factor	Initial Vol. (mL)	Uncertainty Pipette (mL)	Nominal Conc. (µg/mL)	Initial Conc. (µg/mL)	Final Conc. (µg/mL)	Expanded Uncertainty +/- (µg/mL)	CAS#	OSHA PEL (TWA)	LD50	NIST SRM
----------	-------------	------------	-----------------	-------------------	--------------------------	-----------------------	-----------------------	---------------------	----------------------------------	------	----------------	------	----------

1. Ammonium molybdate (Mo) 58142 042220 0.1000 200.0 0.084 1000 10000.9 1000.0 2.2 13106-76-8 5 mg(Mo)/m3 orl-rat 333 mg/kg 3134

[1] Spectrum No.1 [8.584 sec]:57042.D# [Count] [Linear]





Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):

Trace Metals Verification by ICP-MS ($\mu\text{g/mL}$)

Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pt	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Ho	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	U	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	Tl	<0.02	V	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Mo	T	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
B	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02

(T) = Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- * All standard containers are meticulously cleaned prior to use.
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.
- * All Standards should be stored with caps tight and under appropriate laboratory conditions.
- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).



CERTIFIED WEIGHT REPORT:

Part Number: **57015**
Lot Number: **051121**
Description: **Phosphorous (P)**

Lot # 20370011
Solvent: Nitric Acid

2.0% 40.0
(mL) Nitric Acid

Expiration Date: 051124
Recommended Storage: Ambient (20 °C)
Nominal Concentration (µg/mL): **1000**

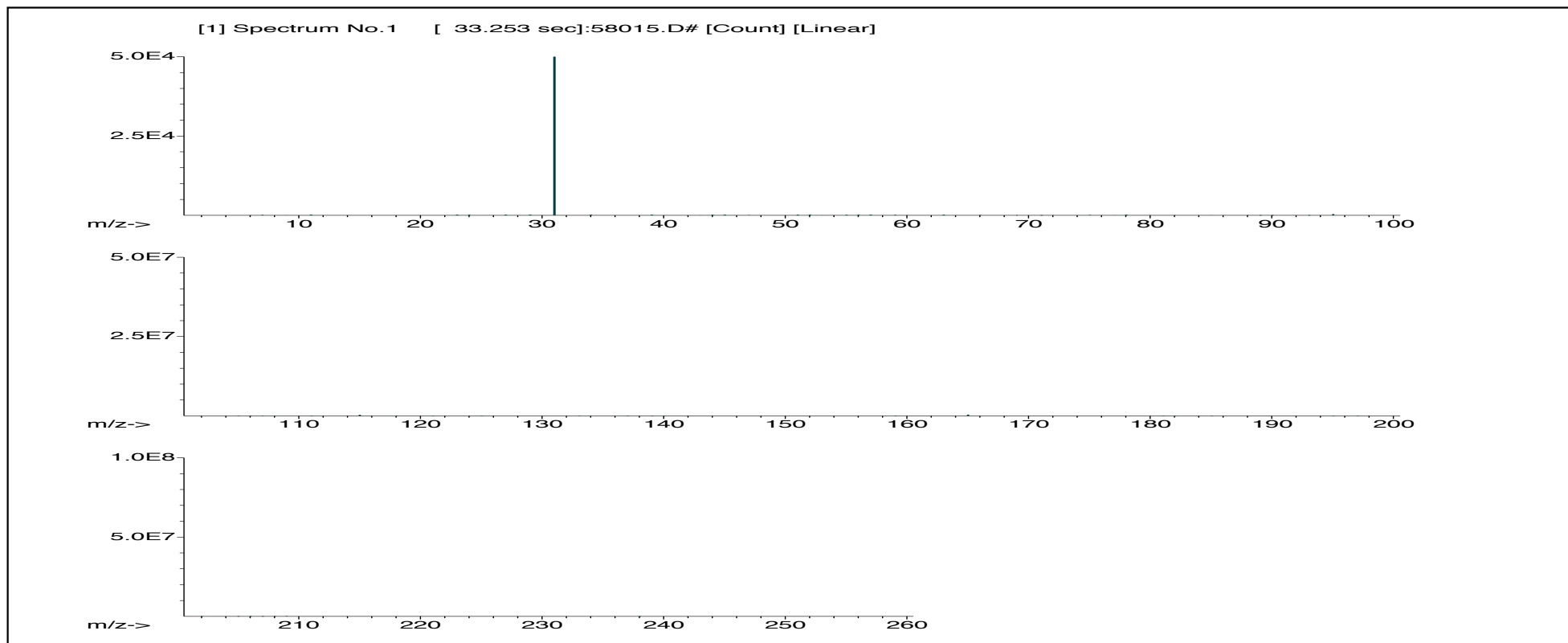
NIST Test Number: 6UTB

5E-05 Balance Uncertainty

Volume shown below was diluted to (mL): 2000.02 0.058 Flask Uncertainty

Formulated By:	Lawrence Barry	051121
Reviewed By:	Pedro L. Rentas	051121

Compound	Part Number	Lot Number	Dilution Factor	Initial Vol. (mL)	Uncertainty Pipette (mL)	Nominal Conc. (µg/mL)	Initial Conc. (µg/mL)	Final Conc. (µg/mL)	Expanded Uncertainty +/- (µg/mL)	SDS Information (Solvent Safety Info. On Attached pg.)			NIST SRM
										CAS#	OSHA PEL (TWA)	LD50	
1. Ammonium dihydrogen phosphate (P)	58115	121020	0.1000	200.0	0.084	1000	10000.3	1000.0	2.2	7722-76-1	5 mg/m3	NA	3186



**Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):****Trace Metals Verification by ICP-MS ($\mu\text{g/mL}$)**

Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Ho	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	U	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	Tl	<0.02	V	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	T	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
B	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02

(T)= Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- * All standard containers are meticulously cleaned prior to use.
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.
- * All Standards should be stored with caps tight and under appropriate laboratory conditions.
- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).



CERTIFIED WEIGHT REPORT:

Part Number: **57082**
 Lot Number: **062221**
 Description: **Lead (Pb)**

Lot # 20370011
 Solvent: Nitric Acid

2.0% 40.0
 (mL) Nitric Acid

Expiration Date: 062224
 Recommended Storage: Ambient (20 °C)
 Nominal Concentration (µg/mL): **1000**

NIST Test Number: 6UTB

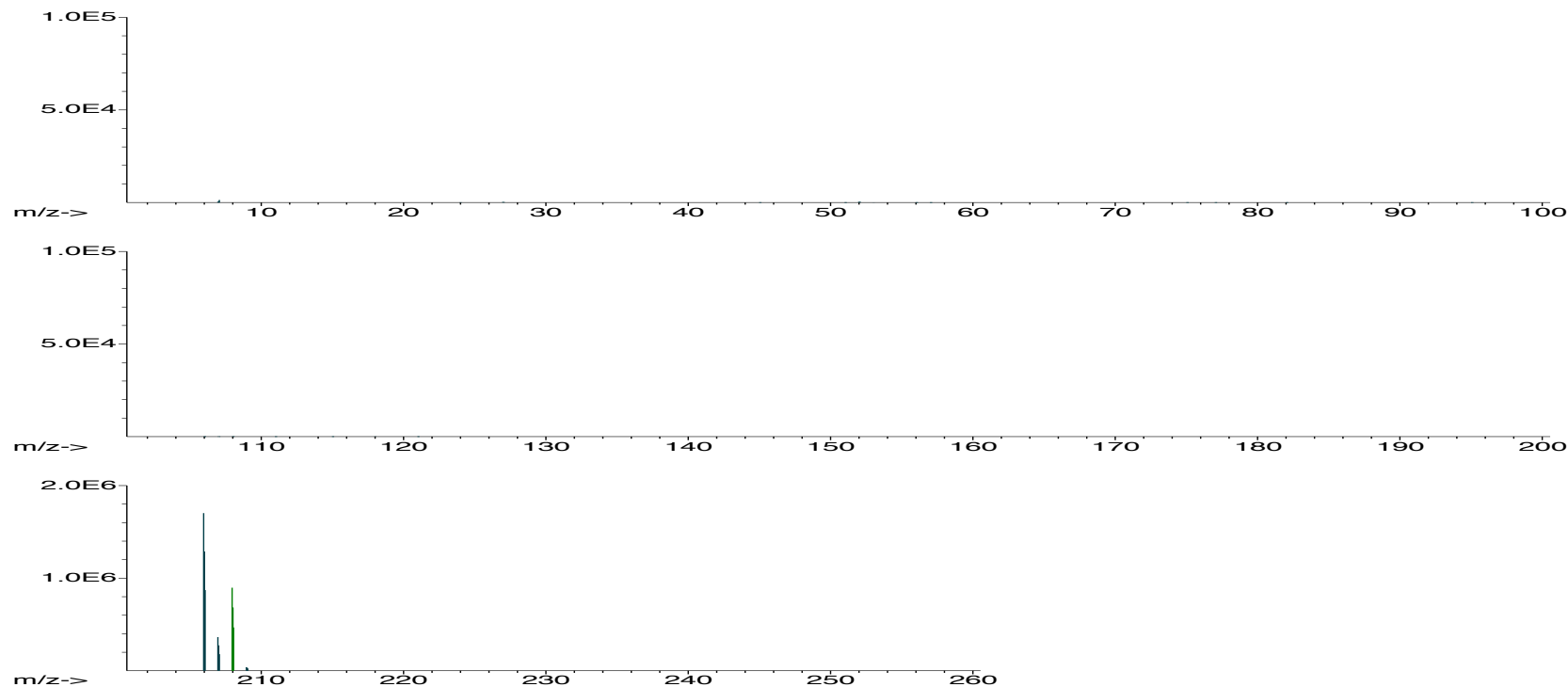
5E-05 Balance Uncertainty

Volume shown below was diluted to (mL): 2000.02 0.058 Flask Uncertainty

Formulated By:	Lawrence Barry	062221
Reviewed By:	Pedro L. Rentas	062221

Compound	Part Number	Lot Number	Dilution Factor	Initial Vol. (mL)	Uncertainty Pipette (mL)	Nominal Conc. (µg/mL)	Initial Conc. (µg/mL)	Final Conc. (µg/mL)	Expanded	SDS Information			NIST SRM
									Uncertainty	(Solvent Safety Info. On Attached pg.)			
									+/- (µg/mL)	CAS#	OSHA PEL (TWA)	LD50	
Lead (II) Nitrate (Pb)	58182	032321	0.1000	200.0	0.084	1000	10000.1	1000.0	2.2	10099-74-8	0.05 mg/m3	intrvns-rat 93 mg/kg	3128

[1] Spectrum No.1 [14.144 sec]:58082.D# [Count] [Linear]





Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):

Trace Metals Verification by ICP-MS ($\mu\text{g/mL}$)

Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Ho	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	U	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	Tl	<0.02	V	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
B	<0.02	Cu	<0.02	Au	<0.02	Pb	T	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02

(T)= Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- * All standard containers are meticulously cleaned prior to use.
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.
- * All standards should be stored with caps tight and under appropriate laboratory conditions.
- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

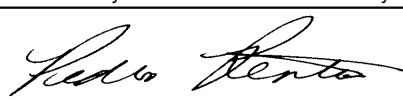


CERTIFIED WEIGHT REPORT:

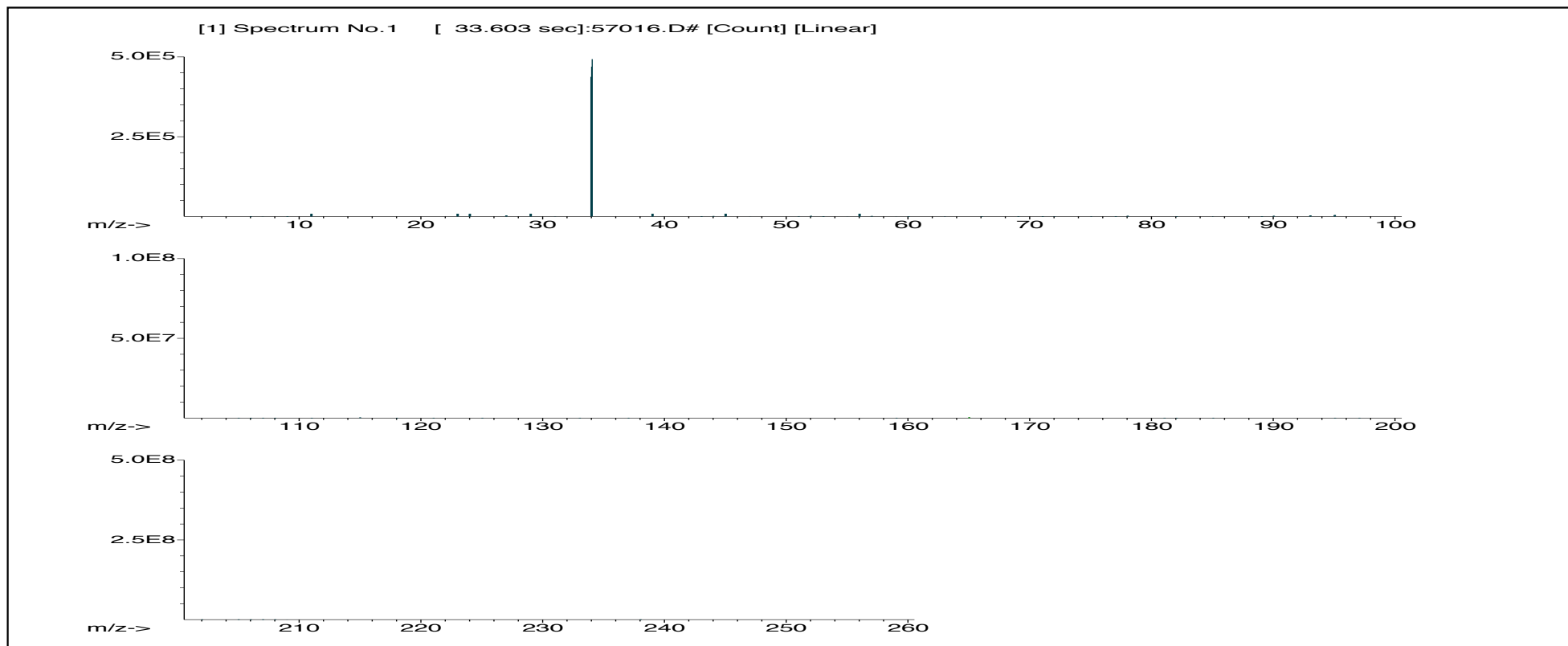
Part Number: **57016**
 Lot Number: **051721**
 Description: **Sulfur (S)**

Lot # 051721 Solvent: ASTM Type 1 Water

Expiration Date: 051724
 Recommended Storage: Ambient (20 °C)
 Nominal Concentration (µg/mL): **1000**
 NIST Test Number: 6UTB 5E-05 Balance Uncertainty
 Volume shown below was diluted to (mL): 1999.48 0.058 Flask Uncertainty

		
Formulated By:	Lawrence Barry	051721
		
Reviewed By:	Pedro L. Rentas	051721

Compound	Part Number	Lot Number	Dilution Factor	Initial Vol. (mL)	Uncertainty Pipette (mL)	Nominal Conc. (µg/mL)	Initial Conc. (µg/mL)	Final Conc. (µg/mL)	Expanded	SDS Information			NIST SRM
									Uncertainty	(Solvent Safety Info. On Attached pg.)			
									+/- (µg/mL)	CAS#	OSHA PEL (TWA)	LD50	
Ammonium sulfate (S)	58116	011421	0.1000	199.9	0.084	1000	10000.2	1000.0	2.2	7783-20-2	NA	NA	3181





Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):

Trace Metals Verification by ICP-MS ($\mu\text{g/mL}$)

Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Ho	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	U	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	Tl	<0.02	V	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	S	T	Sn	<0.02	Zn	<0.02
B	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02

(T)= Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- * All standard containers are meticulously cleaned prior to use.
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.
- * All standards should be stored with caps tight and under appropriate laboratory conditions.
- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).



CERTIFIED WEIGHT REPORT:

Part Number: **57034**
 Lot Number: **070221**
 Description: **Selenium (Se)**

Lot # 20370011
 Solvent: Nitric Acid

2.0% 40.0
 (mL) Nitric Acid

Expiration Date: 070224

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): **1000**

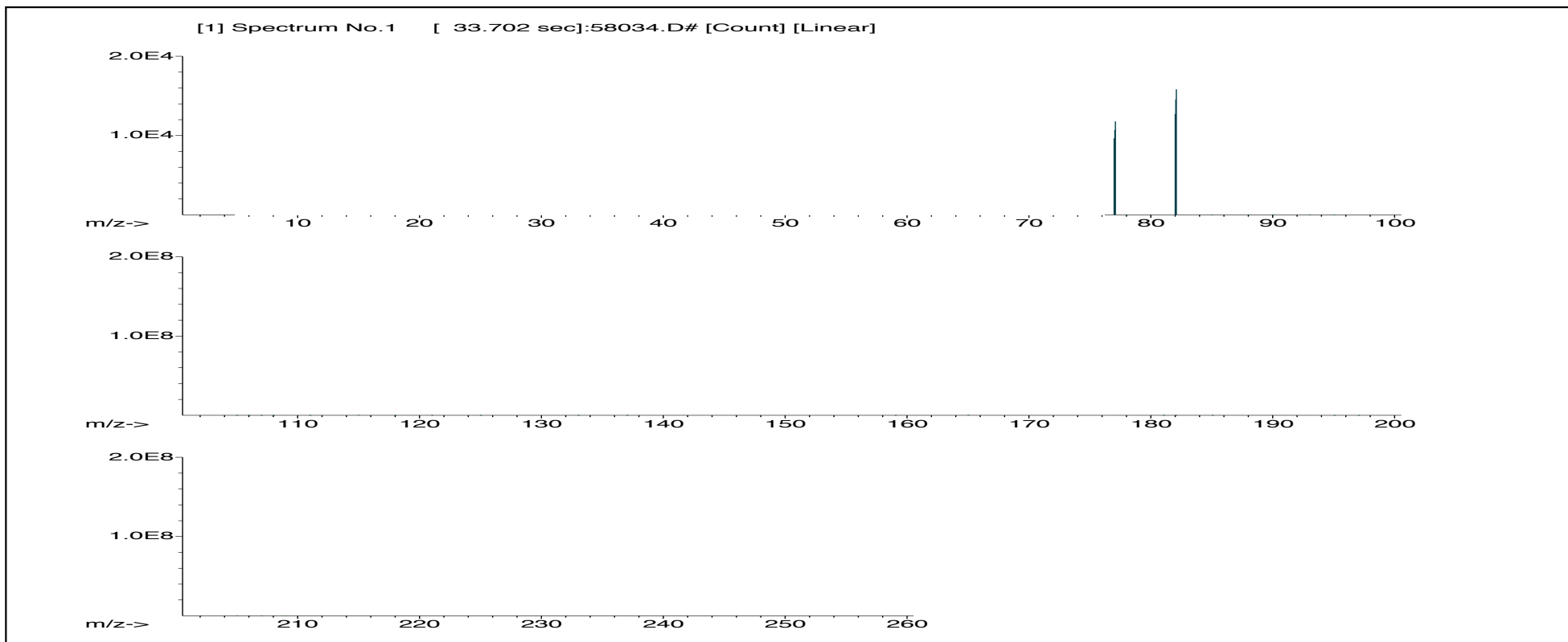
NIST Test Number: 6UTB

5E-05 Balance Uncertainty

Volume shown below was diluted to (mL): 2000.02 0.058 Flask Uncertainty

<i>Giovanni Esposito</i>		
Formulated By:	Giovanni Esposito	070221
<i>Pedro L. Rentas</i>		
Reviewed By:	Pedro L. Rentas	070221

Compound	Part Number	Lot Number	Dilution Factor	Initial Vol. (mL)	Uncertainty Pipette (mL)	Nominal Conc. (µg/mL)	Initial Conc. (µg/mL)	Final Conc. (µg/mL)	Expanded	SDS Information			NIST SRM
									Uncertainty	(Solvent Safety Info. On Attached pg.)			
									+/- (µg/mL)	CAS#	OSHA PEL (TWA)	LD50	
Selenium(IV) oxide (Se)	58134	021621	0.1000	200.0	0.084	1000	10000.2	1000.0	2.2	7446-08-4	0.2 mg/m3	orl-rat 68 mg/kg	3149





Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):

Trace Metals Verification by ICP-MS ($\mu\text{g/mL}$)

Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	T	Tb	<0.02	W	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Ho	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	U	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	Tl	<0.02	V	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
B	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02

(T)= Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- * All standard containers are meticulously cleaned prior to use.
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.
- * All standards should be stored with caps tight and under appropriate laboratory conditions.
- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).



CERTIFIED WEIGHT REPORT:

Part Number: **57014**
Lot Number: **030921**
Description: **Silicon (Si)**

Lot # 19410105
Solvent: Nitric Acid

2.0% 60.0 Nitric Acid
(mL)

Expiration Date: 030924

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): **1000**

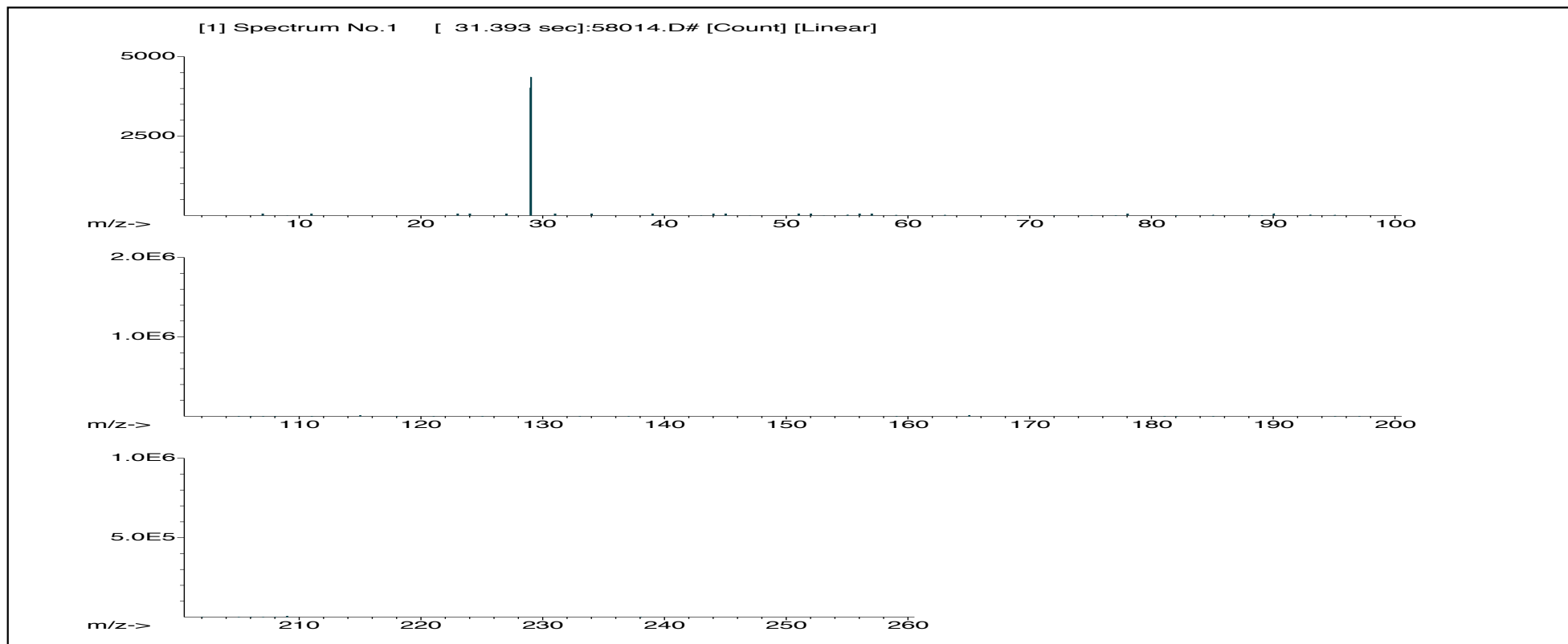
NIST Test Number: 6UTB

5E-05 Balance Uncertainty

Volume shown below was diluted to (mL): 3000.41 0.058 Flask Uncertainty

Formulated By:	Lawrence Barry	030921
Reviewed By:	Pedro L. Rentas	030921

Compound	Part Number	Lot Number	Dilution Factor	Initial Vol. (mL)	Uncertainty Pipette (mL)	Nominal Conc. (µg/mL)	Initial Conc. (µg/mL)	Final Conc. (µg/mL)	Expanded Uncertainty +/- (µg/mL)	SDS Information (Solvent Safety Info. On Attached pg.)			NIST SRM
										CAS#	OSHA PEL (TWA)	LD50	
1. Ammonium hexafluorosilicate (Si)	58114	070120	0.1000	300.0	0.084	1000	10000.0	1000.0	2.1	16919-19-0	2.50 mg/m3	orl-rat 70 mg/kg	NA



**Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):****Trace Metals Verification by ICP-MS ($\mu\text{g/mL}$)**

Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Ho	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	T	Te	<0.02	U	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	Tl	<0.02	V	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
B	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02

(T)= Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- * All standard containers are meticulously cleaned prior to use.
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.
- * All standards should be stored with caps tight and under appropriate laboratory conditions.
- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).



CERTIFIED WEIGHT REPORT:

Part Number: **57047**
Lot Number: **072921**
Description: **Silver (Ag)**

Lot # 20370011
Solvent: Nitric Acid

2.0% 40.0 Nitric Acid
(mL)

Expiration Date: 072924

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): **1000**

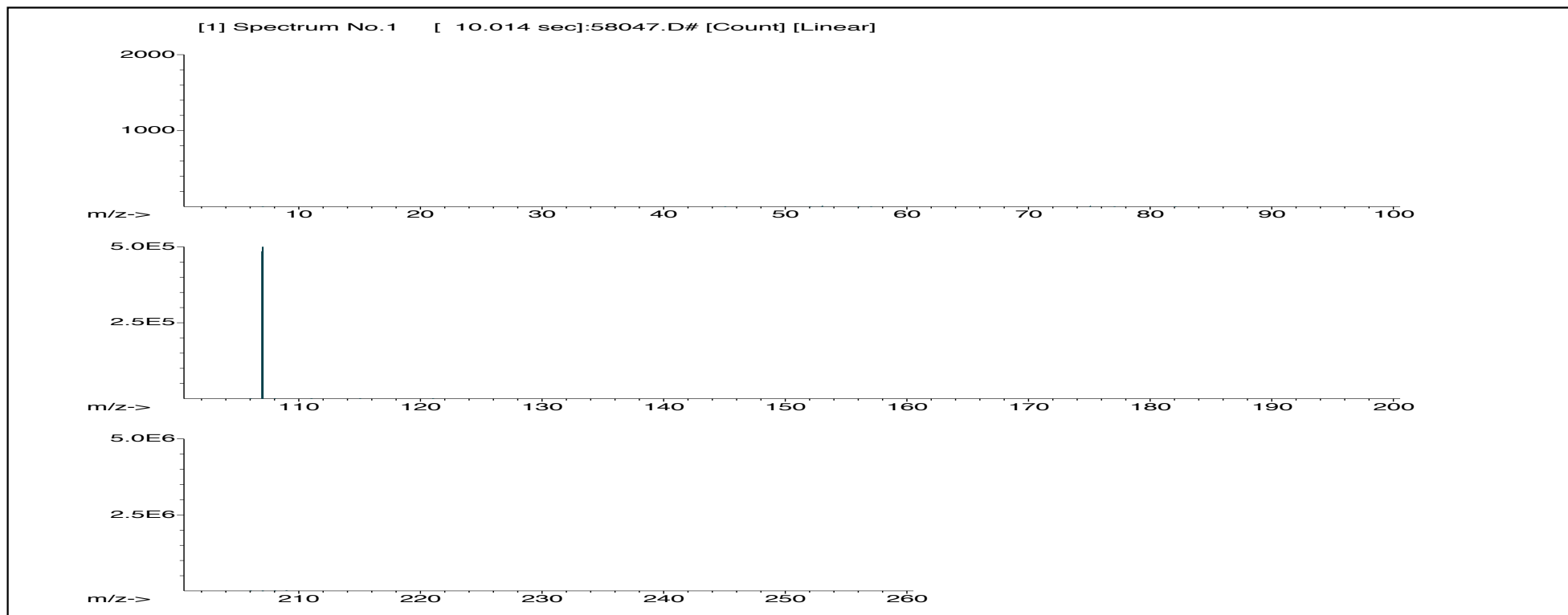
NIST Test Number: 6UTB

5E-05 Balance Uncertainty

Volume shown below was diluted to (mL): 2000.02 0.058 Flask Uncertainty

<i>Giovanni Esposito</i>		
Formulated By:	Giovanni Esposito	072921
<i>Pedro L. Rentas</i>		
Reviewed By:	Pedro L. Rentas	072921

Compound	Part Number	Lot Number	Dilution Factor	Initial Vol. (mL)	Uncertainty Pipette (mL)	Nominal Conc. (µg/mL)	Initial Conc. (µg/mL)	Final Conc. (µg/mL)	Expanded Uncertainty +/- (µg/mL)	SDS Information (Solvent Safety Info. On Attached pg.)			NIST SRM
										CAS#	OSHA PEL (TWA)	LD50	
1. Silver nitrate (Ag)	58147	010820	0.1000	200.0	0.084	1000	10000.4	1000.0	2.2	7761-88-8	10 ug/m3	N/A	3151





Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):

Trace Metals Verification by ICP-MS ($\mu\text{g/mL}$)

Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Ho	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	U	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	T	Tl	<0.02	V	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
B	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02

(T)= Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- * All standard containers are meticulously cleaned prior to use.
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.
- * All standards should be stored with caps tight and under appropriate laboratory conditions.
- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).



CERTIFIED WEIGHT REPORT:

Part Number: **57050**
Lot Number: **021121**
Description: **Tin (Sn)**

Lot #
19410105 Nitric Acid
240241 Hydrochloric acid

2.0% 40.0 Nitric Acid
6.0% 120.0 Hydrochloric acid
(mL)

Expiration Date: 021124
Recommended Storage: Ambient (20 °C)
Nominal Concentration (µg/mL): **1000**

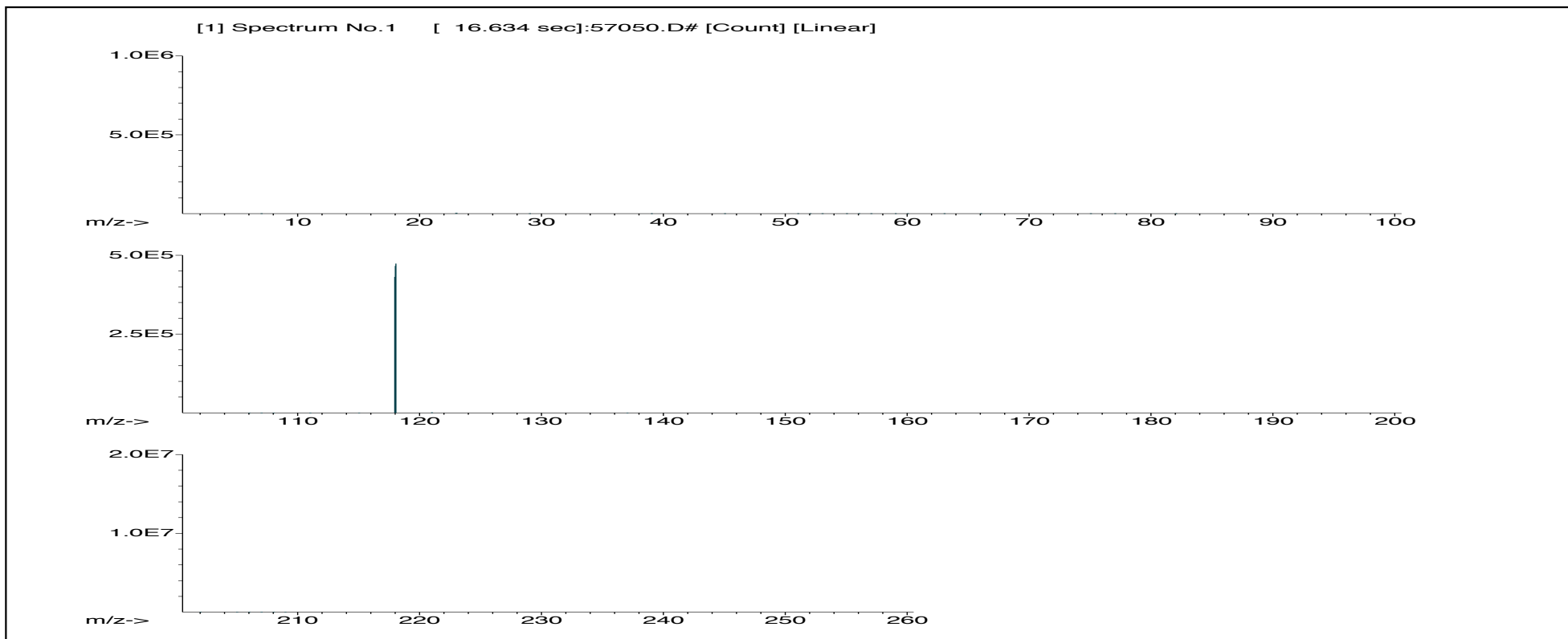
NIST Test Number: 23060

5E-05 Balance Uncertainty

Volume shown below was diluted to (mL): 1999.78 0.265 Flask Uncertainty

Formulated By:	Lawrence Barry	021121
Reviewed By:	Pedro L. Rentas	021121

Compound	Part Number	Lot Number	Dilution Factor	Initial Vol. (mL)	Uncertainty Pipette (mL)	Nominal Conc. (µg/mL)	Initial Conc. (µg/mL)	Final Conc. (µg/mL)	Expanded Uncertainty +/- (µg/mL)	SDS Information (Solvent Safety Info. On Attached pg.)			NIST SRM
										CAS#	OSHA PEL (TWA)	LD50	
1. Ammonium hexafluorostannate (IV) (Sn)	58150	041620	0.1000	200.0	0.084	1000	10000.5	1000.0	2.2	16919-24-7	7 mg/m3	NA	3161a



**Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):****Trace Metals Verification by ICP-MS ($\mu\text{g/mL}$)**

Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Ho	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	U	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	Tl	<0.02	V	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	T	Zn	<0.02
B	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02

(T)= Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- * All standard containers are meticulously cleaned prior to use.
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.
- * All standards should be stored with caps tight and under appropriate laboratory conditions.
- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).



CERTIFIED WEIGHT REPORT:

Part Number: **57022**
Lot Number: **070721**
Description: **Titanium (Ti)**

Lot # 20370011
Solvent: Nitric Acid

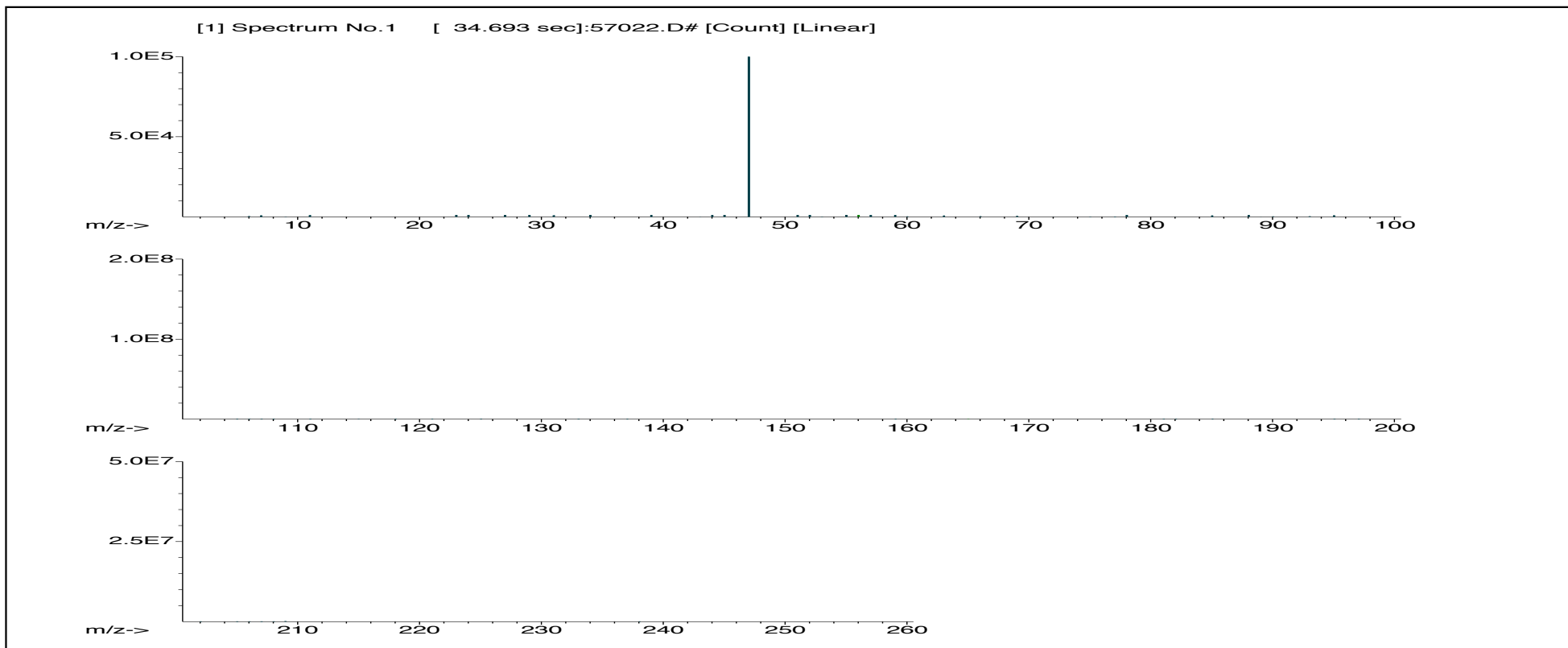
2.0% 40.0
(mL) Nitric Acid

Expiration Date: 070724
Recommended Storage: Ambient (20 °C)
Nominal Concentration (µg/mL): **1000**
NIST Test Number: 6UTB

Volume shown below was diluted to (mL): 2000.02 0.058 Balance Uncertainty
Flask Uncertainty

Formulated By:	Lawrence Barry	070721
Reviewed By:	Pedro L. Rentas	070721

Compound	Part Number	Lot Number	Dilution Factor	Initial Vol. (mL)	Uncertainty Pipette	Nominal Conc. (µg/mL)	Initial Conc. (µg/mL)	Final Conc. (µg/mL)	Expanded Uncertainty +/- (µg/mL)	SDS Information (Solvent Safety Info. On Attached pg.)			NIST SRM
										CAS#	OSHA PEL (TWA)	LD50	
1. Ammonium hexafluorotitanate (Ti)	58122	070120	0.1000	200.0	0.084	1000	10000.1	1000.0	2.2	16962-40-6	2.5 (F) mg/m3	NA	3162a



**Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):****Trace Metals Verification by ICP-MS ($\mu\text{g/mL}$)**

Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Ho	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	U	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	Tl	<0.02	V	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
B	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	Ti	T	Zr	<0.02

(T)= Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- * All standard containers are meticulously cleaned prior to use.
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.
- * All standards should be stored with caps tight and under appropriate laboratory conditions.
- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).



CERTIFIED WEIGHT REPORT:

Part Number: **57081**
 Lot Number: **073021**
 Description: **Thallium (Tl)**

Lot # 20370011
 Solvent: Nitric Acid

2.0% 40.0
 (mL) Nitric Acid

Expiration Date: 073024

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): **1000**

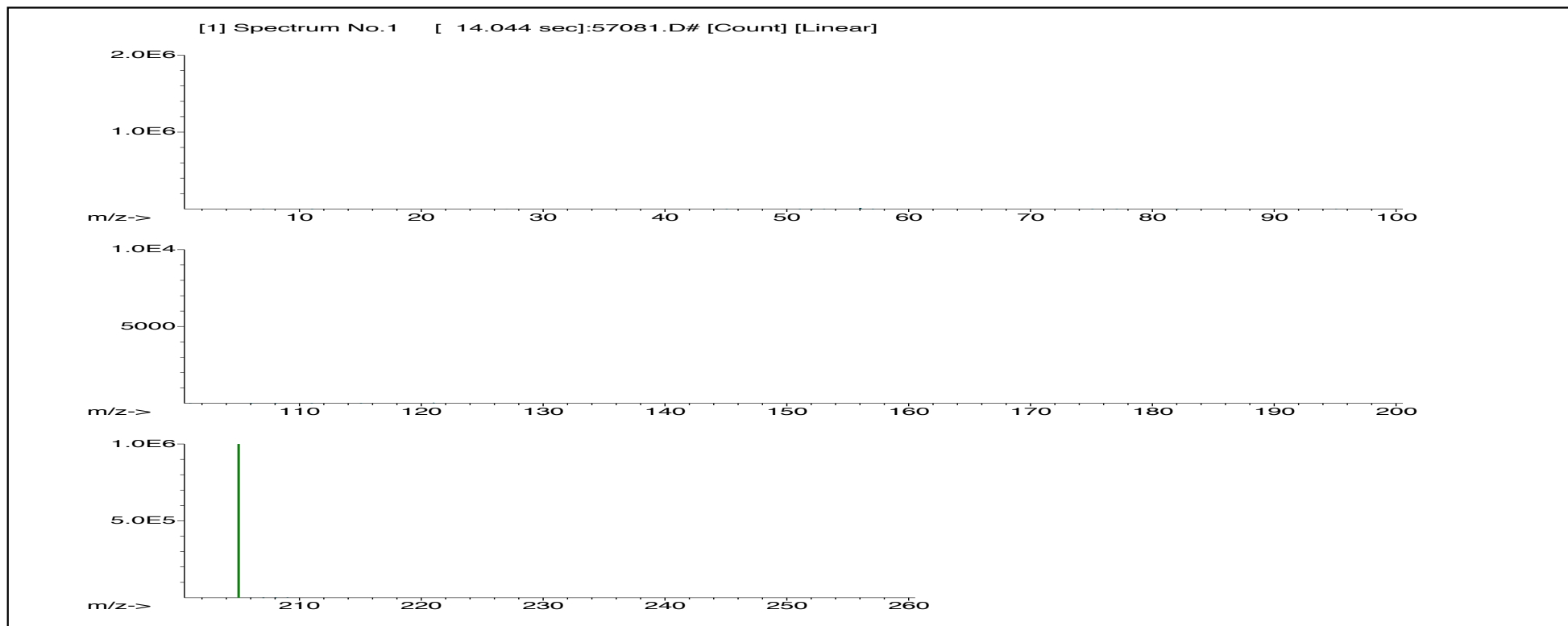
NIST Test Number: 6UTB

5E-05 Balance Uncertainty

Volume shown below was diluted to (mL): 2000.02 0.058 Flask Uncertainty

<i>Giovanni Esposito</i>		
Formulated By:	Giovanni Esposito	073021
<i>Pedro L. Rentas</i>		
Reviewed By:	Pedro L. Rentas	073021

Compound	Part Number	Lot Number	Dilution Factor	Initial Vol. (mL)	Uncertainty Pipette (mL)	Nominal Conc. (µg/mL)	Initial Conc. (µg/mL)	Final Conc. (µg/mL)	Expanded	SDS Information			NIST SRM
									Uncertainty +/- (µg/mL)	(Solvent Safety Info. On Attached pg.)			
									CAS#	OSHA PEL (TWA)	LD50		
1. Thallium (Tl)	58181	060920	0.1000	200.0	0.084	1000	10001.0	1000.0	2.2	7440-28-0	0.1 mg/m3	orl-rat 6700 mg/kg	3158





Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):

Trace Metals Verification by ICP-MS ($\mu\text{g/mL}$)

Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Ho	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	U	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	Tl	T	V	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
B	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02

(T)= Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- * All standard containers are meticulously cleaned prior to use.
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
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- * All Standards should be stored with caps tight and under appropriate laboratory conditions.
- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).



CERTIFIED WEIGHT REPORT:

Part Number: **58030**
 Lot Number: **031921**
 Description: **Zinc (Zn)**

Lot # 20370011
 Solvent: Nitric Acid

2.0% 40.0
 (mL) Nitric Acid

Expiration Date: 031924

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): **1000**

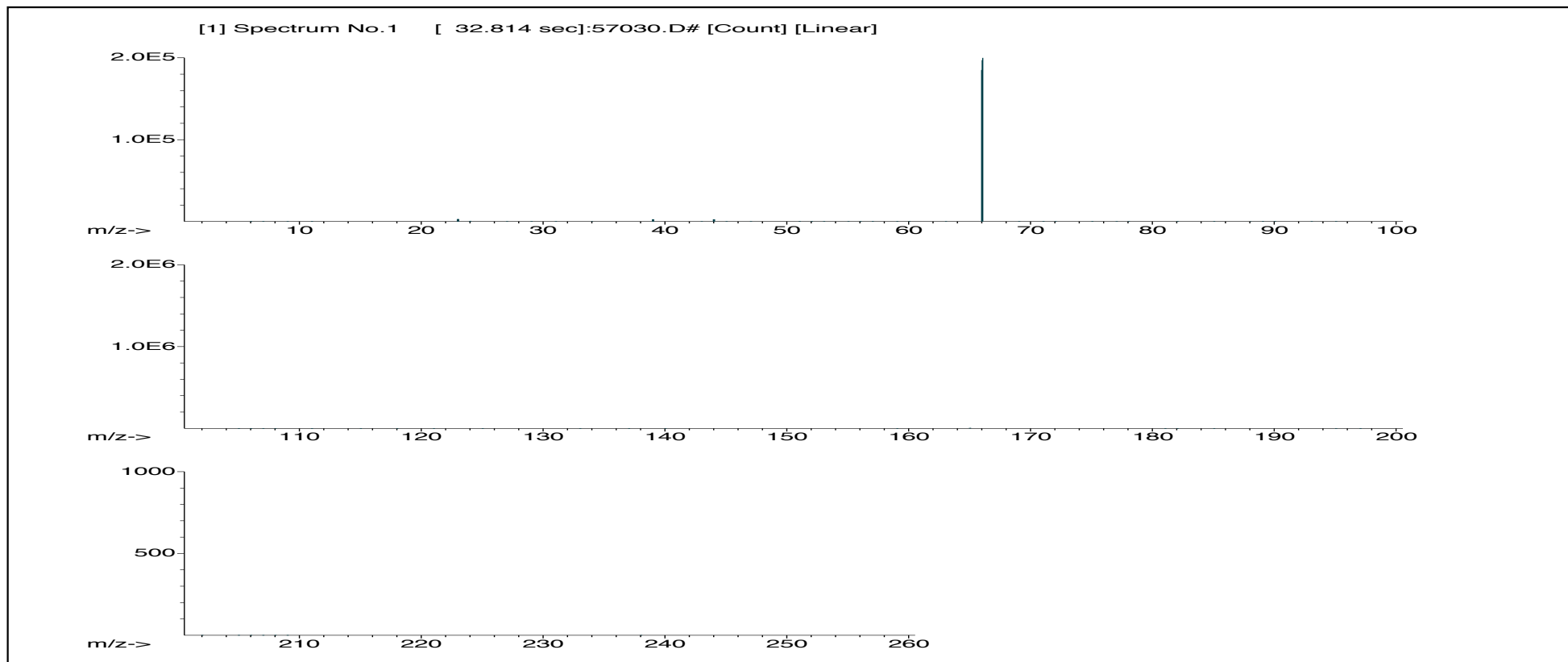
NIST Test Number: 6UTB

5E-05 Balance Uncertainty

Volume shown below was diluted to (mL): 2000.02 0.058 Flask Uncertainty

<i>Giovanni Esposito</i>		
Formulated By:	Giovanni Esposito	031921
<i>Pedro L. Rentas</i>		
Reviewed By:	Pedro L. Rentas	031921

Compound	Part Number	Lot Number	Dilution Factor	Initial Vol. (mL)	Uncertainty Pipette (mL)	Nominal Conc. (µg/mL)	Initial Conc. (µg/mL)	Final Conc. (µg/mL)	Expanded Uncertainty +/- (µg/mL)	SDS Information			NIST SRM
										(Solvent Safety Info. On Attached pg.)			
										CAS#	OSHA PEL (TWA)	LD50	
Zinc nitrate hexahydrate (Zn)	58130	082020	0.1000	200.0	0.084	1000	10000.3	1000.0	2.2	10196-18-6	1 mg/m3	orl-rat 1190mg/kg	3168





Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):

Trace Metals Verification by ICP-MS ($\mu\text{g/mL}$)

Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Ho	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	U	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	Tl	<0.02	V	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	T
B	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02

(T)= Target analyte

Physical Characterization:

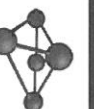
Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- * All standard containers are meticulously cleaned prior to use.
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- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).



M4894 **Fe** **06/25/21**



CERTIFIED WEIGHT REPORT:

Lot #

Part Number:

Solvent:

Lot Number:

Nitric Acid

Description:

Nitric Acid

Expiration Date:

7.0%

Recommended Storage:

210.0 (mL)

Nominal Concentration (µg/mL):

Nitric Acid

NIST Test Number:

6UTB

Weight shown below was diluted to (mL):

3000.41

0.058

Flask Uncertainty

Expanded

SDS Information

Compound

Lot

Nominal

Purity

Uncertainty

Assay

Target

Actual

Actual

Uncertainty

CAS#

OSHA PEL (TWA)

LD50

NIST

SRM

1. Iron (Fe)

IN346

2100409-500

10000

99.99

0.10

100.0

30.0071

30.0085

10000.5

20.0

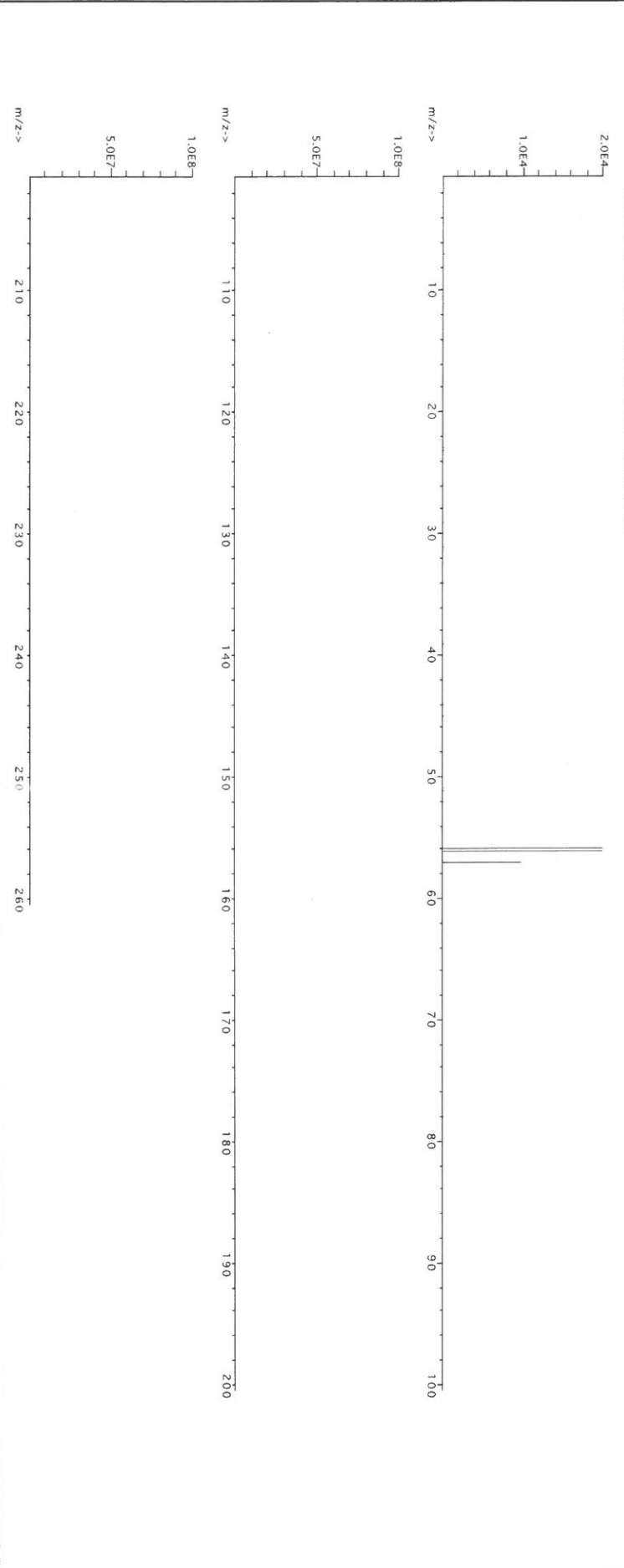
7439-89-6

5 mg/m3

or-rat 7500mg/kg

3126a

[1] Spectrum No. 1 [30.763 sec] 58126.D# [Count] [Linear]





Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):

Trace Metals Verification by ICP-MS (µg/L)

Al	<0.3	Cd	<0.1	Dy	<0.1	Hf	<0.1	Li	<0.1	Ni	75	Pr	<0.1	Se	<0.5	Tb	<0.1	W	<0.1
Sb	<4	Ca	<5	Er	<0.1	Ho	<0.1	Lu	<0.1	Nb	<0.1	Re	<0.1	Si	<10	Te	<0.1	U	<0.3
As	<3	Ce	<0.1	Eu	<0.1	In	<0.1	Mg	<0.5	Os	<0.1	Rh	<0.1	Ag	<0.1	Tl	<0.1	V	<0.3
Ba	<0.1	Cs	<0.1	Gd	<0.1	Ir	<0.1	Mn	85	Pd	<0.1	Rb	<0.1	Na	<5	Th	<0.1	Yb	<0.1
Be	<0.1	Cr	33	Ga	<5	Fe	T	Hg	<0.1	P	<0.1	Ru	<0.1	Sr	<0.1	Tm	<0.1	Y	<0.1
Bi	<0.1	Co	80	Ge	60	La	<0.1	Mo	<3	Pt	<0.1	Sm	<0.1	S	<0.1	Sn	<3	Zn	<45
B	<5	Cu	50	Au	<0.1	Pb	<0.3	Nd	<0.1	K	<5	Sc	<0.1	Ta	<0.1	Ti	<0.1	Zr	<0.1

(T) = Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- * All standard containers are meticulously cleaned prior to use.
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.
- * All Standards should be stored with caps tight and under appropriate laboratory conditions.
- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).



CERTIFIED WEIGHT REPORT:

Part Number: **57005**
 Lot Number: **031921**
 Description: **Boron (B)**

Lot # MKBQ8597V Solvent: Ammonium hydroxide

2.0% 40.0
(mL) Ammonium hydroxide

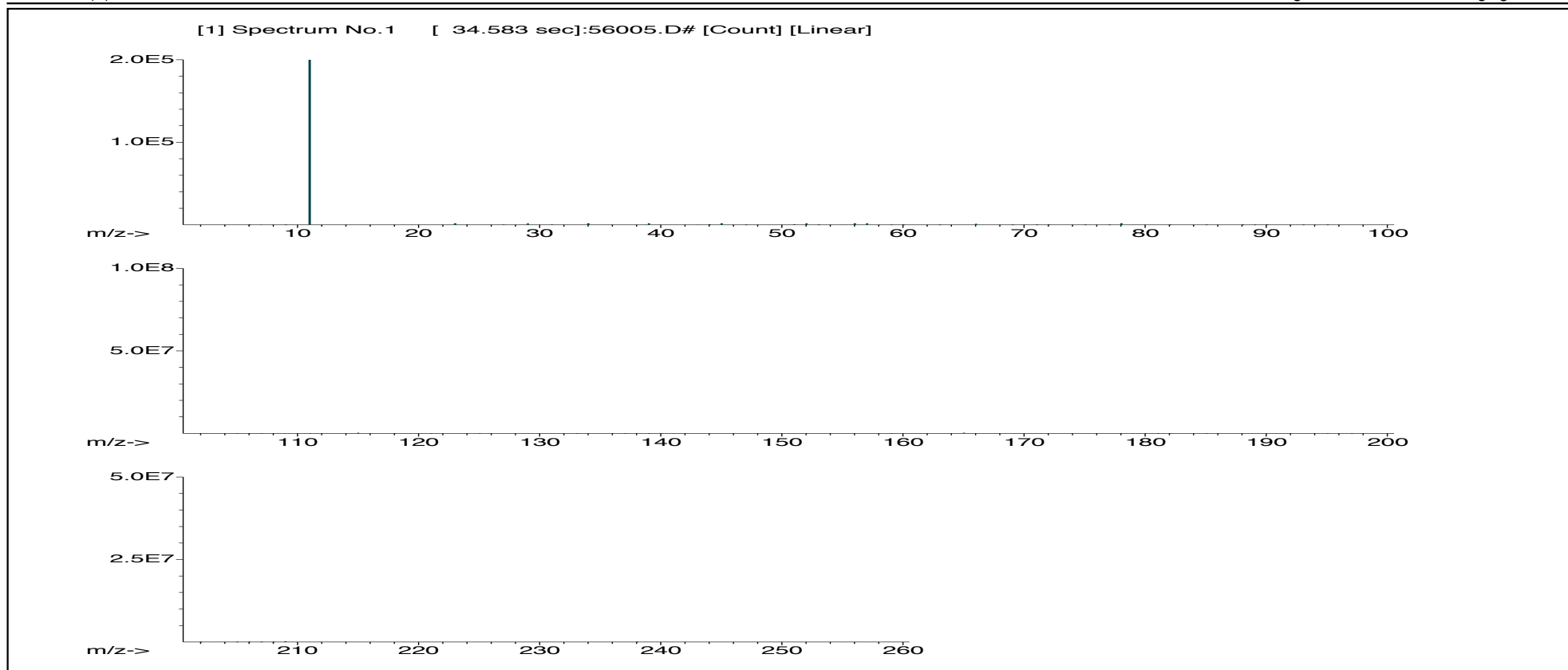
Expiration Date: 031924
 Recommended Storage: Ambient (20 °C)
 Nominal Concentration (µg/mL): **1000**

NIST Test Number: 6UTB 5E-05 Balance Uncertainty

Volume shown below was diluted to (mL): 2000.02 0.058 Flask Uncertainty

<i>Giovanni Esposito</i>		
Formulated By:	Giovanni Esposito	031921
<i>Pedro L. Rentas</i>		
Reviewed By:	Pedro L. Rentas	031921

Compound	Part Number	Lot Number	Dilution Factor	Initial Vol. (mL)	Uncertainty Pipette (mL)	Nominal Conc. (µg/mL)	Initial Conc. (µg/mL)	Final Conc. (µg/mL)	Expanded	SDS Information			NIST SRM
									Uncertainty	(Solvent Safety Info. On Attached pg.)			
									+/- (µg/mL)	CAS#	OSHA PEL (TWA)	LD50	
Boric acid (B)	58105	063020	0.1000	200.0	0.084	1000	10000.0	1000.0	2.2	10043-35-3	2 mg/m3	ori-rat 2660 mg/kg	3107





Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):

Trace Metals Verification by ICP-MS (μg/mL)																			
Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Ho	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	U	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	Tl	<0.02	V	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
B	T	Cu	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02

(T)= Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- * All standard containers are meticulously cleaned prior to use.
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.
- * All standards should be stored with caps tight and under appropriate laboratory conditions.
- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).



CERTIFIED WEIGHT REPORT:

Part Number: **58029**
Lot Number: **080321**
Description: **Copper (Cu)**

Lot # 20370011
Solvent: Nitric Acid

2.0% 40.0
(mL) Nitric Acid

Expiration Date: 080324
Recommended Storage: Ambient (20 °C)
Nominal Concentration (µg/mL): **1000**

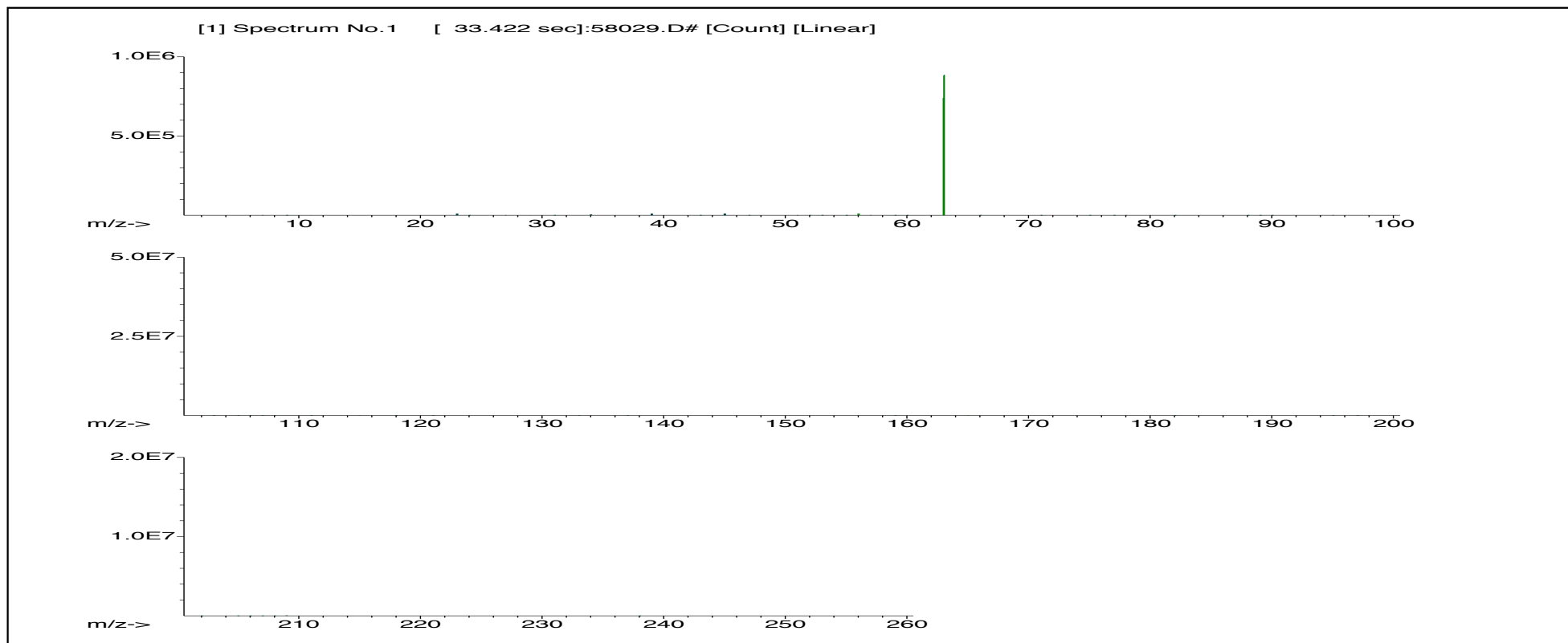
NIST Test Number: 6UTB

5E-05 Balance Uncertainty

Volume shown below was diluted to (mL): 2000.02 0.058 Flask Uncertainty

Formulated By:	Lawrence Barry	080321
Reviewed By:	Pedro L. Rentas	080321

Compound	Part Number	Lot Number	Dilution Factor	Initial Vol. (mL)	Uncertainty Pipette	Nominal Conc. (µg/mL)	Initial Conc. (µg/mL)	Final Conc. (µg/mL)	Expanded Uncertainty +/- (µg/mL)	SDS Information (Solvent Safety Info. On Attached pg.)			NIST SRM
										CAS#	OSHA PEL (TWA)	LD50	
1. Copper(II) nitrate trihydrate (Cu)	58129	020821	0.1000	200.0	0.084	1000	10000.1	1000.0	2.2	10031-43-3	1 mg/m3	ori-rat 794 mg/kg	3114





Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):

Trace Metals Verification by ICP-MS ($\mu\text{g/mL}$)

Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Ho	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	U	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	Tl	<0.02	V	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
B	<0.02	Cu	T	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02

(T)= Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- * All standard containers are meticulously cleaned prior to use.
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.
- * All Standards should be stored with caps tight and under appropriate laboratory conditions.
- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

M4913-16

MS

Certificate of Analysis

1 Reagent Lane
 Fair Lawn, NJ 07410
 201.796.7100 tel
 201.796.1329 fax

Thermo Fisher Scientific's Quality System has been found to conform to Quality Management System
 Standard ISO9001:2015 by SAI Global Certificate Number CERT – 0120632

This is to certify that units of the lot number below were tested and found to comply with the specifications of the grade listed. Certain data have been supplied by third parties. Thermo Fisher Scientific expressly disclaims all warranties, expressed or implied, including the implied warranties of merchantability and fitness for a particular purpose. Products are for research use or further manufacturing. Not for direct administration to humans or animals. It is the responsibility of the final formulator and end user to determine suitability based upon the intended use of the end product. Products are tested to meet the analytical requirements of the noted grade. The following information is the actual analytical results obtained.

Catalog Number	P279	Quality Test / Release Date	01/12/2021
Lot Number	210306		
Description	POTASSIUM PERMANGANATE, A.C.S.		
Country of Origin	United States	Suggested Retest Date	Jan/2026

N/A			
Result Name	Units	Specifications	Test Value
APPEARANCE		REPORT	Dark purple to purple green crystals
ASSAY	%	>= 99	99.3
CHLORIDE & CHLORATE	%	<= 0.005	<0.005
IDENTIFICATION	PASS/FAIL	= PASS TEST	pass test
INSOLUBLE MATTER	%	<= 0.2	<0.2
MERCURY (Hg)	ppm	<= 0.05	<0.004
SULFATE (SO4)	%	<= 0.02	<0.02

Julian Burton

Julian Burton - Quality Control Manager – Fair Lawn

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

*Based on suggested storage condition.

Certificate of Analysis

1 Reagent Lane
 Fair Lawn, NJ 07410
 201.796.7100 tel
 201.796.1329 fax

Thermo Fisher Scientific's Quality System has been found to conform to Quality Management System
 Standard ISO9001:2015 by SAI Global Certificate Number CERT – 0120632

This is to certify that units of the lot number below were tested and found to comply with the specifications of the grade listed. Certain data have been supplied by third parties. Thermo Fisher Scientific expressly disclaims all warranties, expressed or implied, including the implied warranties of merchantability and fitness for a particular purpose. Products are for research use or further manufacturing. Not for direct administration to humans or animals. It is the responsibility of the final formulator and end user to determine suitability based upon the intended use of the end product. Products are tested to meet the analytical requirements of the noted grade. The following information is the actual analytical results obtained.

Catalog Number	T142	Quality Test / Release Date	03/22/2021
Lot Number	210800		
Description	STANNOUS CHLORIDE, DIHYDRATE CERTIFIED ACS (Suitable for Mercury Determination)		
Country of Origin	United States	Suggested Retest Date	Mar/2026
Chemical Origin	Inorganic-non animal		
BSE/TSE Comment	No animal products are used as starting raw material ingredients, or used in processing, including lubricants, processing aids, or any other material that might migrate to the finished product.		

N/A			
Result Name	Units	Specifications	Test Value
APPEARANCE		REPORT	Clear crystals
ASSAY	%	Inclusive Between 98 - 103	101.56
CALCIUM	%	<= 0.005	<0.005
IDENTIFICATION	PASS/FAIL	= PASS TEST	PASS TEST
IRON (Fe)	%	<= 0.003	<0.003
LEAD (Pb)	%	<= 0.01	<0.01
MERCURY (Hg)	ppm	<= 0.05	<0.05
POTASSIUM (K)	%	<= 0.005	<0.005
SODIUM (Na)	%	<= 0.01	<0.01
SOLUBILITY IN HCL	PASS/FAIL	= PASS TEST	PASS TEST
SULFATE (SO4)	PASS/FAIL	= P.T. (ABOUT 0.003%)	P.T. (ABOUT 0.003%)

Julian Burton

Julian Burton - Quality Control Manager – Fair Lawn

Note: The data listed is valid for all package sizes of this lot of this product, expressed as an extension of this catalog number listed above.

If there are any questions with this certificate, please call at (800) 227-6701.

*Based on suggested storage condition.



M4939



CERTIFIED WEIGHT REPORT:

Part Number: 57003
Lot Number: 030221
Description: Lithium (Li)

Lot # 19410105
Solvent: Nitric Acid

2.0% 40.0 (mL) Nitric Acid

Expiration Date: 030224

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): 1000

NIST Test Number: 23060

Volume shown below was diluted to (mL): 2000.02

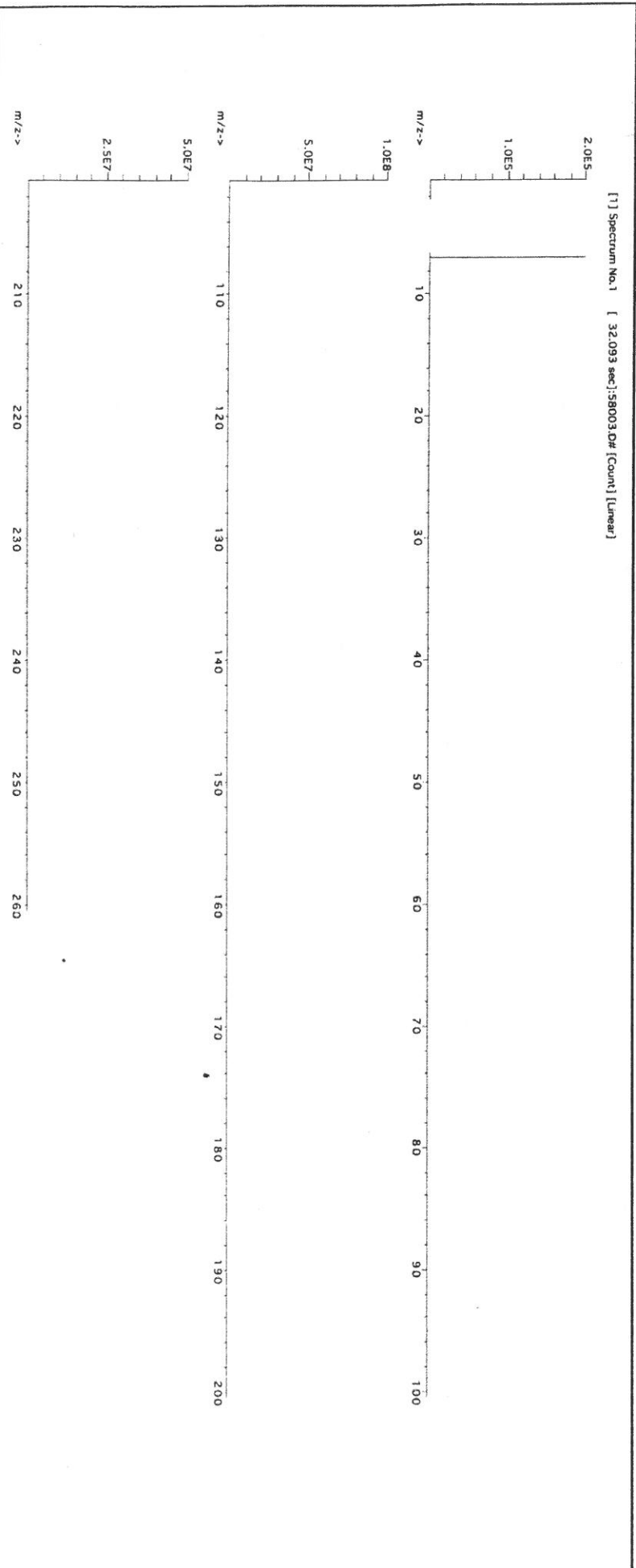
5E-05 Balance Uncertainty
0.058 Flask Uncertainty

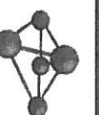
<i>Lawrence Barry</i>	
Formulated By:	Lawrence Barry
Reviewed By:	<i>Patricia Ruelas</i>
	Patricia L. Ruelas
	030221

SDS Information

Compound	Part Number	Lot Number	Dilution Factor	Initial Vol. (mL)	Uncertainty (mL)	Nominal Conc. (µg/mL)	Initial Conc. (µg/mL)	Final Conc. (µg/mL)	Expanded Uncertainty +/- (µg/mL)	CAS#	OSHA PEL (TWA)	LD50	NIST SRM
----------	-------------	------------	-----------------	-------------------	------------------	-----------------------	-----------------------	---------------------	----------------------------------	------	----------------	------	----------

1. Lithium nitrate (Li)	58103	010320	0.1000	200.0	0.084	1000	10000.5	1000.0	2.2	7790-69-4	5 mg/m3	or-rat 1426 mg/kg	NA
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Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):

Trace Metals Verification by ICP-MS (µg/mL)

Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	T	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Ho	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	U	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	Tl	<0.02	V	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
B	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02

(T) = Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- * All standard containers are meticulously cleaned prior to use.
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.
- * All Standards should be stored with caps tight and under appropriate laboratory conditions.
- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).



MC960 R: 10/08/21
BA



CERTIFIED WEIGHT REPORT:

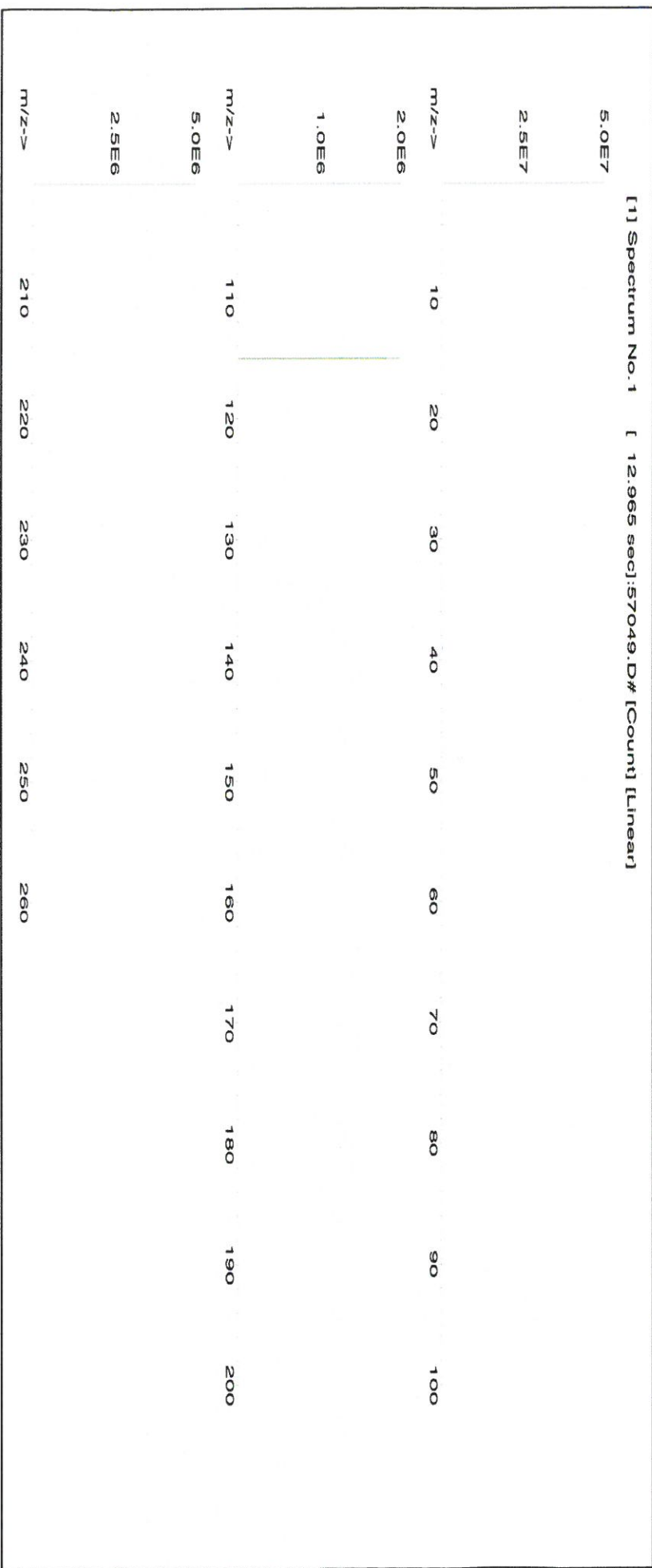
Part Number: 58149
Lot Number: 100721
Description: Indium (In)
Solvent: 20370011 Nitric Acid
Lot #

Expiration Date: 100724
Recommended Storage: Ambient (20 °C)
Nominal Concentration (µg/mL): 10000
NIST Test Number: 6UTB
Weight shown below was diluted to (mL): 500.06
5E-05 Balance Uncertainty
0.058 Flask Uncertainty

<i>Giovanni Caporaso</i>	
Formulated By:	Giovanni Esposito
Reviewed By:	<i>Pedro L. Renteria</i>
	100721

Compound	RM#	Lot Number	Nominal Conc. (µg/mL)	Purity (%)	Uncertainty (%)	Assay (%)	Target Weight (g)	Actual Weight (g)	Actual Conc. (µg/mL)	Expanded Uncertainty		CAS#	SDS Information		NIST SRM
										+/- (µg/mL)	(µg/mL)		(Solvent Safety Info. On Attached pg.)	LD50	

1. Indium Oxide (In)	IN086	W1096A	10000	99.999	0.10	82.6	6.05408	6.05441	10000.6	20.1	1312-43-2	NA	NA	3124a
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Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):

Trace Metals Verification by ICP-MS (µg/mL)

Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pt	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Ho	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	U	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	Tl	<0.02	V	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
B	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02

(T) = Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
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- * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.
- * All Standards should be stored with caps tight and under appropriate laboratory conditions.
- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).



M4961
Certified Reference Material CRM
R: 10/08/21 *(B)*



CERTIFIED WEIGHT REPORT:

Part Number: 58139
Lot Number: 052521
Description: Yttrium (Y)

Solvent: 20370011 Nitric Acid

Lot #

Expiration Date: 052524
Recommended Storage: Ambient (20 °C)
Nominal Concentration (µg/mL): 10000
NIST Test Number: 6UTB
Weight shown below was diluted to (mL): 2000.02
Balance Uncertainty: 5E-05
Flask Uncertainty: 0.058

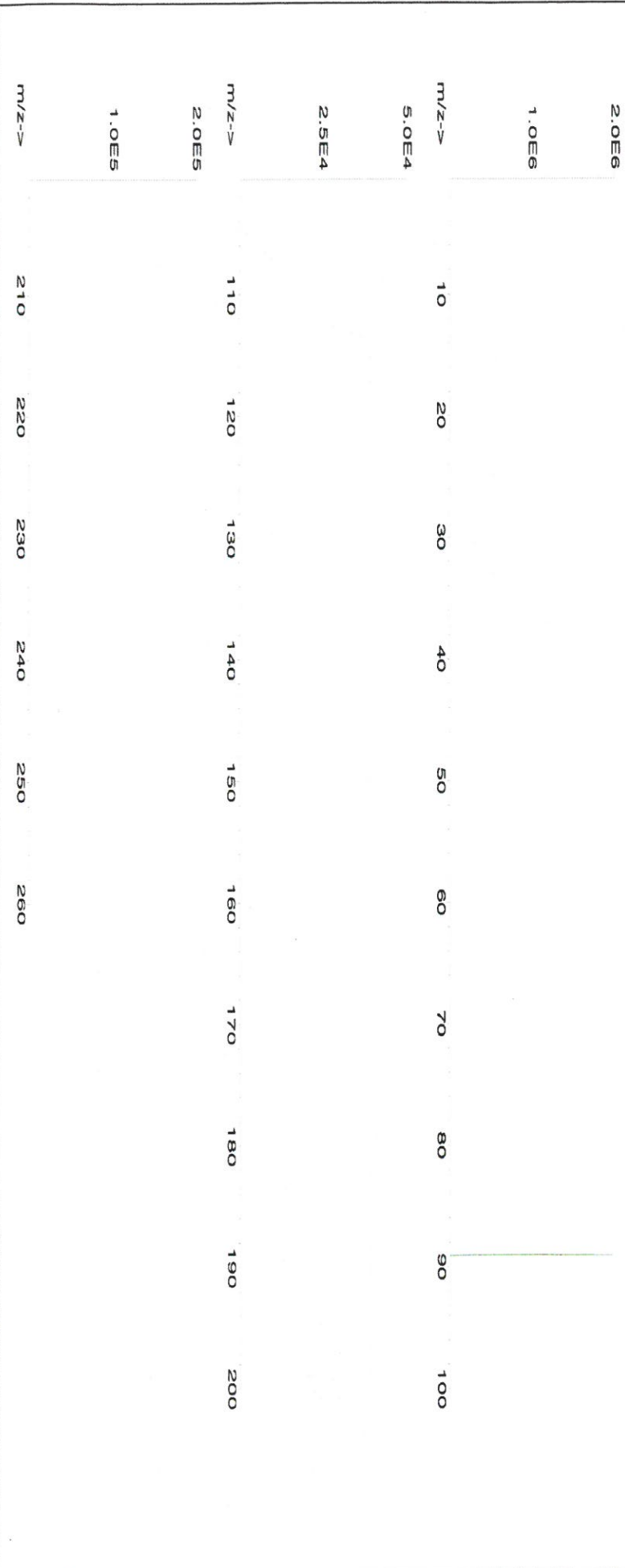
<i>Lawrence Barry</i>	
Formulated By:	Lawrence Barry
Reviewed By:	<i>Pedro L. Rentas</i>
	052521

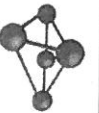
Compound

1. Yttrium (III) Oxide (Y) IN087 YV01201581 10000 99.999 0.10 77.9 25.6744 25.6745 10000.0 20.0 1314-36-9 NA NA

SDS Information
Expanded Uncertainty (Solvent Safety Info. On Attached pg.)
CAS# OSHA PEL (TWA) LD50 SRM

[1] Spectrum No. 1 [12.624 sec]:58139.D# [Count] [Linear]





Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):

Trace Metals Verification by ICP-MS (µg/mL)

Al	<0.02	Cd	<0.02	Dy	<0.02	Hi	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Ho	<0.02	Mg	<0.01	Nb	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	U	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mn	<0.02	Os	<0.02	Rh	<0.02	Ag	<0.02	Ti	<0.02	V	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ir	<0.02	Hg	<0.2	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.2	Mo	<0.02	P	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Nd	<0.02	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
B	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02			K	<0.2	Sc	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02

(T) = Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- * All standard containers are meticulously cleaned prior to use.
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.
- * All Standards should be stored with caps tight and under appropriate laboratory conditions.
- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).



Certified Reference Material CRM

IN 5019 R: 12/09/24 (BP)



CERTIFIED WEIGHT REPORT:

Part Number: 57116

Lot Number: 011421

Description: Sulfur (S)

Solvent: 011421 ASTM Type 1 Water

Lot #

Expiration Date:

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): 10000

NIST Test Number: 23060

Weight shown below was diluted to (mL):

1999.53

5E-05 Balance Uncertainty

0.100 Flask Uncertainty

57116

011421

Sulfur (S)

011424

Ambient (20 °C)

10000

23060

Lot #

Solvent: 011421 ASTM Type 1 Water

57116

011421

Sulfur (S)

011424

Ambient (20 °C)

10000

23060

Lot #

Solvent: 011421 ASTM Type 1 Water

57116

011421

Sulfur (S)

011424

Ambient (20 °C)

10000

23060

Lot #

Solvent: 011421 ASTM Type 1 Water

57116

011421

Sulfur (S)

011424

Ambient (20 °C)

10000

23060

Lot #

Solvent: 011421 ASTM Type 1 Water

57116

011421

Sulfur (S)

011424

Ambient (20 °C)

10000

23060

Lot #

Solvent: 011421 ASTM Type 1 Water

57116

011421

Sulfur (S)

011424

Ambient (20 °C)

10000

23060

Lot #

Solvent: 011421 ASTM Type 1 Water

57116

011421

Sulfur (S)

011424

Ambient (20 °C)

10000

23060

Lot #

Solvent: 011421 ASTM Type 1 Water

57116

011421

Sulfur (S)

011424

Ambient (20 °C)

10000

23060

Lot #

Solvent: 011421 ASTM Type 1 Water

57116

011421

Sulfur (S)

011424

Ambient (20 °C)

10000

23060

Lot #

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57116

011421

Sulfur (S)

011424

Ambient (20 °C)

10000

23060

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57116

011421

Sulfur (S)

011424

Ambient (20 °C)

10000

23060

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57116

011421

Sulfur (S)

011424

Ambient (20 °C)

10000

23060

Lot #

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57116

011421

Sulfur (S)

011424

Ambient (20 °C)

10000

23060

Lot #

Solvent: 011421 ASTM Type 1 Water

57116

011421

Sulfur (S)

011424

Ambient (20 °C)

10000

23060

Lot #

Solvent: 011421 ASTM Type 1 Water

57116

011421

Sulfur (S)

011424

Ambient (20 °C)

10000

23060

Lot #

Solvent: 011421 ASTM Type 1 Water

57116

011421

Sulfur (S)

011424

Ambient (20 °C)

10000

23060

Lot #

Solvent: 011421 ASTM Type 1 Water

57116

011421

Sulfur (S)

011424

Ambient (20 °C)

10000

23060

Lot #

Solvent: 011421 ASTM Type 1 Water

57116

011421

Sulfur (S)

011424

Ambient (20 °C)

10000

23060

Lot #

Solvent: 011421 ASTM Type 1 Water

57116

011421

Sulfur (S)

011424

Ambient (20 °C)

10000

23060

Lot #

Solvent: 011421 ASTM Type 1 Water

57116

011421

Sulfur (S)

011424

Ambient (20 °C)

10000

23060

Lot #

Solvent: 011421 ASTM Type 1 Water

57116

011421

Sulfur (S)

011424

Ambient (20 °C)

10000

23060

Lot #

Solvent: 011421 ASTM Type 1 Water

57116

011421

Sulfur (S)

011424

Ambient (20 °C)

10000

23060

Lot #

Solvent: 011421 ASTM Type 1 Water

57116

011421

Sulfur (S)

011424

Ambient (20 °C)

10000

23060

Lot #

Solvent: 011421 ASTM Type 1 Water

57116

011421

Sulfur (S)

011424

Ambient (20 °C)

10000

23060

Lot #

Solvent: 011421 ASTM Type 1 Water

57116

011421

Sulfur (S)

011424

Ambient (20 °C)

10000

23060

Lot #

Solvent: 011421 ASTM Type 1 Water

57116

011421

Sulfur (S)

011424

Ambient (20 °C)

10000

23060

Lot #

Solvent: 011421 ASTM Type 1 Water

57116

011421

Sulfur (S)

011424

Ambient (20 °C)

10000

23060

Lot #

Solvent: 011421 ASTM Type 1 Water

57116

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Sulfur (S)

011424

Ambient (20 °C)

10000

23060

Lot #

Solvent: 011421 ASTM Type 1 Water

57116

011421

Sulfur (S)

011424

Ambient (20 °C)

10000

23060

Lot #

Solvent: 011421 ASTM Type 1 Water

57116

011421

Sulfur (S)

011424

Ambient (20 °C)

10000

23060

Lot #

Solvent: 011421 ASTM Type 1 Water

57116

011421

Sulfur (S)

011424

Ambient (20 °C)

10000

23060

Lot #

Solvent: 011421 ASTM Type 1 Water

57116

011421

Sulfur (S)

011424

Ambient (20 °C)

10000

23060

Lot #

Solvent: 011421 ASTM Type 1 Water

57116

011421

Sulfur (S)

011424

Ambient (20 °C)

10000

23060

Lot #

Solvent: 011421 ASTM Type 1 Water

57116

011421

Sulfur (S)

011424

Ambient (20 °C)

10000

23060

Lot #

Solvent: 011421 ASTM Type 1 Water

57116

011421

Sulfur (S)

011424

Ambient (20 °C)

10000

23060

Lot #

Solvent: 011421 ASTM Type 1 Water

57116

011421

Sulfur (S



Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):

Trace Metals Verification by ICP-MS (µg/mL)

Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Ho	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Tc	<0.02	U	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	<0.02	Os	<0.01	Rh	<0.02	Ag	<0.02	Tl	<0.02	V	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.2	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	S	T	Sn	<0.02	Zn	<0.02
B	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2	Sc	<0.2	Ta	<0.02	Ti	<0.02	Zr	<0.02

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

(T)= Target analyte

Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- * All standard containers are meticulously cleaned prior to use.
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.
- * All standards should be stored with caps tight and under appropriate laboratory conditions.
- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).



Certified Reference Material CRM

34

MSD



ANAB ISO 17034 Accredited
AR-1539 Certificate Number
https://AbsoluteStandards.com

CERTIFIED WEIGHT REPORT:

Part Number: 57115
Lot Number: 032921
Description: Phosphorous (P)

Lot #
Solvent: 20370011 Nitric Acid

Expiration Date: 032924

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): 10000

NIST Test Number: 6UTB

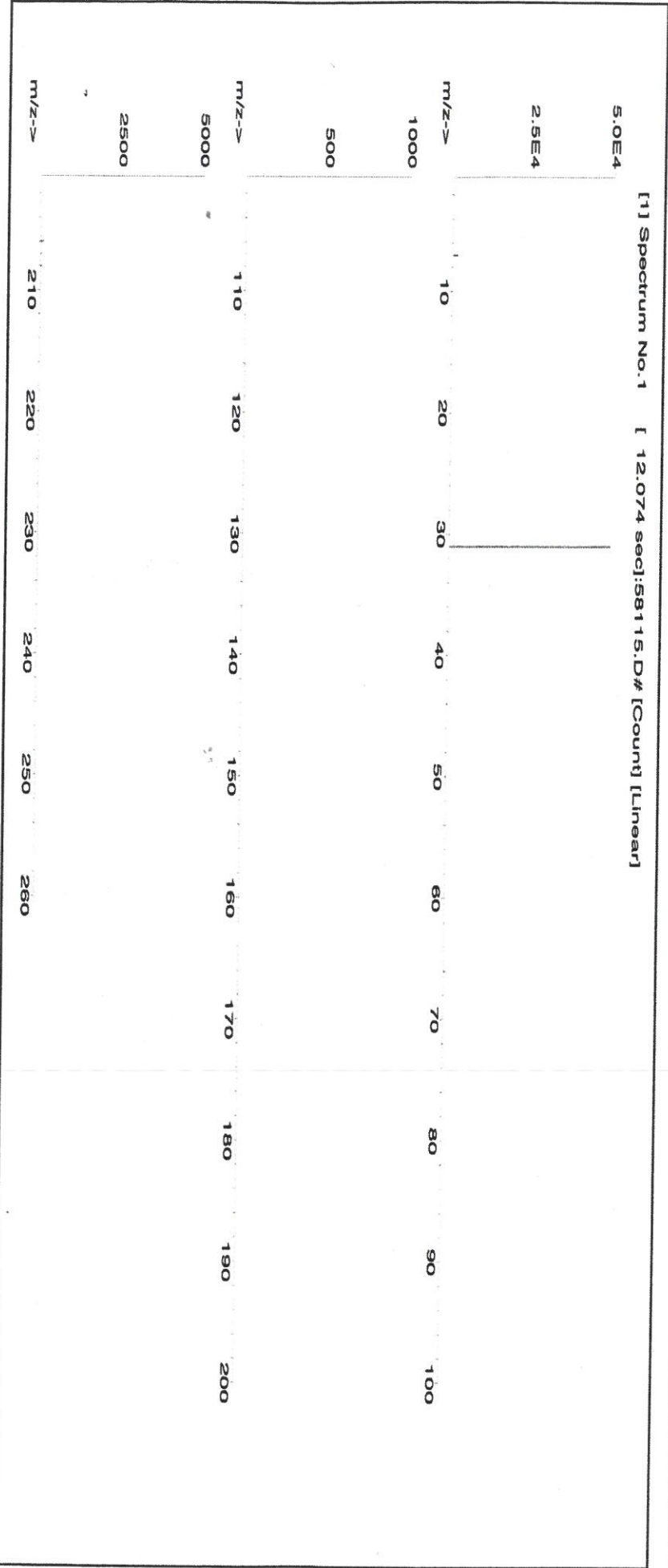
Weight shown below was diluted to (mL): 3000.41

2% 60.0 (mL) Nitric Acid

Formulated By: Lawrence Barry		032921
Reviewed By: Pedro L. Rientas		032921

Compound	Lot	Nominal Conc. (µg/mL)	Purity (%)	Uncertainty (%)	Assay (%)	Target Weight (g)	Actual Weight (g)	Actual Conc. (µg/mL)	Expanded Uncertainty +/- (µg/mL)	CAS#	OSHA PEL (TWA)	LD50	NIST SRM

1. Ammonium dihydrogen phosphate (P) IN008 PUG5201841 10000 99.999 0.10 27.3 109.9063 109.9093 10000.3 20.0 7722-76-1 5 mg/m3 NA 3186





Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):

Trace Metals Verification by ICP-MS (µg/mL)

Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pt	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Ho	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	U	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	Tl	<0.02	V	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	T	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
B	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02

(T) = Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- * All standard containers are meticulously cleaned prior to use.
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.
- * All Standards should be stored with caps tight and under appropriate laboratory conditions.
- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

300 Technology Drive
Christiansburg, VA 24073 USA
inorganicventures.com

P: 800-669-6799/540-585-3030
F: 540-585-3012
info@inorganicventures.com

MS062
MS063
MB

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Mass Spec Solution
Catalog Number: MSHG-10PPM
Lot Number: S2-HG709270
Matrix: 10% (v/v) HCl
Value / Analyte(s): 10 µg/mL ea:
Mercury
Starting Material: Hg metal
Starting Material Lot#: 1959
Starting Material Purity: 99.9994%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10.001 ± 0.053 µg/mL
Density: 1.020 g/mL (measured at 20 ± 4 °C)

Assay Information:

ANALYTE	METHOD	NIST SRM#	SRM LOT#
Hg	ICP Assay	3133	160921
Hg	EDTA	928	928
Hg	Calculated		See Sec. 4.2

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum (w_i) (X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char i}$
 w_i = the weighting factors for each method calculated using the inverse square of the variance.
 $w_i = (1/u_{char i}^2) / (\sum (1/u_{char i}^2))$

$$CRM/RM \text{ Expanded Uncertainty } (z) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum ((w_i)^2 (u_{char i})^2)]^{1/2}$ where $u_{char i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char a})$$

X_a = mean of Assay Method A with

$u_{char a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (z) = U_{CRM/RM} = k (u_{char a}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

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

CRM/RMs 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	Ag	0.000011	M	Eu	<	0.000201	O	Na	0.000004	M	Se	<	0.015915	O	Zn	<	0.001510
O	Al	0.000001	O	Fe	0.000001	M	Nb	<	0.000201	O	Si	0.000005	M	Zr	<	0.000201	
M	As	<	0.000402	M	Ga	<	0.000201	M	Nd	<	0.000201	M	Sm	<	0.000201		
M	Au	<	0.003631	M	Gd	<	0.000201	M	Ni	<	0.000402	M	Sn	<	0.001007		
M	B	<	0.001208	M	Ge	<	0.000201	M	Os	<	0.000605	M	Sr	<	0.000201		
M	Ba	<	0.000201	M	Hf	<	0.000201	O	P	<	0.032370	M	Ta	<	0.000201		
M	Be	<	0.000201	s	Hg	<		M	Pb	<	0.000201	M	Tb	<	0.000201		
M	Bi	<	0.000201	M	Ho	<	0.000201	M	Pd	<	0.000403	M	Te	<	0.002216		
O	Ca	0.000007	M	In	<	0.000201	M	Pr	<	0.000201	M	Th	<	0.000201			
M	Cd	<	0.000201	M	Ir	<	0.000201	M	Pt	<	0.000402	M	Ti	<	0.000402		
M	Ce	<	0.000201	O	K	0.000020	M	Rb	<	0.000201	O	Tl	<	0.016508			
M	Co	<	0.000201	M	La	<	0.000201	M	Re	<	0.000201	M	Tm	<	0.000201		
O	Cr	<	0.003021	O	Li	<	0.000107	M	Rh	<	0.000201	M	U	<	0.008058		
M	Cs	<	0.001208	M	Lu	<	0.000201	M	Ru	<	0.000201	M	V	<	0.000201		
M	Cu	<	0.000402	O	Mg	0.000001	O	S	<	0.053950	M	W	<	0.000604			
M	Dy	<	0.000201	M	Mn	<	0.000604	M	Sb	<	0.001208	M	Y	<	0.000201		
M	Er	<	0.000201	M	Mo	0.000009	M	Sc	<	0.000201	M	Yb	<	0.000201			

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 and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 200.59 +2 4 Hg(OH)(aq) 1+

Chemical Compatibility - Stable in HNO₃. Avoid basic media forming insoluble carbonate. The sulfide, basic carbonate, oxalate, phosphate, arsenite, arsenate and iodide are insoluble in water.

Stability - 2-100 ppb levels not stable in 1% HNO₃ / LDPE container, stable in 10% HNO₃ packaged in borosilicate glass. 1-100 ppm levels stable in 7% HNO₃ packaged in borosilicate glass. 1000-10,000 ppm solutions are chemically stable for years in 5-10% HNO₃ / LDPE container.

Hg Containing Samples (Preparation and Solution) - Metal (soluble in HNO₃); Oxide (Soluble in HNO₃); Ores and Organic based (The literature has more references to the preparation of Hg containing samples than any other element. Please consult the literature for your specific sample type, since such preparations are prone to error. Or e-mail our technical staff and we will contact you to discuss your particular sample preparation questions in further detail.).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 202 amu	9 ppt	n/a	186W16O
ICP-OES 184.950 nm	0.03 / 0.005 µg/mL	1	
ICP-OES 194.227 nm	0.03 / 0.005 µg/mL	1	V
ICP-OES 253.652 nm	0.1 / 0.03 µg/mL	1	Ta, Co, Th ,Rh , Fe, U

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va, 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

September 22, 2021

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **September 22, 2026**

- The date after which this CRM/RM should not be used.
- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:

Uyen Truong
Supervisor, Product Documentation



Certificate Approved By:

Michael Booth
Director, Quality Control



Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director





Instructions for QATS Reference Material: ICP-AES ICS

**QATS LABORATORY INORGANIC REFERENCE MATERIAL
INTERFERENCE CHECK SAMPLE SET FOR ICP-AES (ICSA WITH ICSB)**

NOTE: These instructions are for advisory purposes only. If any apparent conflict exists between these instructions and the analytical protocol or your contract, disregard these instructions.

APPLICATION: For use with the CLP SFAM01.0 SOW and revisions.

CAUTION: Read instructions carefully before opening bottle(s) and proceeding with the analyses.

Contains Heavy Metals
HAZARDOUS MATERIAL

Safety Data Sheets
Available Upon Request

(A) SAMPLE DESCRIPTION

Enclosed is a set of one (1) or more bottles of Aqueous Reference Material, each composed of metals at various concentrations and prepared with nitrate salts and oxy-acids of the respective elements in a 5% nitric acid matrix. **For the reference material source in reporting ICSA and ICSAB mixture use "USEPA". For the reference material lot number for the ICSA use "ICSA-1211" and for the ICSAB mixture use "ICSA-1211+ICSB-0710".**

CAUTION: The bottle(s) should be protected from light during storage to ensure the stability of silver which is contained in the ICSB solution. The bottle(s) should be stored at room temperature. **Do not allow the solution(s) to freeze.**

(B) BREAKAGE OR MISSING ITEMS

Check the contents of the shipment carefully for any broken, leaking, or missing items. Check that the seal is intact on each bottle. Refer to the enclosed chain of custody record. Report any problems to Mr. Keith Strout, APTIM Federal Services, LLC, at (702) 895-8722. If requested, return the chain-of-custody record with appropriate annotations and signatures to the address provided below.

**QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY
APTIM Federal Services, LLC
2700 Chandler Avenue - Building C
Las Vegas, NV 89120**

(C) ANALYSIS OF SAMPLES

The interference check sample set is to be used to verify inter-element and background correction factors of inductively-coupled plasma (ICP) spectrometers. This reference material set consists of two (2) concentrated solutions. The ICSA solution contains the four (4) interferent elements: Al, Ca, Fe, and Mg. The ICSB solution contains the analytes: Ag, As, Sb, Ba, Be,





Instructions for QATS Reference Material: ICP-AES ICS

Cd, Co, Cr, Cu, Mn, Ni, Pb, Tl, Se, V, and Zn. This instruction sheet provides the nominal values for ICP-AES Part A and Part B target analytes when diluted as directed.

Using Class "A" glassware, preparation and analysis must be performed according to the following instructions:

ICSA-1211, Interferents: Pipet 10 mL of the ICSA solution into a 100 mL volumetric flask and dilute to volume with 2% v/v HNO₃. Analyze this ICSA solution by ICP-AES.

ICSB-0710, Analytes, mixed with ICSA-1211, Interferents: Pipet 10 mL of the ICSA solution and 10 mL of the ICSB solution into a 100 mL volumetric flask and dilute to volume with 2% v/v HNO₃. Analyze this ICSAB solution by ICP-AES.

(D) "CERTIFIED VALUE" CONCENTRATIONS OF QATS ICP-AES ICS SOLUTION(S)

The "Certified Value" concentrations of the elements, listed in Table 1 below, were derived from statistically pooled analysis results from the following sources, if available: QATS Laboratory, CLP laboratories, Quarterly Blind (QB)/Proficiency Testing (PT) events, CLP pre-award events, and external referee laboratories.

Table 1. "CERTIFIED VALUES" FOR INTERFERENCE CHECK SAMPLE ICP-AES ICSA-1211, AND ICSA-1211 MIXED WITH ICSB-0710

Element	CRQL	Part A (µg/L)	Low Limit (µg/L)	High Limit (µg/L)	Part A +Part B (µg/L)	Low Limit (µg/L)	High Limit (µg/L)
Al	200	255000	216000	294000	247000	209000	285000
Sb	60	(0.0)	-60.0	60.0	618	525	711
As	10	(0.0)	-10.0	10.0	104	88.4	120
Ba	200	(6.0)	-194	206	(537)	337	737
Be	5.0	(0.0)	-5.0	5.0	495	420	570
Cd	5.0	(1.0)	-4.0	6.0	972	826	1120
Ca	5000	245000	208000	282000	235000	199000	271000
Cr	10	(52.0)	42.0	62.0	542	460	624
Co	50	(0.0)	-50.0	50.0	476	404	548
Cu	25	(2.0)	-23.0	27.0	511	434	588
Fe	100	101000	85600	116500	99300	84400	114500
Pb	10	(0.0)	-10.0	10.0	(49.0)	39.0	59.0
Mg	5000	255000	216000	294000	248000	210000	286000
Mn	15	(7.0)	-8.0	22.0	507	430	584
Ni	40	(2.0)	-38.0	42.0	954	810	1100
Se	35	(0.0)	-35.0	35.0	(46.0)	11.0	81.0
Ag	10	(0.0)	-10.0	10.0	201	170	232
Tl	25	(0.0)	-25.0	25.0	(108)	83.0	133
V	50	(0.0)	-50.0	50.0	491	417	565
Zn	60	(0.0)	-60.0	60.0	952	809	1095

The acceptance ranges for all analytes in parentheses in the above table were determined using the listed certified value ± 1 times the associated CLP SOW CRQL. The acceptance ranges for all other analytes were determined using the certified value ± 15 percent of the listed certified value.

ICSA
M5126
M5127
M5128
M5129
M5130

ICSB
M5219
M5220
M5221
M5222
M5223



CERTIFIED WEIGHT REPORT:

Part Number:
Lot Number:
Description:

58025
060122
Manganese (Mn)

Lot #
Solvent:

20510011
Nitric Acid

2.0%

60.0
(mL)

Nitric Acid

Expiration Date:
Recommended Storage:
Nominal Concentration (µg/mL):

060125
Ambient (20 °C)
1000

NIST Test Number:

6U7B

Volume shown below was diluted to (mL):

3000.41
5E-05
Balance Uncertainty
0.058
Flask Uncertainty

Compound

Part
Lot
Dilution
Factor

Initial
Uncertainty
Pipette (mL)
Conc. (µg/mL)

Nominal

Initial

Final

Expanded
Uncertainty
+/- (µg/mL)

CAS#

OSHA PEL (TWA)

LD50

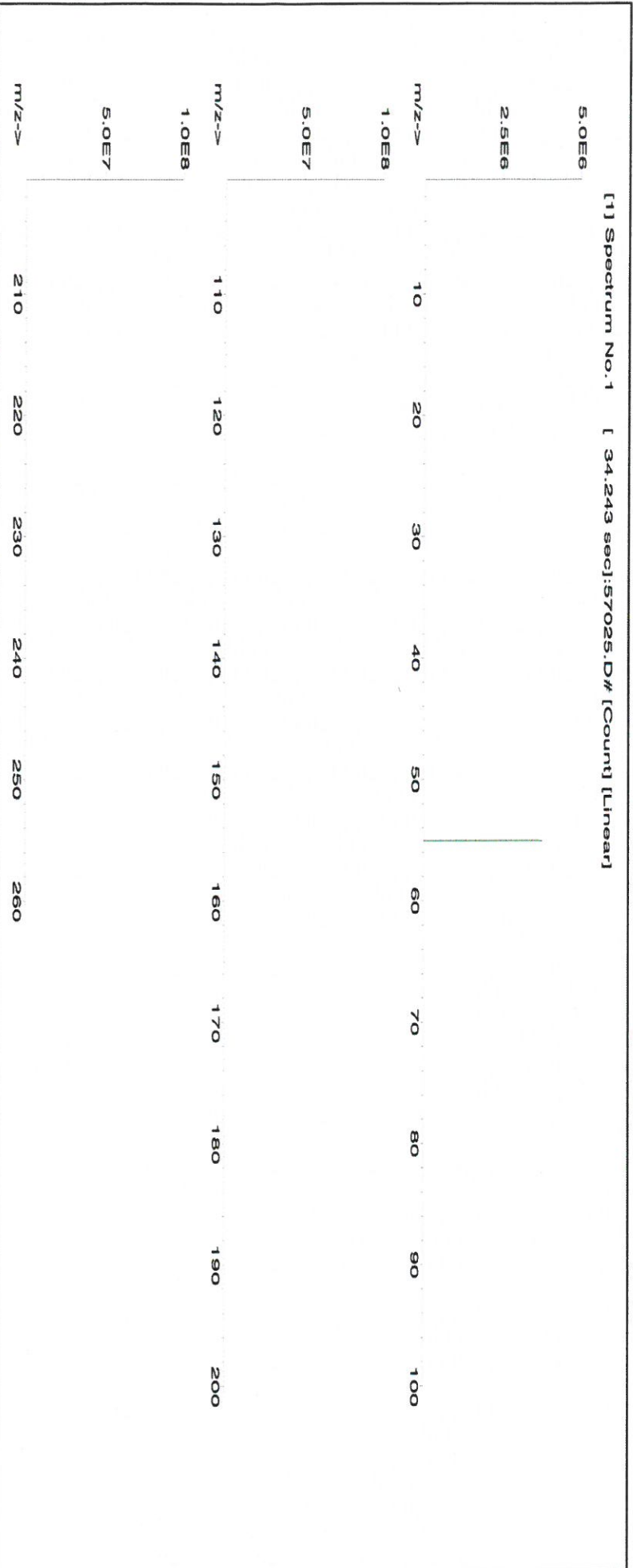
SRM

SDS Information

(Solvent Safety Info. On Attached pg.)

1. Manganese(II) nitrate tetrahydrate (Mn) 58125 021022 0.1000 300.0 0.084 1000 10000.5 1000.0 2.1 20694-39-7 5 mg/m3 or rat >300mg/kg 3132

[1] Spectrum No. 1 [34.243 sec]:57025.D# [Count] [Linear]





Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):

Trace Metals Verification by ICP-MS (µg/mL)

Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pt	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Ho	<0.02	Lu	<0.02	Nb	<0.02	Rc	<0.02	Si	<0.02	Te	<0.02	U	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	Tl	<0.02	V	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ir	<0.02	Mn	T	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
B	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02

(T) = Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the balances that are calibrated with weights traceable to NIST (see above).
- * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.
- * All standards should be stored with caps tight and under appropriate laboratory conditions.
- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

11/21/87

11/21/87



MS193
R: 08/23/21

Certified Reference Material CRM

BA



CERTIFIED WEIGHT REPORT:

Part Number: 58120
Lot Number: 082021
Description: Calcium (Ca)

Lot #
Solvent: 20370011 Nitric Acid

Expiration Date: 082024

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): 10000

NIST Test Number: 6UTB

Weight shown below was diluted to (mL): 3000.4

5E-05 Balance Uncertainty
0.058 Flask Uncertainty

Giovanni Caporale	
Formulated By:	Giovanni Esposito
Reviewed By:	Pedro L. Rentas
	082021

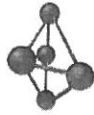
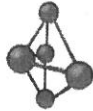
Compound

RM#	Lot Number	Nominal Conc. (µg/mL)	Purity (%)	Uncertainty (%)	Assay (%)	Target Weight (g)	Actual Weight (g)	Actual Conc. (µg/mL)	Expanded Uncertainty +/- (µg/mL)	CAS#	OSHA PEL (TWA)	LD50	NIST SRM
-----	------------	-----------------------	------------	-----------------	-----------	-------------------	-------------------	----------------------	----------------------------------	------	----------------	------	----------

1. Calcium carbonate (Ca) IN014 CA2082019A1 10000 99.9995 0.10 39.9 75.1986 75.2065 10001.0 20.0 471-34-1 5 mg/m3 or-tral >2000mg/kg 3109a

[1] Spectrum No.1 [12.514 sec]:58120.D# [Count] [Linear]





Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):

Trace Metals Verification by ICP-MS (µg/mL)

Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.02	Tb	<0.02	W	<0.02
Sb	<0.02	Ca	T	Er	<0.02	Ho	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	U	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	<0.02	Os	<0.01	Rh	<0.02	Ag	<0.02	Tl	<0.02	V	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.02	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.02	Hg	<0.2	P	<0.2	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
B	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

(T)= Target analyte

Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- * All standard containers are meticulously cleaned prior to use.
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- * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.
- * All Standards should be stored with caps tight and under appropriate laboratory conditions.
- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).



Certified Reference Material CRM
M 5700 R: 10/05/21



CERTIFIED WEIGHT REPORT:

Part Number: 58111
Lot Number: 092121
Description: Sodium (Na)

Solvent: 20370011 Nitric Acid

Lot #

Expiration Date: 092124

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): 10000

NIST Test Number: 6UTB

Weight shown below was diluted to (mL): 3000.41

5E-05 Balance Uncertainty
0.058 Flask Uncertainty

<i>Giovanni Esposito</i>	
Formulated By:	Giovanni Esposito
Reviewed By:	Pedro L. Rentas
	092121

Compound

RM#	Lot Number	Nominal Conc. (µg/mL)	Purity (%)	Uncertainty Purity (%)	Assay (%)	Target Weight (g)	Actual Weight (g)	Actual Conc. (µg/mL)	Expanded Uncertainty +/- (µg/mL)	CAS#	OSHA PEL (TWA)	LD50	NIST SRM
-----	------------	-----------------------	------------	------------------------	-----------	-------------------	-------------------	----------------------	----------------------------------	------	----------------	------	----------

1. Sodium nitrate (Na) IN036 NAV0120151 10000 99.999 0.10 27.0 111.1274 111.1433 10001.4 20.0 7631-99-4 5 mg/m³ or-ral 3236 mg/kg 3152a

[1] Spectrum No. 1 [8.935 sec]:58111.D# [Count] [Linear]

5.OE5	m/z->	110	120	130	140	150	160	170	180	190	200
2.5E5	m/z->	10	20	30	40	50	60	70	80	90	100
5.OE6	m/z->	210	220	230	240	250	260				
2.5E6	m/z->										



Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):

Trace Metals Verification by ICP-MS (µg/mL)

Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Ho	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	U	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	Tl	<0.02	V	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	T	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
B	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02

(T) = Target analyte

Physical Characterization:

Certified by:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- * All standard containers are meticulously cleaned prior to use.
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.
- * All Standards should be stored with caps tight and under appropriate laboratory conditions.
- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).



CERTIFIED WEIGHT REPORT:

Part Number: 57119
Lot Number: 062321
Description: Potassium (K)

Expiration Date: 062324
Recommended Storage: Ambient (20 °C)
Nominal Concentration (µg/mL): 10000
NIST Test Number: 6UTB

Weight shown below was diluted to (mL): 2000.02

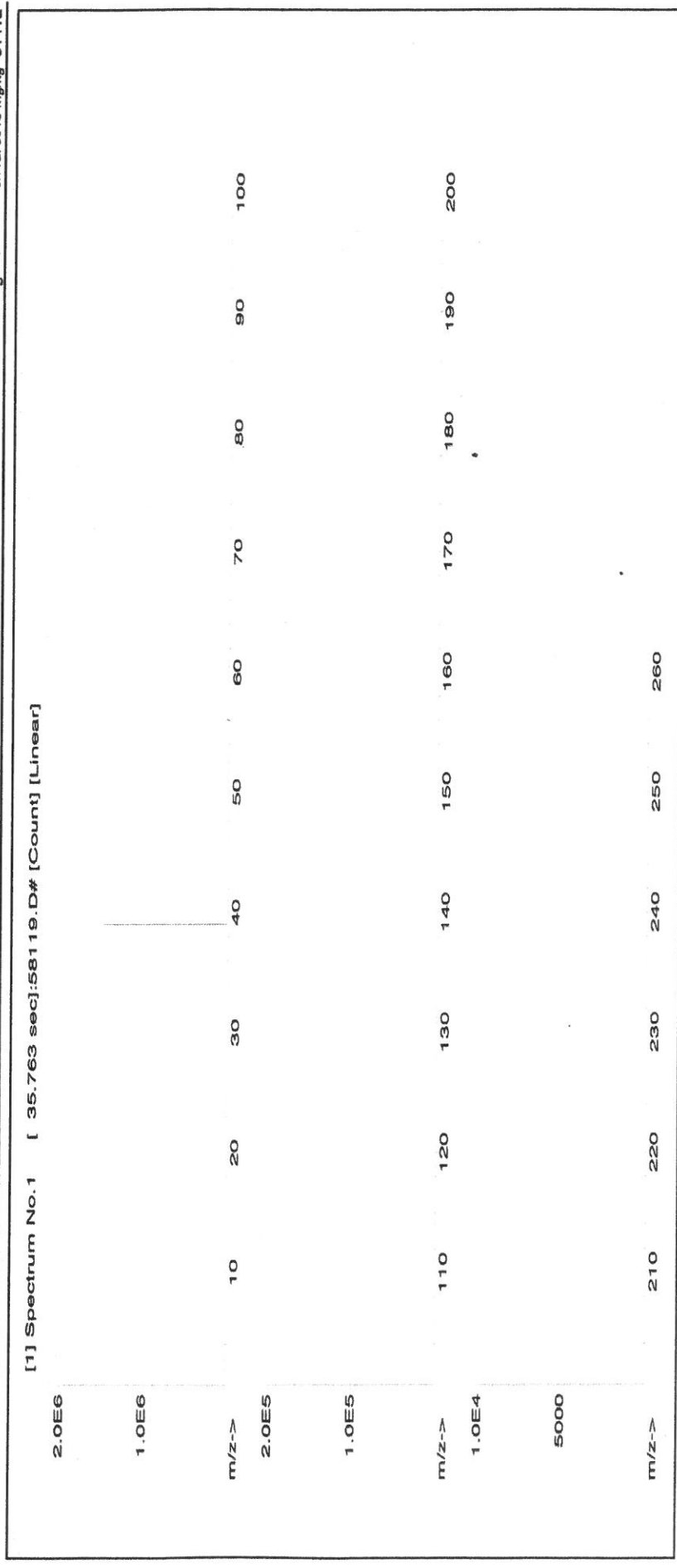
5E-05 Balance Uncertainty
0.058 Flask Uncertainty

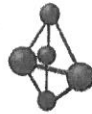
Lot #
Solvent: 20370011 Nitric Acid

2%
40.0
(mL)
Nitric Acid

<i>Gabriel Helland</i>	
Formulated By:	Gabriel Helland
<i>Pedro L. Rentas</i>	
Reviewed By:	Pedro L. Rentas

Compound	RM#	Lot Number	Nominal Conc. (µg/mL)	Purity (%)	Uncertainty (%)	Assay (%)	Target		Actual		Expanded Uncertainty		NIST SRM
							Weight (g)	Weight (g)	Weight (g)	Conc. (µg/mL)	+/- (µg/mL)	CAS#	





Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):

Trace Metals Verification by ICP-MS ($\mu\text{g/mL}$)

Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Ho	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	U	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	<0.02	Os	<0.01	Rh	<0.02	Ag	<0.02	Tl	<0.02	V	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.2	Na	<0.2	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	<0.02	Ga	<0.2	Fe	<0.2	Hg	<0.2	P	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
B	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.02	Sc	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02

(T) = Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
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Sulfuric Acid

BAKER INSTRA-ANALYZED® Reagent

For Trace Metal Analysis

Low Selenium

avantor™



Material No.: 9673-33

Batch No.: 22D0862014

Manufactured Date: 2022-02-23

Retest Date: 2027-02-22

Revision No.: 0

Certificate of Analysis

Test	Specification	Result
ACS – Assay (H ₂ SO ₄)	95.0 – 98.0 %	96.5 %
Appearance	Passes Test	Passes Test
ACS – Color (APHA)	≤ 10	5
ACS – Residue after Ignition	≤ 3 ppm	< 1 ppm
ACS – Substances Reducing Permanganate (as SO ₂)	≤ 2 ppm	< 2 ppm
Ammonium (NH ₄)	≤ 1 ppm	< 1 ppm
Chloride (Cl)	≤ 0.1 ppm	< 0.1 ppm
Nitrate (NO ₃)	≤ 0.2 ppm	< 0.1 ppm
Phosphate (PO ₄)	≤ 0.5 ppm	< 0.1 ppm
Trace Impurities – Aluminum (Al)	≤ 30.0 ppb	1.7 ppb
Arsenic and Antimony (as As)	≤ 4.0 ppb	< 2.0 ppb
Trace Impurities – Boron (B)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities – Cadmium (Cd)	≤ 2.0 ppb	< 0.3 ppb
Trace Impurities – Chromium (Cr)	≤ 6.0 ppb	< 0.4 ppb
Trace Impurities – Cobalt (Co)	≤ 0.5 ppb	< 0.3 ppb
Trace Impurities – Copper (Cu)	≤ 1.0 ppb	< 0.1 ppb
Trace Impurities – Gold (Au)	≤ 10.0 ppb	< 0.2 ppb
Heavy Metals (as Pb)	≤ 500.0 ppb	< 100.0 ppb
Trace Impurities – Iron (Fe)	≤ 50.0 ppb	2.0 ppb
Trace Impurities – Lead (Pb)	≤ 0.5 ppb	< 0.5 ppb
Trace Impurities – Magnesium (Mg)	≤ 7.0 ppb	0.6 ppb
Trace Impurities – Manganese (Mn)	≤ 1.0 ppb	< 0.4 ppb
Trace Impurities – Mercury (Hg)	≤ 0.5 ppb	< 0.1 ppb
Trace Impurities – Nickel (Ni)	≤ 2.0 ppb	< 0.3 ppb
Trace Impurities – Potassium (K)	≤ 500.0 ppb	< 2.0 ppb
Trace Impurities – Selenium (Se)	≤ 50.0 ppb	12.1 ppb
Trace Impurities – Silicon (Si)	≤ 100.0 ppb	4.4 ppb
Trace Impurities – Silver (Ag)	≤ 1.0 ppb	< 0.3 ppb

>>> Continued on page 2 >>>

Sulfuric Acid
BAKER INSTRA-ANALYZED® Reagent
For Trace Metal Analysis
Low Selenium

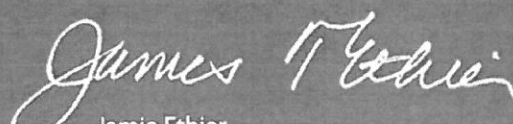


Material No.: 9673-33
Batch No.: 22D0862014

Test	Specification	Result
Trace Impurities – Sodium (Na)	≤ 500.0 ppb	6.2 ppb
Trace Impurities – Strontium (Sr)	≤ 5.0 ppb	< 0.2 ppb
Trace Impurities – Tin (Sn)	≤ 5.0 ppb	< 0.8 ppb
Trace Impurities – Zinc (Zn)	≤ 5.0 ppb	0.6 ppb

For Laboratory, Research, or Manufacturing Use

Country of Origin: USA
Packaging Site: Phillipsburg Mfg Ctr & DC


Jamie Ethier
Vice President Global Quality

Certificate of Analysis

300 Technology Drive
 Christiansburg, VA 24073 USA
 inorganicventures.com

P: 800-669-6799/540-585-3030
 F: 540-585-3012
 info@inorganicventures.com

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Multi Analyte Custom Grade Solution
 Catalog Number: CHEM-QC-4
 Lot Number: S2-MEB711674
 Matrix: 3% (v/v) HNO₃
 3% (v/v) HF
 Value / Analyte(s): 1 000 µg/mL ea:
 Boron, Molybdenum,
 Silicon, Tin,
 Titanium

Second Source: Whenever possible, this solution was manufactured from a second set of concentrates in our manufacturing facility.

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE	CERTIFIED VALUE	ANALYTE	CERTIFIED VALUE
Boron, B	1 000 ± 7 µg/mL	Molybdenum, Mo	1 000 ± 5 µg/mL
Silicon, Si	1 000 ± 7 µg/mL	Tin, Sn	1 000 ± 5 µg/mL
Titanium, Ti	1 001 ± 6 µg/mL		

Density: 1.032 g/mL (measured at 20 ± 4 °C)

Assay Information:

ANALYTE	METHOD	NIST SRM#	SRM LOT#
B	ICP Assay	3107	110830
Mo	ICP Assay	3134	130418
Si	ICP Assay	3150	130912
Sn	ICP Assay	3161a	140917
Ti	ICP Assay	3162a	130925

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{\text{CRM/RM}}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{\text{CRM/RM}} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{\text{char } i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{\text{char } i}^2) / (\sum(1/u_{\text{char } i}^2))$$

$$\text{CRM/RM Expanded Uncertainty } (\pm) = U_{\text{CRM/RM}} = k(u_{\text{char}}^2 + u_{\text{bb}}^2 + u_{\text{Its}}^2 + u_{\text{ts}}^2)^{1/2}$$

k = coverage factor = 2

$u_{\text{char}} = [\sum(w_i)^2(u_{\text{char } i}^2)]^{1/2}$ where $u_{\text{char } i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{\text{CRM/RM}}$, where one method of characterization is used is the mean of individual results:

$$X_{\text{CRM/RM}} = (X_a)(u_{\text{char } a})$$

X_a = mean of Assay Method A with

$u_{\text{char } a}$ = the standard uncertainty of characterization Method A

$$\text{CRM/RM Expanded Uncertainty } (\pm) = U_{\text{CRM/RM}} = k(u_{\text{char } a}^2 + u_{\text{bb}}^2 + u_{\text{Its}}^2 + u_{\text{ts}}^2)^{1/2}$$

k = coverage factor = 2

$u_{\text{char } a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

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

N/A

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

HF Note: This standard should not be prepared or stored in glass.

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

November 02, 2021

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **November 02, 2026**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Director, Quality Control



Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director





QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY
"An ISO 9001:2015 Certified Program"

Instructions for QATS Reference Material: ICP-AES ICS

**QATS LABORATORY INORGANIC REFERENCE MATERIAL
INTERFERENCE CHECK SAMPLE SET FOR ICP-AES (ICSA WITH ICSB)**

NOTE: These instructions are for advisory purposes only. If any apparent conflict exists between these instructions and the analytical protocol or your contract, disregard these instructions.

APPLICATION: For use with the CLP SFAM01.0 SOW and revisions.

CAUTION: Read instructions carefully before opening bottle(s) and proceeding with the analyses.

Contains Heavy Metals
HAZARDOUS MATERIAL

Safety Data Sheets
Available Upon Request

(A) SAMPLE DESCRIPTION

Enclosed is a set of one (1) or more bottles of Aqueous Reference Material, each composed of metals at various concentrations and prepared with nitrate salts and oxy-acids of the respective elements in a 5% nitric acid matrix. **For the reference material source in reporting ICSA and ICSAB mixture use "USEPA". For the reference material lot number for the ICSA use "ICSA-1211" and for the ICSAB mixture use "ICSA-1211+ICSB-0710".**

CAUTION: The bottle(s) should be protected from light during storage to ensure the stability of silver which is contained in the ICSB solution. The bottle(s) should be stored at room temperature. **Do not allow the solution(s) to freeze.**

(B) BREAKAGE OR MISSING ITEMS

Check the contents of the shipment carefully for any broken, leaking, or missing items. Check that the seal is intact on each bottle. Refer to the enclosed chain of custody record. Report any problems to Mr. Keith Strout, APTIM Federal Services, LLC, at (702) 895-8722. If requested, return the chain-of-custody record with appropriate annotations and signatures to the address provided below.

QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY
APTIM Federal Services, LLC
2700 Chandler Avenue - Building C
Las Vegas, NV 89120

(C) ANALYSIS OF SAMPLES

The interference check sample set is to be used to verify inter-element and background correction factors of inductively-coupled plasma (ICP) spectrometers. This reference material set consists of two (2) concentrated solutions. The ICSA solution contains the four (4) interferent elements: Al, Ca, Fe, and Mg. The ICSB solution contains the analytes: Ag, As, Sb, Ba, Be,





Instructions for QATS Reference Material: ICP-AES ICS

Cd, Co, Cr, Cu, Mn, Ni, Pb, Tl, Se, V, and Zn. This instruction sheet provides the nominal values for ICP-AES Part A and Part B target analytes when diluted as directed.

Using Class "A" glassware, preparation and analysis must be performed according to the following instructions:

ICSA-1211, Interferents: Pipet 10 mL of the ICSA solution into a 100 mL volumetric flask and dilute to volume with 2% v/v HNO₃. Analyze this ICSA solution by ICP-AES.

ICSB-0710, Analytes, mixed with ICSA-1211, Interferents: Pipet 10 mL of the ICSA solution and 10 mL of the ICSB solution into a 100 mL volumetric flask and dilute to volume with 2% v/v HNO₃. Analyze this ICSAB solution by ICP-AES.

(D) "CERTIFIED VALUE" CONCENTRATIONS OF QATS ICP-AES ICS SOLUTION(S)

The "Certified Value" concentrations of the elements, listed in Table 1 below, were derived from statistically pooled analysis results from the following sources, if available: QATS Laboratory, CLP laboratories, Quarterly Blind (QB)/Proficiency Testing (PT) events, CLP pre-award events, and external referee laboratories.

Table 1. "CERTIFIED VALUES" FOR INTERFERENCE CHECK SAMPLE ICP-AES ICSA-1211, AND ICSA-1211 MIXED WITH ICSB-0710

Element	CRQL	Part A (µg/L)	Low Limit (µg/L)	High Limit (µg/L)	Part A +Part B (µg/L)	Low Limit (µg/L)	High Limit (µg/L)
Al	200	255000	216000	294000	247000	209000	285000
Sb	60	(0.0)	-60.0	60.0	618	525	711
As	10	(0.0)	-10.0	10.0	104	88.4	120
Ba	200	(6.0)	-194	206	(537)	337	737
Be	5.0	(0.0)	-5.0	5.0	495	420	570
Cd	5.0	(1.0)	-4.0	6.0	972	826	1120
Ca	5000	245000	208000	282000	235000	199000	271000
Cr	10	(52.0)	42.0	62.0	542	460	624
Co	50	(0.0)	-50.0	50.0	476	404	548
Cu	25	(2.0)	-23.0	27.0	511	434	588
Fe	100	101000	85600	116500	99300	84400	114500
Pb	10	(0.0)	-10.0	10.0	(49.0)	39.0	59.0
Mg	5000	255000	216000	294000	248000	210000	286000
Mn	15	(7.0)	-8.0	22.0	507	430	584
Ni	40	(2.0)	-38.0	42.0	954	810	1100
Se	35	(0.0)	-35.0	35.0	(46.0)	11.0	81.0
Ag	10	(0.0)	-10.0	10.0	201	170	232
Tl	25	(0.0)	-25.0	25.0	(108)	83.0	133
V	50	(0.0)	-50.0	50.0	491	417	565
Zn	60	(0.0)	-60.0	60.0	952	809	1095

The acceptance ranges for all analytes in parentheses in the above table were determined using the listed certified value ± 1 times the associated CLP SOW CRQL. The acceptance ranges for all other analytes were determined using the certified value ± 15 percent of the listed certified value.

ICSA
M5126
M5127
M5128
M5129
M5130

ICSB
M5219
M5220
M5221
M5222
M5223



CERTIFIED WEIGHT REPORT:

Part Number: **57051**
 Lot Number: **101521**
 Description: **Antimony (Sb)**

Lot # 20370011
 Solvent: Nitric Acid

2.0% 40.0 Nitric Acid
 (mL)

Expiration Date: 101524

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): **1000**

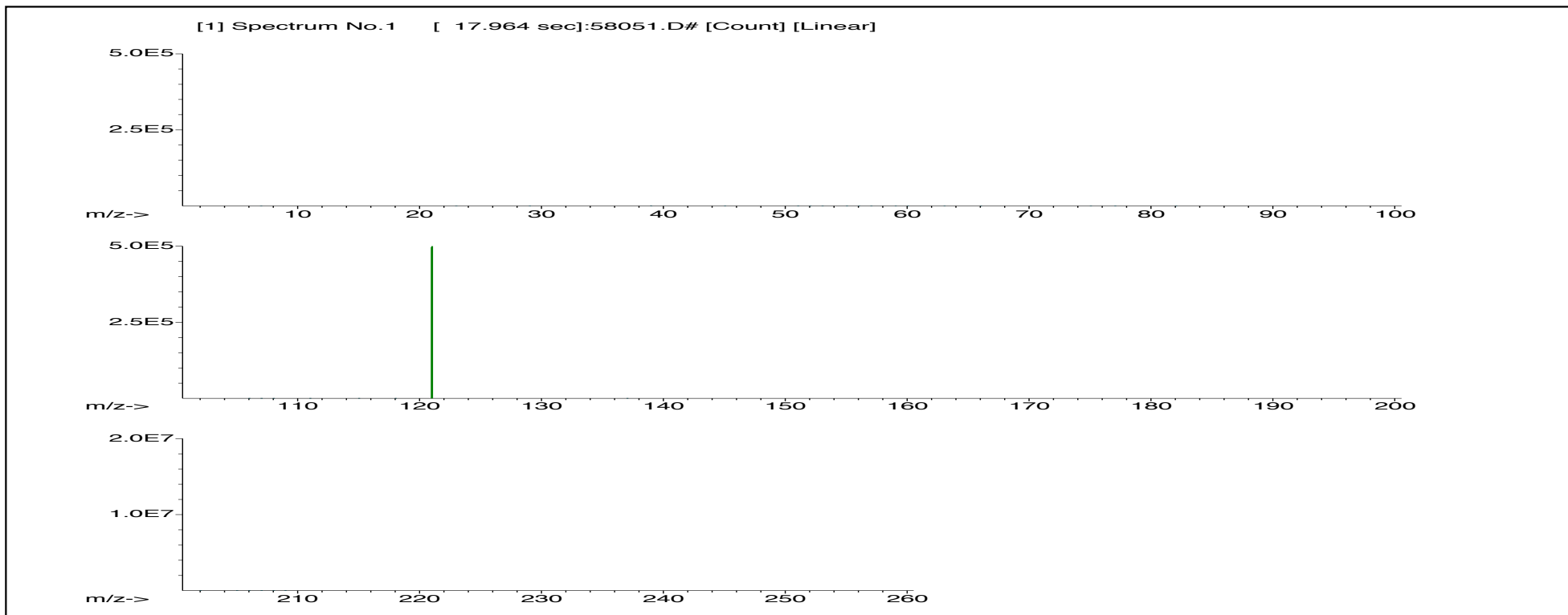
NIST Test Number: 6UTB

5E-05 Balance Uncertainty

Volume shown below was diluted to (mL): 2000.25 0.116 Flask Uncertainty

<i>Giovanni Esposito</i>		
Formulated By:	Giovanni Esposito	101521
<i>Pedro L. Rentas</i>		
Reviewed By:	Pedro L. Rentas	101521

Compound	Part Number	Lot Number	Dilution Factor	Initial Vol. (mL)	Uncertainty Pipette (mL)	Nominal Conc. (µg/mL)	Initial Conc. (µg/mL)	Final Conc. (µg/mL)	Expanded	SDS Information			NIST SRM
									Uncertainty	(Solvent Safety Info. On Attached pg.)			
									+/- (µg/mL)	CAS#	OSHA PEL (TWA)	LD50	
Antimony (Sb)	58151	081820	0.1000	200.0	0.084	1000	10001.5	1000.0	2.2	7440-36-0	0.5 mg/m3	orl-rat 7000 mg/kg	3102a





Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):

Trace Metals Verification by ICP-MS ($\mu\text{g/mL}$)

Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	T	Ca	<0.2	Er	<0.02	Ho	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	U	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	Tl	<0.02	V	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
B	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02

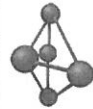
(T)= Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

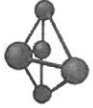
Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- * All standard containers are meticulously cleaned prior to use.
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.
- * All Standards should be stored with caps tight and under appropriate laboratory conditions.
- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).



M526

Certified Reference Material CRM



CERTIFIED WEIGHT REPORT:

Part Number:
Lot Number:
Description:

58029
022822
Copper (Cu)

Expiration Date:
Recommended Storage:
Nominal Concentration (µg/mL):
NIST Test Number:

022825
Ambient (20 °C)
1000
6UTB

Volume shown below was diluted to (mL):

2000.02

5E-05 Balance Uncertainty
0.058 Flask Uncertainty

Lot #
Solvent:

20370011

Nitric Acid

2.0% Nitric Acid
(mL)

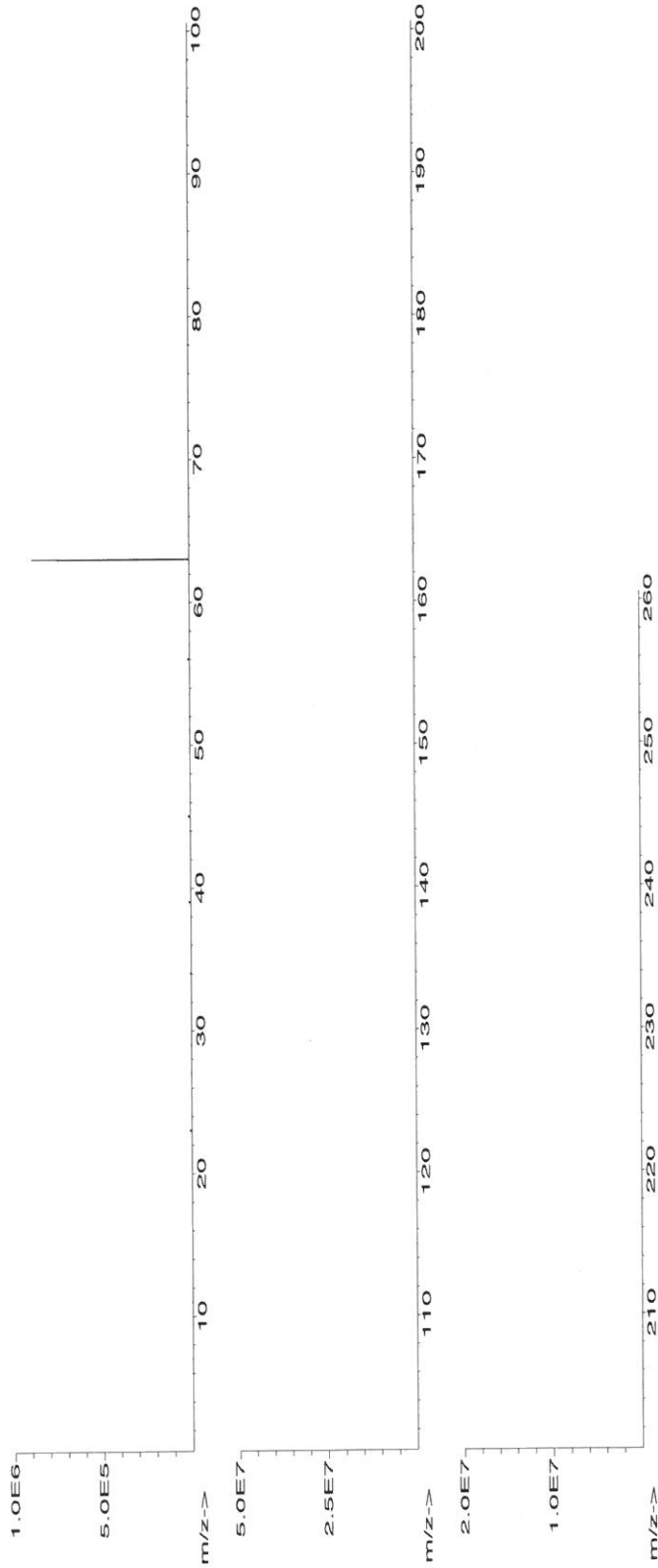
<i>Giovanni Esposito</i>	
Formulated By:	Giovanni Esposito
<i>Pedro L. Rentas</i>	
Reviewed By:	Pedro L. Rentas
022822	

SDS Information

Expanded
Uncertainty
+/- (µg/mL)
CAS#
OSHA PEL (TWA)
LD50
NIST
SRM

1. Copper(II) nitrate trihydrate (Cu) 58129 020821 0.1000 200.0 0.084 1000 10000.1 **1000.0** 2.2 10031-43-3 1 mg/m3 orl-rat 794 mg/kg 3114

[1] Spectrum No.1 [33.422 sec]:58029.D# [Count] [Linear]





Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):

Trace Metals Verification by ICP-MS (µg/mL)

Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Ho	<0.02	La	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	U	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	Tl	<0.02	V	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Ru	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.02	Sm	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sc	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
B	<0.02	Cu	T	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2			Ta	<0.02	Ti	<0.02	Zr	<0.02

(T) = Target analyte

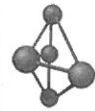
Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- * All standard containers are meticulously cleaned prior to use.
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.
- * All Standards should be stored with caps tight and under appropriate laboratory conditions.
- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

M5227 R: 10/18/2021



Absolute Standards, Inc.
800-368-1131
www.absolutestandards.com

Certified Reference Material CRM



ANAB ISO 17034 Accredited
AR-1539 Certificate Number
<https://AbsoluteStandards.com>

CERTIFIED WEIGHT REPORT:

Part Number: 57023
Lot Number: 100121
Description: Vanadium (V)

Expiration Date: 100124
Recommended Storage: Ambient (20 °C)
Nominal Concentration (µg/mL): 1000
NIST Test Number: 6UTB

Volume shown below was diluted to (mL): 3000.4

5E-05 Balance Uncertainty
0.06 Flask Uncertainty

Lot # 20370011
Solvent: Nitric Acid

2.0% Nitric Acid
60.0 (mL)

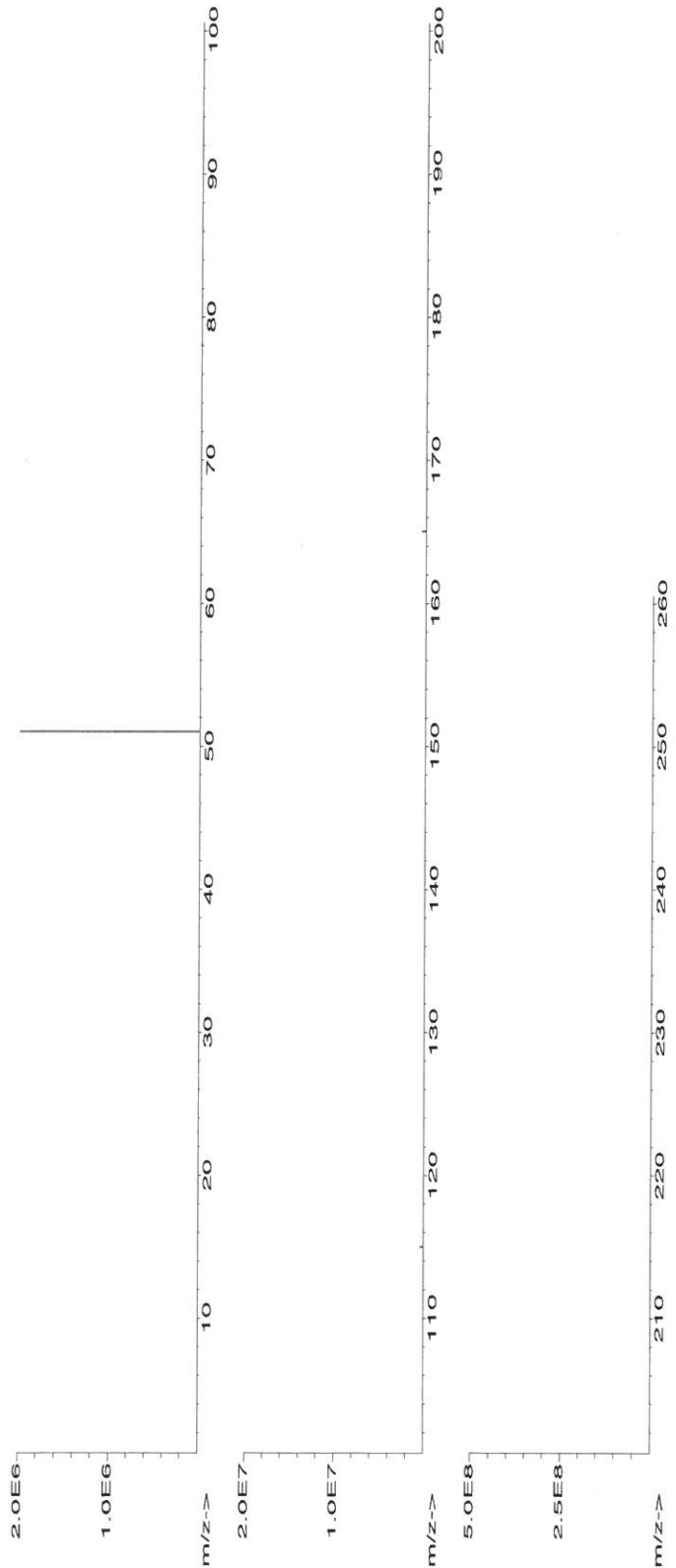
<i>Giovanni Esposito</i>	
Formulated By:	Giovanni Esposito
<i>Pedro L. Rentas</i>	
Reviewed By:	Pedro L. Rentas

SDS Information

Expanded Uncertainty (Solvent Safety Info. On Attached pg.) NIST SRM
+/- (µg/mL) CAS# OSHA PEL (TWA) LD50

1. Ammonium Metavanadate (V) 58123 070721 0.1000 300.0 0.084 1000 10000.4 1000.0 2.1 7803-55-6 1.0 mg/m3 or-rat 630 mg/kg 3165

[1] Spectrum No. 1 [34.243 sec]:s8023.D# [Count] [Linear]





Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):

Trace Metals Verification by ICP-MS (µg/mL)

Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.02	Tb	<0.02	W	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Ho	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	U	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	<0.02	Os	<0.01	Rh	<0.02	Ag	<0.02	Tl	<0.02	V	T
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.2	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
B	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02

(T)= Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- * All standard containers are meticulously cleaned prior to use.
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.
- * All Standards should be stored with caps tight and under appropriate laboratory conditions.
- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).



Certified Reference Material CRM
MS228 R: 07/05/22



CERTIFIED WEIGHT REPORT:

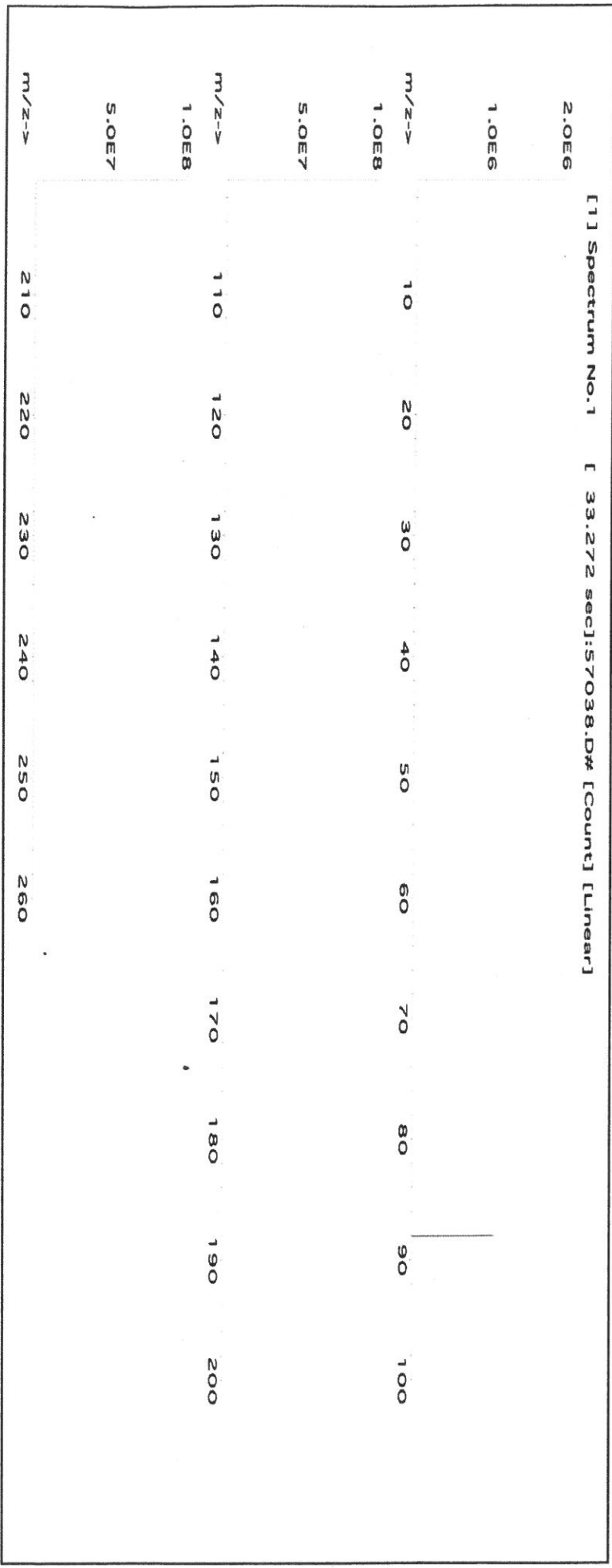
Part Number: 57038
Lot Number: 073021
Description: Strontium (Sr)

Lot # 20370011
Solvent: Nitric Acid

Expiration Date: 073024
Recommended Storage: Ambient (20 °C)
Nominal Concentration (µg/mL): 1000
NIST Test Number: 6LUTB
Volume shown below was diluted to (mL): 3000.41
Balance Uncertainty: 5E-05
Flask Uncertainty: 0.058

Giovanni Esposito	
Formulated By:	Giovanni Esposito
Reviewed By:	Pedro L. Rentas
	073021

SDS Information									
Compound	Part Number	Lot Number	Dilution Factor	Initial Vol. (mL)	Uncertainty (mL)	Nominal Conc. (µg/mL)	Initial Conc. (µg/mL)	Final Conc. (µg/mL)	Expanded Uncertainty +/- (µg/mL)
Strontium nitrate (Sr)	58138	062321	0.1000	300.0	0.084	1000	10000.1	1000.0	2.1
									10042-76-9 NA or-1at 2750mg/kg 3153a





Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):

Trace Metals Verification by ICP-MS (µg/mL)

Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Ho	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Tc	<0.02	U	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	Ti	<0.02	V	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Ru	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Bc	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.02	Sb	<0.02	Sr	T	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
B	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	Tl	<0.02	Zr	<0.02

(T) = Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- * All standard containers are meticulously cleaned prior to use.
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.
- * All Standards should be stored with caps tight and under appropriate laboratory conditions.
- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).



M5289 R: 07/12/22
Certified Reference Material CRM

34



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CERTIFIED WEIGHT REPORT:

Part Number: 58113
Lot Number: 070622
Description: Aluminum (Al)

Lot #
Solvent: 20370011 Nitric Acid

Expiration Date: 070625
Recommended Storage: Ambient (20 °C)
Nominal Concentration (µg/mL): 10000
NIST Test Number: 6UTB

2% 40.0 Nitric Acid
(mL)

Weight shown below was diluted to (mL): 2000.02 0.058 Balance Uncertainty
Flask Uncertainty

Formulated By:	Lawrence Barry
070622	
Reviewed By:	Pedro L. Renteria
070622	

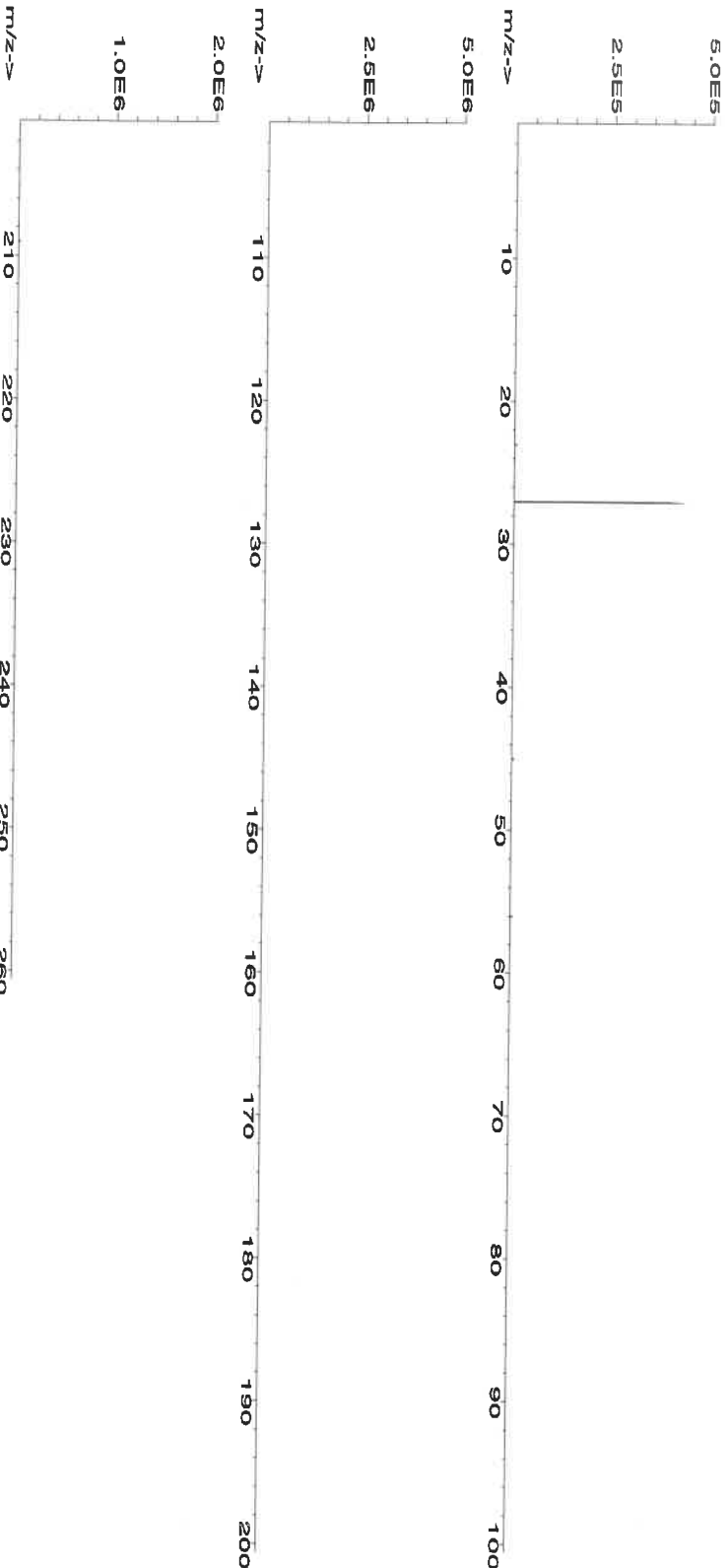
Compound

RM#	Lot Number	Nominal Conc. (µg/mL)	Purity (%)	Uncertainty Purity (%)	Assay (%)	Target Weight (g)	Actual Weight (g)	Actual Conc. (µg/mL)	Expanded Uncertainty +/- (µg/mL)	CAS#	OSHA PEL (TWA)	LD50	NIST SRM
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SDS Information

1. Aluminum nitrate nonahydrate (Al) IN022 ALD012021A1 10000 99.999 0.10 7.10 281.6956 281.6977 10000.1 20.0 7784-27-2 2 mg/m3 or-tal 3671 mg/kg 3101a

[1] Spectrum No. 1 [15.014 sec]:58113.D# [Count] [Linear]





Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):

Trace Metals Verification by ICP-MS (µg/mL)

Al	T	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pt	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Ho	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	U	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	Tl	<0.02	V	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Ru	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.02	Sr	<0.02	S	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	Ta	<0.02	Sn	<0.02	Zn	<0.02
B	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Ti	<0.02	Ti	<0.02	Zr	<0.02

(T) = Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- * All standard containers are meticulously cleaned prior to use.
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.
- * All Standards should be stored with caps tight and under appropriate laboratory conditions.
- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).



Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):

Trace Metals Verification by ICP-MS (µg/mL)																	
Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.10	Pr	<0.02	Se	<0.2	Tb	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Ho	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.01	Mg	<0.02	Os	<0.02	Rh	<0.02	Ag	<0.02	Tl	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ir	<0.10	Mn	<0.02	Pd	<0.02	Rb	<0.2	Na	<0.02	Th	<0.02
Be	<0.01	Cr	<0.5	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02
Bi	<0.02	Co	<0.10	Ge	<0.10	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02
B	<0.02	Cu	<0.10	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	Ti	<0.02
																W	<0.02
																U	<0.02
																V	<0.02
																Yb	<0.02
																Y	<0.02
																Zn	<0.02
																Zr	<0.02

(T)= Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- * All standard containers are meticulously cleaned prior to use.
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.
- * All Standards should be stored with caps tight and under appropriate laboratory conditions.
- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).



Certified Reference Material CRM



ANAB ISO 17034 Accredited
AP-1539 Certificate Number
<https://AbsoluteStandards.com>

CERTIFIED WEIGHT REPORT:

Part Number: 58112
Lot Number: 071222
Description: Magnesium (Mg)

Solvent: 20510011 Nitric Acid

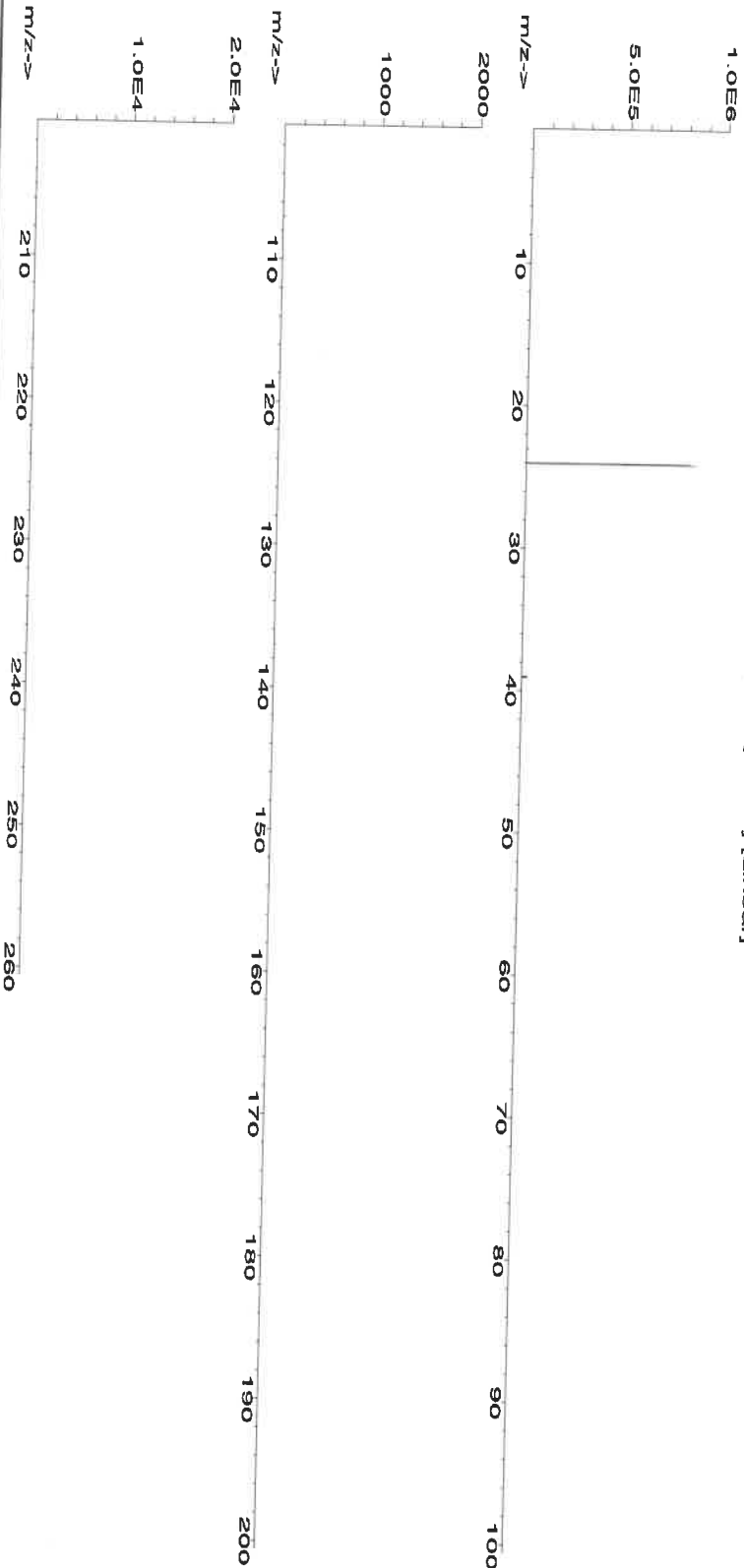
Expiration Date: 071225
Recommended Storage: Ambient (20 °C)
Nominal Concentration (µg/mL): 10000
NIST Test Number: 6UTB
Weight shown below was diluted to (mL): 3000.41
5E-05 Balance Uncertainty
0.058 Flask Uncertainty

<i>Giovanni Esposito</i>	
Formulated By:	Giovanni Esposito
Reviewed By:	<i>Pedro L. Rentas</i>
	071222

Compound	Lot Number	Nominal Conc. (µg/mL)	Purity (%)	Uncertainty Purity (%)	Assay (%)	Target Weight (g)	Actual Weight (g)	Actual Conc. (µg/mL)	Expanded Uncertainty +/- (µg/mL)	CAS#	OSHA PEL (TWA)	LD50	NIST SRM
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1. Magnesium nitrate hexahydrate (Mg) IN030 MGMT1021A1 10000 99.999 0.10 8.74 343.2213 343.2264 10000.1 20.0 13446-18-9 NA or-rat 5440 mg/kg 3131a

[1] Spectrum No. 1 [19.923 sec]:58112.D# [Count] [Linear]





Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):

Trace Metals Verification by ICP-MS (µg/mL)

Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pt	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Ho	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	U	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	T	Os	<0.02	Rh	<0.02	Ag	<0.02	Tl	<0.02	V	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
B	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02

(T) = Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- * All standard containers are meticulously cleaned prior to use.
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.
- * All Standards should be stored with caps tight and under appropriate laboratory conditions.
- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).



R. 02/20/20
S

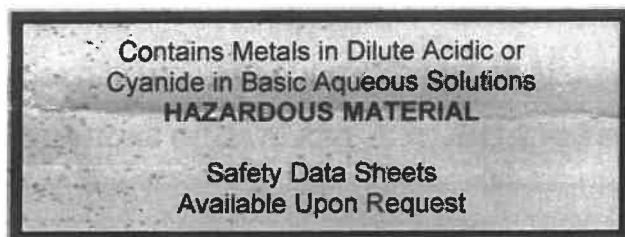
Instructions for QATS Reference Material: *Inorganic ICV Solutions*

QATS LABORATORY INORGANIC REFERENCE MATERIAL
INITIAL CALIBRATION VERIFICATION SOLUTIONS
(ICV1, ICV5, AND ICV6)

NOTE: These instructions are for advisory purposes only. If any apparent conflict exists between these instructions and the analytical protocol or your contract, disregard these instructions.

APPLICATION: For use with CLP SOWs and revisions.

CAUTION: Read instructions carefully before opening bottle(s) and proceeding with the analyses.



M5291

M5292

M5293

M5294

M5295

BD

(A) **SAMPLE DESCRIPTION**

Enclosed is a set of one (1) or more Aqueous Inorganic Reference Materials containing various analyte concentrations. ICV1 and ICV5 are in a matrix of dilute nitric acid. ICV6 is in a matrix of dilute basic solution. **For the reference material source in reporting ICVs use "USEPA". For the reference material lot number for the ICV1, ICV5, and ICV6 solutions use "ICV1-1014", "ICV5-0415", and "ICV6-0400", respectively.**

(B) **BREAKAGE OR MISSING ITEMS**

Check the contents of the shipment carefully for any broken, leaking, or missing items. Check that the seal is intact on each bottle. Refer to the enclosed chain-of-custody record. Report any problems to Mr. Keith Strout, APTIM Federal Services, LLC, at (702) 895-8722. If requested, return the chain-of-custody record with appropriate annotations and signatures to the address provided below.

QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY
APTIM Federal Services, LLC
2700 Chandler Avenue - Building C
Las Vegas, NV 89120

(C) **ANALYSIS OF SAMPLES**

The Initial Calibration Verification Solutions (ICVs) are to be used to evaluate the accuracy of the initial calibrations of ICP, AA, and Cyanide colorimetric instruments, and are to be used with the CLP SOWs and revisions. The values for each element in the ICVs are listed below in µg/L (ppb) for the resulting solution(s) after the dilution of the concentrate(s) according to the following instructions. Use Class 'A' glassware to prepare the solution(s).

ICV1-1014 For ICP-AES use: dilute the ICV1 concentrate 10-fold with 2% (v/v) nitric acid; pipet 10 mL of the concentrate into a 100 mL volumetric flask and dilute to volume with 2% (v/v) nitric acid.



QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY
"An ISO 9001:2015 Certified Program"

R: 02/20/20
53

Instructions for QATS Reference Material: *Inorganic ICV Solutions*

For ICP-MS use: dilute the ICV1 concentrate 50-fold with 1% (v/v) nitric acid; pipet 2 mL of the concentrate into a 100 mL volumetric flask and dilute to volume with 1% (v/v) nitric acid.

ICV5-0415 For the cold vapor analysis of mercury by AA: dilute the ICV5 concentrate 100-fold with 2% (v/v) nitric acid; pipet 1 mL of the concentrate into a 100 mL volumetric flask and dilute to volume with 2% (v/v) nitric acid. The ICV5 concentrate is prepared in 0.05% (w/v) $K_2Cr_2O_7$ and 5% (v/v) nitric acid.

ICV6-0400 For the analysis of cyanide: dilute the ICV6 concentrate 100-fold with Type II water; pipet 1 mL of the concentrate into a 100 mL volumetric flask and dilute to volume with Type II water. Distill this solution along with the samples before analysis. The cyanide concentrate is prepared from $K_3Fe(CN)_6$, Type II water, and 0.1 % sodium hydroxide, and will decompose rapidly if exposed to light.

NOTE: USE TYPE II WATER AND HIGH-PURITY ACIDS FOR ALL DILUTIONS.

(D) **CERTIFIED CONCENTRATIONS OF QATS ICV1, ICV5, AND ICV6 SOLUTIONS**

ICV1-1014		
Element	Concentration ($\mu\text{g/L}$) (after 10-fold dilution)	Concentration ($\mu\text{g/L}$) (after 50-fold dilution)
Al	2520	504
Sb	1010	202
As	997	199
Ba	518	104
Be	514	103
Cd	514	103
Ca	10000	2000
Cr	517	103
Co	521	104
Cu	505	101
Fe	10100	2020
Pb	1030	206
Mg	5990	1198
Mn	524	105
Ni	525	105
K	9940	1988
Se	1030	206
Ag	252	50
Na	10100	2020
Tl	1040	208
V	504	101
Zn	1010	202

ICV5-0415		ICV6-0400	
Element	Concentration ($\mu\text{g/L}$) (after 100-fold dilution)	Analyte	Concentration ($\mu\text{g/L}$) (after 100-fold dilution)
Hg	4.0	CN ⁻	99



R-09/18/22 (RH)
Certified Reference Material CRM

MS387 - MS389 - MS390 - MS391 - MS392



CERTIFIED WEIGHT REPORT:

Part Number: 57056
Lot Number: 072122
Description: Barium (Ba)

Solvent: 20510011 Nitric Acid

Lot #

Expiration Date: 072125
Recommended Storage: Ambient (20 °C)
Nominal Concentration (µg/mL): 1000
NIST Test Number: 6UTB
Weight shown below was diluted to (mL): 2000.02 0.058 Balance Uncertainty
5E-05 Flask Uncertainty

2% 40.0 (mL) Nitric Acid

<i>Giovanni Esposito</i>	
Formulated By:	Giovanni Esposito
Reviewed By:	<i>Pedro L. Renteria</i>
	072122

SDS Information									
Compound	Lot Number	Nominal Conc. (µg/mL)	Purity (%)	Uncertainty (%)	Assay (%)	Target Weight (g)	Actual Weight (g)	Actual Conc. (µg/mL)	Expanded Uncertainty +/- (µg/mL)
1. Barium nitrate (Ba)	IN023 BA022019A1	1000	99.899	0.10	52.3	3.82417	3.82426	1000.0	2.0
									10022-31-8
									0.5 mg/m3
									or -at 355 mg/kg 31046

[1] Spectrum No. 1 [12.514 sec]:58156.D# [Count] [Linear]





Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):

Trace Metals Verification by ICP-MS (µg/mL)																	
Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.02	Tb	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Ho	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	<0.02	Os	<0.01	Rh	<0.02	Ag	<0.02	Tl	<0.02
Ba	T	Cs	<0.02	Gd	<0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.02	Th	<0.02
Be	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.02	Hg	<0.2	P	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02
B	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	Ti	<0.02

(T)= Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- * All standard containers are meticulously cleaned prior to use.
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.
- * All Standards should be stored with caps tight and under appropriate laboratory conditions.
- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

Hydrochloric Acid, 36.5–38.0%
BAKER INSTRA–ANALYZED® Reagent
For Trace Metal Analysis



M5408 M5409 M5410

Material No.: 9530–33
Batch No.: 22E1662006
Manufactured Date: 2022–04–11
Retest Date: 2027–04–10
Revision No.: 0

Certificate of Analysis

Test	Specification	Result
ACS – Assay (as HCl) (by acid–base titrn)	36.5 – 38.0 %	37.6 %
ACS – Color (APHA)	≤ 10	5
ACS – Residue after Ignition	≤ 3 ppm	< 1 ppm
ACS – Specific Gravity at 60°/60°F	1.185 – 1.192	1.190
ACS – Bromide (Br)	≤ 0.005 %	< 0.005 %
ACS – Extractable Organic Substances	≤ 5 ppm	< 1 ppm
ACS – Free Chlorine (as Cl ₂)	≤ 0.5 ppm	< 0.5 ppm
Phosphate (PO ₄)	≤ 0.05 ppm	< 0.03 ppm
Sulfate (SO ₄)	≤ 0.5 ppm	< 0.3 ppm
Sulfite (SO ₃)	≤ 0.8 ppm	0.3 ppm
Ammonium (NH ₄)	≤ 3 ppm	< 1 ppm
Trace Impurities – Arsenic (As)	≤ 0.010 ppm	< 0.003 ppm
Trace Impurities – Aluminum (Al)	≤ 10.0 ppb	< 0.2 ppb
Arsenic and Antimony (as As)	≤ 5.0 ppb	< 3.0 ppb
Trace Impurities – Barium (Ba)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Beryllium (Be)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Bismuth (Bi)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities – Boron (B)	≤ 20.0 ppb	< 5.0 ppb
Trace Impurities – Cadmium (Cd)	≤ 1.0 ppb	< 0.3 ppb
Trace Impurities – Calcium (Ca)	≤ 50.0 ppb	37.0 ppb
Trace Impurities – Chromium (Cr)	≤ 1.0 ppb	< 0.4 ppb
Trace Impurities – Cobalt (Co)	≤ 1.0 ppb	< 0.3 ppb
Trace Impurities – Copper (Cu)	≤ 1.0 ppb	< 0.1 ppb
Trace Impurities – Gallium (Ga)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Germanium (Ge)	≤ 3.0 ppb	< 2.0 ppb
Trace Impurities – Gold (Au)	≤ 4.0 ppb	0.2 ppb
Heavy Metals (as Pb)	≤ 100 ppb	< 50 ppb
Trace Impurities – Iron (Fe)	≤ 15 ppb	1 ppb

>>> Continued on page 2 >>>

Test	Specification	Result
Trace Impurities – Lead (Pb)	≤ 1.0 ppb	< 0.5 ppb
Trace Impurities – Lithium (Li)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Magnesium (Mg)	≤ 10.0 ppb	1.0 ppb
Trace Impurities – Manganese (Mn)	≤ 1.0 ppb	< 0.4 ppb
Trace Impurities – Mercury (Hg)	≤ 0.5 ppb	0.1 ppb
Trace Impurities – Molybdenum (Mo)	≤ 10.0 ppb	< 3.0 ppb
Trace Impurities – Nickel (Ni)	≤ 4.0 ppb	< 0.3 ppb
Trace Impurities – Niobium (Nb)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Potassium (K)	≤ 9.0 ppb	< 2.0 ppb
Trace Impurities – Selenium (Se), For Information Only		1.0 ppb
Trace Impurities – Silicon (Si)	≤ 100.0 ppb	< 0.4 ppb
Trace Impurities – Silver (Ag)	≤ 1.0 ppb	< 0.3 ppb
Trace Impurities – Sodium (Na)	≤ 100.0 ppb	1.9 ppb
Trace Impurities – Strontium (Sr)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Tantalum (Ta)	≤ 1.0 ppb	< 0.9 ppb
Trace Impurities – Thallium (Tl)	≤ 5.0 ppb	< 2.0 ppb
Trace Impurities – Tin (Sn)	≤ 5.0 ppb	< 0.8 ppb
Trace Impurities – Titanium (Ti)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Vanadium (V)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Zinc (Zn)	≤ 5.0 ppb	< 0.3 ppb
Trace Impurities – Zirconium (Zr)	≤ 1.0 ppb	< 0.1 ppb

>>> Continued on page 3 >>>

Hydrochloric Acid, 36.5–38.0%
BAKER INSTRA–ANALYZED® Reagent
For Trace Metal Analysis



Material No.: 9530–33
Batch No.: 22E1662006

Test	Specification	Result
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For Laboratory, Research, or Manufacturing Use
Product Information (not specifications):
Appearance (clear, fuming liquid)
Meets ACS Specifications
Storage Condition: Store below 25 °C.

Country of Origin: USA
Packaging Site: Phillipsburg Mfg Ctr & DC


Jamie Ethier
Vice President Global Quality

For questions on this Certificate of Analysis please contact Technical Services at 855.282.6867 or +1.610.386.1700
Avantor Performance Materials, LLC
100 Matsonford Rd, Suite 200, Radnor, PA 19087. U.S.A. Phone 610.386.1700

Nitric Acid
CMOS



M5411 M5412 M5413
M5414 M5415

Material No.: 9606-03
Batch No.: 22B0862001
Manufactured Date: 2022-01-28
Retest Date: 2027-01-27
Revision No.: 0

Certificate of Analysis

Test	Specification	Result
Assay (HNO ₃)	69.0 - 70.0 %	69.7 %
Appearance	Passes Test	Passes Test
Color (APHA)	≤ 10	5
Residue after Ignition	≤ 2 ppm	< 1 ppm
Chloride (Cl)	≤ 0.08 ppm	< 0.03 ppm
Phosphate (PO ₄)	≤ 0.10 ppm	< 0.03 ppm
Sulfate (SO ₄)	≤ 0.2 ppm	< 0.2 ppm
Trace Impurities - Aluminum (Al)	≤ 40.0 ppb	< 1.0 ppb
Arsenic and Antimony (as As)	≤ 5.0 ppb	< 2.0 ppb
Trace Impurities - Barium (Ba)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Beryllium (Be)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Bismuth (Bi)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities - Boron (B)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Cadmium (Cd)	≤ 50 ppb	< 1 ppb
Trace Impurities - Calcium (Ca)	≤ 50.0 ppb	1.5 ppb
Trace Impurities - Chromium (Cr)	≤ 30.0 ppb	2.3 ppb
Trace Impurities - Cobalt (Co)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Copper (Cu)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Gallium (Ga)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Germanium (Ge)	≤ 20 ppb	< 10 ppb
Trace Impurities - Gold (Au)	≤ 20 ppb	< 5 ppb
Heavy Metals (as Pb)	≤ 100 ppb	< 50 ppb
Trace Impurities - Iron (Fe)	≤ 40.0 ppb	< 1.0 ppb
Trace Impurities - Lead (Pb)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities - Lithium (Li)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Magnesium (Mg)	≤ 20 ppb	< 1 ppb
Trace Impurities - Manganese (Mn)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Nickel (Ni)	≤ 20.0 ppb	< 5.0 ppb

>>> Continued on page 2 >>>

For questions on this Certificate of Analysis please contact Technical Services at 855.282.6867 or +1.610.386.1700
Avantor Performance Materials, LLC
100 Matsonford Rd, Suite 200, Radnor, PA 19087. U.S.A. Phone 610.386.1700

Nitric Acid
CMOS



Material No.: 9606-03
Batch No.: 22B0862001

Test	Specification	Result
Trace Impurities - Niobium (Nb)	≤ 50.0 ppb	< 1.0 ppb
Trace Impurities - Potassium (K)	≤ 50 ppb	< 10 ppb
Trace Impurities - Silicon (Si)	≤ 50 ppb	< 10 ppb
Trace Impurities - Silver (Ag)	≤ 20.0 ppb	< 1.0 ppb
Trace Impurities - Sodium (Na)	≤ 150.0 ppb	< 5.0 ppb
Trace Impurities - Strontium (Sr)	≤ 30.0 ppb	< 1.0 ppb
Trace Impurities - Tantalum (Ta)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Thallium (Tl)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Tin (Sn)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities - Titanium (Ti)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Vanadium (V)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Zinc (Zn)	≤ 20.0 ppb	< 1.0 ppb
Trace Impurities - Zirconium (Zr)	≤ 10.0 ppb	< 1.0 ppb
Particle Count - 0.5 µm and greater	≤ 60 par/ml	4 par/ml
Particle Count - 1.0 µm and greater	≤ 10 par/ml	1 par/ml

>>> Continued on page 3 >>>

For questions on this Certificate of Analysis please contact Technical Services at 855.282.6867 or +1.610.386.1700
Avantor Performance Materials, LLC
100 Matsonford Rd, Suite 200, Radnor, PA 19087. U.S.A. Phone 610.386.1700

Nitric Acid
CMOS



Material No.: 9606-03
Batch No.: 22B0862001

Test	Specification	Result
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For Microelectronic Use
Country of Origin: USA
Packaging Site: Phillipsburg Mfg Ctr & DC


Jamie Ethier
Vice President Global Quality

For questions on this Certificate of Analysis please contact Technical Services at 855.282.6867 or +1.610.386.1700
Avantor Performance Materials, LLC
100 Matsonford Rd, Suite 200, Radnor, PA 19087. U.S.A. Phone 610.386.1700

Nitric Acid
CMOS



M5411 M5412 M5413
M5414 M5415

Material No.: 9606-03
Batch No.: 22B0862001
Manufactured Date: 2022-01-28
Retest Date: 2027-01-27
Revision No.: 0

Certificate of Analysis

Test	Specification	Result
Assay (HNO ₃)	69.0 - 70.0 %	69.7 %
Appearance	Passes Test	Passes Test
Color (APHA)	≤ 10	5
Residue after Ignition	≤ 2 ppm	< 1 ppm
Chloride (Cl)	≤ 0.08 ppm	< 0.03 ppm
Phosphate (PO ₄)	≤ 0.10 ppm	< 0.03 ppm
Sulfate (SO ₄)	≤ 0.2 ppm	< 0.2 ppm
Trace Impurities - Aluminum (Al)	≤ 40.0 ppb	< 1.0 ppb
Arsenic and Antimony (as As)	≤ 5.0 ppb	< 2.0 ppb
Trace Impurities - Barium (Ba)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Beryllium (Be)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Bismuth (Bi)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities - Boron (B)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Cadmium (Cd)	≤ 50 ppb	< 1 ppb
Trace Impurities - Calcium (Ca)	≤ 50.0 ppb	1.5 ppb
Trace Impurities - Chromium (Cr)	≤ 30.0 ppb	2.3 ppb
Trace Impurities - Cobalt (Co)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Copper (Cu)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Gallium (Ga)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Germanium (Ge)	≤ 20 ppb	< 10 ppb
Trace Impurities - Gold (Au)	≤ 20 ppb	< 5 ppb
Heavy Metals (as Pb)	≤ 100 ppb	< 50 ppb
Trace Impurities - Iron (Fe)	≤ 40.0 ppb	< 1.0 ppb
Trace Impurities - Lead (Pb)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities - Lithium (Li)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Magnesium (Mg)	≤ 20 ppb	< 1 ppb
Trace Impurities - Manganese (Mn)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Nickel (Ni)	≤ 20.0 ppb	< 5.0 ppb

>>> Continued on page 2 >>>

For questions on this Certificate of Analysis please contact Technical Services at 855.282.6867 or +1.610.386.1700
Avantor Performance Materials, LLC
100 Matsonford Rd, Suite 200, Radnor, PA 19087. U.S.A. Phone 610.386.1700

Nitric Acid
CMOS



Material No.: 9606-03
Batch No.: 22B0862001

Test	Specification	Result
Trace Impurities - Niobium (Nb)	≤ 50.0 ppb	< 1.0 ppb
Trace Impurities - Potassium (K)	≤ 50 ppb	< 10 ppb
Trace Impurities - Silicon (Si)	≤ 50 ppb	< 10 ppb
Trace Impurities - Silver (Ag)	≤ 20.0 ppb	< 1.0 ppb
Trace Impurities - Sodium (Na)	≤ 150.0 ppb	< 5.0 ppb
Trace Impurities - Strontium (Sr)	≤ 30.0 ppb	< 1.0 ppb
Trace Impurities - Tantalum (Ta)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Thallium (Tl)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Tin (Sn)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities - Titanium (Ti)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Vanadium (V)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Zinc (Zn)	≤ 20.0 ppb	< 1.0 ppb
Trace Impurities - Zirconium (Zr)	≤ 10.0 ppb	< 1.0 ppb
Particle Count - 0.5 µm and greater	≤ 60 par/ml	4 par/ml
Particle Count - 1.0 µm and greater	≤ 10 par/ml	1 par/ml

>>> Continued on page 3 >>>

For questions on this Certificate of Analysis please contact Technical Services at 855.282.6867 or +1.610.386.1700
Avantor Performance Materials, LLC
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Nitric Acid
CMOS



Material No.: 9606-03
Batch No.: 22B0862001

Test	Specification	Result
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For Microelectronic Use
Country of Origin: USA
Packaging Site: Phillipsburg Mfg Ctr & DC


Jamie Ethier
Vice President Global Quality

For questions on this Certificate of Analysis please contact Technical Services at 855.282.6867 or +1.610.386.1700
Avantor Performance Materials, LLC
100 Matsonford Rd, Suite 200, Radnor, PA 19087. U.S.A. Phone 610.386.1700

Hydrochloric Acid, 36.5–38.0%
BAKER INSTRA–ANALYZED® Reagent
For Trace Metal Analysis



M5416 M5417 M5418
M5419 M5420 M5421

Material No.: 9530–33
Batch No.: 22D1462006
Manufactured Date: 2022–02–24
Retest Date: 2027–02–23
Revision No.: 0

Certificate of Analysis

Test	Specification	Result
ACS – Assay (as HCl) (by acid–base titrn)	36.5 – 38.0 %	37.6 %
ACS – Color (APHA)	≤ 10	5
ACS – Residue after Ignition	≤ 3 ppm	< 1 ppm
ACS – Specific Gravity at 60°/60°F	1.185 – 1.192	1.190
ACS – Bromide (Br)	≤ 0.005 %	< 0.005 %
ACS – Extractable Organic Substances	≤ 5 ppm	< 1 ppm
ACS – Free Chlorine (as Cl ₂)	≤ 0.5 ppm	< 0.5 ppm
Phosphate (PO ₄)	≤ 0.05 ppm	< 0.03 ppm
Sulfate (SO ₄)	≤ 0.5 ppm	< 0.5 ppm
Sulfite (SO ₃)	≤ 0.8 ppm	0.3 ppm
Ammonium (NH ₄)	≤ 3 ppm	< 1 ppm
Trace Impurities – Arsenic (As)	≤ 0.010 ppm	< 0.003 ppm
Trace Impurities – Aluminum (Al)	≤ 10.0 ppb	0.2 ppb
Arsenic and Antimony (as As)	≤ 5.0 ppb	< 3.0 ppb
Trace Impurities – Barium (Ba)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Beryllium (Be)	≤ 1.0 ppb	< 1.0 ppb
Trace Impurities – Bismuth (Bi)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities – Boron (B)	≤ 20.0 ppb	1.4 ppb
Trace Impurities – Cadmium (Cd)	≤ 1.0 ppb	< 0.3 ppb
Trace Impurities – Calcium (Ca)	≤ 50.0 ppb	48.0 ppb
Trace Impurities – Chromium (Cr)	≤ 1.0 ppb	< 0.4 ppb
Trace Impurities – Cobalt (Co)	≤ 1.0 ppb	< 0.3 ppb
Trace Impurities – Copper (Cu)	≤ 1.0 ppb	< 0.1 ppb
Trace Impurities – Gallium (Ga)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Germanium (Ge)	≤ 3.0 ppb	< 2.0 ppb
Trace Impurities – Gold (Au)	≤ 4.0 ppb	0.2 ppb
Heavy Metals (as Pb)	≤ 100 ppb	< 50 ppb
Trace Impurities – Iron (Fe)	≤ 15 ppb	2 ppb

>>> Continued on page 2 >>>

Hydrochloric Acid, 36.5–38.0%
BAKER INSTRA-ANALYZED® Reagent
For Trace Metal Analysis



Material No.: 9530-33
Batch No.: 22D1462006

Test	Specification	Result
Trace Impurities – Lead (Pb)	≤ 1.0 ppb	< 0.5 ppb
Trace Impurities – Lithium (Li)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Magnesium (Mg)	≤ 10.0 ppb	0.7 ppb
Trace Impurities – Manganese (Mn)	≤ 1.0 ppb	< 0.4 ppb
Trace Impurities – Mercury (Hg)	≤ 0.5 ppb	< 0.1 ppb
Trace Impurities – Molybdenum (Mo)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities – Nickel (Ni)	≤ 4.0 ppb	< 0.3 ppb
Trace Impurities – Niobium (Nb)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Potassium (K)	≤ 9.0 ppb	< 2.0 ppb
Trace Impurities – Selenium (Se), For Information Only		< 1.0 ppb
Trace Impurities – Silicon (Si)	≤ 100.0 ppb	< 10.0 ppb
Trace Impurities – Silver (Ag)	≤ 1.0 ppb	< 0.3 ppb
Trace Impurities – Sodium (Na)	≤ 100.0 ppb	< 5.0 ppb
Trace Impurities – Strontium (Sr)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Tantalum (Ta)	≤ 1.0 ppb	< 0.9 ppb
Trace Impurities – Thallium (Tl)	≤ 5.0 ppb	< 0.9 ppb
Trace Impurities – Tin (Sn)	≤ 5.0 ppb	< 0.8 ppb
Trace Impurities – Titanium (Ti)	≤ 1.0 ppb	0.3 ppb
Trace Impurities – Vanadium (V)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Zinc (Zn)	≤ 5.0 ppb	0.5 ppb
Trace Impurities – Zirconium (Zr)	≤ 1.0 ppb	< 0.1 ppb

>>> Continued on page 3 >>>

Hydrochloric Acid, 36.5–38.0%
BAKER INSTRA–ANALYZED® Reagent
For Trace Metal Analysis



Material No.: 9530–33
Batch No.: 22D1462006

Test	Specification	Result
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For Laboratory, Research, or Manufacturing Use
Product Information (not specifications):
Appearance (clear, fuming liquid)
Meets ACS Specifications
Storage Condition: Store below 25 °C.

Country of Origin: USA
Packaging Site: Phillipsburg Mfg Ctr & DC


Jamie Ethier
Vice President Global Quality

For questions on this Certificate of Analysis please contact Technical Services at 855.282.6867 or +1.610.386.1700

Avantor Performance Materials, LLC

100 Matsonford Rd, Suite 200, Radnor, PA 19087. U.S.A. Phone 610.386.1700

Nitric Acid
CMOS



M5423 M5424 M5425
M5426 M5427 M5428

Material No.: 9606-03
Batch No.: 22C0462001
Manufactured Date: 2022-02-11
Retest Date: 2027-02-10
Revision No.: 0

Certificate of Analysis

Test	Specification	Result
Assay (HNO ₃)	69.0 - 70.0 %	69.4 %
Appearance	Passes Test	Passes Test
Color (APHA)	≤ 10	5
Residue after Ignition	≤ 2 ppm	< 1 ppm
Chloride (Cl)	≤ 0.08 ppm	< 0.03 ppm
Phosphate (PO ₄)	≤ 0.10 ppm	< 0.03 ppm
Sulfate (SO ₄)	≤ 0.2 ppm	< 0.2 ppm
Trace Impurities - Aluminum (Al)	≤ 40.0 ppb	< 1.0 ppb
Arsenic and Antimony (as As)	≤ 5.0 ppb	< 2.0 ppb
Trace Impurities - Barium (Ba)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Beryllium (Be)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Bismuth (Bi)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities - Boron (B)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Cadmium (Cd)	≤ 50 ppb	< 1 ppb
Trace Impurities - Calcium (Ca)	≤ 50.0 ppb	1.2 ppb
Trace Impurities - Chromium (Cr)	≤ 30.0 ppb	1.7 ppb
Trace Impurities - Cobalt (Co)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Copper (Cu)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Gallium (Ga)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Germanium (Ge)	≤ 20 ppb	< 10 ppb
Trace Impurities - Gold (Au)	≤ 20 ppb	< 5 ppb
Heavy Metals (as Pb)	≤ 100 ppb	< 50 ppb
Trace Impurities - Iron (Fe)	≤ 40.0 ppb	< 1.0 ppb
Trace Impurities - Lead (Pb)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities - Lithium (Li)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Magnesium (Mg)	≤ 20 ppb	< 1 ppb
Trace Impurities - Manganese (Mn)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Nickel (Ni)	≤ 20.0 ppb	< 5.0 ppb

>>> Continued on page 2 >>>

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Nitric Acid
CMOS



Material No.: 9606-03
Batch No.: 22C0462001

Test	Specification	Result
Trace Impurities - Niobium (Nb)	≤ 50.0 ppb	< 1.0 ppb
Trace Impurities - Potassium (K)	≤ 50 ppb	< 10 ppb
Trace Impurities - Silicon (Si)	≤ 50 ppb	< 10 ppb
Trace Impurities - Silver (Ag)	≤ 20.0 ppb	< 1.0 ppb
Trace Impurities - Sodium (Na)	≤ 150.0 ppb	< 5.0 ppb
Trace Impurities - Strontium (Sr)	≤ 30.0 ppb	< 1.0 ppb
Trace Impurities - Tantalum (Ta)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Thallium (Tl)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Tin (Sn)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities - Titanium (Ti)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Vanadium (V)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Zinc (Zn)	≤ 20.0 ppb	< 1.0 ppb
Trace Impurities - Zirconium (Zr)	≤ 10.0 ppb	< 1.0 ppb
Particle Count - 0.5 µm and greater	≤ 60 par/ml	7 par/ml
Particle Count - 1.0 µm and greater	≤ 10 par/ml	2 par/ml

>>> Continued on page 3 >>>

For questions on this Certificate of Analysis please contact Technical Services at 855.282.6867 or +1.610.386.1700
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Nitric Acid
CMOS



Material No.: 9606-03
Batch No.: 22C0462001

Test	Specification	Result
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For Microelectronic Use
Country of Origin: USA
Packaging Site: Phillipsburg Mfg Ctr & DC


Jamie Ethier
Vice President Global Quality

For questions on this Certificate of Analysis please contact Technical Services at 855.282.6867 or +1.610.386.1700
Avantor Performance Materials, LLC
100 Matsonford Rd, Suite 200, Radnor, PA 19087. U.S.A. Phone 610.386.1700

Nitric Acid
CMOS



M5423 M5424 M5425
M5426 M5427 M5428

Material No.: 9606-03
Batch No.: 22C0462001
Manufactured Date: 2022-02-11
Retest Date: 2027-02-10
Revision No.: 0

Certificate of Analysis

Test	Specification	Result
Assay (HNO ₃)	69.0 - 70.0 %	69.4 %
Appearance	Passes Test	Passes Test
Color (APHA)	≤ 10	5
Residue after Ignition	≤ 2 ppm	< 1 ppm
Chloride (Cl)	≤ 0.08 ppm	< 0.03 ppm
Phosphate (PO ₄)	≤ 0.10 ppm	< 0.03 ppm
Sulfate (SO ₄)	≤ 0.2 ppm	< 0.2 ppm
Trace Impurities - Aluminum (Al)	≤ 40.0 ppb	< 1.0 ppb
Arsenic and Antimony (as As)	≤ 5.0 ppb	< 2.0 ppb
Trace Impurities - Barium (Ba)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Beryllium (Be)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Bismuth (Bi)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities - Boron (B)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Cadmium (Cd)	≤ 50 ppb	< 1 ppb
Trace Impurities - Calcium (Ca)	≤ 50.0 ppb	1.2 ppb
Trace Impurities - Chromium (Cr)	≤ 30.0 ppb	1.7 ppb
Trace Impurities - Cobalt (Co)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Copper (Cu)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Gallium (Ga)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Germanium (Ge)	≤ 20 ppb	< 10 ppb
Trace Impurities - Gold (Au)	≤ 20 ppb	< 5 ppb
Heavy Metals (as Pb)	≤ 100 ppb	< 50 ppb
Trace Impurities - Iron (Fe)	≤ 40.0 ppb	< 1.0 ppb
Trace Impurities - Lead (Pb)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities - Lithium (Li)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Magnesium (Mg)	≤ 20 ppb	< 1 ppb
Trace Impurities - Manganese (Mn)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Nickel (Ni)	≤ 20.0 ppb	< 5.0 ppb

>>> Continued on page 2 >>>

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Nitric Acid
CMOS



Material No.: 9606-03
Batch No.: 22C0462001

Test	Specification	Result
Trace Impurities - Niobium (Nb)	≤ 50.0 ppb	< 1.0 ppb
Trace Impurities - Potassium (K)	≤ 50 ppb	< 10 ppb
Trace Impurities - Silicon (Si)	≤ 50 ppb	< 10 ppb
Trace Impurities - Silver (Ag)	≤ 20.0 ppb	< 1.0 ppb
Trace Impurities - Sodium (Na)	≤ 150.0 ppb	< 5.0 ppb
Trace Impurities - Strontium (Sr)	≤ 30.0 ppb	< 1.0 ppb
Trace Impurities - Tantalum (Ta)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Thallium (Tl)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Tin (Sn)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities - Titanium (Ti)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Vanadium (V)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Zinc (Zn)	≤ 20.0 ppb	< 1.0 ppb
Trace Impurities - Zirconium (Zr)	≤ 10.0 ppb	< 1.0 ppb
Particle Count - 0.5 µm and greater	≤ 60 par/ml	7 par/ml
Particle Count - 1.0 µm and greater	≤ 10 par/ml	2 par/ml

>>> Continued on page 3 >>>

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Nitric Acid
CMOS



Material No.: 9606-03
Batch No.: 22C0462001

Test	Specification	Result
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For Microelectronic Use
Country of Origin: USA
Packaging Site: Phillipsburg Mfg Ctr & DC


Jamie Ethier
Vice President Global Quality

For questions on this Certificate of Analysis please contact Technical Services at 855.282.6867 or +1.610.386.1700
Avantor Performance Materials, LLC
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Hydrochloric Acid, 36.5–38.0%
BAKER INSTRA–ANALYZED® Reagent
For Trace Metal Analysis



Material No.: 9530–33
Batch No.: 22E1662006
Manufactured Date: 2022–04–11
Retest Date: 2027–04–10
Revision No.: 0

Certificate of Analysis

Test	Specification	Result
ACS – Assay (as HCl) (by acid–base titrn)	36.5 – 38.0 %	37.6 %
ACS – Color (APHA)	≤ 10	5
ACS – Residue after Ignition	≤ 3 ppm	< 1 ppm
ACS – Specific Gravity at 60°/60°F	1.185 – 1.192	1.190
ACS – Bromide (Br)	≤ 0.005 %	< 0.005 %
ACS – Extractable Organic Substances	≤ 5 ppm	< 1 ppm
ACS – Free Chlorine (as Cl ₂)	≤ 0.5 ppm	< 0.5 ppm
Phosphate (PO ₄)	≤ 0.05 ppm	< 0.03 ppm
Sulfate (SO ₄)	≤ 0.5 ppm	< 0.3 ppm
Sulfite (SO ₃)	≤ 0.8 ppm	0.3 ppm
Ammonium (NH ₄)	≤ 3 ppm	< 1 ppm
Trace Impurities – Arsenic (As)	≤ 0.010 ppm	< 0.003 ppm
Trace Impurities – Aluminum (Al)	≤ 10.0 ppb	< 0.2 ppb
Arsenic and Antimony (as As)	≤ 5.0 ppb	< 3.0 ppb
Trace Impurities – Barium (Ba)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Beryllium (Be)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Bismuth (Bi)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities – Boron (B)	≤ 20.0 ppb	< 5.0 ppb
Trace Impurities – Cadmium (Cd)	≤ 1.0 ppb	< 0.3 ppb
Trace Impurities – Calcium (Ca)	≤ 50.0 ppb	37.0 ppb
Trace Impurities – Chromium (Cr)	≤ 1.0 ppb	< 0.4 ppb
Trace Impurities – Cobalt (Co)	≤ 1.0 ppb	< 0.3 ppb
Trace Impurities – Copper (Cu)	≤ 1.0 ppb	< 0.1 ppb
Trace Impurities – Gallium (Ga)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Germanium (Ge)	≤ 3.0 ppb	< 2.0 ppb
Trace Impurities – Gold (Au)	≤ 4.0 ppb	0.2 ppb
Heavy Metals (as Pb)	≤ 100 ppb	< 50 ppb
Trace Impurities – Iron (Fe)	≤ 15 ppb	1 ppb

>>> Continued on page 2 >>>

Hydrochloric Acid, 36.5–38.0%
BAKER INSTRA–ANALYZED® Reagent
For Trace Metal Analysis



Material No.: 9530–33
Batch No.: 22E1662006

Test	Specification	Result
Trace Impurities – Lead (Pb)	≤ 1.0 ppb	< 0.5 ppb
Trace Impurities – Lithium (Li)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Magnesium (Mg)	≤ 10.0 ppb	1.0 ppb
Trace Impurities – Manganese (Mn)	≤ 1.0 ppb	< 0.4 ppb
Trace Impurities – Mercury (Hg)	≤ 0.5 ppb	0.1 ppb
Trace Impurities – Molybdenum (Mo)	≤ 10.0 ppb	< 3.0 ppb
Trace Impurities – Nickel (Ni)	≤ 4.0 ppb	< 0.3 ppb
Trace Impurities – Niobium (Nb)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Potassium (K)	≤ 9.0 ppb	< 2.0 ppb
Trace Impurities – Selenium (Se), For Information Only		1.0 ppb
Trace Impurities – Silicon (Si)	≤ 100.0 ppb	< 0.4 ppb
Trace Impurities – Silver (Ag)	≤ 1.0 ppb	< 0.3 ppb
Trace Impurities – Sodium (Na)	≤ 100.0 ppb	1.9 ppb
Trace Impurities – Strontium (Sr)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Tantalum (Ta)	≤ 1.0 ppb	< 0.9 ppb
Trace Impurities – Thallium (Tl)	≤ 5.0 ppb	< 2.0 ppb
Trace Impurities – Tin (Sn)	≤ 5.0 ppb	< 0.8 ppb
Trace Impurities – Titanium (Ti)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Vanadium (V)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Zinc (Zn)	≤ 5.0 ppb	< 0.3 ppb
Trace Impurities – Zirconium (Zr)	≤ 1.0 ppb	< 0.1 ppb

>>> Continued on page 3 >>>

Hydrochloric Acid, 36.5–38.0%
BAKER INSTRA–ANALYZED® Reagent
For Trace Metal Analysis



Material No.: 9530–33
Batch No.: 22E1662006

Test	Specification	Result
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For Laboratory, Research, or Manufacturing Use
Product Information (not specifications):
Appearance (clear, fuming liquid)
Meets ACS Specifications
Storage Condition: Store below 25 °C.

Country of Origin: USA
Packaging Site: Phillipsburg Mfg Ctr & DC


Jamie Ethier
Vice President Global Quality

For questions on this Certificate of Analysis please contact Technical Services at 855.282.6867 or +1.610.386.1700

Avantor Performance Materials, LLC

100 Matsonford Rd, Suite 200, Radnor, PA 19087. U.S.A. Phone 610.386.1700



Refine your results. Redefine your industry.

Certificate of Analysis

300 Technology Drive
Christiansburg, VA 24073 USA
inorganicventures.com

P: 800-669-6799/540-585-3030
F: 540-585-3012
info@inorganicventures.com

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code:	Multi Analyte Custom Grade Solution
Catalog Number:	WW-LFS-1
Lot Number:	S2-MEB710999
Matrix:	5% (v/v) HNO ₃

Value / Analyte(s):	1 000 µg/mL ea: Potassium,	
	600 µg/mL ea: Phosphorus,	
	300 µg/mL ea: Sodium,	Iron,
	200 µg/mL ea: Magnesium, Cerium, Thallium,	Aluminum, Selenium,
	100 µg/mL ea: Lead,	Calcium,
	80 µg/mL ea: Arsenic,	
	70 µg/mL ea: Mercury,	
	50 µg/mL ea: Nickel,	
	40 µg/mL ea: Chromium,	
	30 µg/mL ea: Copper, Vanadium,	Boron,
	20 µg/mL ea: Zinc, Barium, Cadmium, Manganese,	Strontium, Beryllium, Cobalt, Lithium,
	7.5 µg/mL ea: Silver	

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE	CERTIFIED VALUE	ANALYTE	CERTIFIED VALUE
Aluminum, Al	200.0 ± 0.7 µg/mL	Arsenic, As	80.0 ± 0.5 µg/mL
Barium, Ba	20.00 ± 0.09 µg/mL	Beryllium, Be	20.00 ± 0.10 µg/mL
Boron, B	30.00 ± 0.20 µg/mL	Cadmium, Cd	20.00 ± 0.09 µg/mL
Calcium, Ca	100.0 ± 0.4 µg/mL	Cerium, Ce	200.0 ± 0.8 µg/mL
Chromium, Cr	40.00 ± 0.20 µg/mL	Cobalt, Co	20.00 ± 0.09 µg/mL
Copper, Cu	30.00 ± 0.13 µg/mL	Iron, Fe	300.0 ± 1.3 µg/mL
Lead, Pb	100.0 ± 0.5 µg/mL	Lithium, Li	20.00 ± 0.09 µg/mL
Magnesium, Mg	200.0 ± 0.8 µg/mL	Manganese, Mn	20.00 ± 0.09 µg/mL
Mercury, Hg	70.0 ± 0.3 µg/mL	Nickel, Ni	50.00 ± 0.22 µg/mL
Phosphorus, P	600.0 ± 2.7 µg/mL	Potassium, K	1 000 ± 4 µg/mL
Selenium, Se	200.0 ± 1.6 µg/mL	Silver, Ag	7.50 ± 0.05 µg/mL
Sodium, Na	300.0 ± 1.1 µg/mL	Strontium, Sr	20.00 ± 0.09 µg/mL
Thallium, Tl	200.0 ± 1.4 µg/mL	Vanadium, V	30.00 ± 0.13 µg/mL
Zinc, Zn	20.00 ± 0.09 µg/mL		

Density: 1.037 g/mL (measured at 20 ± 4 °C)

Assay Information:

ANALYTE	METHOD	NIST SRM#	SRM LOT#
Ag	ICP Assay	3151	160729
Ag	Volhard	999c	999c
Ag	Calculated		See Sec. 4.2
Al	ICP Assay	3101a	140903
Al	EDTA	928	928
As	ICP Assay	3103a	100818
B	ICP Assay	3107	110830
Ba	ICP Assay	3104a	140909
Ba	Calculated		See Sec. 4.2
Ba	Gravimetric		See Sec. 4.2
Be	ICP Assay	3105a	090514
Be	Calculated		See Sec. 4.2
Ca	ICP Assay	3109a	130213
Ca	EDTA	928	928
Ca	Calculated		See Sec. 4.2
Cd	ICP Assay	3108	130116
Cd	EDTA	928	928
Cd	Calculated		See Sec. 4.2
Ce	ICP Assay	3110	090504
Ce	EDTA	928	928
Co	ICP Assay	3113	190630
Co	EDTA	928	928
Co	Calculated		See Sec. 4.2
Cr	ICP Assay	3112a	170630
Cr	Calculated		See Sec. 4.2
Cu	ICP Assay	3114	121207
Cu	EDTA	928	928
Cu	Calculated		See Sec. 4.2
Fe	ICP Assay	3126a	140812
Fe	EDTA	928	928
Hg	ICP Assay	3133	061204
Hg	EDTA	928	928
K	ICP Assay	3141a	140813
K	Gravimetric		See Sec. 4.2
Li	ICP Assay	3129a	100714
Li	Calculated		See Sec. 4.2
Li	Gravimetric		See Sec. 4.2
Mg	ICP Assay	3131a	140110
Mg	EDTA	928	928
Mn	ICP Assay	3132	050429
Mn	EDTA	928	928
Mn	Calculated		See Sec. 4.2
Na	ICP Assay	3152a	120715
Na	Gravimetric		See Sec. 4.2
Ni	ICP Assay	3136	120619
Ni	EDTA	928	928
Ni	Calculated		See Sec. 4.2
P	ICP Assay	3139a	060717
P	Acidimetric	84L	84L

Pb	ICP Assay	3128	101026
Pb	EDTA	928	928
Se	ICP Assay	3149	100901
Sr	EDTA	928	928
Sr	ICP Assay	Traceable to 3153a	K2-SR650985
Sr	Calculated		See Sec. 4.2
Tl	ICP Assay	3158	151215
V	ICP Assay	3165	160906
V	EDTA	928	928
Zn	ICP Assay	3168a	120629
Zn	EDTA	928	928
Zn	Calculated		See Sec. 4.2

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{\text{CRM/RM}}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{\text{CRM/RM}} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{\text{char } i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{\text{char } i})^2 / (\sum(1/(u_{\text{char } i})^2))$$

$$\text{CRM/RM Expanded Uncertainty } (\pm) = U_{\text{CRM/RM}} = k(u_{\text{char}}^2 + u_{\text{bb}}^2 + u_{\text{Its}}^2 + u_{\text{ts}}^2)^{1/2}$$

k = coverage factor = 2

$u_{\text{char}} = [\sum(w_i)^2(u_{\text{char } i})^2]^{1/2}$ where $u_{\text{char } i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{\text{CRM/RM}}$, where one method of characterization is used is the mean of individual results:

$$X_{\text{CRM/RM}} = (X_a)(u_{\text{char } a})$$

X_a = mean of Assay Method A with

$u_{\text{char } a}$ = the standard uncertainty of characterization Method A

$$\text{CRM/RM Expanded Uncertainty } (\pm) = U_{\text{CRM/RM}} = k(u_{\text{char } a}^2 + u_{\text{bb}}^2 + u_{\text{Its}}^2 + u_{\text{ts}}^2)^{1/2}$$

k = coverage factor = 2

$u_{\text{char } a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

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

N/A

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Low Silver Note: This solution contains "LOW" levels of Silver. Please store this entire bottle inside a sealed glass jar.

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

October 18, 2021

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **October 18, 2025**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Director, Quality Control



Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Multi Analyte Custom Grade Solution
 Catalog Number: WW-LFS-2
 Lot Number: R2-MEB693161
 Matrix: 5% (v/v) HNO₃
 tr. HF
 Value / Analyte(s):
 200 µg/mL ea:
 Silica,
 80 µg/mL ea:
 Antimony,
 70 µg/mL ea:
 Tin,
 40 µg/mL ea:
 Molybdenum,
 20 µg/mL ea:
 Titanium

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE	CERTIFIED VALUE	ANALYTE	CERTIFIED VALUE
Antimony, Sb	80.0 ± 0.6 µg/mL	Molybdenum, Mo	40.00 ± 0.17 µg/mL
Silica, SiO ₂	200.0 ± 1.5 µg/mL	Tin, Sn	70.0 ± 0.3 µg/mL
Titanium, Ti	20.00 ± 0.12 µg/mL		

Density: 1.024 g/mL (measured at 20 ± 4 °C)

Assay Information:

ANALYTE	METHOD	NIST SRM#	SRM LOT#
Mo	ICP Assay	3134	130418
Mo	Calculated		See Sec. 4.2
Sb	ICP Assay	3102a	140911
SiO ₂	Calculated		See Sec. 4.2
Sn	ICP Assay	3161a	070330
Ti	ICP Assay	3162a	130925
Ti	Calculated		See Sec. 4.2

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{\text{CRM/RM}}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{\text{CRM/RM}} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{\text{char } i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{\text{char } i}^2) / (\sum(1/u_{\text{char } i}^2))$$

$$\text{CRM/RM Expanded Uncertainty } (\pm) = U_{\text{CRM/RM}} = k(u_{\text{char}}^2 + u_{\text{bb}}^2 + u_{\text{Its}}^2 + u_{\text{ts}}^2)^{1/2}$$

k = coverage factor = 2

$u_{\text{char}} = [\sum(w_i)^2(u_{\text{char } i}^2)]^{1/2}$ where $u_{\text{char } i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{\text{CRM/RM}}$, where one method of characterization is used is the mean of individual results:

$$X_{\text{CRM/RM}} = (X_a)(u_{\text{char } a})$$

X_a = mean of Assay Method A with

$u_{\text{char } a}$ = the standard uncertainty of characterization Method A

$$\text{CRM/RM Expanded Uncertainty } (\pm) = U_{\text{CRM/RM}} = k(u_{\text{char } a}^2 + u_{\text{bb}}^2 + u_{\text{Its}}^2 + u_{\text{ts}}^2)^{1/2}$$

k = coverage factor = 2

$u_{\text{char } a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

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

N/A

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

HF Note: This standard should not be prepared or stored in glass.

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

May 20, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- May 20, 2024

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



SHIPPING DOCUMENTS

CHEMTECH

CHAIN OF CUSTODY RECORD

284 Sheffield Street, Mountainside, NJ 07092

(908) 789-8900 Fax: (908) 78-8922

www.chemtech.net

Chemtech Project Number:

01232/33

COC Number:

CLIENT INFORMATION

COMPANY: Louis Berger dba WSP USA Inc.

ADDRESS: 350 Mt. Kemble Ave

CITY: Morristown STATE: NJ ZIP: 07962

ATTENTION: Jonathan Ganz (Jon.Ganz@wsp.com)

PHONE: 212-612-7995

FAX:

PROJECT INFORMATION

PROJECT NAME: HWR1140A PCSMP Ph II SCI

PROJECT #: 31202661.297 Task 02 LOCATION: Staten Island

PROJECT MANAGER: Jon Ganz

E-MAIL: Jon.Ganz@wsp.com

PHONE: 212-612-7995

FAX:

BILLING INFORMATION

BILL TO: Louis Berger

PO# 31202661.297 Task 02

ADDRESS: 350 Mt. Kemble Ave

CITY: Morristown

STATE: NJ ZIP: 07962

ATTENTION: Jon Ganz

PHONE: 212-612-7995

DATA TURNAROUND INFORMATION

TAX: _____ DAYS
HARD COPY: _____ DAYS*
EDD See Contract Rates below DAYS*
* TO BE APPROVED BY CHEMTECH
STANDARD TURNAROUND TIME IS 10 BUSINESS DAYS

TCL VOC - 2 days

TCL SVOC - 5 days

PAH - 5 days

TPH GRO/DRO - 3 days

TAL Metals - 5 Days

PCBs and Pesticides - 5 Day

TCLP RCRA Metals - 5 Day

RCRA Characteristics and Paint Filter - 3 Days

DATA DELIVERABLE INFORMATION

- ☐ RESULTS ONLY ☐ USEPA CLP
☐ RESULTS + QC ☐ New York State ASP "B"
☐ New Jersey REDUCED ☐ New York State ASP "A"
☐ New Jersey CLP ☐ Other _____

Level 2

☐ EDD Format

ANALYSIS

TCL VOC (8260C)	TCL SVOC (8270C/625)	TCL Pest (8081A/608)	PCB (3550B, 8082/608)	TAL Metals (7471A and 6010B)	PCBs (8082), PAHs (8270)	TCLP Metals (RCRA 8) EPA 1311/ 6010B	RCRA Char- EPA 9012B/9034, 1030/1010A, 9045C, 9095B	TPH-DRO/GRO (8015B)	Paint Filter Test (EPA 9095B)
1	2	3	4	5	6	7	8	9	

PRESERVATIVES

COMMENTS

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE		SAMPLE COLLECTION		# of Bottles	Preservatives									Comments ← Specify Preservatives A-HCl B-HNO3 C-H2SO4 D-NaOH E-ICE F-Other
			COMP	GRAB	DATE	TIME		1	2	3	4	5	6	7	8	9	
1.	B-P17A	507		X	1/18/23	0950	1	X	X	X	X	X					
2.	B-P17B	508		X	1/18/23	1005	1	X	X	X	X	X					
3.	W017	509	X		1/18/23	1010	1						X	X	X	X	
4.	B-P18A			X	1/18/23	1025		X	X	X	X	X					
5.	B-P18B			X	1/18/23	1045		X	X	X	X	X					
6.	B-P19A			X	1/18/23	1125		X	X	X	X	X					
7.	B-P19B			X	1/18/23	1135		X	X	X	X	X					
8.	B-P35A			X	1/18/23	1225		X	X	X	X	X					
9.	B-P35B			X	1/18/23	1245		X	X	X	X	X					
10.	DUPO1			X				X	X	X	X	X					

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER	DATE/TIME	RECEIVED BY	1333	Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non Compliant ☐ Cooler Temp <u>3.0</u>
1. <i>[Signature]</i>	1/19/23	<i>[Signature]</i>	1-19-23	MeOH extraction requires an additional 4oz. Jar for percent solid
RELINQUISHED BY	DATE/TIME	RECEIVED BY		Comments:
2. <i>[Signature]</i>	1-19-23	2. <i>[Signature]</i>		
RELINQUISHED BY	DATE/TIME	RECEIVED FOR LAB BY		SHIPPED VIA: CLIENT: ☐ Hand Delivered ☐ Overnight
3. <i>[Signature]</i>	1-19-23	3. <i>[Signature]</i>		CHEMTECH: ☐ Picked Up ☐ Overnight
				Shipment Complete ☐ YES ☐ NO

Page 1 of 3

WHITE - CHEMTECH COPY FOR RETURN TO CLIENT

YELLOW - CHEMTECH COPY

PINK - SAMPLER COPY

CHEMTECH CHAIN OF CUSTODY RECORD		284 Sheffield Street, Mountainside, NJ 07092 (908) 789-8900 Fax: (908) 78-8922 www.chemtech.net		Chemtech Project Number: <u>01232/33</u>																																					
CLIENT INFORMATION		PROJECT INFORMATION		BILLING INFORMATION																																					
COMPANY: Louis Berger dba WSP USA Inc. ADDRESS: 350 Mt. Kemble Ave CITY: Morristown STATE: NJ ZIP: 07962 ATTENTION: Jonathan Ganz (Jon.Ganz@wsp.com) PHONE: 212-612-7995 FAX:		PROJECT NAME: HWR1140A PCSMP Ph II SCI PROJECT #: 31202661.297 Task 02 LOCATION: Staten Island PROJECT MANAGER: Jon Ganz E-MAIL: Jon.Ganz@wsp.com PHONE: 212-612-7995 FAX:		BILL TO: Louis Berger PO# 31202661.297 Task 02 ADDRESS: 350 Mt. Kemble Ave CITY: Morristown STATE: NJ ZIP: 07962 ATTENTION: Jon Ganz PHONE: 212-612-7995																																					
DATA TURNAROUND INFORMATION		DATA DELIVERABLE INFORMATION		ANALYSIS																																					
FAX: _____ DAYS HARD COPY: _____ DAYS* EDD See Contract Rates below DAYS* * TO BE APPROVED BY CHEMTECH STANDARD TURNAROUND TIME IS 10 BUSINESS DAYS TCL VOC - 2 days TCL SVOC - 5 days PAH - 5 days TPH GRO/DRO - 3 days TAL Metals - 5 Days PCBs and Pesticides - 5 Day TCLP RCRA Metals - 5 Day RCRA Characteristics and Paint Filter - 3 Days		☐ RESULTS ONLY ☐ USEPA CLP ☐ RESULTS + QC ☐ New York State ASP "B" ☐ New Jersey REDUCED ☐ New York State ASP "A" ☐ New Jersey CLP ☐ Other _____ Level 2 ☐ EDD Format _____		<table border="1" style="width:100%; border-collapse: collapse; font-size: 0.8em;"> <tr> <th style="writing-mode: vertical-rl; transform: rotate(180deg);">TCL VOC (8260C)</th> <th style="writing-mode: vertical-rl; transform: rotate(180deg);">TCL SVOC (8270C/625)</th> <th style="writing-mode: vertical-rl; transform: rotate(180deg);">TCL Pest (8081A/608)</th> <th style="writing-mode: vertical-rl; transform: rotate(180deg);">PCB (3550B, 8082/608)</th> <th style="writing-mode: vertical-rl; transform: rotate(180deg);">TAL Metals (7471A and 6010B)</th> <th style="writing-mode: vertical-rl; transform: rotate(180deg);">PCBs (8082), PAHs (8270)</th> <th style="writing-mode: vertical-rl; transform: rotate(180deg);">TCLP Metals (RCRA 8)</th> <th style="writing-mode: vertical-rl; transform: rotate(180deg);">EPA 1311/6010B</th> <th style="writing-mode: vertical-rl; transform: rotate(180deg);">RCRA Char- EPA 9012B/9034, 1030/1010A, 9045C, 9095B</th> <th style="writing-mode: vertical-rl; transform: rotate(180deg);">TPH-DRO/GRO (8015B), Paint Filter Test (EPA 9095B)</th> </tr> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td> </tr> </table>		TCL VOC (8260C)	TCL SVOC (8270C/625)	TCL Pest (8081A/608)	PCB (3550B, 8082/608)	TAL Metals (7471A and 6010B)	PCBs (8082), PAHs (8270)	TCLP Metals (RCRA 8)	EPA 1311/6010B	RCRA Char- EPA 9012B/9034, 1030/1010A, 9045C, 9095B	TPH-DRO/GRO (8015B), Paint Filter Test (EPA 9095B)	1	2	3	4	5	6	7	8	9																	
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RELINQUISHED BY SAMPLER 1. <u>[Signature]</u>		DATE/TIME 1/19/23		RECEIVED BY <u>[Signature]</u>		Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non Compliant ☐ Cooler Temp <u>3.0</u> MeOH extraction requires an additional 4oz. Jar for percent solid ☐ Ice in Cooler?: _____ Comments:																																			
RELINQUISHED BY 2. <u>[Signature]</u>		DATE/TIME 1-19-23		RECEIVED BY <u>[Signature]</u>																																					
RELINQUISHED BY 3. <u>[Signature]</u>		DATE/TIME 1-19-23		RECEIVED FOR LAB BY <u>[Signature]</u>		Page <u>3</u> of <u>3</u>				SHIPPED VIA: CLIENT: ☐ Hand Delivered ☐ Overnight CHEMTECH: ☐ Picked Up ☐ Overnight				Shipment Complete ☐ YES ☐ NO																											
WHITE - CHEMTECH COPY FOR RETURN TO CLIENT YELLOW - CHEMTECH COPY PINK - SAMPLER COPY																																									



284 Sheffield Street, Mountainside NJ 07092 (908)-789-8900 Fax : 908 789 8922

Laboratory Certification

Certified By	License No.
CAS EPA CLP Contract	68HERH20D0011
Connecticut	PH-0649
DOD ELAP (L-A-B)	L2219
Maine	2022022
Maryland	296
New Hampshire	255422
New Jersey	20012
New York	11376
Pennsylvania	68-00548
Soil Permit	P330-21-00137
Texas	T104704488-22-15



LOGIN REPORT/SAMPLE TRANSFER

Order ID : O1232 loui01
Client Name : Louis Berger U.S., Inc., A V
Client Contact : Jonathan Ganz
Invoice Name : Louis Berger U.S., Inc., A V
Invoice Contact : Jonathan Ganz

Order Date : 1/19/2023 1:44:00 PM
Project Name : NYCDDC Phase II SCI Artl
Receive DateTime : 1/19/2023 12:00:00 AM
Purchase Order : 18:05

Project Mgr :
Report Type : Level 1
EDD Type : Excel NY
Hard Copy Date :
Date Signoff :

LAB ID	CLIENT ID	MATRIX	SAMPLE DATE	SAMPLE TIME	TEST	TEST GROUP	METHOD	FAX DATE	DUE DATES
O1232-01	B-P-17A	Solid	01/18/2023	09:50	VOC-TCLVOA-10		8260D	2 Bus. Days	
O1232-02	B-P-17B	Solid	01/18/2023	10:05	VOC-TCLVOA-10		8260D	2 Bus. Days	
O1232-04	B-P-18A	Solid	01/18/2023	10:25	VOC-TCLVOA-10		8260D	2 Bus. Days	
O1232-05	B-P-18B	Solid	01/18/2023	10:45	VOC-TCLVOA-10		8260D	2 Bus. Days	
O1232-06	B-P-19A	Solid	01/18/2023	11:25	VOC-TCLVOA-10		8260D	2 Bus. Days	
O1232-07	B-P-19B	Solid	01/18/2023	11:35	VOC-TCLVOA-10		8260D	2 Bus. Days	
O1232-08	B-P-35A	Solid	01/18/2023	12:25	VOC-TCLVOA-10		8260D	2 Bus. Days	
O1232-09	B-P-35B	Solid	01/18/2023	12:45	VOC-TCLVOA-10		8260D	2 Bus. Days	
O1232-10	DUP01	Solid	01/18/2023	00:00					

LOGIN REPORT/SAMPLE TRANSFER

Order ID : O1232 loui01	Order Date : 1/19/2023 1:44:00 PM	Project Mgr :
Client Name : Louis Berger U.S., Inc., A V	Project Name : NYCDDC Phase II SCI Artl	Report Type : Level 1
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Invoice Contact : Jonathan Ganz		Date Signoff :

LAB ID	CLIENT ID	MATRIX	SAMPLE DATE	SAMPLE TIME	TEST	TEST GROUP	METHOD	FAX DATE	DUE DATES
					VOC-TCLVOA-10		8260D	2 Bus. Days	

*JAN
samples*

*stored in roa
#22 #02*

Relinquished By : *cl*
Date / Time : 1/20/23 9:20

Received By : *mmTadu*
Date / Time : 1/20/23 9:20

Storage Area : VOA Refridgerator Room