FAC #: 313340
Document #: 2225557
Date: 05/23/2013

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

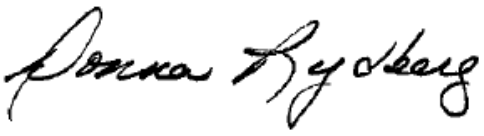
ANALYTICAL REPORT

Job Number: 280-42446-2

Job Description: Tatonka Culverwell

For:
Colorado Oil&Gas Conservation Commision
1120 Lincoln St.
Suite 801
Denver, CO 80203

Attention: Mr. Alex Fischer



Approved for release.
Donna R Rydberg
Project Manager II
5/29/2013 4:20 PM

Donna R Rydberg, Project Manager II
4955 Yarrow Street, Arvada, CO, 80002
(303)736-0192
donna.rydberg@testamericainc.com
05/29/2013

The test results in this report relate only to the samples in this report and meet all requirements of NELAC, with any exceptions noted. Pursuant to NELAP, this report shall not be reproduced except in full, without the written approval of the laboratory. All questions regarding this report should be directed to the TestAmerica Denver Project Manager.

The Lab Certification ID# is E87667.

Reporting limits are adjusted for sample size used, dilutions and moisture content if applicable.

Table of Contents

Table of Contents

CASE NARRATIVE

Client: Colorado Oil&Gas Conservation Commission

Project: Tatonka Culverwell

Report Number: 280-42446-2

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

RECEIPT
One sample was received at the TestAmerica Denver laboratory on May 17, 2013. The sample arrived in good condition, properly preserved and on ice. The temperature of the cooler at receipt was 5.6ºC.

VOLATILE ORGANIC COMPOUNDS (GC-MS)
Sample 0516131315 (280-42446-5) was analyzed for volatile organic compounds (GC-MS) in accordance with EPA SW-846 Method 8260B.

No difficulties were encountered during the VOC analysis.

All quality control parameters were within the acceptance limits.

SEMIVOLATILE ORGANIC COMPOUNDS (GC-MS)
Sample 0516131315 (280-42446-5) was analyzed for semivolatile organic compounds (GC-MS) in accordance with EPA SW-846 Method 8270C.

No difficulties were encountered during the SVOC analysis.

All quality control parameters were within the acceptance limits.

GASOLINE RANGE ORGANICS (GRO)
Sample 0516131315 (280-42446-5) was analyzed for gasoline range organics (GRO) in accordance with EPA SW-846 Method 8015B - GRO.

No difficulties were encountered during the GRO analysis.

All quality control parameters were within the acceptance limits.

DIESEL RANGE ORGANICS
Sample 0516131315 (280-42446-5) was analyzed for diesel range organics in accordance with EPA SW-846 Method 8015B - DRO.

No difficulties were encountered during the DRO analysis.

All quality control parameters were within the acceptance limits.

SODIUM ABSORPTION RATIO
Sample 0516131315 (280-42446-5) was analyzed for Sodium Absorption Ratio in accordance with USDA Handbook 60 - 20B.

No difficulties were encountered during the SAR analysis.

All quality control parameters were within the acceptance limits.

TOTAL METALS
Sample 0516131315 (280-42446-5) was analyzed for total metals in accordance with EPA SW-846 Method 6010B.

No difficulties were encountered during the metals analysis.

All quality control parameters were within the acceptance limits.

TOTAL MERCURY
Sample 0516131315 (280-42446-5) was analyzed for total mercury in accordance with EPA SW-846 Method 7471A.

The relative percent difference between the MS and MSD for Mercury exceeded control limits in batch 280-175234. The individual spike recoveries were in control. No further action was required.

No other difficulties were encountered during the mercury analysis.

All other quality control parameters were within the acceptance limits.

SPECIFIC CONDUCTIVITY
Sample 0516131315 (280-42446-5) was analyzed for specific conductivity in accordance with SM20 2510B.

No difficulties were encountered during the conductivity analysis.

All quality control parameters were within the acceptance limits.

HEXAVALENT CHROMIUM
Sample 0516131315 (280-42446-5) was analyzed for hexavalent chromium in accordance with EPA SW-846 Method 3060A/7196A.

Sample 0516131315 (280-42446-5) required a 1.02X dilution prior to analysis. The reporting limit was raised accordingly.

No other anomalies were observed.

TRIVALENT CHROMIUM
Sample 0516131315 (280-42446-5) was analyzed for Trivalent Chromium in accordance with SW-846 7196A_CR3.

No difficulties were encountered during the trivalent chromium analysis.

All quality control parameters were within the acceptance limits.

PH
Sample 0516131315 (280-42446-5) was analyzed for pH in accordance with EPA SW-846 Method 9045C.

No difficulties were encountered during the pH analysis.

All quality control parameters were within the acceptance limits.

SAMPLE SUMMARY

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

Lab Sample ID	Client Sample ID	Client Matrix	Date/Time Sampled	Date/Time Received
280-42446-5	0516131315	Solid	05/16/2013 1315	05/17/2013 1641

EXECUTIVE SUMMARY - Detections

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

Lab Sample ID / Analyte	Client Sample ID	Result	Qualifier	Reporting Limit	Units	Method
280-42446-5	**0516131315**					
Arsenic		2.9		1.8	mg/Kg	6010B
Barium		140		0.92	mg/Kg	6010B
Copper		6.2		1.8	mg/Kg	6010B
Lead		3.1		0.73	mg/Kg	6010B
Zinc		17		2.8	mg/Kg	6010B
Cr (III)		4.7		2.0	mg/Kg	7196A
Cr		4.7		2.0	mg/Kg	7196A
Soluble						
Sodium		12000		10000	ug/Kg	20B
Calcium		560000		2000	ug/Kg	20B
Magnesium		13000		2000	ug/Kg	20B
pH adj. to 25 deg C-Soluble		9.13		0.100	SU	9045C
Temperature-Soluble		21.9		1.00	Degrees C	9045C
Specific Conductance-Soluble		34		2.0	umhos/cm	SM 2510B

METHOD SUMMARY

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

Description	Lab Location	Method	Preparation Method
Matrix: Solid			
Volatile Organic Compounds (GC/MS)	TAL DEN	SW846 8260B	
Purge and Trap	TAL DEN		SW846 5030B
Semivolatile Organic Compounds (GC/MS)	TAL DEN	SW846 8270C	
Ultrasonic Extraction	TAL DEN		SW846 3550C
Gasoline Range Organics - (GC)	TAL DEN	SW846 8015B	
Purge and Trap	TAL DEN		SW846 5030B
Diesel Range Organics (DRO) (GC)	TAL DEN	SW846 8015B	
Microwave Extraction	TAL DEN		SW846 3546
Sodium Adsorption Ratio	TAL DEN	USDA 20B	
Preparation, Sodium Absorption Ratio	TAL DEN		USDA 20B
Metals (ICP)	TAL DEN	SW846 6010B	
Preparation, Metals	TAL DEN		SW846 3050B
Mercury (CVAA)	TAL DEN	SW846 7471A	
Preparation, Mercury	TAL DEN		SW846 7471A
Chromium, Hexavalent	TAL DEN	SW846 7196A	
Alkaline Digestion (Chromium, Hexavalent)	TAL DEN		SW846 3060A
Chromium, Trivalent (Colorimetric)	TAL DEN	SW846 7196A	
pH	TAL DEN	SW846 9045C	
Deionized Water Leaching Procedure	TAL DEN		ASTM DI Leach
Conductivity, Specific Conductance	TAL DEN	SM SM 2510B	
Deionized Water Leaching Procedure	TAL DEN		ASTM DI Leach

Lab References:

TAL DEN = TestAmerica Denver

Method References:

ASTM = ASTM International

SM = "Standard Methods For The Examination Of Water And Wastewater"

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

USDA = "USDA Agriculture Handbook 60, section 20B".

METHOD / ANALYST SUMMARY

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

Method	Analyst	Analyst ID
SW846 8260B	Seifert, Judy	JS
SW846 8270C	Kiekel, Daniel C	DCK
SW846 8015B	Moore, Tegan E	TEM
SW846 8015B	Birdsell, Matthew R	MRB
USDA 20B	Harre, John K	JKH
SW846 6010B	Harre, John K	JKH
SW846 7471A	Mooney, Joseph C	JM
SW846 7196A	Gomer, Doug	DG
SW846 7196A	Smith, Matthew P	MPS
SW846 9045C	Ayala, Delaina	DA
SM SM 2510B	Kilker, Lorelei M	LMK

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

Client Sample ID: **0516131315**

Lab Sample ID: 280-42446-5
Client Matrix: Solid

Date Sampled: 05/16/2013 1315
Date Received: 05/17/2013 1641

8260B Volatile Organic Compounds (GC/MS)

Analysis Method:	8260B	Analysis Batch:	280-175392	Instrument ID:	VMS_P
Prep Method:	5030B	Prep Batch:	280-175286	Lab File ID:	P9055.D
Dilution:	1.0			Initial Weight/Volume:	4.963 g
Analysis Date:	05/21/2013 1857			Final Weight/Volume:	1000 mL
Prep Date:	05/21/2013 1355				

Analyte	DryWt Corrected: N	Result (ug/Kg)	Qualifier	RL
Benzene		ND		250
Ethylbenzene		ND		250
Toluene		ND		250
m-Xylene & p-Xylene		ND		250
o-Xylene		ND		130

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	87		50 - 139
Toluene-d8 (Surr)	86		68 - 143
4-Bromofluorobenzene (Surr)	82		62 - 133
Dibromofluoromethane (Surr)	97		60 - 133

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

Client Sample ID: **0516131315**

Lab Sample ID: 280-42446-5
Client Matrix: Solid

Date Sampled: 05/16/2013 1315
Date Received: 05/17/2013 1641

8270C Semivolatile Organic Compounds (GC/MS)

Analysis Method:	8270C	Analysis Batch:	280-175805	Instrument ID:	SMS_K
Prep Method:	3550C	Prep Batch:	280-175318	Lab File ID:	K1762.D
Dilution:	1.0			Initial Weight/Volume:	30.0 g
Analysis Date:	05/24/2013 1622			Final Weight/Volume:	1000 uL
Prep Date:	05/21/2013 1830			Injection Volume:	0.5 uL

Analyte	DryWt Corrected: N	Result (ug/Kg)	Qualifier	RL
Phenanthrene		ND		330
Pyrene		ND		330
Acenaphthene		ND		330
Acenaphthylene		ND		330
Anthracene		ND		330
Benzo[a]anthracene		ND		330
Benzo[b]fluoranthene		ND		330
Benzo[k]fluoranthene		ND		330
Benzo[g,h,i]perylene		ND		330
Benzo[a]pyrene		ND		330
Chrysene		ND		330
Dibenz(a,h)anthracene		ND		330
Fluoranthene		ND		330
Fluorene		ND		330
Indeno[1,2,3-cd]pyrene		ND		330
Naphthalene		ND		330
1-Methylnaphthalene		ND		330
2-Methylnaphthalene		ND		330

Surrogate	%Rec	Qualifier	Acceptance Limits
2-Fluorobiphenyl	73		50 - 120
Nitrobenzene-d5	74		50 - 120
Terphenyl-d14	89		55 - 120

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

Client Sample ID: **0516131315**

Lab Sample ID: 280-42446-5
Client Matrix: Solid

Date Sampled: 05/16/2013 1315
Date Received: 05/17/2013 1641

8015B Gasoline Range Organics - (GC)

Analysis Method:	8015B	Analysis Batch:	280-175231	Instrument ID:	VGC_L
Prep Method:	5030B	Prep Batch:	280-175184	Initial Weight/Volume:	10.03 g
Dilution:	1.0			Final Weight/Volume:	10 mL
Analysis Date:	05/21/2013 1359			Injection Volume:	
Prep Date:	05/21/2013 0722			Result Type:	PRIMARY

Analyte	DryWt Corrected: N	Result (mg/Kg)	Qualifier	RL
Gasoline Range Organics (GRO)-C6-C10		ND		1.2

Surrogate	%Rec	Qualifier	Acceptance Limits
a,a,a-Trifluorotoluene	90		77 - 123

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

Client Sample ID: **0516131315**

Lab Sample ID: 280-42446-5
Client Matrix: Solid

Date Sampled: 05/16/2013 1315
Date Received: 05/17/2013 1641

8015B Diesel Range Organics (DRO) (GC)

Analysis Method:	8015B	Analysis Batch:	280-175601	Instrument ID:	SGC_U
Prep Method:	3546	Prep Batch:	280-175304	Initial Weight/Volume:	31.1 g
Dilution:	1.0			Final Weight/Volume:	1000 uL
Analysis Date:	05/23/2013 1822			Injection Volume:	1 uL
Prep Date:	05/21/2013 1740			Result Type:	PRIMARY

Analyte	DryWt Corrected: N	Result (mg/Kg)	Qualifier	RL
C10-C36		ND		3.9

Surrogate	%Rec	Qualifier	Acceptance Limits
o-Terphenyl	76		49 - 115

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

Client Sample ID: **0516131315**

Lab Sample ID: 280-42446-5
Client Matrix: Solid

Date Sampled: 05/16/2013 1315
Date Received: 05/17/2013 1641

20B Sodium Adsorption Ratio-Soluble

Analysis Method:	20B	Analysis Batch:	280-176257	Instrument ID:	MT_025
Prep Method:	20B	Prep Batch:	280-175617	Lab File ID:	N/A
Dilution:	10			Initial Weight/Volume:	2 g
Analysis Date:	05/29/2013 0711			Final Weight/Volume:	20 mL
Prep Date:	05/28/2013 0800				

Analyte	DryWt Corrected: N	Result (No Unit)	Qualifier	RL
Sodium Adsorption Ratio		ND		1.2
Exchangeable Sodium Percentage		ND		0.50

Analyte	DryWt Corrected: N	Result (ug/Kg)	Qualifier	RL
Sodium		12000		10000
Calcium		560000		2000
Magnesium		13000		2000

6010B Metals (ICP)

Analysis Method:	6010B	Analysis Batch:	280-175593	Instrument ID:	MT_025
Prep Method:	3050B	Prep Batch:	280-175294	Lab File ID:	25A4052213.asc
Dilution:	1.0			Initial Weight/Volume:	1.09 g
Analysis Date:	05/22/2013 2127			Final Weight/Volume:	100 mL
Prep Date:	05/22/2013 1330				

Analyte	DryWt Corrected: N	Result (mg/Kg)	Qualifier	RL
Arsenic		2.9		1.8
Barium		140		0.92
Boron		ND		9.2
Cadmium		ND		0.46
Copper		6.2		1.8
Lead		3.1		0.73
Nickel		ND		3.7
Selenium		ND		1.2
Silver		ND		0.92
Zinc		17		2.8

7471A Mercury (CVAA)

Analysis Method:	7471A	Analysis Batch:	280-175441	Instrument ID:	MT_033
Prep Method:	7471A	Prep Batch:	280-175234	Lab File ID:	130521ab.txt
Dilution:	1.0			Initial Weight/Volume:	0.64 g
Analysis Date:	05/21/2013 1619			Final Weight/Volume:	50 mL
Prep Date:	05/21/2013 1150				

Analyte	DryWt Corrected: N	Result (ug/Kg)	Qualifier	RL
Mercury		ND		16

General Chemistry

Client Sample ID: **0516131315**

Lab Sample ID: 280-42446-5 Date Sampled: 05/16/2013 1315
Client Matrix: Solid Date Received: 05/17/2013 1641

Analyte	Result	Qual	Units	RL	Dil	Method
Chromium, hexavalent	ND		mg/Kg	2.0	1.02	7196A
Analysis Batch: 280-175495	Analysis Date: 05/22/2013 1336					DryWt Corrected: N
Prep Batch: 280-175306	Prep Date: 05/21/2013 1529					
Cr (III)	4.7		mg/Kg	2.0	1.0	7196A
Analysis Batch: 280-176263	Analysis Date: 05/29/2013 0726					DryWt Corrected: N
Cr	4.7		mg/Kg	2.0	1.0	7196A
Analysis Batch: 280-176263	Analysis Date: 05/29/2013 0726					DryWt Corrected: N
Cr (VI)	ND		mg/Kg	1.4	1.0	7196A
Analysis Batch: 280-176263	Analysis Date: 05/29/2013 0726					DryWt Corrected: N
pH adj. to 25 deg C-Soluble	9.13		SU	0.100	1.0	9045C
Analysis Batch: 280-176055	Analysis Date: 05/25/2013 1349					DryWt Corrected: N
Temperature-Soluble	21.9		Degrees C	1.00	1.0	9045C
Analysis Batch: 280-176055	Analysis Date: 05/25/2013 1349					DryWt Corrected: N
Specific Conductance-Soluble	34		umhos/cm	2.0	1.0	SM 2510B
Analysis Batch: 280-175360	Analysis Date: 05/21/2013 2256					DryWt Corrected: N

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

Surrogate Recovery Report

8260B Volatile Organic Compounds (GC/MS)

Client Matrix: Solid

Lab Sample ID	Client Sample ID	DBFM %Rec	DCA %Rec	TOL %Rec	BFB %Rec
280-42446-5	0516131315	97	87	86	82
MB 280-175286/1-A		116	109	104	103
LCS 280-175286/2-A		107	99	94	86
280-42446-5 MS	0516131315 MS	98	84	89	81
280-42446-5 MSD	0516131315 MSD	100	90	92	89

Surrogate	Acceptance Limits
DBFM = Dibromofluoromethane (Surr)	60-133
DCA = 1,2-Dichloroethane-d4 (Surr)	50-139
TOL = Toluene-d8 (Surr)	68-143
BFB = 4-Bromofluorobenzene (Surr)	62-133

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

Surrogate Recovery Report

8270C Semivolatile Organic Compounds (GC/MS)

Client Matrix: Solid

Lab Sample ID	Client Sample ID	NBZ %Rec	FBP %Rec	TPH %Rec
280-42446-5	0516131315	74	73	89
MB 280-175318/1-A		79	81	97
LCS 280-175318/2-A		79	86	94

Surrogate	Acceptance Limits
NBZ = Nitrobenzene-d5	50-120
FBP = 2-Fluorobiphenyl	50-120
TPH = Terphenyl-d14	55-120

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

Surrogate Recovery Report

8015B Gasoline Range Organics - (GC)

Client Matrix: Solid

Lab Sample ID	Client Sample ID	TFT1 %Rec
280-42446-5	0516131315	90
MB 280-175184/1-A		105
LCS 280-175184/2-A		83
LCSD 280-175184/3-A		98
280-42446-5 MS	0516131315 MS	83
280-42446-5 MSD	0516131315 MSD	96

Surrogate	Acceptance Limits
TFT = a,a,a-Trifluorotoluene	77-123

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

Surrogate Recovery Report

8015B Diesel Range Organics (DRO) (GC)

Client Matrix: Solid

Lab Sample ID	Client Sample ID	OTPH1 %Rec
280-42446-5	0516131315	76
MB 280-175304/1-A		88
LCS 280-175304/2-A		93
280-42131-A-6-I MS		109
280-42131-A-6-J MSD		114

Surrogate	Acceptance Limits
OTPH = o-Terphenyl	49-115

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

Method Blank - Batch: 280-175286

Method: 8260B
Preparation: 5030B

Lab Sample ID:	MB 280-175286/1-A	Analysis Batch:	280-175392	Instrument ID:	VMS_P
Client Matrix:	Solid	Prep Batch:	280-175286	Lab File ID:	P9050.D
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	5.013 g
Analysis Date:	05/21/2013 1715	Units:	ug/Kg	Final Weight/Volume:	1000 mL
Prep Date:	05/21/2013 1355				
Leach Date:	N/A				

Analyte	Result	Qual	RL
Benzene	ND		250
Ethylbenzene	ND		250
Toluene	ND		250
m-Xylene & p-Xylene	ND		250
o-Xylene	ND		120

Surrogate	% Rec	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	109	50 - 139
Toluene-d8 (Surr)	104	68 - 143
4-Bromofluorobenzene (Surr)	103	62 - 133
Dibromofluoromethane (Surr)	116	60 - 133

Lab Control Sample - Batch: 280-175286

Method: 8260B
Preparation: 5030B

Lab Sample ID:	LCS 280-175286/2-A	Analysis Batch:	280-175392	Instrument ID:	VMS_P
Client Matrix:	Solid	Prep Batch:	280-175286	Lab File ID:	P9051.D
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	5 g
Analysis Date:	05/21/2013 1735	Units:	ug/Kg	Final Weight/Volume:	1000 mL
Prep Date:	05/21/2013 1355				
Leach Date:	N/A				

Analyte	Spike Amount	Result	% Rec.	Limit	Qual
Benzene	2000	1900	95	78 - 135	
Ethylbenzene	2000	1890	95	77 - 128	
Toluene	2000	1920	96	83 - 120	
m-Xylene & p-Xylene	2000	1810	91	77 - 135	
o-Xylene	2000	1870	93	78 - 135	

Surrogate	% Rec	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	99	50 - 139
Toluene-d8 (Surr)	94	68 - 143
4-Bromofluorobenzene (Surr)	86	62 - 133
Dibromofluoromethane (Surr)	107	60 - 133

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

Matrix Spike/
Matrix Spike Duplicate Recovery Report - Batch: 280-175286

Method: 8260B
Preparation: 5030B

MS Lab Sample ID:	280-42446-5	Analysis Batch:	280-175392	Instrument ID:	VMS_P
Client Matrix:	Solid	Prep Batch:	280-175286	Lab File ID:	P9056.D
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	5.001 g
Analysis Date:	05/21/2013 1917			Final Weight/Volume:	1000 mL
Prep Date:	05/21/2013 1355				
Leach Date:	N/A				

MSD Lab Sample ID:	280-42446-5	Analysis Batch:	280-175400	Instrument ID:	VMS_P
Client Matrix:	Solid	Prep Batch:	280-175286	Lab File ID:	P9073.D
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	5.012 g
Analysis Date:	05/22/2013 1112			Final Weight/Volume:	1000 mL
Prep Date:	05/21/2013 1355				
Leach Date:	N/A				

	% Rec.						
Analyte	MS	MSD	Limit	RPD	RPD Limit	MS Qual	MSD Qual
Benzene	89	90	78 - 135	1	20		
Ethylbenzene	88	91	77 - 128	3	20		
Toluene	89	92	83 - 120	4	20		
m-Xylene & p-Xylene	87	89	77 - 135	1	23		
o-Xylene	87	89	78 - 135	2	20		

Surrogate	MS % Rec	MSD % Rec	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	84	90	50 - 139
Toluene-d8 (Surr)	89	92	68 - 143
4-Bromofluorobenzene (Surr)	81	89	62 - 133
Dibromofluoromethane (Surr)	98	100	60 - 133

Matrix Spike/
Matrix Spike Duplicate Recovery Report - Batch: 280-175286

Method: 8260B
Preparation: 5030B

MS Lab Sample ID:	280-42446-5	Units:	ug/Kg	MSD Lab Sample ID:	280-42446-5
Client Matrix:	Solid			Client Matrix:	Solid
Dilution:	1.0			Dilution:	1.0
Analysis Date:	05/21/2013 1917			Analysis Date:	05/22/2013 1112
Prep Date:	05/21/2013 1355			Prep Date:	05/21/2013 1355
Leach Date:	N/A			Leach Date:	N/A

Analyte	Sample Result/Qual	MS Spike Amount	MSD Spike Amount	MS Result/Qual	MSD Result/Qual
Benzene	ND	2000	2000	1770	1790
Ethylbenzene	ND	2000	2000	1760	1810
Toluene	ND	2000	2000	1810	1890
m-Xylene & p-Xylene	ND	2000	2000	1750	1770
o-Xylene	ND	2000	2000	1750	1780

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

Method Blank - Batch: 280-175318

Method: 8270C
Preparation: 3550C

Lab Sample ID:	MB 280-175318/1-A	Analysis Batch:	280-175805	Instrument ID:	SMS_K
Client Matrix:	Solid	Prep Batch:	280-175318	Lab File ID:	K1748.D
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	32.2 g
Analysis Date:	05/24/2013 1000	Units:	ug/Kg	Final Weight/Volume:	1000 uL
Prep Date:	05/21/2013 1830			Injection Volume:	0.5 uL
Leach Date:	N/A				

Analyte	Result	Qual	RL
Phenanthrene	ND		310
Pyrene	ND		310
Acenaphthene	ND		310
Acenaphthylene	ND		310
Anthracene	ND		310
Benzo[a]anthracene	ND		310
Benzo[b]fluoranthene	ND		310
Benzo[k]fluoranthene	ND		310
Benzo[g,h,i]perylene	ND		310
Benzo[a]pyrene	ND		310
Chrysene	ND		310
Dibenz(a,h)anthracene	ND		310
Fluoranthene	ND		310
Fluorene	ND		310
Indeno[1,2,3-cd]pyrene	ND		310
Naphthalene	ND		310
1-Methylnaphthalene	ND		310
2-Methylnaphthalene	ND		310

Surrogate	% Rec	Acceptance Limits
2-Fluorobiphenyl	81	50 - 120
Nitrobenzene-d5	79	50 - 120
Terphenyl-d14	97	55 - 120

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

Lab Control Sample - Batch: 280-175318

Method: 8270C
Preparation: 3550C

Lab Sample ID:	LCS 280-175318/2-A	Analysis Batch:	280-175805	Instrument ID:	SMS_K
Client Matrix:	Solid	Prep Batch:	280-175318	Lab File ID:	K1749.D
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	32.4 g
Analysis Date:	05/24/2013 1027	Units:	ug/Kg	Final Weight/Volume:	1000 uL
Prep Date:	05/21/2013 1830			Injection Volume:	0.5 uL
Leach Date:	N/A				

Analyte	Spike Amount	Result	% Rec.	Limit	Qual
Phenanthrene	2470	2270	92	64 - 120	
Pyrene	2470	2210	89	64 - 120	
Acenaphthene	2470	2160	87	60 - 120	
Acenaphthylene	2470	2220	90	64 - 120	
Anthracene	2470	2250	91	63 - 120	
Benzo[a]anthracene	2470	2250	91	65 - 120	
Benzo[b]fluoranthene	2470	2660	108	47 - 129	
Benzo[k]fluoranthene	2470	2820	114	48 - 130	
Benzo[g,h,i]perylene	2470	2570	104	55 - 126	
Benzo[a]pyrene	2470	2440	99	59 - 120	
Chrysene	2470	2220	90	64 - 120	
Dibenz(a,h)anthracene	2470	2230	90	50 - 133	
Fluoranthene	2470	2310	94	66 - 120	
Fluorene	2470	2260	92	64 - 120	
Indeno[1,2,3-cd]pyrene	2470	2250	91	63 - 120	
Naphthalene	2470	2010	81	57 - 120	
1-Methylnaphthalene	2470	2100	85	59 - 120	
2-Methylnaphthalene	2470	2010	82	57 - 120	

Surrogate	% Rec	Acceptance Limits
2-Fluorobiphenyl	86	50 - 120
Nitrobenzene-d5	79	50 - 120
Terphenyl-d14	94	55 - 120

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

Method Blank - Batch: 280-175184

Method: 8015B
Preparation: 5030B

Lab Sample ID:	MB 280-175184/1-A	Analysis Batch:	280-175231	Instrument ID:	VGC_L
Client Matrix:	Solid	Prep Batch:	280-175184	Lab File ID:	105F0301.D
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	10.00 g
Analysis Date:	05/21/2013 1051	Units:	mg/Kg	Final Weight/Volume:	10 mL
Prep Date:	05/21/2013 0722			Injection Volume:	
Leach Date:	N/A			Column ID:	PRIMARY

Analyte	Result	Qual	RL
Gasoline Range Organics (GRO)-C6-C10	ND		1.2

Surrogate	% Rec	Acceptance Limits
a,a,a-Trifluorotoluene	105	77 - 123

Lab Control Sample/
Lab Control Sample Duplicate Recovery Report - Batch: 280-175184

Method: 8015B
Preparation: 5030B

LCS Lab Sample ID:	LCS 280-175184/2-A	Analysis Batch:	280-175231	Instrument ID:	VGC_L
Client Matrix:	Solid	Prep Batch:	280-175184	Lab File ID:	106F0401.D
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	10.16 g
Analysis Date:	05/21/2013 1129	Units:	mg/Kg	Final Weight/Volume:	10 mL
Prep Date:	05/21/2013 0722			Injection Volume:	
Leach Date:	N/A			Column ID:	PRIMARY

LCSD Lab Sample ID:	LCSD 280-175184/3-A	Analysis Batch:	280-175231	Instrument ID:	VGC_L
Client Matrix:	Solid	Prep Batch:	280-175184	Lab File ID:	107F0501.D
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	10.13 g
Analysis Date:	05/21/2013 1206	Units:	mg/Kg	Final Weight/Volume:	10 mL
Prep Date:	05/21/2013 0722			Injection Volume:	
Leach Date:	N/A			Column ID:	PRIMARY

	% Rec.						
Analyte	LCS	LCSD	Limit	RPD	RPD Limit	LCS Qual	LCSD Qual
Gasoline Range Organics (GRO)-C6-C10	117	130	85 - 153	10	30		

Surrogate	LCS % Rec	LCSD % Rec	Acceptance Limits
a,a,a-Trifluorotoluene	83	98	77 - 123

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

Laboratory Control/
Laboratory Duplicate Data Report - Batch: 280-175184

Method: 8015B
Preparation: 5030B

LCS Lab Sample ID:	LCS 280-175184/2-A	Units: mg/Kg		LCSD Lab Sample ID:	LCSD 280-175184/3-A
Client Matrix:	Solid			Client Matrix:	Solid
Dilution:	1.0			Dilution:	1.0
Analysis Date:	05/21/2013 1129			Analysis Date:	05/21/2013 1206
Prep Date:	05/21/2013 0722			Prep Date:	05/21/2013 0722
Leach Date:	N/A			Leach Date:	N/A

Analyte	LCS Spike Amount	LCSD Spike Amount	LCS Result/Qual	LCSD Result/Qual
Gasoline Range Organics (GRO)-C6-C10	5.41	5.43	6.36	7.04

Matrix Spike/
Matrix Spike Duplicate Recovery Report - Batch: 280-175184

Method: 8015B
Preparation: 5030B

MS Lab Sample ID:	280-42446-5	Analysis Batch:	280-175231	Instrument ID:	VGC_L
Client Matrix:	Solid	Prep Batch:	280-175184	Lab File ID:	109F0901.D
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	10.17 g
Analysis Date:	05/21/2013 1436			Final Weight/Volume:	10 mL
Prep Date:	05/21/2013 0722			Injection Volume:	
Leach Date:	N/A			Column ID:	PRIMARY
MSD Lab Sample ID:	280-42446-5	Analysis Batch:	280-175231	Instrument ID:	VGC_L
Client Matrix:	Solid	Prep Batch:	280-175184	Lab File ID:	110F1001.D
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	10.17 g
Analysis Date:	05/21/2013 1514			Final Weight/Volume:	10 mL
Prep Date:	05/21/2013 0722			Injection Volume:	
Leach Date:	N/A			Column ID:	PRIMARY

	% Rec.						
Analyte	MS	MSD	Limit	RPD	RPD Limit	MS Qual	MSD Qual
Gasoline Range Organics (GRO)-C6-C10	115	133	85 - 153	15	30		

Surrogate	MS % Rec	MSD % Rec	Acceptance Limits
a,a,a-Trifluorotoluene	83	96	77 - 123

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

Matrix Spike/
Matrix Spike Duplicate Recovery Report - Batch: 280-175184

Method: 8015B
Preparation: 5030B

MS Lab Sample ID:	280-42446-5	Units: mg/Kg	MSD Lab Sample ID:	280-42446-5	
Client Matrix:	Solid		Client Matrix:	Solid	
Dilution:	1.0		Dilution:	1.0	
Analysis Date:	05/21/2013 1436		Analysis Date:	05/21/2013 1514	
Prep Date:	05/21/2013 0722		Prep Date:	05/21/2013 0722	
Leach Date:	N/A		Leach Date:	N/A	

Analyte	Sample Result/Qual	MS Spike Amount	MSD Spike Amount	MS Result/Qual	MSD Result/Qual
Gasoline Range Organics (GRO)-C6-C10	ND	5.41	5.41	6.20	7.19

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

Method Blank - Batch: 280-175304

Method: 8015B
Preparation: 3546

Lab Sample ID:	MB 280-175304/1-A	Analysis Batch:	280-175601	Instrument ID:	SGC_U
Client Matrix:	Solid	Prep Batch:	280-175304	Lab File ID:	05230008.D
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	30.6 g
Analysis Date:	05/23/2013 1236	Units:	mg/Kg	Final Weight/Volume:	1000 uL
Prep Date:	05/21/2013 1740			Injection Volume:	1 uL
Leach Date:	N/A			Column ID:	PRIMARY

Analyte	Result	Qual	RL
C10-C36	ND		3.9

Surrogate	% Rec	Acceptance Limits
o-Terphenyl	88	49 - 115

Lab Control Sample - Batch: 280-175304

Method: 8015B
Preparation: 3546

Lab Sample ID:	LCS 280-175304/2-A	Analysis Batch:	280-175601	Instrument ID:	SGC_U
Client Matrix:	Solid	Prep Batch:	280-175304	Lab File ID:	05230009.D
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	32.4 g
Analysis Date:	05/23/2013 1305	Units:	mg/Kg	Final Weight/Volume:	1000 uL
Prep Date:	05/21/2013 1740			Injection Volume:	1 uL
Leach Date:	N/A			Column ID:	PRIMARY

Analyte	Spike Amount	Result	% Rec.	Limit	Qual
C10-C36	61.8	61.1	99	57 - 115	

Surrogate	% Rec	Acceptance Limits
o-Terphenyl	93	49 - 115

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

Matrix Spike/
Matrix Spike Duplicate Recovery Report - Batch: 280-175304

Method: 8015B
Preparation: 3546

MS Lab Sample ID:	280-42131-A-6-I MS	Analysis Batch:	280-175601	Instrument ID:	SGC_U
Client Matrix:	Solid	Prep Batch:	280-175304	Lab File ID:	05230011.D
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	30.8 g
Analysis Date:	05/23/2013 1403			Final Weight/Volume:	1000 uL
Prep Date:	05/21/2013 1740			Injection Volume:	1 uL
Leach Date:	N/A			Column ID:	PRIMARY

MSD Lab Sample ID:	280-42131-A-6-J MSD	Analysis Batch:	280-175601	Instrument ID:	SGC_U
Client Matrix:	Solid	Prep Batch:	280-175304	Lab File ID:	05230012.D
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	32.5 g
Analysis Date:	05/23/2013 1432			Final Weight/Volume:	1000 uL
Prep Date:	05/21/2013 1740			Injection Volume:	1 uL
Leach Date:	N/A			Column ID:	PRIMARY

	% Rec.						
Analyte	MS	MSD	Limit	RPD	RPD Limit	MS Qual	MSD Qual
C10-C36	87	100	57 - 115	3	23		

Surrogate	MS % Rec	MSD % Rec	Acceptance Limits
o-Terphenyl	109	114	49 - 115

Matrix Spike/
Matrix Spike Duplicate Recovery Report - Batch: 280-175304

Method: 8015B
Preparation: 3546

MS Lab Sample ID:	280-42131-A-6-I MS	Units:	mg/Kg	MSD Lab Sample ID:	280-42131-A-6-J MSD
Client Matrix:	Solid			Client Matrix:	Solid
Dilution:	1.0			Dilution:	1.0
Analysis Date:	05/23/2013 1403			Analysis Date:	05/23/2013 1432
Prep Date:	05/21/2013 1740			Prep Date:	05/21/2013 1740
Leach Date:	N/A			Leach Date:	N/A

Analyte	Sample Result/Qual	MS Spike Amount	MSD Spike Amount	MS Result/Qual	MSD Result/Qual
C10-C36	120	65.0	61.6	177	182

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

Method Blank - Batch: 280-175617

Method: 20B
Preparation: 20B
Soluble

Lab Sample ID:	MB 280-175617/1-A	Analysis Batch:	280-176257	Instrument ID:	MT_025
Client Matrix:	Solid	Prep Batch:	280-175617	Lab File ID:	N/A
Dilution:	10	Leach Batch:	N/A	Initial Weight/Volume:	5 g
Analysis Date:	05/29/2013 0711	Units:	No Unit	Final Weight/Volume:	50 mL
Prep Date:	05/28/2013 0800				
Leach Date:	N/A				

Analyte	Result	Qual	RL
Sodium Adsorption Ratio	ND		1.2
Exchangeable Sodium Percentage	ND		0.50

Method Blank - Batch: 280-175617

Method: 20B
Preparation: 20B
Soluble

Lab Sample ID:	MB 280-175617/1-A	Analysis Batch:	280-176257	Instrument ID:	MT_025
Client Matrix:	Solid	Prep Batch:	280-175617	Lab File ID:	N/A
Dilution:	10	Leach Batch:	N/A	Initial Weight/Volume:	5 g
Analysis Date:	05/29/2013 0711	Units:	ug/Kg	Final Weight/Volume:	50 mL
Prep Date:	05/28/2013 0800				
Leach Date:	N/A				

Analyte	Result	Qual	RL
Sodium	ND		10000
Calcium	ND		2000
Magnesium	ND		2000

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

Method Blank - Batch: 280-175294

Method: 6010B
Preparation: 3050B

Lab Sample ID:	MB 280-175294/1-A	Analysis Batch:	280-175593	Instrument ID:	MT_025
Client Matrix:	Solid	Prep Batch:	280-175294	Lab File ID:	25A4052213.asc
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	1 g
Analysis Date:	05/22/2013 2059	Units:	mg/Kg	Final Weight/Volume:	100 mL
Prep Date:	05/22/2013 1330				
Leach Date:	N/A				

Analyte	Result	Qual	RL
Arsenic	ND		2.0
Barium	ND		1.0
Boron	ND		10
Cadmium	ND		0.50
Copper	ND		2.0
Lead	ND		0.80
Nickel	ND		4.0
Selenium	ND		1.3
Silver	ND		1.0
Zinc	ND		3.0

Lab Control Sample - Batch: 280-175294

Method: 6010B
Preparation: 3050B

Lab Sample ID:	LCS 280-175294/2-A	Analysis Batch:	280-175593	Instrument ID:	MT_025
Client Matrix:	Solid	Prep Batch:	280-175294	Lab File ID:	25A4052213.asc
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	1 g
Analysis Date:	05/22/2013 2101	Units:	mg/Kg	Final Weight/Volume:	100 mL
Prep Date:	05/22/2013 1330				
Leach Date:	N/A				

Analyte	Spike Amount	Result	% Rec.	Limit	Qual
Arsenic	100	92.2	92	85 - 110	
Barium	200	190	95	87 - 112	
Boron	100	91.1	91	80 - 120	
Cadmium	10.0	9.74	97	87 - 110	
Copper	25.0	25.0	100	88 - 110	
Lead	50.0	46.0	92	86 - 110	
Nickel	50.0	45.8	92	87 - 110	
Selenium	200	181	90	83 - 110	
Silver	5.00	4.86	97	87 - 114	
Zinc	50.0	48.3	97	76 - 114	

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

Matrix Spike/
Matrix Spike Duplicate Recovery Report - Batch: 280-175294

Method: 6010B
Preparation: 3050B

MS Lab Sample ID:	550-3088-A-1-E MS	Analysis Batch:	280-175593	Instrument ID:	MT_025
Client Matrix:	Solid	Prep Batch:	280-175294	Lab File ID:	25A4052213.asc
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	1.08 g
Analysis Date:	05/22/2013 2107			Final Weight/Volume:	100 mL
Prep Date:	05/22/2013 1330				
Leach Date:	N/A				

MSD Lab Sample ID:	550-3088-A-1-F MSD	Analysis Batch:	280-175593	Instrument ID:	MT_025
Client Matrix:	Solid	Prep Batch:	280-175294	Lab File ID:	25A4052213.asc
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	1.11 g
Analysis Date:	05/22/2013 2109			Final Weight/Volume:	100 mL
Prep Date:	05/22/2013 1330				
Leach Date:	N/A				

	% Rec.						
Analyte	MS	MSD	Limit	RPD	RPD Limit	MS Qual	MSD Qual
Arsenic	92	92	76 - 111	3	20		
Barium	96	96	52 - 159	3	20		
Boron	91	91	80 - 120	2	20		
Cadmium	98	97	40 - 130	3	20		
Copper	80	83	37 - 187	0	20		
Lead	91	92	70 - 200	1	20		
Nickel	92	89	61 - 126	5	20		
Selenium	91	90	76 - 104	4	20		
Silver	100	97	75 - 141	4	20		
Zinc	96	95	70 - 200	1	20		

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

Matrix Spike/
Matrix Spike Duplicate Recovery Report - Batch: 280-175294

Method: 6010B
Preparation: 3050B

MS Lab Sample ID:	550-3088-A-1-E MS	Units: mg/Kg	MSD Lab Sample ID:	550-3088-A-1-F MSD	
Client Matrix:	Solid		Client Matrix:	Solid	
Dilution:	1.0		Dilution:	1.0	
Analysis Date:	05/22/2013 2107		Analysis Date:	05/22/2013 2109	
Prep Date:	05/22/2013 1330		Prep Date:	05/22/2013 1330	
Leach Date:	N/A		Leach Date:	N/A	

Analyte	Sample Result/Qual	MS Spike Amount	MSD Spike Amount	MS Result/Qual	MSD Result/Qual
Arsenic	1.9	92.6	90.1	86.8	84.4
Barium	50	185	180	228	223
Boron	ND	92.6	90.1	87.7	85.8
Cadmium	ND	9.26	9.01	9.36	9.05
Copper	83	23.1	22.5	102	102
Lead	2.3	46.3	45.0	44.3	43.7
Nickel	ND	46.3	45.0	45.5	43.3
Selenium	1.4	185	180	169	164
Silver	1.3	4.63	4.50	5.95	5.72
Zinc	150	46.3	45.0	196	195

Serial Dilution - Batch: 280-175294

Method: 6010B
Preparation: 3050B

Lab Sample ID:	550-3088-A-1-D SD ^5	Analysis Batch:	280-175593	Instrument ID:	MT_025
Client Matrix:	Solid	Prep Batch:	280-175294	Lab File ID:	25A4052213.asc
Dilution:	5.0	Leach Batch:	N/A	Initial Weight/Volume:	1.11 g
Analysis Date:	05/22/2013 2105	Units:	mg/Kg	Final Weight/Volume:	100 mL
Prep Date:	05/22/2013 1330				
Leach Date:	N/A				

Analyte	Sample Result/Qual	Result	%Diff	Limit	Qual
Arsenic	1.9	ND	NC	10	
Barium	50	51.6	3.6	10	
Boron	ND	ND	NC	10	
Cadmium	ND	ND	NC	10	
Copper	83	85.0	2.2	10	
Lead	2.3	ND	NC	10	
Nickel	ND	ND	NC	10	
Selenium	1.4	ND	NC	10	
Silver	1.3	ND	NC	10	
Zinc	150	158	4.3	10	

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

Method Blank - Batch: 280-175234

Method: 7471A
Preparation: 7471A

Lab Sample ID:	MB 280-175234/1-A	Analysis Batch:	280-175441	Instrument ID:	MT_033
Client Matrix:	Solid	Prep Batch:	280-175234	Lab File ID:	130521ab.txt
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	.6 g
Analysis Date:	05/21/2013 1554	Units:	ug/Kg	Final Weight/Volume:	50 mL
Prep Date:	05/21/2013 1150				
Leach Date:	N/A				

Analyte	Result	Qual	RL
Mercury	ND		17

Lab Control Sample - Batch: 280-175234

Method: 7471A
Preparation: 7471A

Lab Sample ID:	LCS 280-175234/2-A	Analysis Batch:	280-175441	Instrument ID:	MT_033
Client Matrix:	Solid	Prep Batch:	280-175234	Lab File ID:	130521ab.txt
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	.6 g
Analysis Date:	05/21/2013 1558	Units:	ug/Kg	Final Weight/Volume:	50 mL
Prep Date:	05/21/2013 1150				
Leach Date:	N/A				

Analyte	Spike Amount	Result	% Rec.	Limit	Qual
Mercury	417	395	95	87 - 111	

Matrix Spike/
Matrix Spike Duplicate Recovery Report - Batch: 280-175234

Method: 7471A
Preparation: 7471A

MS Lab Sample ID:	280-42398-A-1-D MS	Analysis Batch:	280-175441	Instrument ID:	MT_033
Client Matrix:	Solid	Prep Batch:	280-175234	Lab File ID:	130521ab.txt
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	0.55 g
Analysis Date:	05/21/2013 1607			Final Weight/Volume:	50 mL
Prep Date:	05/21/2013 1150				
Leach Date:	N/A				

MSD Lab Sample ID:	280-42398-A-1-E MSD	Analysis Batch:	280-175441	Instrument ID:	MT_033
Client Matrix:	Solid	Prep Batch:	280-175234	Lab File ID:	130521ab.txt
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	0.65 g
Analysis Date:	05/21/2013 1610			Final Weight/Volume:	50 mL
Prep Date:	05/21/2013 1150				
Leach Date:	N/A				

	% Rec.						
Analyte	MS	MSD	Limit	RPD	RPD Limit	MS Qual	MSD Qual
Mercury	103	97	87 - 111	22	20		F

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

Matrix Spike/
Matrix Spike Duplicate Recovery Report - Batch: 280-175234

Method: 7471A
Preparation: 7471A

MS Lab Sample ID:	280-42398-A-1-D MS	Units: ug/Kg	MSD Lab Sample ID:	280-42398-A-1-E MSD	
Client Matrix:	Solid		Client Matrix:	Solid	
Dilution:	1.0		Dilution:	1.0	
Analysis Date:	05/21/2013 1607		Analysis Date:	05/21/2013 1610	
Prep Date:	05/21/2013 1150		Prep Date:	05/21/2013 1150	
Leach Date:	N/A		Leach Date:	N/A	

Analyte	Sample Result/Qual	MS Spike Amount	MSD Spike Amount	MS Result/Qual	MSD Result/Qual	
Mercury	ND	455	385	468	373	F

Method Blank - Batch: 280-175306

Method: 7196A
Preparation: 3060A

Lab Sample ID:	MB 280-175306/3-A	Analysis Batch:	280-175495	Instrument ID:	No Equipment
Client Matrix:	Solid	Prep Batch:	280-175306	Lab File ID:	N/A
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	2.52 g
Analysis Date:	05/22/2013 1336	Units:	mg/Kg	Final Weight/Volume:	100 mL
Prep Date:	05/21/2013 1529				
Leach Date:	N/A				

Analyte	Result	Qual	RL
Chromium, hexavalent	ND		2.0

Lab Control Sample Insoluble - Batch: 280-175306

Method: 7196A
Preparation: 3060A

Lab Sample ID:	LCSI 280-175306/6-A	Analysis Batch:	280-175495	Instrument ID:	No Equipment
Client Matrix:	Solid	Prep Batch:	280-175306	Lab File ID:	N/A
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	2.54 g
Analysis Date:	05/22/2013 1336	Units:	mg/Kg	Final Weight/Volume:	100 mL
Prep Date:	05/21/2013 1529				
Leach Date:	N/A				

Analyte	Spike Amount	Result	% Rec.	Limit	Qual
Chromium, hexavalent	631	746	118	70 - 130	

Lab Control Sample/
Lab Control Sample Duplicate Recovery Report - Batch: 280-175306

Method: 7196A
Preparation: 3060A

LCS Lab Sample ID:	LCS 280-175306/4-A	Analysis Batch:	280-175495	Instrument ID:	No Equipment
Client Matrix:	Solid	Prep Batch:	280-175306	Lab File ID:	N/A
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	2.45 g
Analysis Date:	05/22/2013 1336	Units:	mg/Kg	Final Weight/Volume:	100 mL
Prep Date:	05/21/2013 1529				
Leach Date:	N/A				

LCSD Lab Sample ID:	LCSD 280-175306/5-A	Analysis Batch:	280-175495	Instrument ID:	No Equipment
Client Matrix:	Solid	Prep Batch:	280-175306	Lab File ID:	N/A
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	2.51 g
Analysis Date:	05/22/2013 1336	Units:	mg/Kg	Final Weight/Volume:	100 mL
Prep Date:	05/21/2013 1529				
Leach Date:	N/A				

	% Rec.						
Analyte	LCS	LCSD	Limit	RPD	RPD Limit	LCS Qual	LCSD Qual
Chromium, hexavalent	97	103	80 - 120	6	20		

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

Laboratory Control/
Laboratory Duplicate Data Report - Batch: 280-175306

Method: 7196A
Preparation: 3060A

LCS Lab Sample ID:	LCS 280-175306/4-A	Units: mg/Kg		LCSD Lab Sample ID:	LCSD 280-175306/5-A
Client Matrix:	Solid			Client Matrix:	Solid
Dilution:	1.0			Dilution:	1.0
Analysis Date:	05/22/2013 1336			Analysis Date:	05/22/2013 1336
Prep Date:	05/21/2013 1529			Prep Date:	05/21/2013 1529
Leach Date:	N/A			Leach Date:	N/A

Analyte	LCS Spike Amount	LCSD Spike Amount	LCS Result/Qual	LCSD Result/Qual
Chromium, hexavalent	10.0	10.0	9.71	10.3

Duplicate - Batch: 280-175306

Method: 7196A
Preparation: 3060A

Lab Sample ID:	280-42131-C-12-D DU	Analysis Batch:	280-175495	Instrument ID:	No Equipment
Client Matrix:	Solid	Prep Batch:	280-175306	Lab File ID:	N/A
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	2.49 g
Analysis Date:	05/22/2013 1336	Units:	mg/Kg	Final Weight/Volume:	100 mL
Prep Date:	05/21/2013 1529				
Leach Date:	N/A				

Analyte	Sample Result/Qual	Result	RPD	Limit	Qual
Chromium, hexavalent	ND	ND	NC	20	

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

Method Blank - Batch: 280-176263

Method: 7196A
Preparation: N/A

Lab Sample ID:	MB 280-176263/1	Analysis Batch:	280-176263	Instrument ID:	MT_025
Client Matrix:	Solid	Prep Batch:	N/A	Lab File ID:	N/A
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	
Analysis Date:	05/29/2013 0726	Units:	mg/Kg	Final Weight/Volume:	
Prep Date:	N/A				
Leach Date:	N/A				

Analyte	Result	Qual	RL
Cr (III)	ND		2.0
Cr	ND		2.0
Cr (VI)	ND		1.4

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

Lab Control Sample/
Lab Control Sample Duplicate Recovery Report - Batch: 280-176055

Method: 9045C
Preparation: N/A

LCS Lab Sample ID:	LCS 280-176055/28	Analysis Batch:	280-176055	Instrument ID:	No Equipment
Client Matrix:	Solid	Prep Batch:	N/A	Lab File ID:	N/A
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	
Analysis Date:	05/25/2013 1349	Units:	SU	Final Weight/Volume:	
Prep Date:	N/A				
Leach Date:	N/A				

LCSD Lab Sample ID:	LCSD 280-176055/29	Analysis Batch:	280-176055	Instrument ID:	No Equipment
Client Matrix:	Solid	Prep Batch:	N/A	Lab File ID:	N/A
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	
Analysis Date:	05/25/2013 1349	Units:	SU	Final Weight/Volume:	
Prep Date:	N/A				
Leach Date:	N/A				

	% Rec.						
Analyte	LCS	LCSD	Limit	RPD	RPD Limit	LCS Qual	LCSD Qual
pH adj. to 25 deg C-Soluble	100	100	97 - 103	0	5		

Laboratory Control/
Laboratory Duplicate Data Report - Batch: 280-176055

Method: 9045C
Preparation: N/A

LCS Lab Sample ID:	LCS 280-176055/28	Units:	SU	LCSD Lab Sample ID:	LCSD 280-176055/29
Client Matrix:	Solid			Client Matrix:	Solid
Dilution:	1.0			Dilution:	1.0
Analysis Date:	05/25/2013 1349			Analysis Date:	05/25/2013 1349
Prep Date:	N/A			Prep Date:	N/A
Leach Date:	N/A			Leach Date:	N/A

Analyte	LCS Spike Amount	LCSD Spike Amount	LCS Result/Qual	LCSD Result/Qual
pH adj. to 25 deg C-Soluble	7.00	7.00	7.020	7.020

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

Duplicate - Batch: 280-176055

Method: 9045C
Preparation: N/A

Lab Sample ID:	280-42546-A-5-G DU	Analysis Batch:	280-176055	Instrument ID:	No Equipment
Client Matrix:	Solid	Prep Batch:	N/A	Lab File ID:	N/A
Dilution:	1.0	Leach Batch:	280-176047	Initial Weight/Volume:	
Analysis Date:	05/25/2013 1349	Units:	Degrees C	Final Weight/Volume:	
Prep Date:	N/A				
Leach Date:	05/25/2013 1050				

Analyte	Sample Result/Qual	Result	RPD	Limit	Qual
Temperature-Soluble	22.2	22.30	0.4	5	

Duplicate - Batch: 280-176055

Method: 9045C
Preparation: N/A

Lab Sample ID:	280-42546-A-5-G DU	Analysis Batch:	280-176055	Instrument ID:	No Equipment
Client Matrix:	Solid	Prep Batch:	N/A	Lab File ID:	N/A
Dilution:	1.0	Leach Batch:	280-176047	Initial Weight/Volume:	
Analysis Date:	05/25/2013 1349	Units:	SU	Final Weight/Volume:	
Prep Date:	N/A				
Leach Date:	05/25/2013 1050				

Analyte	Sample Result/Qual	Result	RPD	Limit	Qual
pH adj. to 25 deg C-Soluble	9.65	9.660	0.1	5	

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

Method Blank - Batch: 280-175360

Method: SM 2510B
Preparation: N/A

Lab Sample ID:	MB 280-175359/1-A	Analysis Batch:	280-175360	Instrument ID:	No Equipment
Client Matrix:	Solid	Prep Batch:	N/A	Lab File ID:	N/A
Dilution:	1.0	Leach Batch:	280-175359	Initial Weight/Volume:	
Analysis Date:	05/21/2013 2256	Units:	umhos/cm	Final Weight/Volume:	
Prep Date:	N/A				
Leach Date:	05/21/2013 2200				

Analyte	Result	Qual	RL
Specific Conductance-Soluble	ND		2.0

Lab Control Sample/
Lab Control Sample Duplicate Recovery Report - Batch: 280-175360

Method: SM 2510B
Preparation: N/A

LCS Lab Sample ID:	LCS 280-175360/3	Analysis Batch:	280-175360	Instrument ID:	No Equipment
Client Matrix:	Solid	Prep Batch:	N/A	Lab File ID:	N/A
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	
Analysis Date:	05/21/2013 2256	Units:	umhos/cm	Final Weight/Volume:	
Prep Date:	N/A				
Leach Date:	N/A				

LCSD Lab Sample ID:	LCSD 280-175360/4	Analysis Batch:	280-175360	Instrument ID:	No Equipment
Client Matrix:	Solid	Prep Batch:	N/A	Lab File ID:	N/A
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	
Analysis Date:	05/21/2013 2256	Units:	umhos/cm	Final Weight/Volume:	
Prep Date:	N/A				
Leach Date:	N/A				

	% Rec.						
Analyte	LCS	LCSD	Limit	RPD	RPD Limit	LCS Qual	LCSD Qual
Specific Conductance-Soluble	96	96	90 - 110	1	10		

Laboratory Control/
Laboratory Duplicate Data Report - Batch: 280-175360

Method: SM 2510B
Preparation: N/A

LCS Lab Sample ID:	LCS 280-175360/3	Units:	umhos/cm	LCSD Lab Sample ID:	LCSD 280-175360/4
Client Matrix:	Solid			Client Matrix:	Solid
Dilution:	1.0			Dilution:	1.0
Analysis Date:	05/21/2013 2256			Analysis Date:	05/21/2013 2256
Prep Date:	N/A			Prep Date:	N/A
Leach Date:	N/A			Leach Date:	N/A

Analyte	LCS Spike Amount	LCSD Spike Amount	LCS Result/Qual	LCSD Result/Qual
Specific Conductance-Soluble	1410	1410	1360	1350

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

Duplicate - Batch: 280-175360

Method: SM 2510B
Preparation: N/A

Lab Sample ID:	280-42446-A-2-F DU	Analysis Batch:	280-175360	Instrument ID:	No Equipment
Client Matrix:	Solid	Prep Batch:	N/A	Lab File ID:	N/A
Dilution:	1.0	Leach Batch:	280-175359	Initial Weight/Volume:	
Analysis Date:	05/21/2013 2256	Units:	umhos/cm	Final Weight/Volume:	
Prep Date:	N/A				
Leach Date:	05/21/2013 2200				

Analyte	Sample Result/Qual	Result	RPD	Limit	Qual
Specific Conductance-Soluble	540	552	3	20	

DATA REPORTING QUALIFIERS

Client: Colorado Oil&Gas Conservation Commision Job Number: 280-42446-2

Lab Section	Qualifier	Description
Metals		
	F	RPD of the MS and MSD exceeds the control limits

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

QC Association Summary

Lab Sample ID	Client Sample ID	Report Basis	Client Matrix	Method	Prep Batch
GC/MS VOA					
Prep Batch: 280-175286					
LCS 280-175286/2-A	Lab Control Sample	T	Solid	5030B	
MB 280-175286/1-A	Method Blank	T	Solid	5030B	
280-42446-5	0516131315	T	Solid	5030B	
280-42446-5MS	Matrix Spike	T	Solid	5030B	
280-42446-5MSD	Matrix Spike Duplicate	T	Solid	5030B	
Analysis Batch:280-175392					
LCS 280-175286/2-A	Lab Control Sample	T	Solid	8260B	280-175286
MB 280-175286/1-A	Method Blank	T	Solid	8260B	280-175286
280-42446-5	0516131315	T	Solid	8260B	280-175286
280-42446-5MS	Matrix Spike	T	Solid	8260B	280-175286
Analysis Batch:280-175400					
280-42446-5MSD	Matrix Spike Duplicate	T	Solid	8260B	280-175286

Report Basis
T = Total

GC/MS Semi VOA					
Prep Batch: 280-175318					
LCS 280-175318/2-A	Lab Control Sample	T	Solid	3550C	
MB 280-175318/1-A	Method Blank	T	Solid	3550C	
280-42446-5	0516131315	T	Solid	3550C	
Analysis Batch:280-175805					
LCS 280-175318/2-A	Lab Control Sample	T	Solid	8270C	280-175318
MB 280-175318/1-A	Method Blank	T	Solid	8270C	280-175318
280-42446-5	0516131315	T	Solid	8270C	280-175318

Report Basis
T = Total

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

QC Association Summary

Lab Sample ID	Client Sample ID	Report Basis	Client Matrix	Method	Prep Batch
GC VOA					
Prep Batch: 280-175184					
LCS 280-175184/2-A	Lab Control Sample	T	Solid	5030B	
LCSD 280-175184/3-A	Lab Control Sample Duplicate	T	Solid	5030B	
MB 280-175184/1-A	Method Blank	T	Solid	5030B	
280-42446-5	0516131315	T	Solid	5030B	
280-42446-5MS	Matrix Spike	T	Solid	5030B	
280-42446-5MSD	Matrix Spike Duplicate	T	Solid	5030B	
Analysis Batch:280-175231					
LCS 280-175184/2-A	Lab Control Sample	T	Solid	8015B	280-175184
LCSD 280-175184/3-A	Lab Control Sample Duplicate	T	Solid	8015B	280-175184
MB 280-175184/1-A	Method Blank	T	Solid	8015B	280-175184
280-42446-5	0516131315	T	Solid	8015B	280-175184
280-42446-5MS	Matrix Spike	T	Solid	8015B	280-175184
280-42446-5MSD	Matrix Spike Duplicate	T	Solid	8015B	280-175184

Report Basis
T = Total

Lab Sample ID	Client Sample ID	Report Basis	Client Matrix	Method	Prep Batch
GC Semi VOA					
Prep Batch: 280-175304					
LCS 280-175304/2-A	Lab Control Sample	T	Solid	3546	
MB 280-175304/1-A	Method Blank	T	Solid	3546	
280-42131-A-6-I MS	Matrix Spike	T	Solid	3546	
280-42131-A-6-J MSD	Matrix Spike Duplicate	T	Solid	3546	
280-42446-5	0516131315	T	Solid	3546	
Analysis Batch:280-175601					
LCS 280-175304/2-A	Lab Control Sample	T	Solid	8015B	280-175304
MB 280-175304/1-A	Method Blank	T	Solid	8015B	280-175304
280-42131-A-6-I MS	Matrix Spike	T	Solid	8015B	280-175304
280-42131-A-6-J MSD	Matrix Spike Duplicate	T	Solid	8015B	280-175304
280-42446-5	0516131315	T	Solid	8015B	280-175304

Report Basis
T = Total

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

QC Association Summary

Lab Sample ID	Client Sample ID	Report Basis	Client Matrix	Method	Prep Batch
Metals					
Prep Batch: 280-175234					
LCS 280-175234/2-A	Lab Control Sample	T	Solid	7471A	
MB 280-175234/1-A	Method Blank	T	Solid	7471A	
280-42398-A-1-D MS	Matrix Spike	T	Solid	7471A	
280-42398-A-1-E MSD	Matrix Spike Duplicate	T	Solid	7471A	
280-42446-5	0516131315	T	Solid	7471A	
Prep Batch: 280-175294					
LCS 280-175294/2-A	Lab Control Sample	T	Solid	3050B	
MB 280-175294/1-A	Method Blank	T	Solid	3050B	
550-3088-A-1-E MS	Matrix Spike	T	Solid	3050B	
550-3088-A-1-F MSD	Matrix Spike Duplicate	T	Solid	3050B	
280-42446-5	0516131315	T	Solid	3050B	
Analysis Batch:280-175441					
LCS 280-175234/2-A	Lab Control Sample	T	Solid	7471A	280-175234
MB 280-175234/1-A	Method Blank	T	Solid	7471A	280-175234
280-42398-A-1-D MS	Matrix Spike	T	Solid	7471A	280-175234
280-42398-A-1-E MSD	Matrix Spike Duplicate	T	Solid	7471A	280-175234
280-42446-5	0516131315	T	Solid	7471A	280-175234
Analysis Batch:280-175593					
LCS 280-175294/2-A	Lab Control Sample	T	Solid	6010B	280-175294
MB 280-175294/1-A	Method Blank	T	Solid	6010B	280-175294
550-3088-A-1-E MS	Matrix Spike	T	Solid	6010B	280-175294
550-3088-A-1-F MSD	Matrix Spike Duplicate	T	Solid	6010B	280-175294
280-42446-5	0516131315	T	Solid	6010B	280-175294
Prep Batch: 280-175617					
MB 280-175617/1-A	Method Blank	S	Solid	20B	
280-42446-5	0516131315	S	Solid	20B	
Analysis Batch:280-176257					
MB 280-175617/1-A	Method Blank	S	Solid	20B	280-175617
280-42446-5	0516131315	S	Solid	20B	280-175617

Report Basis

S = Soluble

T = Total

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

QC Association Summary

Lab Sample ID	Client Sample ID	Report Basis	Client Matrix	Method	Prep Batch
General Chemistry					
Prep Batch: 280-175306					
LCS 280-175306/4-A	Lab Control Sample	T	Solid	3060A	
LCSD 280-175306/5-A	Lab Control Sample Duplicate	T	Solid	3060A	
LCSI 280-175306/6-A	Lab Control Sample Insoluble	T	Solid	3060A	
MB 280-175306/3-A	Method Blank	T	Solid	3060A	
280-42131-C-12-D DU	Duplicate	T	Solid	3060A	
280-42446-5	0516131315	T	Solid	3060A	
Prep Batch: 280-175359					
MB 280-175359/1-A	Method Blank	S	Solid	DI Leach	
280-42446-A-2-F DU	Duplicate	S	Solid	DI Leach	
280-42446-5	0516131315	S	Solid	DI Leach	
Analysis Batch:280-175360					
LCS 280-175360/3	Lab Control Sample	T	Solid	SM 2510B	
LCSD 280-175360/4	Lab Control Sample Duplicate	T	Solid	SM 2510B	
MB 280-175359/1-A	Method Blank	S	Solid	SM 2510B	
280-42446-A-2-F DU	Duplicate	S	Solid	SM 2510B	
280-42446-5	0516131315	S	Solid	SM 2510B	
Analysis Batch:280-175495					
LCS 280-175306/4-A	Lab Control Sample	T	Solid	7196A	280-175306
LCSD 280-175306/5-A	Lab Control Sample Duplicate	T	Solid	7196A	280-175306
LCSI 280-175306/6-A	Lab Control Sample Insoluble	T	Solid	7196A	280-175306
MB 280-175306/3-A	Method Blank	T	Solid	7196A	280-175306
280-42131-C-12-D DU	Duplicate	T	Solid	7196A	280-175306
280-42446-5	0516131315	T	Solid	7196A	280-175306
Prep Batch: 280-176047					
280-42446-5	0516131315	S	Solid	DI Leach	
280-42546-A-5-G DU	Duplicate	S	Solid	DI Leach	
Analysis Batch:280-176055					
LCS 280-176055/28	Lab Control Sample	T	Solid	9045C	
LCSD 280-176055/29	Lab Control Sample Duplicate	T	Solid	9045C	
280-42446-5	0516131315	S	Solid	9045C	
280-42546-A-5-G DU	Duplicate	S	Solid	9045C	
Analysis Batch:280-176263					
MB 280-176263/1	Method Blank	T	Solid	7196A	
280-42446-5	0516131315	T	Solid	7196A	

Report Basis

S = Soluble

T = Total

Client: Colorado Oil&Gas Conservation Commision Job Number: 280-42446-2

Laboratory Chronicle

Lab ID: 280-42446-5 **Client ID: 0516131315**

Sample Date/Time: 05/16/2013 13:15 Received Date/Time: 05/17/2013 16:41

Method	Bottle ID	Run	Analysis Batch	Prep Batch	Date Prepared / Analyzed	Dil	Lab	Analyst
P:5030B	280-42446-D-5-A		280-175392	280-175286	05/21/2013 13:55	1	TAL DEN	RLM
A:8260B	280-42446-D-5-A		280-175392	280-175286	05/21/2013 18:57	1	TAL DEN	JS
P:3550C	280-42446-B-5-B		280-175805	280-175318	05/21/2013 18:30	1	TAL DEN	BJ
A:8270C	280-42446-B-5-B		280-175805	280-175318	05/24/2013 16:22	1	TAL DEN	DCK
P:5030B	280-42446-C-5-A		280-175231	280-175184	05/21/2013 07:22	1	TAL DEN	TEM
A:8015B	280-42446-C-5-A		280-175231	280-175184	05/21/2013 13:59	1	TAL DEN	TEM
P:3546	280-42446-B-5-A		280-175601	280-175304	05/21/2013 17:40	1	TAL DEN	BJ
A:8015B	280-42446-B-5-A		280-175601	280-175304	05/23/2013 18:22	1	TAL DEN	MRB
P:20B	280-42446-A-5-D		280-176257	280-175617	05/28/2013 08:00	10	TAL DEN	JA
A:20B	280-42446-A-5-D		280-176257	280-175617	05/29/2013 07:11	10	TAL DEN	JKH
P:3050B	280-42446-A-5-B		280-175593	280-175294	05/22/2013 13:30	1	TAL DEN	RC
A:6010B	280-42446-A-5-B		280-175593	280-175294	05/22/2013 21:27	1	TAL DEN	JKH
P:7471A	280-42446-A-5-A		280-175441	280-175234	05/21/2013 11:50	1	TAL DEN	JM
A:7471A	280-42446-A-5-A		280-175441	280-175234	05/21/2013 16:19	1	TAL DEN	JM
P:3060A	280-42446-A-5-C		280-175495	280-175306	05/21/2013 15:29	1.02	TAL DEN	MPS
A:7196A	280-42446-A-5-C		280-175495	280-175306	05/22/2013 13:36	1.02	TAL DEN	MPS
A:7196A	280-42446-A-5		280-176263		05/29/2013 07:26	1	TAL DEN	DG
A:9045C	280-42446-A-5-E		280-176055		05/25/2013 13:49	1	TAL DEN	DA
A:SM 2510B	280-42446-B-5-C		280-175360		05/21/2013 22:56	1	TAL DEN	LMK

Lab ID: 280-42446-5 MS **Client ID: 0516131315**

Sample Date/Time: 05/16/2013 13:15 Received Date/Time: 05/17/2013 16:41

Method	Bottle ID	Run	Analysis Batch	Prep Batch	Date Prepared / Analyzed	Dil	Lab	Analyst
P:5030B	280-42446-D-5-B MS		280-175392	280-175286	05/21/2013 13:55	1	TAL DEN	RLM
A:8260B	280-42446-D-5-B MS		280-175392	280-175286	05/21/2013 19:17	1	TAL DEN	JS
P:5030B	280-42446-C-5-B MS		280-175231	280-175184	05/21/2013 07:22	1	TAL DEN	TEM
A:8015B	280-42446-C-5-B MS		280-175231	280-175184	05/21/2013 14:36	1	TAL DEN	TEM

Lab ID: 280-42446-5 MSD **Client ID: 0516131315**

Sample Date/Time: 05/16/2013 13:15 Received Date/Time: 05/17/2013 16:41

Method	Bottle ID	Run	Analysis Batch	Prep Batch	Date Prepared / Analyzed	Dil	Lab	Analyst
P:5030B	280-42446-D-5-C MSD		280-175400	280-175286	05/21/2013 13:55	1	TAL DEN	RLM
A:8260B	280-42446-D-5-C MSD		280-175400	280-175286	05/22/2013 11:12	1	TAL DEN	JS
P:5030B	280-42446-C-5-C MSD		280-175231	280-175184	05/21/2013 07:22	1	TAL DEN	TEM
A:8015B	280-42446-C-5-C MSD		280-175231	280-175184	05/21/2013 15:14	1	TAL DEN	TEM

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

Laboratory Chronicle

Lab ID: MB **Client ID:** N/A

Sample Date/Time: N/A Received Date/Time: N/A

Method	Bottle ID	Run	Analysis Batch	Prep Batch	Date Prepared / Analyzed	Dil	Lab	Analyst
P:5030B	MB 280-175286/1-A		280-175392	280-175286	05/21/2013 13:55	1	TAL DEN	RLM
A:8260B	MB 280-175286/1-A		280-175392	280-175286	05/21/2013 17:15	1	TAL DEN	JS
P:3550C	MB 280-175318/1-A		280-175805	280-175318	05/21/2013 18:30	1	TAL DEN	BJ
A:8270C	MB 280-175318/1-A		280-175805	280-175318	05/24/2013 10:00	1	TAL DEN	DCK
P:5030B	MB 280-175184/1-A		280-175231	280-175184	05/21/2013 07:22	1	TAL DEN	TEM
A:8015B	MB 280-175184/1-A		280-175231	280-175184	05/21/2013 10:51	1	TAL DEN	TEM
P:3546	MB 280-175304/1-A		280-175601	280-175304	05/21/2013 17:40	1	TAL DEN	BJ
A:8015B	MB 280-175304/1-A		280-175601	280-175304	05/23/2013 12:36	1	TAL DEN	MRB
P:20B	MB 280-175617/1-A		280-176257	280-175617	05/28/2013 08:00	10	TAL DEN	JA
A:20B	MB 280-175617/1-A		280-176257	280-175617	05/29/2013 07:11	10	TAL DEN	JKH
P:3050B	MB 280-175294/1-A		280-175593	280-175294	05/22/2013 13:30	1	TAL DEN	RC
A:6010B	MB 280-175294/1-A		280-175593	280-175294	05/22/2013 20:59	1	TAL DEN	JKH
P:7471A	MB 280-175234/1-A		280-175441	280-175234	05/21/2013 11:50	1	TAL DEN	JM
A:7471A	MB 280-175234/1-A		280-175441	280-175234	05/21/2013 15:54	1	TAL DEN	JM
P:3060A	MB 280-175306/3-A		280-175495	280-175306	05/21/2013 15:29	1	TAL DEN	MPS
A:7196A	MB 280-175306/3-A		280-175495	280-175306	05/22/2013 13:36	1	TAL DEN	MPS
A:7196A	MB 280-176263/1		280-176263		05/29/2013 07:26	1	TAL DEN	DG
A:SM 2510B	MB 280-175359/1-A		280-175360		05/21/2013 22:56	1	TAL DEN	LMK

Lab ID: LCS **Client ID:** N/A

Sample Date/Time: N/A Received Date/Time: N/A

Method	Bottle ID	Run	Analysis Batch	Prep Batch	Date Prepared / Analyzed	Dil	Lab	Analyst
P:5030B	LCS 280-175286/2-A		280-175392	280-175286	05/21/2013 13:55	1	TAL DEN	RLM
A:8260B	LCS 280-175286/2-A		280-175392	280-175286	05/21/2013 17:35	1	TAL DEN	JS
P:3550C	LCS 280-175318/2-A		280-175805	280-175318	05/21/2013 18:30	1	TAL DEN	BJ
A:8270C	LCS 280-175318/2-A		280-175805	280-175318	05/24/2013 10:27	1	TAL DEN	DCK
P:5030B	LCS 280-175184/2-A		280-175231	280-175184	05/21/2013 07:22	1	TAL DEN	TEM
A:8015B	LCS 280-175184/2-A		280-175231	280-175184	05/21/2013 11:29	1	TAL DEN	TEM
P:3546	LCS 280-175304/2-A		280-175601	280-175304	05/21/2013 17:40	1	TAL DEN	BJ
A:8015B	LCS 280-175304/2-A		280-175601	280-175304	05/23/2013 13:05	1	TAL DEN	MRB
P:3050B	LCS 280-175294/2-A		280-175593	280-175294	05/22/2013 13:30	1	TAL DEN	RC
A:6010B	LCS 280-175294/2-A		280-175593	280-175294	05/22/2013 21:01	1	TAL DEN	JKH
P:7471A	LCS 280-175234/2-A		280-175441	280-175234	05/21/2013 11:50	1	TAL DEN	JM
A:7471A	LCS 280-175234/2-A		280-175441	280-175234	05/21/2013 15:58	1	TAL DEN	JM
P:3060A	LCS 280-175306/4-A		280-175495	280-175306	05/21/2013 15:29	1	TAL DEN	MPS
A:7196A	LCS 280-175306/4-A		280-175495	280-175306	05/22/2013 13:36	1	TAL DEN	MPS
A:9045C	LCS 280-176055/28		280-176055		05/25/2013 13:49	1	TAL DEN	DA
A:SM 2510B	LCS 280-175360/3		280-175360		05/21/2013 22:56	1	TAL DEN	LMK

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

Laboratory Chronicle

Lab ID: LCSD **Client ID:** N/A

Sample Date/Time: N/A Received Date/Time: N/A

Method	Bottle ID	Run	Analysis Batch	Prep Batch	Date Prepared / Analyzed	Dil	Lab	Analyst
P:5030B	LCSD 280-175184/3-A		280-175231	280-175184	05/21/2013 07:22	1	TAL DEN	TEM
A:8015B	LCSD 280-175184/3-A		280-175231	280-175184	05/21/2013 12:06	1	TAL DEN	TEM
P:3060A	LCSD 280-175306/5-A		280-175495	280-175306	05/21/2013 15:29	1	TAL DEN	MPS
A:7196A	LCSD 280-175306/5-A		280-175495	280-175306	05/22/2013 13:36	1	TAL DEN	MPS
A:9045C	LCSD 280-176055/29		280-176055		05/25/2013 13:49	1	TAL DEN	DA
A:SM 2510B	LCSD 280-175360/4		280-175360		05/21/2013 22:56	1	TAL DEN	LMK

Lab ID: MS **Client ID:** N/A

Sample Date/Time: N/A Received Date/Time: N/A

Method	Bottle ID	Run	Analysis Batch	Prep Batch	Date Prepared / Analyzed	Dil	Lab	Analyst
P:3546	280-42131-A-6-I MS		280-175601	280-175304	05/21/2013 17:40	1	TAL DEN	BJ
A:8015B	280-42131-A-6-I MS		280-175601	280-175304	05/23/2013 14:03	1	TAL DEN	MRB
P:3050B	550-3088-A-1-E MS		280-175593	280-175294	05/22/2013 13:30	1	TAL DEN	RC
A:6010B	550-3088-A-1-E MS		280-175593	280-175294	05/22/2013 21:07	1	TAL DEN	JKH
P:7471A	280-42398-A-1-D MS		280-175441	280-175234	05/21/2013 11:50	1	TAL DEN	JM
A:7471A	280-42398-A-1-D MS		280-175441	280-175234	05/21/2013 16:07	1	TAL DEN	JM

Lab ID: MSD **Client ID:** N/A

Sample Date/Time: N/A Received Date/Time: N/A

Method	Bottle ID	Run	Analysis Batch	Prep Batch	Date Prepared / Analyzed	Dil	Lab	Analyst
P:3546	280-42131-A-6-J MSD		280-175601	280-175304	05/21/2013 17:40	1	TAL DEN	BJ
A:8015B	280-42131-A-6-J MSD		280-175601	280-175304	05/23/2013 14:32	1	TAL DEN	MRB
P:3050B	550-3088-A-1-F MSD		280-175593	280-175294	05/22/2013 13:30	1	TAL DEN	RC
A:6010B	550-3088-A-1-F MSD		280-175593	280-175294	05/22/2013 21:09	1	TAL DEN	JKH
P:7471A	280-42398-A-1-E MSD		280-175441	280-175234	05/21/2013 11:50	1	TAL DEN	JM
A:7471A	280-42398-A-1-E MSD		280-175441	280-175234	05/21/2013 16:10	1	TAL DEN	JM

Client: Colorado Oil&Gas Conservation Commision

Job Number: 280-42446-2

Laboratory Chronicle

Lab ID: DU **Client ID:** N/A

Sample Date/Time: N/A Received Date/Time: N/A

Method	Bottle ID	Run	Analysis Batch	Prep Batch	Date Prepared / Analyzed	Dil	Lab	Analyst
P:3060A	280-42131-C-12-D DU		280-175495	280-175306	05/21/2013 15:29	1	TAL DEN	MPS
A:7196A	280-42131-C-12-D DU		280-175495	280-175306	05/22/2013 13:36	1	TAL DEN	MPS
A:9045C	280-42546-A-5-G DU		280-176055		05/25/2013 13:49	1	TAL DEN	DA
A:SM 2510B	280-42446-A-2-F DU		280-175360		05/21/2013 22:56	1	TAL DEN	LMK

Lab ID: SD **Client ID:** N/A

Sample Date/Time: N/A Received Date/Time: N/A

Method	Bottle ID	Run	Analysis Batch	Prep Batch	Date Prepared / Analyzed	Dil	Lab	Analyst
P:3050B	550-3088-A-1-D SD ^5		280-175593	280-175294	05/22/2013 13:30	5	TAL DEN	RC
A:6010B	550-3088-A-1-D SD ^5		280-175593	280-175294	05/22/2013 21:05	5	TAL DEN	JKH
P:3060A	LCSI 280-175306/6-A		280-175495	280-175306	05/21/2013 15:29	1	TAL DEN	MPS
A:7196A	LCSI 280-175306/6-A		280-175495	280-175306	05/22/2013 13:36	1	TAL DEN	MPS

Lab References:

TAL DEN = TestAmerica Denver

INORGANIC VENTURES™
300 Technology Drive
Christiansburg, VA 24073 • USA
inorganicventures.com

CERTIFICATE OF ANALYSIS

tel: 800.669.6799 • 540.585.3030
fax: 540.585.3012
info@inorganicventures.com

1.0 **INORGANIC VENTURES** is an ISO Guide 34 "General Requirements for the Competence of Reference Material Producers" and ISO 9001 registered manufacturer. Our manufacturing laboratory is accredited to ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories."

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 **DESCRIPTION OF CRM** **1000 µg/mL Arsenic in 2% (v/v) HNO3**

Catalog Number:	CGAS1-1, CGAS1-2, and CGAS1-5
Lot Number:	**F2-AS02083**
Starting Material:	As pieces
Starting Material Purity (%):	99.9996
Starting Material Lot No:	1665
Matrix:	2% (v/v) HNO3

1575937
ID: 1000 As_00008
1000 As IV

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1,001 ± 5 µg/mL - no weighted mean

Certified Density: 1.010 g/mL (measured at 20 ± 1°C)

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.

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

$$\text{Uncertainty } (\pm) = 2\,[\,\Sigma(s_i)^2\,]^{1/2}$$

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements
2 = the coverage factor.
$[\,\Sigma(s_i)^2\,]^{1/2}$ = The square root of the sum of the squares of the most common errors (where 's' stands for the standard deviation) from instrumental measurement, density, NIST SRM uncertainty, weighing, dilution to volume, homogeneity, long term stability and short term stability.

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

· "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

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

4.1 **Assay Method #1** **1,001 ± 3 µg/mL**
ICP Assay NIST SRM 3103a Lot Number: 100818

Assay Method #2 **1,000 ± 3 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION -** All analytical balances are calibrated yearly by an A2LA accredited calibration laboratory and are traceable to a class E 2 analytical weight set with NIST Traceability. All balances are checked daily using an in-house procedure. The weights used for testing are annually compared to master weights and are traceable to the National Institute of Standards and Technology (NIST).

4.3 **THERMOMETER CALIBRATION -** All thermometers are NIST traceable through thermometers that are calibrated by an A2LA accredited calibration laboratory.

4.4 **GLASSWARE CALIBRATION -** An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM's.

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

CRM's solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.000232	M	Dy	< 0.031014	O	Li	< 0.000020	M	Pr	< 0.001551	M	Te	< 0.155069
O	Sb	< 0.010000	M	Er	< 0.025845	M	Lu	< 0.002068	O	Re	< 0.010000	M	Tb	< 0.001551
s	As		M	Eu	< 0.015507	O	Mg	0.000019	M	Rh	< 0.005169	M	Tl	< 0.005169
M	Ba	< 0.051690	M	Gd	< 0.005169	O	Mn	< 0.000030	M	Rb	< 0.005169	M	Th	< 0.005169
M	Be	< 0.002584	M	Ga	< 0.005169	O	Hg	< 0.012000	M	Ru	< 0.010338	M	Tm	< 0.002068
M	Bi	0.000080	M	Ge	< 0.031014	M	Mo	< 0.010338	M	Sm	< 0.005169	O	Sn	< 0.004000
O	B	< 0.012000	M	Au	< 0.015507	M	Nd	< 0.010338	M	Sc	< 0.051690	M	Ti	< 0.258449
M	Cd	< 0.015507	M	Hf	< 0.010338	O	Ni	< 0.002000	M	Se	< 0.041352	M	W	< 0.051690
O	Ca	0.000484	M	Ho	< 0.002584	O	Nb	< 0.002000	O	Si	0.002515	M	U	< 0.010338
M	Ce	< 0.025845	M	In	< 0.051690	n	Os		M	Ag	< 0.010338	M	V	< 0.010338
M	Cs	< 0.001551	M	Ir	< 0.025845	M	Pd	< 0.025845	O	Na	0.000387	M	Yb	< 0.005169
O	Cr	< 0.000800	O	Fe	0.000213	O	P	< 0.002600	M	Sr	< 0.002584	M	Y	< 0.206759
M	Co	< 0.015507	M	La	< 0.002584	M	Pt	< 0.010338	n	S		M	Zn	0.000340
M	Cu	< 0.031014	M	Pb	< 0.015507	O	K	< 0.002000	M	Ta	< 0.036183	M	Zr	< 0.025845

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
HPLC, IC, TLC, ISE, IR, NMR, UV/VIS, MS, Capillary Eletrophoresis, Potentiometry, Wet Chemistry and Voltammetry
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact Technical Staff

This CRM was manufactured using 18 megohm doubly deionized water that has been filtered through a 0.2 micron filter.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 74.9216; mix of +3 and +5; 6; H_3AsO_4 and $HAsO_2$

Chemical Compatibility -Arsenic has no cationic chemistry. It is soluble in HCl, HNO_3,H_3PO_4, H_2SO_4 and HF aqueous matrices water and NH_4OH . It is stable with most inorganic anions (forms arsenate when boiled with chromate) but many cationic metals form the insoluble arsenates under pH neutral conditions. When fluorinated and / or under acidic conditions arsenate formation is typically not a problem at moderate to low concentrations.

Stability - 2-100 ppb levels stable for months alone or mixed with other elements at equivalent levels in 1% HNO_3 / LDPE container.

1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

As Containing Samples (Preparation and Solution) - As0 (soluble in 1:1 H_2O / HNO_3); Oxides (the oxide exists in crystalline and amorphous forms where the amorphoric form is more water soluble. The oxides typically dissolve in dilute acidic solutions when boiled); Minerals (One gram of powered sample is fused in a Ni0 crucible with 10 grams of a 1:1 mix of K_2CO_3 and KNO_3 and

the melt extracted with hot water); Organic Matrices (0.2 to 0.5 grams of the sample are fused with 15 grams of a 1:1 Na_2CO_3 / Na_2O_2 mix in a Ni0 crucible. The fuseate is extracted with water and acidified with HNO_3)

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

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe)
ICP-OES189.042 nm	0.05 / 0.005 µg/mL	1	atom	Cr
ICP-OES193.696 nm	0.1 / 0.01 µg/mL	1	atom	V, Ge
ICP-OES 228.812 nm	0.1 / 0.01 µg/mL	1	atom	Cd, Pt, Ir, Co
ICP-MS 75 amu	20 ppt	n/a	M+	40Ar35Cl, 59Co16O, 36Ar38Ar1H, 38Ar37Cl,Ar39K, 150Nd2+,150Sm2+

Uranium Note: If uranium is present in this standard, it is natural abundance unless specified in Section 3.0.

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Safety Data sheet for information regarding this CRM.

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration
- QMI File Number 010105

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration"
- Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 "General Requirements for the Competence of Reference Material Producers"
- Reference Materials Production - Accredited A2LA Certificate Number 883.02

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission
- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission
- Reporting Defects and Non-Compliance

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability.

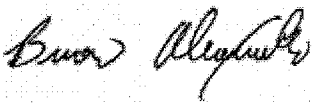
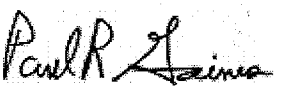
11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Manufacturer concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

11.3 Chemical Stability - Studies have been conducted on this or similar CRMs and it has been demonstrated that this CRM is chemically stable for a period of not less than two years provided the "Storage & Handling" conditions are followed that are described in section 7.0.

Certification Date: May 21, 2012
Expiration Date:

EXPIRES
01 SEP 2013

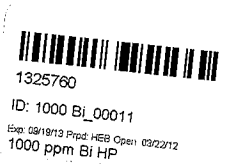
12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	Danny Feeny Product Documentation Technician	
Certificate Approved By:	Brian Alexander PhD., Quality Control Supervisor	
Certifying Officer:	Paul Gaines PhD., Senior Technical Director	

HIGH-PURITY STANDARDS
www.highpuritystandards.com

P.O. Box 41727
Charleston, SC 29423
Phone (843) 767-7900
Fax (843) 767-7906

Certificate of Analysis



Product Description:

Name:	Bismuth	Source Material:	Bismuth Metal
Part Number:	**10006-1**	Material Purity:	99.9998%
Lot Number:	**1202025**	Matrix:	2% (v/v) HNO_3

Certified Value: 1000 µg/mL ± 3 µg/mL

The Certified value is based on gravimetric and volumetric preparation, and confirmed against SRM 3106 (lot number 991212) by inductively coupled plasma optical emission spectrometry (ICP-OES) using an internal laboratory-developed method. The uncertainty in the certified value is calculated for a 95% confidence interval and coverage factor *k* is about 2.

Density: 1.009 g/mL ± 0.002 g/mL @ 24.1°C

Uncertified Values:

Trace Metal Impurity Scan: The data reported are based upon a scan of this specific lot at 1000 µg/mL via ICP analysis. The values are reported in µg/L.

Ag	<	0.02	Cu	<	0.1	Li	<	0.02	Rb	<	0.02	Th	<	0.02
Al	<	0.1	Dy	<	0.02	Lu	<	0.02	Re	<	0.02	Ti	<	0.02
As	<	0.05	Er	<	0.02	Mg	<	0.5	Rh	<	0.02	Tl	<	0.02
Au	<	0.02	Eu	<	0.02	Mn	<	0.1	Ru	<	0.02	Tm	<	0.02
B	<	1	Fe	<	1	Mo	<	0.02	Sb	<	0.02	U	<	0.1
Ba	<	0.02	Ga	<	0.02	Na	<	3	Sc	<	0.02	V	<	0.05
Be	<	0.02	Gd	<	0.02	Nb	<	0.02	Se	<	0.1	W	<	0.02
Bi		M	Ge	<	0.02	Nd	<	0.02	Si	<	5	Y	<	0.02
Ca	<	1	Hf	<	0.02	Ni	<	0.02	Sm	<	0.02	Yb	<	0.02
Cd	<	0.02	Ho	<	0.02	Os	<	0.02	Sn	<	1	Zn	<	0.5
Ce	<	0.02	In	<	0.02	Pb	<	2	Sr	<	0.02	Zr	<	0.02
Co	<	0.05	Ir	<	0.02	Pd	<	0.02	Ta	<	0.02			
Cr	<	0.1	K	<	1	Pr	<	0.02	Tb	<	0.02			
Cs		na	La	<	0.02	Pt	<	0.02	Te	<	0.02	na - not analyzed		

Preparation Information:

The standard solution is prepared using high purity materials and assayed by analytical methods for conformity prior to use. This standard was prepared using the methods developed at NIST for SRM Spectrometric Standard Solutions under appropriate laboratory conditions.

Sub-boiling distilled high-purity acid has been used to place the materials in solution and to stabilize the standard. The matrix is as noted above in 18 megaohm deionized water.

Stability of this product is based upon rigorous short term and long term testing of the solution for the certified value. This testing includes, but is not limited to, the effect of temperature and packaging on the product.

Intended Use:

This Certified Reference Material (CRM) is intended for use as a calibration standard for the quantitative determination of bismuth, calibration of instruments such as ICPOES, ICPMS, AAS and XRF, and validation of analytical methods. It also can be used in EPA, ASTM and other methods.

Traceability Information:

The traceability of this standard is maintained through an unbroken chain of comparisons to appropriate standards with suitable procedure and measurement uncertainties. The maintenance of the base and derived units of International System of Units (SI) with traceability of measurement results (contemporary metrology) to SI ensures their comparability over time as follows.

a. **Standard Weight and Analytical Balance**
The standard weights (NBS weights Inventory No 20231A) are calibrated every two years by South Carolina Metrology Laboratory that is a participant in "NIST Weights and Measures Measurement Assurance Program" with a certificate of measurement traceability to NIST primary standards.
The balances are calibrated yearly by the ISO 17025 accredited metrology service, and are verified weekly by an in-house method using standard weights.

b. **Volumetric Device**
The calibration of volumetric vessels is checked annually using the NBS 602 method.

c. **Thermometer**
The standard thermometers are calibrated every year by the ISO 17025 accredited metrology service. The thermometers used in-house are verified against the standard thermometers yearly.

d. **Calibration Standards:**
The Calibration Standard is directly traceable to SRM 3100 Series Spectrometric Standard Solutions.

Packaging and Storage Conditions:

The standard is packaged in a pre-cleaned polyethylene bottle. To maintain the integrity of this product, the solution should be kept tightly capped and stored under normal laboratory conditions.

Refer to Material Safety Datasheet (MSDS) for hazardous information.

Expiration Information:

The expiry date is guaranteed to be valid for eighteen months from the shipping date provided. For this reason, standards from the same lot may have different expiration dates.

Preparation Date:	**January 20, 2012**
Shipped Date:	MAR 1 9 2012
Expiration Date:	SEP 1 9 2013
Certificate Issue Date:	**January 24, 2012**

Quality Information:

ISO/IEC 17025:2005 Accreditation
Certificate Number AT-1529

ISO Guide 34:2009 (RMP) Accreditation
Certificate Number AR-1436

Vanny T. Yib,	**Kim-Phuong Tran**	**Theodore Rains, PhD**
Inorganic Laboratory Manager	**Quality Manager**	**President**

INORGANIC VENTURES™
300 Technology Drive
Christiansburg, VA 24073 • USA
inorganicventures.com

CERTIFICATE OF ANALYSIS

tel: 800.669.6799 • 540.585.3030
fax: 540.585.3012
info@inorganicventures.com

1.0 **INORGANIC VENTURES** is an ISO Guide 34 "General Requirements for the Competence of Reference Material Producers" and ISO 9001 registered manufacturer. Our manufacturing laboratory is accredited to ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories."

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 **DESCRIPTION OF CRM** **1000 µg/mL Lead in 0.5% (v/v) HNO3**

Catalog Number:	CGPB1-1, CGPB1-2, and CGPB1-5
Lot Number:	**F2-PB03035**
Starting Material:	Pb(NO3)2
Starting Material Purity (%):	99.9998
Starting Material Lot No:	1717
Matrix:	0.5% (v/v) HNO3

1892189
ID: 1000 Pb_00011
Exp:03/01/14 Prpd:HEB Opn:02/18/13
1000 Pb IV

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1,001 ± 5 µg/mL - weighted mean

Certified Density: 1.002 g/mL (measured at 20 ± 1°C)

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.

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors (Most common are the errors from instrumental measurement, weighing, dilution to volume and the fixed error reported on the NIST SRM certificate of analysis)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

· "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

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

4.1 **Assay Method #1** **1,000 ± 3 µg/mL**
ICP Assay NIST SRM 3128 Lot Number: 101026

Assay Method #2 **1,002 ± 3 µg/mL**
EDTA NIST SRM 928 Lot Number: 928

4.2 **BALANCE CALIBRATION** - All analytical balances are calibrated yearly by an A2LA accredited calibration laboratory and are traceable to a class E 2 analytical weight set with NIST Traceability. All balances are checked daily using an in-house procedure. The weights used for testing are annually compared to master weights and are traceable to the National Institute of Standards and Technology (NIST).

4.3 **THERMOMETER CALIBRATION** - All thermometers are NIST traceable through thermometers that are calibrated by an A2LA accredited calibration laboratory.

4.4 **GLASSWARE CALIBRATION** - An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM's.

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

CRM's solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.000477	M	Dy	< 0.017590	O	Li	0.000136	M	Pr	< 0.000880	M	Te	< 0.087952
M	Sb	< 0.001466	M	Er	< 0.014659	M	Lu	< 0.001173	M	Re	< 0.002932	M	Tb	< 0.000880
M	As	< 0.029317	M	Eu	< 0.008795	O	Mg	0.000102	O	Rh	< 0.009000	O	Tl	< 0.022000
O	Ba	0.000545	M	Gd	< 0.002932	M	Mn	< 0.011727	M	Rb	< 0.002932	M	Th	< 0.002932
M	Be	< 0.001466	M	Ga	< 0.002932	O	Hg	< 0.015000	M	Ru	< 0.005863	M	Tm	< 0.001173
O	Bi	< 0.020000	M	Ge	< 0.017590	M	Mo	< 0.005863	M	Sm	< 0.002932	M	Sn	< 0.014659
O	B	< 0.040000	M	Au	< 0.008795	M	Nd	< 0.005863	M	Sc	< 0.029317	M	Ti	< 0.146587
M	Cd	< 0.008795	M	Hf	< 0.005863	O	Ni	< 0.003000	M	Se	< 0.023454	M	W	< 0.029317
O	Ca	0.000682	M	Ho	< 0.001466	M	Nb	< 0.001466	O	Si	< 0.003400	M	U	< 0.005863
M	Ce	< 0.014659	M	In	< 0.029317	n	Os		M	Ag	< 0.005863	M	V	< 0.005863
M	Cs	< 0.000880	M	Ir	< 0.014659	M	Pd	< 0.014659	O	Na	< 0.006000	M	Yb	< 0.002932
M	Cr	< 0.014659	O	Fe	0.000545	O	P	< 0.005000	O	Sr	0.000204	M	Y	< 0.117270
M	Co	< 0.008795	M	La	< 0.001466	M	Pt	< 0.005863	O	S	< 0.100000	O	Zn	< 0.000200
M	Cu	< 0.017590	s	Pb		O	K	< 0.001800	M	Ta	< 0.020522	M	Zr	< 0.014659

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
HPLC, IC, TLC, ISE, IR, NMR, UV/VIS, MS, Capillary Eletrophoresis, Potentiometry, Wet Chemistry and Voltammetry
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact Technical Staff

This CRM was manufactured using 18 megohm doubly deionized water that has been filtered through a 0.2 micron filter.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 207.2; +2; 6; $Pb(H_2O)_{6}^{+2}$

Chemical Compatibility - Soluble in HCl, HF and HNO_3. Avoid H_2SO_4. Stable with most metals and inorganic anions forming insoluble carbonate, borate, sulfate, sulfite, sulfide, phosphate, oxalate, chromate, tannate, iodate, and cyanide in neutral aqueous media.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO_3 / LDPE container.

Pb Containing Samples (Preparation and Solution) - Metal (Best dissolved in 1:1 H_2O / HNO_3); Oxides (The many different Pb oxides are soluble in HNO_3 with the exception of PbO_2 which is soluble in HCl or HF); Ores and Alloys (Best attacked using 1:1 H_2O / HNO_3); Organic Matrices (Dry ash and dissolve in dilute HCl.).

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

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe)
ICP-OES 168.215 nm	0.03 / 0.003 µg/mL	1	ion	Co
ICP-OES 220.353 nm	0.04 / 0.006 µg/mL	1	ion	Bi, Nb
ICP-OES 217.000 nm	0.09 / 0.03 µg/mL	1	atom	W, Ir, Hf, Sb, Th
ICP-MS 208 amu	5 ppt	n/a	M+	192Pt16O, 192Os16O

Uranium Note: If uranium is present in this standard, it is natural abundance unless specified in Section 3.0.

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Safety Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to an in house procedure and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration
- QMI File Number 010105

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration"
- Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 "General Requirements for the Competence of Reference Material Producers"
- Reference Materials Production - Accredited A2LA Certificate Number 883.02

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission
- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission
- Reporting Defects and Non-Compliance

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Manufacturer concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

11.3 Chemical Stability - Studies have been conducted on this or similar CRMs and it has been demonstrated that this CRM is chemically stable for a period of not less than two years provided the "Storage & Handling" conditions are followed that are described in section 7.0.

Certification Date: February 10, 2012

Expiration Date: EXPIRES 01 MAR 2014

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	Danny Feeny Product Documentation Technician	
Certificate Approved By:	Brian Alexander PhD., Quality Control Supervisor	
Certifying Officer:	Paul Gaines PhD., Senior Technical Director	

HIGH-PURITY STANDARDS
www.highpuritystandards.com

P.O. Box 41727
Charleston, SC 29423
Phone (843) 767-7900
Fax (843) 767-7906

Certificate of Analysis

1245298
ID: 1000 S_00008
1000 S HP

Product Description:

Name:	Sulfur	Source Material:	Sulfuric Acid
Part Number:	**100054-5**	Material Purity:	99.999%
Lot Number:	**1132501**	Matrix:	H_2O

Certified Value: 1000 µg/mL ± 5 µg/mL

The Certified value is based on gravimetric and volumetric preparation, and confirmed against SRM 3154 (lot number 892205) by inductively coupled plasma optical emission spectrometry (ICP-OES) using an internal laboratory-developed method. The uncertainty in the certified value is calculated for a 95% confidence interval and coverage factor *k* is about 2.

Density: 1.003 g/mL ± 0.002 g/mL @ 22.6°C

Uncertified Values:

Trace Metal Impurity Scan: The data reported are based upon a scan of this specific lot at 1000 µg/mL via ICP analysis. The values are reported in µg/L.

Ag	<	0.02	Cu	<	0.1	Li	<	0.02	Rb	<	0.02	Th	<	0.02
Al	<	0.1	Dy	<	0.02	Lu	<	0.02	Re	<	0.02	Ti	<	0.02
As	<	0.05	Er	<	0.02	Mg	<	0.5	Rh	<	0.02	Tl	<	0.02
Au	<	0.02	Eu	<	0.02	Mn	<	0.1	Ru	<	0.02	Tm	<	0.02
B	<	1	Fe	<	1	Mo	<	0.02	Sb	<	0.02	U	<	0.1
Ba	<	0.02	Ga	<	0.02	Na	<	3	Sc	<	0.02	V	<	0.05
Be	<	0.02	Gd	<	0.02	Nb	<	0.02	Se	<	0.1	W	<	0.02
Bi	<	0.02	Ge	<	0.02	Nd	<	0.02	Si	<	5	Y	<	0.02
Ca	<	1	Hf	<	0.02	Ni	<	0.02	Sm	<	0.02	Yb	<	0.02
Cd	<	0.5	Ho	<	0.02	Os	<	0.02	Sn	<	1	Zn	<	0.1
Ce	<	0.02	In	<	0.02	Pb	<	0.05	Sr	<	0.02	Zr	<	0.02
Co	<	0.05	Ir	<	0.02	Pd	<	0.02	Ta	<	0.02	S		M
Cr	<	0.1	K	<	1	Pr	<	0.02	Tb	<	0.02			
Cs		na	La	<	0.02	Pt	<	0.02	Te	<	0.02	na - not analyzed		

Preparation Information:

The standard solution is prepared using high purity materials and assayed by analytical methods for conformity prior to use. This standard was prepared using the methods developed at NIST for SRM Spectrometric Standard Solutions under appropriate laboratory conditions.
The matrix is 18 megaohm deionized water.
Stability of this product is based upon rigorous short term and long term testing of the solution for the certified value. This testing includes, but is not limited to, the effect of temperature and packaging on the product.

Intended Use:

This Certified Reference Material (CRM) is intended for use as a calibration standard for the quantitative determination of sulfur, calibration of instruments such as ICPOES, ICPMS, AAS and XRF, and validation of analytical methods. It also can be used in EPA, ASTM and other methods.

Traceability Information:

The traceability of this standard is maintained through an unbroken chain of comparisons to appropriate standards with suitable procedure and measurement uncertainties. The maintenance of the base and derived units of International System of Units (SI) with traceability of measurement results (contemporary metrology) to SI ensures their comparability over time as follows.

a. **Standard Weight and Analytical Balance**
The standard weights (NBS weights Inventory No 20231A) are calibrated every two years by South Carolina Metrology Laboratory that is a participant in "NIST Weights and Measures Measurement Assurance Program" with a certificate of measurement traceability to NIST primary standards.
The balances are calibrated yearly by the ISO 17025 accredited metrology service, and are verified weekly by an in-house method using standard weights.

b. **Volumetric Device**
The calibration of volumetric vessels is checked annually using the NBS 602 method.

c. **Thermometer**
The standard thermometers are calibrated every year by the ISO 17025 accredited metrology service. The thermometers used in-house are verified against the standard thermometers yearly.

d. **Calibration Standards:**
The Calibration Standard is directly traceable to SRM 3100 Series Spectrometric Standard Solutions.

Packaging and Storage Conditions:

The standard is packaged in a pre-cleaned polyethylene bottle. To maintain the integrity of this product, the solution should be kept tightly capped and stored under normal laboratory conditions.

Refer to Material Safety Datasheet (MSDS) for hazardous information.

Expiration Information:

The expiry date is guaranteed to be valid for eighteen months from the shipping date provided. For this reason, standards from the same lot may have different expiration dates.

Preparation Date:	**November 21, 2011**
Shipped Date:	JAN 31 2012
Expiration Date:	JUL 31 2013
Certificate Issue Date:	**December 19, 2011**

Quality Information:

ACLASS ACCREDITED TESTING

ISO/IEC 17025:2005 Accreditation
Certificate Number AT-1529

ACLASS ACCREDITED REFERENCE MATERIAL PRODUCER

ISO Guide 34:2009 (RMP) Accreditation
Certificate Number AR-1436

Vanny T. Yib,	**Kim-Phuong Tran**	**Theodore Rains, PhD**
Inorganic Laboratory Manager	**Quality Manager**	**President**

INORGANIC VENTURES™
300 Technology Drive
Christiansburg, VA 24073 • USA
inorganicventures.com

CERTIFICATE OF ANALYSIS

tel: 800.669.6799 • 540.585.3030
fax: 540.585.3012
info@inorganicventures.com

1.0 **INORGANIC VENTURES** is an ISO Guide 34 "General Requirements for the Competence of Reference Material Producers" and ISO 9001 registered manufacturer. Our manufacturing laboratory is accredited to ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories."

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 **DESCRIPTION OF CRM** **1000 µg/mL Selenium(+4) in 2% (v/v) HNO3**

Catalog Number:	CGSE(4)1-1, CGSE(4)1-2, and CGSE(4)1-5
Lot Number:	**E2-SE02033**
Starting Material:	Se shot
Starting Material Purity (%):	99.9996
Starting Material Lot No:	1616
Matrix:	2% (v/v) HNO3

1615671
ID: 1000 Se_00006
Exp. 10/01/13 Prod: HEB Open 08/14/12
1000 Se IV

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1,001 ± 6 µg/mL - weighted mean

Certified Density: 1.011 g/mL (measured at 20 ± 1°C)

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.

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors (Most common are the errors from instrumental measurement, weighing, dilution to volume and the fixed error reported on the NIST SRM certificate of analysis)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

· "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

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

4.1 **Assay Method #1** **1,002 ± 4 µg/mL**
ICP Assay NIST SRM 3149 Lot Number: 100901

Assay Method #2 **1,000 ± 3 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION -** All analytical balances are calibrated yearly by an A2LA accredited calibration laboratory and are traceable to a class E 2 analytical weight set with NIST Traceability. All balances are checked daily using an in-house procedure. The weights used for testing are annually compared to master weights and are traceable to the National Institute of Standards and Technology (NIST).

4.3 **THERMOMETER CALIBRATION -** All thermometers are NIST traceable through thermometers that are calibrated by an A2LA accredited calibration laboratory.

4.4 **GLASSWARE CALIBRATION -** An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM's.

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

CRM's solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.000169	M	Dy	< 0.022740	O	Li	< 0.000030	M	Pr	< 0.001137	M	Te	< 0.113700
M	Sb	< 0.001895	M	Er	< 0.018950	M	Lu	< 0.001516	O	Re	< 0.009000	M	Tb	< 0.001137
O	As	< 0.005000	M	Eu	< 0.011370	O	Mg	0.000066	M	Rh	< 0.003790	M	Tl	< 0.003790
M	Ba	< 0.037900	M	Gd	< 0.003790	M	Mn	< 0.015160	M	Rb	< 0.003790	M	Th	< 0.003790
O	Be	< 0.000090	M	Ga	< 0.003790	O	Hg	< 0.014000	O	Ru	< 0.007000	M	Tm	< 0.001516
M	Bi	< 0.001516	M	Ge	< 0.022740	O	Mo	< 0.004000	M	Sm	< 0.003790	M	Sn	< 0.018950
O	B	0.000686	M	Au	< 0.011370	M	Nd	< 0.007580	M	Sc	< 0.037900	M	Ti	< 0.189500
M	Cd	< 0.011370	M	Hf	< 0.007580	O	Ni	< 0.000900	s	Se		M	W	< 0.037900
O	Ca	0.000435	M	Ho	< 0.001895	O	Nb	< 0.004000	O	Si	< 0.003000	M	U	< 0.007580
M	Ce	< 0.018950	M	In	< 0.037900	n	Os		M	Ag	< 0.007580	M	V	< 0.007580
M	Cs	< 0.001137	M	Ir	< 0.018950	M	Pd	< 0.018950	O	Na	0.002638	M	Yb	< 0.003790
M	Cr	< 0.018950	O	Fe	0.000198	O	P	< 0.003000	M	Sr	< 0.001895	M	Y	< 0.151600
M	Co	< 0.011370	M	La	< 0.001895	M	Pt	< 0.007580	O	S	< 0.040000	O	Zn	< 0.000200
M	Cu	< 0.022740	M	Pb	< 0.011370	O	K	0.000211	M	Ta	< 0.026530	O	Zr	< 0.000400

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
HPLC, IC, TLC, ISE, IR, NMR, UV/VIS, MS, Capillary Eletrophoresis, Potentiometry, Wet Chemistry and Voltammetry
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact Technical Staff

This CRM was manufactured using 18 megohm doubly deionized water that has been filtered through a 0.2 micron filter.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 78.96; +4; 6; H_2SeO_3

Chemical Compatibility - Soluble in HCl, HNO_3, H_3PO_4, H_2SO_4 and HF aqueous matrices and water. It is stable with most inorganic anions but many cationic metals form the insoluble selenites under pH neutral conditions. When fluorinated and/or under acidic conditions precipitation is typically not a problem at moderate to low concentrations.

Stability - 2-100 ppb levels- stable for months alone or mixed with other elements at equivalent levels - in 1 % HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

Se Containing Samples (Preparation and Solution) - Metal (Soluble in HNO_3); Oxides (Readily soluble in water); Minerals and alloys (Acid digestion with HNO_3or HNO_3 / HF); Organic Matrices (Acid digestion with hot concentrated H_2SO_4 accompanied by the careful dropwise addition of H_2O_2 until clear)

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

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe)
ICP-OES 196.026 nm	0.08 / 0.006 µg/mL	1	atom	Fe
ICP-OES 203.985 nm	0.2 / 0.05 µg/mL	1	atom	Sb, Ir, Cr, Ta
ICP-OES 206.279 nm	0.3 / 0.16 µg/mL	1	atom	Cr, Pt
ICP-MS 82 amu	200 ppt	n/a	M+	12C35Cl2

Uranium Note: If uranium is present in this standard, it is natural abundance unless specified in Section 3.0.

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Safety Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to an in house procedure and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration
- QMI File Number 010105

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration"
- Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 "General Requirements for the Competence of Reference Material Producers"
- Reference Materials Production - Accredited A2LA Certificate Number 883.02

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission
- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission
- Reporting Defects and Non-Compliance

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability.

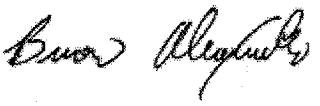
11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Manufacturer concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

11.3 Chemical Stability - Studies have been conducted on this or similar CRMs and it has been demonstrated that this CRM is chemically stable for a period of not less than two years provided the "Storage & Handling" conditions are followed that are described in section 7.0.

Certification Date: December 15, 2011

Expiration Date: EXPIRES 01 Sep 2013

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	Danny Feeny Product Documentation Technician	
Certificate Approved By:	Brian Alexander PhD., Quality Control Supervisor	
Certifying Officer:	Paul Gaines PhD., Senior Technical Director	

INORGANIC VENTURES™
300 Technology Drive
Christiansburg, VA 24073 • USA
inorganicventures.com

CERTIFICATE OF ANALYSIS

tel: 800.669.6799 • 540.585.3030
fax: 540.585.3012
info@inorganicventures.com

1.0 **INORGANIC VENTURES** is an ISO Guide 34 "General Requirements for the Competence of Reference Material Producers" and ISO 9001 registered manufacturer. Our manufacturing laboratory is accredited to ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories."

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 **DESCRIPTION OF CRM** **1000 µg/mL Zirconium in tr. HF**

Catalog Number:	CGZR1-1, CGZR1-2, and CGZR1-5
Lot Number:	**F2-ZR01094**
Starting Material:	ZrO2
Starting Material Purity (%):	99.9947
Starting Material Lot No:	1765
Matrix:	tr. HF

1956326
ID: 1000 Zr_00005
Exp:04/01/14 Prpd:HEB Opn:03/25/13
1000 Zr IV

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 999 ± 5 µg/mL - weighted mean

Certified Density: 1.000 g/mL (measured at 20 ± 1°C)

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.

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

$$\text{Uncertainty } (\pm) = 2\,[\,\Sigma(s_i)^2\,]^{1/2}$$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
2 = the coverage factor.
$[\,\Sigma(s_i)^2\,]^{1/2}$ = The square root of the sum of the squares of the most common errors (where 's' stands for the standard deviation) from instrumental measurement, density, NIST SRM uncertainty, weighing, dilution to volume, homogeneity, long term stability and short term stability.

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

· "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO ViM, 2nd ed., 1993, definition 6.10)

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

4.1 **Assay Method #1** **999 ± 3 µg/mL**
ICP Assay NIST SRM 3169 Lot Number: 071226

Assay Method #2 **999 ± 3 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION -** All analytical balances are calibrated yearly by an A2LA accredited calibration laboratory and are traceable to a class E 2 analytical weight set with NIST Traceability. All balances are checked daily using an in-house procedure. The weights used for testing are annually compared to master weights and are traceable to the National Institute of Standards and Technology (NIST).

4.3 **THERMOMETER CALIBRATION -** All thermometers are NIST traceable through thermometers that are calibrated by an A2LA accredited calibration laboratory.

4.4 **GLASSWARE CALIBRATION -** An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM's.

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

CRM's solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	< 0.006034	M	Dy	< 0.014723	O	Li	< 0.000201	M	Pr	< 0.000736	M	Te	< 0.073617
M	Sb	< 0.001227	M	Er	< 0.012270	M	Lu	< 0.000982	M	Re	< 0.002454	M	Tb	< 0.000736
M	As	< 0.024539	M	Eu	< 0.007362	O	Mg	0.003514	M	Rh	< 0.002454	M	Tl	< 0.002454
M	Ba	< 0.024539	M	Gd	< 0.002454	O	Mn	< 0.006704	M	Rb	0.000396	M	Th	< 0.002454
O	Be	< 0.670443	M	Ga	< 0.002454	O	Hg	< 0.073749	M	Ru	< 0.004908	M	Tm	< 0.000982
M	Bi	< 0.000982	M	Ge	< 0.014723	O	Mo	< 0.670443	M	Sm	< 0.002454	M	Sn	0.000693
M	B	< 0.171774	M	Au	< 0.007362	M	Nd	< 0.004908	O	Sc	< 0.001073	O	Ti	< 0.268177
O	Cd	0.020272	M	Hf	0.019786	O	Ni	< 0.019443	M	Se	< 0.019631	M	W	< 0.024539
O	Ca	0.018921	M	Ho	< 0.001227	O	Nb	< 0.134089	O	Si	< 1.340886	M	U	< 0.004908
M	Ce	< 0.012270	M	In	< 0.024539	n	Os		O	Ag	< 0.670443	M	V	< 0.004908
M	Cs	< 0.000736	M	Ir	< 0.012270	i	Pd		O	Na	0.010542	M	Yb	< 0.002454
O	Cr	< 0.014750	O	Fe	0.005136	O	P	< 0.032181	M	Sr	< 0.001227	O	Y	< 0.006704
M	Co	< 0.007362	M	La	< 0.001227	M	Pt	< 0.004908	O	S	< 0.469310	O	Zn	< 0.067044
M	Cu	0.000722	M	Pb	< 0.007362	O	K	0.005406	M	Ta	0.000989	s	Zr	

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
HPLC, IC, TLC, ISE, IR, NMR, UV/VIS, MS, Capillary Eletrophoresis, Potentiometry, Wet Chemistry and Voltammetry
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact Technical Staff

This CRM was manufactured using 18 megohm doubly deionized water that has been filtered through a 0.2 micron filter.

4.2 **BALANCE CALIBRATION -** All analytical balances are calibrated yearly by an A2LA accredited calibration laboratory and are traceable to a class E 2 analytical weight set with NIST Traceability. All balances are checked daily using an in-house procedure. The weights used for testing are annually compared to master weights and are traceable to the National Institute of Standards and Technology (NIST).

4.3 **THERMOMETER CALIBRATION -** All thermometers are NIST traceable through thermometers that are calibrated by an A2LA accredited calibration laboratory.

4.4 **GLASSWARE CALIBRATION -** An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM's.

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

CRM's solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	< 0.006034	M	Dy	< 0.014723	O	Li	< 0.000201	M	Pr	< 0.000736
M	Sb	< 0.001227	M	Er	< 0.012270	M	Lu	< 0.000982	M	Re	< 0.002454
M	As	< 0.024539	M	Eu	< 0.007362	O	Mg	0.003514	M	Rh	< 0.002454
M	Ba	< 0.024539	M	Gd	< 0.002454	O	Mn	< 0.006704	M	Rb	0.000396
O	Be	< 0.670443	M	Ga	< 0.002454	O	Hg	< 0.073749	M	Ru	< 0.004908
M	Bi	< 0.000982	M	Ge	< 0.014723	O	Mo	< 0.670443	M	Sm	< 0.002454
M	B	< 0.171774	M	Au	< 0.007362	M	Nd	< 0.004908	O	Sc	< 0.001073
O	Cd	0.020272	M	Hf	0.019786	O	Ni	< 0.019443	M	Se	< 0.019631
O	Ca	0.018921	M	Ho	< 0.001227	O	Nb	< 0.134089	O	Si	< 1.340886
M	Ce	< 0.012270	M	In	< 0.024539	n	Os		O	Ag	< 0.670443
M	Cs	< 0.000736	M	Ir	< 0.012270	i	Pd		O	Na	0.010542
O	Cr	< 0.014750	O	Fe	0.005136	O	P	< 0.032181	M	Sr	< 0.001227
M	Co	< 0.007362	M	La	< 0.001227	M	Pt	< 0.004908	O	S	< 0.469310
M	Cu	0.000722	M	Pb	< 0.007362	O	K	0.005406	M	Ta	0.000989

M	Te	<	0.073617
M	Tb	<	0.000736
M	Tl	<	0.002454
M	Th	<	0.002454
M	Tm	<	0.000982
M	Sn		0.000693
O	Ti	<	0.268177
M	W	<	0.024539
M	U	<	0.004908
M	V	<	0.004908
M	Yb	<	0.002454
O	Y	<	0.006704
O	Zn	<	0.067044
s	Zr		

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
HPLC, IC, TLC, ISE, IR, NMR, UV/VIS, MS, Capillary Eletrophoresis, Potentiometry, Wet Chemistry and Voltammetry
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact Technical Staff

This CRM was manufactured using 18 megohm doubly deionized water that has been filtered through a 0.2 micron filter.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 91.224; +4; **6**,*7*,*8*; Zr(F)6-2
Chemical Compatibility - Soluble in concentrated HCl, HF, H2SO4 (very hot) and HNO3. Avoid H3PO4 and neutral to basic media. Unstable at ppm levels with metals that would pull F- away (i.e. Do not mix with Alkaline or Rare Earths or high levels of transition elements unless they are fluorinated). Stable with most inorganic anions but precipitation with phosphate, oxalate, and tartrate with a tendency to hydrolyze forming the hydrated oxide in all dilute acids except HF .
Stability - 2-100 ppb levels stable (alone or mixed with all other metals that are at comparable levels) as the Zr(F)6-2 + Zr(OH)4F2-2 for months in 1% HNO3 / LDPE container. 1-10,000 ppm single element solutions as the Zr(F)6-2 chemically stable for years in 2-5% HNO3 / trace HF in an LDPE container.
Zr Containing Samples (Preparation and Solution) - Metal (Soluble in H2O / HF / HNO3); Oxide - unlike TiO2 the ZrO2 is best fused in one of the following ways (Na2O2 in Ni0, Na2CO3 in Pt0 or Borax in Pt0); Organic Matrices (Dry ash at 450 0C in Pt0 and dissolve by fusing with Na2CO3 and dissolving in HF / HNO3 / H2O).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe)
ICP-OES 343.823 nm	0.007 / 0.0004 µg/mL	1	ion	Hf, Nb
ICP-OES 339.198 nm	0.008 / 0.0007 µg/mL	1	ion	Th, Mo
ICP-OES 272.261 nm	0.018 / 0.001 µg/mL	1	ion	Cr, V, Th, W
ICP-MS 90 amu	2 ppt	n/a	M+	74Ge16O, 74Se16O, [180X+2 (where X = Hf, Ta, W)]

HF Note: This standard should not be prepared or stored in glass.
Uranium Note: If uranium is present in this standard, it is natural abundance unless specified in Section 3.0.

8.0 HAZARDOUS INFORMATION -

Please refer to the enclosed Material Safety Data sheet for information regarding this CRM.

9.0 HOMOGENEITY -

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration
- QMI File Number 010105

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration"
- Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 "General Requirements for the Competence of Reference Material Producers"
- Reference Materials Production - Accredited A2LA Certificate Number 883.02

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission
- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission
- Reporting Defects and Non-Compliance

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

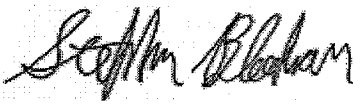
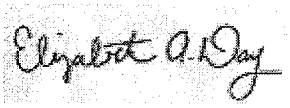
11.1 Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Manufacturer concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

11.3 Chemical Stability - Studies have been conducted on this or similar CRMs and it has been demonstrated that this CRM is chemically stable for a period of not less than two years provided the "Storage & Handling" conditions are followed that are described in section 7.0.

Certification Date: November 02, 2012
Expiration Date: EXPIRES 01 APR 2014

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	Stephan Blaakman Product Documentation Technician	
Certificate Approved By:	Beth Day Quality Assurance Specialist	
Certifying Officer:	Paul Gaines PhD., Senior Technical Director	

INORGANIC VENTURES™
300 Technology Drive
Christiansburg, VA 24073 • USA
inorganicventures.com

CERTIFICATE OF ANALYSIS

tel: 800.669.6799 • 540.585.3030
fax: 540.585.3012
info@inorganicventures.com

1.0 **INORGANIC VENTURES** is an ISO Guide 34 "General Requirements for the Competence of Reference Material Producers" and ISO 9001 registered manufacturer. Our manufacturing laboratory is accredited to ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories."

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 DESCRIPTION OF CRM **10000 µg/mL Sulfur in H2O**

Catalog Number:	CGS10-1, CGS10-2 and CGS10-5
Lot Number:	**E2-S01120**
Starting Material:	H2SO4
Starting Material Purity (%):	100.0000
Starting Material Lot No:	H44F03
Matrix:	H2O

1512760
ID: 10000 S_00005
10000 Sulfur IV

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 10,031 ± 58 µg/mL - weighted mean

Certified Density: 1.018 g/mL (measured at 20 ± 1°C)

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.

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors (Most common are the errors from instrumental measurement, weighing, dilution to volume and the fixed error reported on the NIST SRM certificate of analysis)

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

· "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

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

4.1 **Assay Method #1** **10,026 ± 20 µg/mL**
Acidimetric NIST SRM 84L Lot Number: 84L

Assay Method #2 **10,032 ± 44 µg/mL**
ICP Assay NIST SRM 3154 Lot Number: 892205

4.2 **BALANCE CALIBRATION -** All analytical balances are calibrated yearly by an A2LA accredited calibration laboratory and are traceable to a class E 2 analytical weight set with NIST Traceability. All balances are checked daily using an in-house procedure. The weights used for testing are annually compared to master weights and are traceable to the National Institute of Standards and Technology (NIST).

4.3 **THERMOMETER CALIBRATION -** All thermometers are NIST traceable through thermometers that are calibrated by an A2LA accredited calibration laboratory.

4.4 **GLASSWARE CALIBRATION -** An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM's.

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

CRM's solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.000101	M	Dy < 0.000060	O	Li < 0.000160	M	Pr < 0.000003	M	Te < 0.000300
M	Sb < 0.000005		M	Er < 0.000050	M	Lu < 0.000004	M	Re < 0.000010	M	Tb < 0.000003
M	As < 0.000100		M	Eu < 0.000030	O	Mg < 0.000040	M	Rh < 0.000010	M	Tl < 0.000010
M	Ba < 0.000100		M	Gd < 0.000010	M	Mn < 0.000040	M	Rb < 0.000010	M	Th < 0.000010
O	Be < 0.002000		M	Ga < 0.000010	O	Hg < 0.011000	M	Ru < 0.000020	M	Tm < 0.000004
M	Bi < 0.000004		M	Ge < 0.000060	M	Mo < 0.000020	M	Sm < 0.000010	M	Sn < 0.000050
O	B < 0.009900		M	Au < 0.000030	M	Nd < 0.000020	M	Sc < 0.000100	M	Ti < 0.000500
M	Cd < 0.000030		M	Hf < 0.000020	O	Ni < 0.002300	O	Se < 0.006200	M	W < 0.000100
O	Ca	0.000084	M	Ho < 0.000005	M	Nb < 0.000005	O	Si < 0.004100	M	U < 0.000020
M	Ce < 0.000050		M	In < 0.000100	n	Os	M	Ag < 0.000020	M	V < 0.000020
M	Cs < 0.000003		M	Ir < 0.000050	M	Pd < 0.000050	O	Na 0.000101	M	Yb < 0.000010
M	Cr < 0.000050		O	Fe < 0.001100	O	P < 0.004800	M	Sr < 0.000005	M	Y < 0.000400
M	Co < 0.000030		M	La < 0.000005	M	Pt < 0.000020	s	S	O	Zn < 0.000400
M	Cu < 0.000060		M	Pb < 0.000030	O	K < 0.001700	M	Ta < 0.000070	M	Zr < 0.000050

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
HPLC, IC, TLC, ISE, IR, NMR, UV/VIS, MS, Capillary Eletrophoresis, Potentiometry, Wet Chemistry and Voltammetry
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact Technical Staff

This CRM was manufactured using 18 megohm doubly deionized water that has been filtered through a 0.2 micron filter.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 32.066; +6; 6; (O=)2 S(OH)2

Chemical Compatibility - Soluble in HCl, HNO3, H3PO4 and HF aqueous matrices water and NH4OH . Stable with all metals and inorganic anions at low to moderate ppm levels under acidic conditions except Ba and Pb and to a lesser extent Sr, and Ca.

Stability - 2-100 ppb levels- stability unknown- in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in LDPE container.

S Containing Samples (Preparation and Solution) - We most often get questions about the determination of S in Rocks, Silicates and insoluble sulfates (the finely powered sample is fused in a Pt0 crucible with $6 times its weight of Na2CO3 + 0.5 grams KNO3. The fuseate is extracted with water. Any BaSO4 present in the sample is transposed by the carbonate fusion to the BaCO3 which is left behind in the water-insoluble residue. If PbSO4 is present the fuseate should be boiled with a sodium carbonate saturated with CO2 solution for 1 hour or more where the PbSO4 will be transposed to the water insoluble carbonate which can be filtered off. Boiling the fuseate with a saturated carbonate solution is good insurance for samples containing Ba, Sr, and Ca. The Ba, Pb, Sr, Ca, free filtrate can be acidified and measured by ICP.)

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

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe)
ICP-OES 166.669nm	0.2 / 0.19 µg/mL	1	atom	Si, B
ICP-OES 182.034 nm	0.3 / 0.024 µg/mL	1	atom	
ICP-OES 143.328 nm	0.4 / 0.035 µg/mL	1	atom	
ICP-MS 32 amu	30,000 ppt	n/a	M+	16O2, 14N18O, 15N17O, 14N17O1H, 15N16O1H

Uranium Note: If uranium is present in this standard, it is natural abundance unless specified in Section 3.0.

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Safety Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to an in house procedure and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration
- QMI File Number 010105

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration"
- Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 "General Requirements for the Competence of Reference Material Producers"
- Reference Materials Production - Accredited A2LA Certificate Number 883.02

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission
- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission
- Reporting Defects and Non-Compliance

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Manufacturer concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

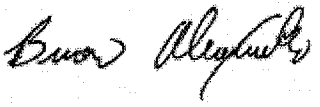
11.3 Chemical Stability - Studies have been conducted on this or similar CRMs and it has been demonstrated that this CRM is chemically stable for a period of not less than two years provided the "Storage & Handling" conditions are followed that are described in section 7.0.

Certification Date: November 11, 2011

Expiration Date:

EXPIRES
01/2013

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	Danny Feeny Product Documentation Technician	
Certificate Approved By:	Brian Alexander PhD., Quality Control Supervisor	
Certifying Officer:	Paul Gaines PhD., Senior Technical Director	

INORGANIC VENTURES™
300 Technology Drive
Christiansburg, VA 24073 • USA
inorganicventures.com

CERTIFICATE OF ANALYSIS

tel: 800.669.6799 • 540.585.3030
fax: 540.585.3012
info@inorganicventures.com

1.0 **INORGANIC VENTURES** is an ISO Guide 34 "General Requirements for the Competence of Reference Material Producers" and ISO 9001 registered manufacturer. Our manufacturing laboratory is accredited to ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories."

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 **DESCRIPTION OF CRM** **10000 µg/mL Silicon in 1% (v/v) HNO3 / 1.4% (v/v) HF**

Catalog Number:	CGSI10-1, CGSI10-2, and CGSI10-5
Lot Number:	**F2-SI03018**
Starting Material:	SiO2
Starting Material Purity (%):	99.9993
Starting Material Lot No:	1551
Matrix:	1% (v/v) HNO3 / 1.4% (v/v) HF

1956330
ID: 10000 Si_00008
Exp:04/01/14 Prpd:HEB Opn:03/25/13
10000 Si IV

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 9,992 ± 51 µg/mL - weighted mean

Certified Density: 1.046 g/mL (measured at 20 ± 1°C)

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.

Certified Value $(\bar{x}) = \frac{\Sigma x_i}{n}$ ($\bar{x}$) = mean

x_i = individual results

n = number of measurements

Uncertainty (±) = $2 [\Sigma(s_i)^2]^{½}$ 2 = the coverage factor.

$[\Sigma(s_i)^2]^{½}$ = The square root of the sum of the squares of the most common errors (where 's' stands for the standard deviation) from instrumental measurement, density, NIST SRM uncertainty, weighing, dilution to volume, homogeneity, long term stability and short term stability.

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

· "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

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

4.1 **Assay Method #1** **9,982 ± 28 µg/mL**
ICP Assay NIST SRM 3150 Lot Number: 071204

Assay Method #2 **10,000 ± 30 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION** - All analytical balances are calibrated yearly by an A2LA accredited calibration laboratory and are traceable to a class E 2 analytical weight set with NIST Traceability. All balances are checked daily using an in-house procedure. The weights used for testing are annually compared to master weights and are traceable to the National Institute of Standards and Technology (NIST).

4.3 **THERMOMETER CALIBRATION** - All thermometers are NIST traceable through thermometers that are calibrated by an A2LA accredited calibration laboratory.

4.4 **GLASSWARE CALIBRATION** - An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM's.

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

CRM's solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	< 0.005154	M	Dy	< 0.014460	O	Li	< 0.000034	M	Pr	< 0.000723	M	Te	< 0.072301
M	Sb	< 0.001205	M	Er	< 0.012050	M	Lu	< 0.000964	M	Re	< 0.002410	M	Tb	< 0.000723
M	As	< 0.024100	M	Eu	< 0.007230	O	Mg	0.002058	M	Rh	< 0.002410	M	Tl	< 0.002410
M	Ba	< 0.024100	M	Gd	< 0.002410	M	Mn	< 0.009640	M	Rb	< 0.002410	M	Th	< 0.002410
O	Be	< 0.000344	M	Ga	< 0.002410	O	Hg	< 0.018898	M	Ru	< 0.004820	M	Tm	< 0.000964
M	Bi	< 0.000964	M	Ge	< 0.014460	M	Mo	< 0.004820	M	Sm	< 0.002410	M	Sn	0.006736
n	B		M	Au	< 0.007230	M	Nd	< 0.004820	O	Sc	< 0.000344	O	Ti	0.006860
M	Cd	< 0.007230	M	Hf	< 0.004820	O	Ni	< 0.003951	M	Se	< 0.019280	O	W	< 0.006872
O	Ca	0.030870	M	Ho	< 0.001205	M	Nb	< 0.001205	s	Si		M	U	< 0.004820
M	Ce	< 0.012050	M	In	< 0.024100	n	Os		M	Ag	< 0.004820	O	V	< 0.001546
M	Cs	< 0.000723	M	Ir	< 0.012050	M	Pd	< 0.012050	n	Na		M	Yb	< 0.002410
O	Cr	< 0.002577	O	Fe	0.006860	O	P	< 0.008590	O	Sr	< 0.000120	M	Y	< 0.096401
M	Co	< 0.007230	M	La	< 0.001205	M	Pt	< 0.004820	O	S	< 0.042951	O	Zn	< 0.000344
O	Cu	< 0.001718	M	Pb	< 0.007230	O	K	0.027440	O	Ta	< 0.010308	M	Zr	< 0.012050

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
HPLC, IC, TLC, ISE, IR, NMR, UV/VIS, MS, Capillary Eletrophoresis, Potentiometry, Wet Chemistry and Voltammetry
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact Technical Staff

This CRM was manufactured using 18 megohm doubly deionized water that has been filtered through a 0.2 micron filter.

4.2 BALANCE CALIBRATION - All analytical balances are calibrated yearly by an A2LA accredited calibration laboratory and are traceable to a class E 2 analytical weight set with NIST Traceability. All balances are checked daily using an in-house procedure. The weights used for testing are annually compared to master weights and are traceable to the National Institute of Standards and Technology (NIST).

4.3 THERMOMETER CALIBRATION - All thermometers are NIST traceable through thermometers that are calibrated by an A2LA accredited calibration laboratory.

4.4 GLASSWARE CALIBRATION - An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM's.

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

CRM's solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	< 0.005154	M	Dy	< 0.014460	O	Li	< 0.000034	M	Pr	< 0.000723
M	Sb	< 0.001205	M	Er	< 0.012050	M	Lu	< 0.000964	M	Re	< 0.002410
M	As	< 0.024100	M	Eu	< 0.007230	O	Mg	0.002058	M	Rh	< 0.002410
M	Ba	< 0.024100	M	Gd	< 0.002410	M	Mn	< 0.009640	M	Rb	< 0.002410
O	Be	< 0.000344	M	Ga	< 0.002410	O	Hg	< 0.018898	M	Ru	< 0.004820
M	Bi	< 0.000964	M	Ge	< 0.014460	M	Mo	< 0.004820	M	Sm	< 0.002410
n	B		M	Au	< 0.007230	M	Nd	< 0.004820	O	Sc	< 0.000344
M	Cd	< 0.007230	M	Hf	< 0.004820	O	Ni	< 0.003951	M	Se	< 0.019280
O	Ca	0.030870	M	Ho	< 0.001205	M	Nb	< 0.001205	s	Si	
M	Ce	< 0.012050	M	In	< 0.024100	n	Os		M	Ag	< 0.004820
M	Cs	< 0.000723	M	Ir	< 0.012050	M	Pd	< 0.012050	n	Na	
O	Cr	< 0.002577	O	Fe	0.006860	O	P	< 0.008590	O	Sr	< 0.000120
M	Co	< 0.007230	M	La	< 0.001205	M	Pt	< 0.004820	O	S	< 0.042951
O	Cu	< 0.001718	M	Pb	< 0.007230	O	K	0.027440	O	Ta	< 0.010308

M	Te	< 0.072301
M	Tb	< 0.000723
M	Tl	< 0.002410
M	Th	< 0.002410
M	Tm	< 0.000964
M	Sn	0.006736
O	Ti	0.006860
O	W	< 0.006872
M	U	< 0.004820
O	V	< 0.001546
M	Yb	< 0.002410
M	Y	< 0.096401
O	Zn	< 0.000344
M	Zr	< 0.012050

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
HPLC, IC, TLC, ISE, IR, NMR, UV/VIS, MS, Capillary Eletrophoresis, Potentiometry, Wet Chemistry and Voltammetry
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact Technical Staff

This CRM was manufactured using 18 megohm doubly deionized water that has been filtered through a 0.2 micron filter.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 28.0855; +4; 6; Si(OH)x(F)y2-
Chemical Compatibility - Soluble in HCl, HF, H3PO4 H2SO4 and HNO3 as the Si(OH)x(F)y2-. Avoid neutral to basic media. Unstable at ppm levels with metals that would pull F- away (i.e. Do not mix with Alkaline or Rare Earths, or high levels of transition elements unless they are fluorinated). Stable with most inorganic anions with a tendency to hydrolyze forming silicic acid (silicic acid is soluble up to ~100 ppm in water) in all dilute acids except HF.
Stability - 2-100 ppb levels - stability unknown - (alone or mixed with all other metals) as the Si(OH)x(F)y2-. 1-10,000 ppm single element solutions as the Si(OH)x(F)y2- chemically stable for years in 2-5 % HNO3 / trace HF in a LDPE container.
Si Containing Samples (Preparation and Solution) - Metal (Soluble in 1:1:1 H2O / HF / HNO3); Oxide - SiO2, amorphic (Dissolve by heating in 1:1:1 H2O / HF / HNO3); Oxide - quartz (Fuse in Pt0 with Na2CO3); Geological Samples (Fuse in Pt0with Na2CO3 followed by HCl solution of the fuseate); Organic Matrices containing silicates and non volatile silicon compounds (Dry ash at 450□C in Pt0 and dissolve by gently warming with 1:1:1 H2O / HF / H2SO4 or fuse / ash with Na2CO3 and dissolve fuseate with HCl / H2O); Silicone Oils - dimethyl silicones depolymerize to form volatile monomer units when heated (Measure directly in alcoholic KOH / xylene mixture where sample is treated first with the KOH at 60-100 □C to "unzip" the Si-O-Si polymeric structure or digest with concentrated H2SO4/H2O2 followed by cooling and dissolution of the dehydrated silica with HF.) Note that the direct analysis of silicone oils in an organic solvent will result in false high results due to high vapor pressure of volatile monomer units like hexamethylcyclotrisiloxane. The KOH forms the K2+Si(CH3)2O= salt which is not volatile at room temperature.
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe)
ICP-OES 251.611 nm	0.012 / 0.003 µg/mL	1	ion	Ta, U, Zn, Th
ICP-OES 212.412 nm	0.02 / 0.01 µg/mL	1	ion	Hf, Os, Mo, Ta
ICP-OES 288.158 nm	0.03 / 0.004 µg/mL	1	ion	Ta, Ce, Cr, Cd, Th
ICP-MS 28 amu	4000 - 8000 ppt	n/a	M+	14N2, 12C16O

HF Note: This standard should not be prepared or stored in glass.
Uranium Note: If uranium is present in this standard, it is natural abundance unless specified in Section 3.0.

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Safety Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to an in house procedure and is guaranteed to be homogeneous.

Inorganic Ventures homogeneity data indicate that the end user should take a minimum sample size of 0.2mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration
- QMI File Number 010105

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration"
- Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 "General Requirements for the Competence of Reference Material Producers"
- Reference Materials Production - Accredited A2LA Certificate Number 883.02

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission
- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission
- Reporting Defects and Non-Compliance

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Manufacturer concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

11.3 Chemical Stability - Studies have been conducted on this or similar CRMs and it has been demonstrated that this CRM is chemically stable for a period of not less than two years provided the "Storage & Handling" conditions are followed that are described in section 7.0.

Certification Date: August 27, 2012
Expiration Date:

EXPIRES
01 APR 2014

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	Zach Saunders Product Documentation Technician	Zachary Saunders
Certificate Approved By:	Beth Day Quality Assurance Specialist	Elizabeth A. Day
Certifying Officer:	Paul Gaines PhD., Senior Technical Director	Paul R Gaines

125 Market Street
New Haven, CT 06513
USA

AccuStandard® Inc.

Tel (203)786-5290
Fax (203)786-5287
www.AccuStandard.com

CERTIFICATE OF ANALYSIS

Catalog No: DRO-AK-102-LCS-10X
Description: #2 Diesel Fuel (Extra Low Sulfur)
Lot: 212081083
Solvent: N/A

8-14-12

Date Certified: Aug 7, 2012
Expiration: Aug 7, 2022
Sample Size: 1 mL
Storage Condition: Ambient
Hazards: HIGHLY FLAMMABLE

☐ Included on ISO/IEC 17025 Scope of Accreditation
☐ Included on ISO Guide 34 Scope of Accreditation

Component	CAS #	Purity % (GC/FID)	Prepared Concentration[1] (mg/mL)	Certified Analyte Concentration[2] (mg/mL)
#2 Diesel Fuel (Extra Low Sulfur)	68476-34-6	Tech	50.00	50.00

AccuStandard follows U.S. conventions in reporting numerical values on both certificates and labels:

A comma (,) is used to separate units of one-thousand or greater.
A period (.) is used as a decimal place marker.

1. All weights are traceable through NIST, Test No822-275872-11
2. Certified Analyte Concentration = Purity x Prepared Concentration. The Uncertainty associated with the gravimetric values reported on this certificate is ±0.24%. The CRM Uncertainty calculated for this product is ±5%. These values are the expanded uncertainty and represent an estimated standard deviation equal to the positive square root of the total variation of the uncertainty of components. A normal distribution is assumed and a coverage factor of K=2 is chosen using approximately a 95% confidence level.
3. A product with a suffix (-1A, -2B, etc. or -01, -02, etc.) on its lot# has had its expiration date extended and is identical to the same lot# without the suffix.

For use in routine laboratory analysis.

See reverse side for additional information
Refer to the MSDS for additional safety information

Certified by: R. Cooper
Russ Cooper, QC Manager

AccuStandard is accredited to ISO Guide 34, ISO/IEC 17025 and certified to ISO 9001

OR-ORG/INO-001
Rev. 7/11

125 Market Street
New Haven, CT 06513
USA

AccuStandard® Inc.

Tel (203)786-5290
Fax (203)786-5287
www.AccuStandard.com

CERTIFICATE OF ANALYSIS

Catalog No: DRO-AK-102-LCS-10X
Description: #2 Diesel Fuel (Extra Low Sulfur)
Lot: 212081083
Solvent: N/A

8-14-12

Date Certified: Aug 7, 2012
Expiration: Aug 7, 2022
Sample Size: 1 mL
Storage Condition: Ambient
Hazards: HIGHLY FLAMMABLE

☐ Included on ISO/IEC 17025 Scope of Accreditation
☐ Included on ISO Guide 34 Scope of Accreditation

Component	CAS #	Purity % (GC/FID)	Prepared Concentration[1] (mg/mL)	Certified Analyte Concentration[2] (mg/mL)
#2 Diesel Fuel (Extra Low Sulfur)	68476-34-6	Tech	50.00	50.00

AccuStandard follows U.S. conventions in reporting numerical values on both certificates and labels:

A comma (,) is used to separate units of one-thousand or greater.
A period (.) is used as a decimal place marker.

1. All weights are traceable through NIST, Test No822-275872-11
2. Certified Analyte Concentration = Purity x Prepared Concentration. The Uncertainty associated with the gravimetric values reported on this certificate is ±0.24%. The CRM Uncertainty calculated for this product is ±5%. These values are the expanded uncertainty and represent an estimated standard deviation equal to the positive square root of the total variation of the uncertainty of components. A normal distribution is assumed and a coverage factor of K=2 is chosen using approximately a 95% confidence level.
3. A product with a suffix (-1A, -2B, etc. or -01, -02, etc.) on its lot# has had its expiration date extended and is identical to the same lot# without the suffix.

For use in routine laboratory analysis.

See reverse side for additional information
Refer to the MSDS for additional safety information

Certified by: R. Cooper
Russ Cooper, QC Manager

AccuStandard is accredited to ISO Guide 34, ISO/IEC 17025 and certified to ISO 9001

OR-ORG/INO-001
Rev. 7/11

125 Market Street
New Haven, CT 06513
USA

AccuStandard® Inc.

Tel (203)786-5290
Fax (203)786-5287
www.AccuStandard.com

CERTIFICATE OF ANALYSIS

Catalog No: DRO-AK-102-LCS-10X
Description: #2 Diesel Fuel (Extra Low Sulfur)
Lot: 212081083
Solvent: N/A

8-14-12

Date Certified: Aug 7, 2012
Expiration: Aug 7, 2022
Sample Size: 1 mL
Storage Condition: Ambient
Hazards: HIGHLY FLAMMABLE

☐ Included on ISO/IEC 17025 Scope of Accreditation
☐ Included on ISO Guide 34 Scope of Accreditation

Component	CAS #	Purity % (GC/FID)	Prepared Concentration[1] (mg/mL)	Certified Analyte Concentration[2] (mg/mL)
#2 Diesel Fuel (Extra Low Sulfur)	68476-34-6	Tech	50.00	50.00

AccuStandard follows U.S. conventions in reporting numerical values on both certificates and labels:

A comma (,) is used to separate units of one-thousand or greater.
A period (.) is used as a decimal place marker.

1. All weights are traceable through NIST, Test No822-275872-11
2. Certified Analyte Concentration = Purity x Prepared Concentration. The Uncertainty associated with the gravimetric values reported on this certificate is ±0.24%. The CRM Uncertainty calculated for this product is ±5%. These values are the expanded uncertainty and represent an estimated standard deviation equal to the positive square root of the total variation of the uncertainty of components. A normal distribution is assumed and a coverage factor of K=2 is chosen using approximately a 95% confidence level.
3. A product with a suffix (-1A, -2B, etc. or -01, -02, etc.) on its lot# has had its expiration date extended and is identical to the same lot# without the suffix.

For use in routine laboratory analysis.

See reverse side for additional information
Refer to the MSDS for additional safety information

Certified by: R. Cooper
Russ Cooper, QC Manager

AccuStandard is accredited to ISO Guide 34, ISO/IEC 17025 and certified to ISO 9001

OR-ORG/INO-001
Rev. 7/11

125 Market Street
New Haven, CT 06513
USA

AccuStandard® Inc.

Tel (203)786-5290
Fax (203)786-5287
www.AccuStandard.com

CERTIFICATE OF ANALYSIS

Catalog No: DRO-AK-102-LCS-10X
Description: #2 Diesel Fuel (Extra Low Sulfur)
Lot: 212081083
Solvent: N/A

8-14-12

Date Certified: Aug 7, 2012
Expiration: Aug 7, 2022
Sample Size: 1 mL
Storage Condition: Ambient
Hazards: HIGHLY FLAMMABLE

☐ Included on ISO/IEC 17025 Scope of Accreditation
☐ Included on ISO Guide 34 Scope of Accreditation

Component	CAS #	Purity % (GC/FID)	Prepared Concentration[1] (mg/mL)	Certified Analyte Concentration[2] (mg/mL)
#2 Diesel Fuel (Extra Low Sulfur)	68476-34-6	Tech	50.00	50.00

AccuStandard follows U.S. conventions in reporting numerical values on both certificates and labels:

A comma (,) is used to separate units of one-thousand or greater.
A period (.) is used as a decimal place marker.

1. All weights are traceable through NIST, Test No822-275872-11
2. Certified Analyte Concentration = Purity x Prepared Concentration. The Uncertainty associated with the gravimetric values reported on this certificate is ±0.24%. The CRM Uncertainty calculated for this product is ±5%. These values are the expanded uncertainty and represent an estimated standard deviation equal to the positive square root of the total variation of the uncertainty of components. A normal distribution is assumed and a coverage factor of K=2 is chosen using approximately a 95% confidence level.
3. A product with a suffix (-1A, -2B, etc. or -01, -02, etc.) on its lot# has had its expiration date extended and is identical to the same lot# without the suffix.

For use in routine laboratory analysis.

See reverse side for additional information
Refer to the MSDS for additional safety information

Certified by: R. Cooper
Russ Cooper, QC Manager

AccuStandard is accredited to ISO Guide 34, ISO/IEC 17025 and certified to ISO 9001

OR-ORG/INO-001
Rev. 7/11

125 Market Street
New Haven, CT 06513
USA

AccuStandard® Inc.

Tel (203)786-5290
Fax (203)786-5287
www.AccuStandard.com

CERTIFICATE OF ANALYSIS

Catalog No: DRO-AK-102-LCS-10X
Description: #2 Diesel Fuel (Extra Low Sulfur)
Lot: 212081083
Solvent: N/A

8-14-12

Date Certified: Aug 7, 2012
Expiration: Aug 7, 2022
Sample Size: 1 mL
Storage Condition: Ambient
Hazards: HIGHLY FLAMMABLE

☐ Included on ISO/IEC 17025 Scope of Accreditation
☐ Included on ISO Guide 34 Scope of Accreditation

Component	CAS #	Purity % (GC/FID)	Prepared Concentration[1] (mg/mL)	Certified Analyte Concentration[2] (mg/mL)
#2 Diesel Fuel (Extra Low Sulfur)	68476-34-6	Tech	50.00	50.00

AccuStandard follows U.S. conventions in reporting numerical values on both certificates and labels:

A comma (,) is used to separate units of one-thousand or greater.
A period (.) is used as a decimal place marker.

1. All weights are traceable through NIST, Test No822-275872-11
2. Certified Analyte Concentration = Purity x Prepared Concentration. The Uncertainty associated with the gravimetric values reported on this certificate is ±0.24%. The CRM Uncertainty calculated for this product is ±5%. These values are the expanded uncertainty and represent an estimated standard deviation equal to the positive square root of the total variation of the uncertainty of components. A normal distribution is assumed and a coverage factor of K=2 is chosen using approximately a 95% confidence level.
3. A product with a suffix (-1A, -2B, etc. or -01, -02, etc.) on its lot# has had its expiration date extended and is identical to the same lot# without the suffix.

For use in routine laboratory analysis.

See reverse side for additional information
Refer to the MSDS for additional safety information

Certified by: R. Cooper
Russ Cooper, QC Manager

AccuStandard is accredited to ISO Guide 34, ISO/IEC 17025 and certified to ISO 9001

OR-ORG/INO-001
Rev. 7/11

125 Market Street
New Haven, CT 06513
USA

AccuStandard® Inc.

Tel (203)786-5290
Fax (203)786-5287
www.AccuStandard.com

CERTIFICATE OF ANALYSIS

Catalog No: DRO-AK-102-LCS-10X
Description: #2 Diesel Fuel (Extra Low Sulfur)
Lot: 212081083
Solvent: N/A

8-14-12

Date Certified: Aug 7, 2012
Expiration: Aug 7, 2022
Sample Size: 1 mL
Storage Condition: Ambient
Hazards: HIGHLY FLAMMABLE

☐ Included on ISO/IEC 17025 Scope of Accreditation
☐ Included on ISO Guide 34 Scope of Accreditation

Component	CAS #	Purity % (GC/FID)	Prepared Concentration[1] (mg/mL)	Certified Analyte Concentration[2] (mg/mL)
#2 Diesel Fuel (Extra Low Sulfur)	68476-34-6	Tech	50.00	50.00

AccuStandard follows U.S. conventions in reporting numerical values on both certificates and labels:

A comma (,) is used to separate units of one-thousand or greater.
A period (.) is used as a decimal place marker.

1. All weights are traceable through NIST, Test No822-275872-11
2. Certified Analyte Concentration = Purity x Prepared Concentration. The Uncertainty associated with the gravimetric values reported on this certificate is ±0.24%. The CRM Uncertainty calculated for this product is ±5%. These values are the expanded uncertainty and represent an estimated standard deviation equal to the positive square root of the total variation of the uncertainty of components. A normal distribution is assumed and a coverage factor of K=2 is chosen using approximately a 95% confidence level.
3. A product with a suffix (-1A, -2B, etc. or -01, -02, etc.) on its lot# has had its expiration date extended and is identical to the same lot# without the suffix.

For use in routine laboratory analysis.

See reverse side for additional information
Refer to the MSDS for additional safety information

Certified by: R. Cooper
Russ Cooper, QC Manager

AccuStandard is accredited to ISO Guide 34, ISO/IEC 17025 and certified to ISO 9001

OR-ORG/INO-001
Rev. 7/11

125 Market Street
New Haven, CT 06513
USA

AccuStandard® Inc.

Tel (203)786-5290
Fax (203)786-5287
www.AccuStandard.com

CERTIFICATE OF ANALYSIS

Catalog No: DRO-AK-102-LCS-10X
Description: #2 Diesel Fuel (Extra Low Sulfur)
Lot: 212081083
Solvent: N/A

8-14-12

Date Certified: Aug 7, 2012
Expiration: Aug 7, 2022
Sample Size: 1 mL
Storage Condition: Ambient
Hazards: HIGHLY FLAMMABLE

☐ Included on ISO/IEC 17025 Scope of Accreditation
☐ Included on ISO Guide 34 Scope of Accreditation

Component	CAS #	Purity % (GC/FID)	Prepared Concentration[1] (mg/mL)	Certified Analyte Concentration[2] (mg/mL)
#2 Diesel Fuel (Extra Low Sulfur)	68476-34-6	Tech	50.00	50.00

AccuStandard follows U.S. conventions in reporting numerical values on both certificates and labels:

A comma (,) is used to separate units of one-thousand or greater.
A period (.) is used as a decimal place marker.

1. All weights are traceable through NIST, Test No822-275872-11
2. Certified Analyte Concentration = Purity x Prepared Concentration. The Uncertainty associated with the gravimetric values reported on this certificate is ±0.24%. The CRM Uncertainty calculated for this product is ±5%. These values are the expanded uncertainty and represent an estimated standard deviation equal to the positive square root of the total variation of the uncertainty of components. A normal distribution is assumed and a coverage factor of K=2 is chosen using approximately a 95% confidence level.
3. A product with a suffix (-1A, -2B, etc. or -01, -02, etc.) on its lot# has had its expiration date extended and is identical to the same lot# without the suffix.

For use in routine laboratory analysis.

See reverse side for additional information
Refer to the MSDS for additional safety information

Certified by: R. Cooper
Russ Cooper, QC Manager

AccuStandard is accredited to ISO Guide 34, ISO/IEC 17025 and certified to ISO 9001

OR-ORG/INO-001
Rev. 7/11

125 Market Street
New Haven, CT 06513
USA

AccuStandard® Inc.

Tel (203)786-5290
Fax (203)786-5287
www.AccuStandard.com

CERTIFICATE OF ANALYSIS

Catalog No: DRO-AK-102-LCS-10X
Description: #2 Diesel Fuel (Extra Low Sulfur)
Lot: 212081083
Solvent: N/A

8-14-12

Date Certified: Aug 7, 2012
Expiration: Aug 7, 2022
Sample Size: 1 mL
Storage Condition: Ambient
Hazards: HIGHLY FLAMMABLE

☐ Included on ISO/IEC 17025 Scope of Accreditation
☐ Included on ISO Guide 34 Scope of Accreditation

Component	CAS #	Purity % (GC/FID)	Prepared Concentration[1] (mg/mL)	Certified Analyte Concentration[2] (mg/mL)
#2 Diesel Fuel (Extra Low Sulfur)	68476-34-6	Tech	50.00	50.00

AccuStandard follows U.S. conventions in reporting numerical values on both certificates and labels:

A comma (,) is used to separate units of one-thousand or greater.
A period (.) is used as a decimal place marker.

1. All weights are traceable through NIST, Test No822-275872-11
2. Certified Analyte Concentration = Purity x Prepared Concentration. The Uncertainty associated with the gravimetric values reported on this certificate is ±0.24%. The CRM Uncertainty calculated for this product is ±5%. These values are the expanded uncertainty and represent an estimated standard deviation equal to the positive square root of the total variation of the uncertainty of components. A normal distribution is assumed and a coverage factor of K=2 is chosen using approximately a 95% confidence level.
3. A product with a suffix (-1A, -2B, etc. or -01, -02, etc.) on its lot# has had its expiration date extended and is identical to the same lot# without the suffix.

For use in routine laboratory analysis.

See reverse side for additional information
Refer to the MSDS for additional safety information

Certified by: R. Cooper
Russ Cooper, QC Manager

AccuStandard is accredited to ISO Guide 34, ISO/IEC 17025 and certified to ISO 9001

OR-ORG/INO-001
Rev. 7/11

125 Market Street
New Haven, CT 06513
USA

AccuStandard® Inc.

Tel (203)786-5290
Fax (203)786-5287
www.AccuStandard.com

CERTIFICATE OF ANALYSIS

CATALOG NO: S-8087-2.5X
DESCRIPTION: Custom Standard
LOT: 212111159
SOLVENT: Dichloromethane

EXPIRATION: Nov 8 , 2015
DATE CERTIFIED: Nov 8, 2012
SAMPLE SIZE: 1 mL
STORAGE CONDITION: Refrig (0-5° C)
HAZARDS: HARMFUL

Refer to the MSDS for additional safety information

[X] Included on ISO/IEC 17025 Scope of Accreditation
[X] Included on ISO Guide 34 Scope of Accreditation

Component	Cas Number	Purity % (GC/MS)	Prepared Concentration[1] (µg/mL)	Certified Analyte Concentration[2] (µg/mL)
o-Terphenyl	84-15-1	100	5001	5001
n-Octacosane	630-02-4	99.9	5002	4997

2 Components

1. All weights are traceable through NIST, Test No. 822-275872-11
2. Certified Analyte Concentration = Purity x Prepared Concentration. The Uncertainty associated with the gravimetric values reported on this certificate is ±0.24%. The CRM Uncertainty calculated for this product is ±5%. Those values are the expanded uncertainty and represent an estimated standard deviation equal to the positive square root of the total variation of the uncertainty of components. A normal distribution is assumed and a coverage factor of K=2 is chosen using approximately a 95% confidence level.
3. A product with a suffix (-1A, -2B, etc. or -01, -02, etc.) on its lot# has had its expiration date extended and is identical to the same lot# without the suffix.

For use in routine laboratory analysis.

Certified by: R. Cooper
Russ Cooper, QC Manager

125 Market Street
New Haven, CT 06513
USA

AccuStandard® Inc.

Tel (203)786-5290
Fax (203)786-5287
www.AccuStandard.com

CERTIFICATE OF ANALYSIS

CATALOG NO: S-8087-2.5X
DESCRIPTION: Custom Standard
LOT: 212111159
SOLVENT: Dichloromethane

EXPIRATION: Nov 8 , 2015
DATE CERTIFIED: Nov 8, 2012
SAMPLE SIZE: 1 mL
STORAGE CONDITION: Refrig (0-5° C)
HAZARDS: HARMFUL

Refer to the MSDS for additional safety information

[X] Included on ISO/IEC 17025 Scope of Accreditation
[X] Included on ISO Guide 34 Scope of Accreditation

Component	Cas Number	Purity % (GC/MS)	Prepared Concentration[1] (µg/mL)	Certified Analyte Concentration[2] (µg/mL)
o-Terphenyl	84-15-1	100	5001	5001
n-Octacosane	630-02-4	99.9	5002	4997

2 Components

1. All weights are traceable through NIST, Test No. 822-275872-11
2. Certified Analyte Concentration = Purity x Prepared Concentration. The Uncertainty associated with the gravimetric values reported on this certificate is ±0.24%. The CRM Uncertainty calculated for this product is ±5%. Those values are the expanded uncertainty and represent an estimated standard deviation equal to the positive square root of the total variation of the uncertainty of components. A normal distribution is assumed and a coverage factor of K=2 is chosen using approximately a 95% confidence level.
3. A product with a suffix (-1A, -2B, etc. or -01, -02, etc.) on its lot# has had its expiration date extended and is identical to the same lot# without the suffix.

For use in routine laboratory analysis.

Certified by: R. Cooper
Russ Cooper, QC Manager

5

110 Benner Circle
Bellefonte, PA 16823-8812
Tel: (800)356-1688
Fax: (814)353-1309

www.Restek.com

Certificate of Analysis

FOR LABORATORY USE ONLY-READ MSDS PRIOR TO USE.

Catalog No. : 30237 **Lot No.:** A084889

Description : Certified BTEX in Unleaded Gas Composite

VOA Mix, UST Method, Cert.BTEX in unleaded gas, 5,500µg/ml, P&T MeOH, 1ml/ampule

Container Size : [5] 2 mL **Pkg Amt:** [5] > 1 mL

Expiration Date : [1] December 2018 **Storage:** 0°C or colder

Elution Order	Compound	CAS #	Percent Purity [2]	Grav. Conc. (weight/volume) [3]	Grav.Uncert. (95% C.L.; K=2) [4]
1	Unleaded Gasoline Composite (certified)	8006-61-9	----%	5,500.0 ug/mL	+/- 32.2037 ug/mL
Solvent:	P&T Methanol	67-56-1	99%		

Column:
60m x .25mm x 1.4um
Rtx-502.2 (cat.#10916)

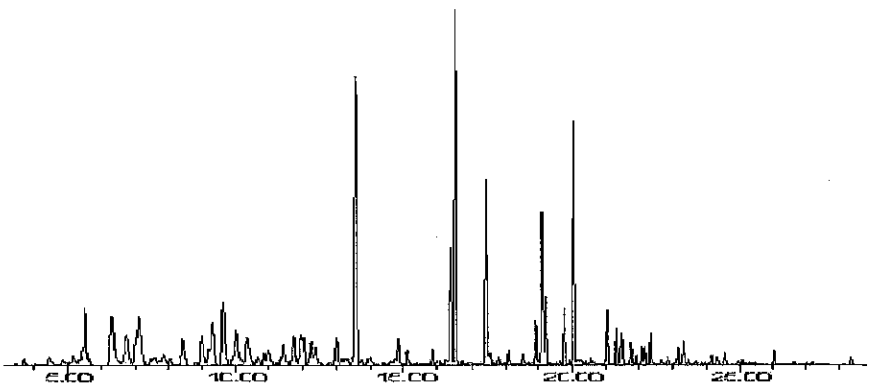
Carrier Gas:
helium-constant pressure 30 psi

Temp. Program:
40°C (hold 2 min.) to 240°C
@ 8°C/min. (hold 5 min.)

Inj. Temp:
200°C

Det. Temp:
250°C

Det. Type:
MSD



Rec'd
11/12/12

Preliminary Report

TestAmerica Denver

Recovery Report

Data File:	\\Denchrom\ChromData\SGC_U\20130430-11130.b\04300002.D		
Lims ID:	8015Surr_80	Client ID:	
Inject. Date:	30-Apr-2013 16:35:06	Dil. Factor:	1.0000
Sample Type:	Client		
Sample ID:	8015Surr_80		
Misc. Info.:			
Operator:	MB	Instrument ID:	SGC_U
Injection Vol:	1.0 ul	ALS Bottle#:	2
Lims Batch ID:	11130	Lims Sample ID:	2
Detector:	GC FID1B		
Method:	\\Denchrom\ChromData\SGC_U\20130430-11130.b\DRO_U.m		
Last Update:	01-May-2013 11:34:26	Calib Date:	24-Apr-2013 16:24:11
Quant Method:	External Standard	Quant By:	Initial Calibration
Last ICal File:	\\Denchrom\ChromData\SGC_U\20130424-10941.b\04240009.D		
Limit Group:	GCSV - DRO		
Integrator:	Falcon		
Column Type:	RTX-1 (30.32)	Column Dia:	0.25 mm
Process Host:	DENPC248		

Compound	Amount Added	Amount Recovered	% Rec.
$ 1 o-Terphenyl	20.0	18.1	90.66
$ 2 n-Octacosane	20.0	18.4	91.91

5-1-13

Reagent ID: 8015Surrogate_00080

		Expiration Date:	10/29/2013
Description:	20 ug/mL 8015 Surrogate	Laboratory:	TestAmerica Denver
No. of Bottles:	2	Prepared By:	Curley, Nick
Storage Location:	North Prep	Solvent:	90:10 Acetone:MeCl2
Reagent Volume:	500.000 mL	Solvent Lot:	90Ace10MeCl2_00013
Creation Date:	04/29/2013		
Container(s):	2018798, 2018799		
Comment:	Take 2mL 8015 SurStock (S-8087-2.5X) and dilute to 500mL in 90:10 ACETONE/MeCl2. 6 month expiration.		

Reagent Analyte Information

Analyte	Source ID	Source Expiration Date	Source Conc.	Source Conc. Units	Final Conc.	Final Conc. Units
n-Octacosane	8015 SurStock_00118	11/08/2015	5000.000	ug/mL	20.00000	ug/mL
o-Terphenyl	8015 SurStock_00118	11/08/2015	5000.000	ug/mL	20.00000	ug/mL
n-Octacosane	8015 SurStock_00119	11/08/2015	5000.000	ug/mL	20.00000	ug/mL
o-Terphenyl	8015 SurStock_00119	11/08/2015	5000.000	ug/mL	20.00000	ug/mL

Source Reagents

Reagent	Description	Type	Expiration	Vendor	Vendor Lot #	Vendor Cat Lot #	Volume Used	Volume Units
8015 SurStock_00118	DenCustom Standard S-8087-2.5X	ASTD	11/08/15	AccuStandard	212111159	S-8087-2.5X	1.00000	mL
8015 SurStock_00119	DenCustom Standard S-8087-2.5X	ASTD	11/08/15	AccuStandard	212111159	S-8087-2.5X	1.00000	mL

ULTRA SCIENTIFIC
Analytical Solutions

Certificate of Analysis

12
Rec'd 12/4/12

alpha,alpha,alpha-Trifluorotoluene Solution

Product Number: STS-220N **Page:** 1 of 1

Lot Number: CE-1903A **Lot Issue Date:** 28-Jun-2011 **Expiration Date:** 31-Jul-2014

This Certified Reference Material (RM) was manufactured and verified in accordance with ULTRA's ISO 9001 registered quality system, and the analyte concentrations were verified by our ISO 17025 accredited laboratory. The true value and uncertainty value at the 95% confidence level for each analyte, determined gravimetrically, is listed below.

Analyte	CAS#	Analyte Lot	True Value
a,a,a-trifluorotoluene	000098-08-8	TS 11520AS	2010 ± 10 µg/mL

Matrix: methanol (methyl alcohol)

Storage: Store at < 4° C

ULTRA uses balances calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z-540-1 and ISO 9001, and calibrated Class A glassware in the manufacturing of these standards.

ACCREDITED
ISO 17025:2005 Accredited A2LA Cert. No. 0851-01
ISO 9001:2008 Registered TUV USA, Inc. Cert. No. 09-1009

250 Smith Street, North Kingstown, RI 02852 USA
401-294-9400 Fax: 295-2330
wwww.ultrasci.com

William J. Leary
Quality Assurance Manager

05/29/2013

10

125 Market Street
New Haven, CT 06513
USA

AccuStandard® Inc.

Tel (203)786-5290
Fax (203)786-5287
www.AccuStandard.com

CERTIFICATE OF ANALYSIS

Rec'd 3/1/13

Catalog No: M-602-SS-10X
Description: α,α,α-Trifluorotoluene

Lot: 213021313
Solvent: Methanol

Date Certified: Feb 22, 2013
Expiration: Feb 22, 2023
Sample Size: 1 mL
Storage Condition: Ambient
Hazards: HIGHLY FLAMMABLE

[X] Included on ISO/IEC 17025 Scope of Accreditation
[X] Included on ISO Guide 34 Scope of Accreditation

Component	CAS #	Purity % (GC/MS)	Prepared Concentration[1] (µg/mL)	Certified Analyte Concentration[2] (µg/mL)
a,a,a-Trifluorotoluene	98-08-8	99.9	2002	2000

AccuStandard follows U.S. conventions in reporting numerical values on both certificates and labels:

A comma (,) is used to separate units of one-thousand or greater.
A period (.) is used as a decimal place marker.

1. All weights are traceable through NIST, Test No.822-275872-11
2. Certified Analyte Concentration = Purity x Prepared Concentration. The Uncertainty associated with the gravimetric values reported on this certificate is ±0.24%. The CRM Uncertainty calculated for this product is ±5%. These values are the expanded uncertainty and represent an estimated standard deviation equal to the positive square root of the total variation of the uncertainty of components. A normal distribution is assumed and a coverage factor of K=2 is chosen using approximately a 95% confidence level.
3. A product with a suffix (-1A, -2B, etc. or -01, -02, etc.) on its lot# has had its expiration date extended and is identical to the same lot# without the suffix.

For use in routine laboratory analysis.

See reverse side for additional information
Refer to the MSDS for additional safety information

Certified by: R. Cooper
Russ Cooper, QC Manager

AccuStandard is accredited to ISO Guide 34, ISO/IEC 17025 and certified to ISO 9001

OR-ORG/INO-001
Rev. 7/11

125 Market Street
New Haven, CT 06513
USA

AccuStandard® Inc.

Tel (203)786-5290
Fax (203)786-5287
www.AccuStandard.com

CERTIFICATE OF ANALYSIS

Catalog No: M-602-SS-10X
Description: α,α,α-Trifluorotoluene

Lot: 213021313
Solvent: Methanol

Date Certified: Feb 22, 2013
Expiration: Feb 22, 2023
Sample Size: 1 mL
Storage Condition: Ambient
Hazards: HIGHLY FLAMMABLE

[X] Included on ISO/IEC 17025 Scope of Accreditation
[X] Included on ISO Guide 34 Scope of Accreditation

Component	CAS #	Purity % (GC/MS)	Prepared Concentration[1] (µg/mL)	Certified Analyte Concentration[2] (µg/mL)
a,a,a-Trifluorotoluene	98-08-8	99.9	2002	2000

Rec'd 4/16/13 TH

AccuStandard follows U.S. conventions in reporting numerical values on both certificates and labels:

A comma (,) is used to separate units of one-thousand or greater.
A period (.) is used as a decimal place marker.

1. All weights are traceable through NIST, Test No.822-275872-11
2. Certified Analyte Concentration = Purity x Prepared Concentration. The Uncertainty associated with the gravimetric values reported on this certificate is ±0.24%. The CRM Uncertainty calculated for this product is ±5%. These values are the expanded uncertainty and represent an estimated standard deviation equal to the positive square root of the total variation of the uncertainty of components. A normal distribution is assumed and a coverage factor of K=2 is chosen using approximately a 95% confidence level.
3. A product with a suffix (-1A, -2B, etc. or -01, -02, etc.) on its lot# has had its expiration date extended and is identical to the same lot# without the suffix.

For use in routine laboratory analysis.

See reverse side for additional information
Refer to the MSDS for additional safety information

Certified by: R. Cooper
Russ Cooper, QC Manager

AccuStandard is accredited to ISO Guide 34, ISO/IEC 17025 and certified to ISO 9001

OR-ORG/INO-001
Rev. 7/11

125 Market Street
New Haven, CT 06513
USA

AccuStandard®, Inc.

Tel (203)786-5290
Fax (203)786-5287
Website AccuStandard.com

CERTIFICATE OF ANALYSIS

Catalog No: M-8015B/5031-10
Description: 1,4-Dioxane
Lot: 211061176
Solvent: Water

9-16-11

Date Certified: Jun 24, 2011
Expiration: Jun 24, 2021
Sample Size: 1 mL
Storage Condition: Ambient
Hazards: IRRITANT

[X] Included on ISO/IEC 17025 Scope of Accreditation
[X] Included on ISO Guide 34 Scope of Accreditation

Component	CAS #	Purity % (GC/MS)	Prepared Concentration[1] (mg/mL)	Certified Analyte Concentration[2] (mg/mL)
p-Dioxane	123-91-1	99.7	10.00	9.97

AccuStandard follows U.S. conventions in reporting numerical values on both certificates and labels:

A comma (,) is used to separate units of one-thousand or greater.
A period (.) is used as a decimal place marker.

1. All weights are traceable through NIST, Test No822/272103-05
2. Certified Analyte Concentration = Purity x Prepared Concentration. The Uncertainty associated with the gravimetric values reported on this certificate is ±0.24%. The CRM Uncertainty calculated for this product is ±5%. These values are the expanded uncertainty and represent an estimated standard deviation equal to the positive square root of the total variation of the uncertainty of components. A normal distribution is assumed and a coverage factor of K=2 is chosen using approximately a 95% confidence level.
3. A product with a suffix (-1A, -2B, etc. or -01, -02, etc.) on its lot# has had its expiration date extended and is identical to the same lot# without the suffix.

For use in routine laboratory analysis.

See reverse side for additional information
Refer to the MSDS for additional safety information

Certified by: R. Cooper
Russ Cooper, QC Manager

125 Market Street
New Haven, CT 06513
USA

AccuStandard®, Inc.

Tel (203)786-5290
Fax (203)786-5287
Website AccuStandard.com

CERTIFICATE OF ANALYSIS

Catalog No: M-8015B/5031-10
Description: 1,4-Dioxane
Lot: 211061176
Solvent: Water

9-16-11

Date Certified: Jun 24, 2011
Expiration: Jun 24, 2021
Sample Size: 1 mL
Storage Condition: Ambient
Hazards: IRRITANT

[X] Included on ISO/IEC 17025 Scope of Accreditation
[X] Included on ISO Guide 34 Scope of Accreditation

Component	CAS #	Purity % (GC/MS)	Prepared Concentration[1] (mg/mL)	Certified Analyte Concentration[2] (mg/mL)
p-Dioxane	123-91-1	99.7	10.00	9.97

AccuStandard follows U.S. conventions in reporting numerical values on both certificates and labels:

A comma (,) is used to separate units of one-thousand or greater.
A period (.) is used as a decimal place marker.

1. All weights are traceable through NIST, Test No822/272103-05
2. Certified Analyte Concentration = Purity x Prepared Concentration. The Uncertainty associated with the gravimetric values reported on this certificate is ±0.24%. The CRM Uncertainty calculated for this product is ±5%. These values are the expanded uncertainty and represent an estimated standard deviation equal to the positive square root of the total variation of the uncertainty of components. A normal distribution is assumed and a coverage factor of K=2 is chosen using approximately a 95% confidence level.
3. A product with a suffix (-1A, -2B, etc. or -01, -02, etc.) on its lot# has had its expiration date extended and is identical to the same lot# without the suffix.

For use in routine laboratory analysis.

See reverse side for additional information
Refer to the MSDS for additional safety information

Certified by: R. Cooper
Russ Cooper, QC Manager

Certificate of Analysis

DESCRIPTION: HC 8270 LCS Spike Mix

CATALOG NO.: 40032-U
LOT NO.: LB97647

MFG DATE: Jan-2013
EXPIRATION DATE: Jan-2014

SOLVENT: METHANOL:BENZ:DCM (80:1.25:18.75)

ANALYTE (1)	CAS NUMBER	PERCENT PURITY(2)	WEIGHT(3) CONCENTRATION	ANALYTICAL(4)		STD DEV	SUPELCO LOT NO
ACENAPHTHENE	83-32-9	99.9	200.0	196.5	+/-	23.01	LB82590
ACENAPHTHYLENE	208-96-8	99.9	200.0	204.1	+/-	20.55	LB84923
ANILINE	62-53-3	99.9	200.0	221.6	+/-	13.21	LA41596
ANTHRACENE	120-12-7	99.5	200.0	199.6	+/-	11.32	LB77576
AZOBENZENE	103-33-3	99.9	200.0	202.7	+/-	9.46	LB91797
BENZO (A) ANTHRACENE	56-55-3	99.9 (a)	200.0	200.1	+/-	13.34	LB89579
BENZO (A) PYRENE	50-32-8	99.9 (a)	200.0	200.4	+/-	15.09	LB90586
BENZO (B) FLUORANTHENE	205-99-2	97.3	200.0	200.8	+/-	13.97	LB96148
BENZO (G,H,I) PERYLENE	191-24-2	99.3	200.0	217.3	+/-	3.46	LB92103
BENZO (K) FLUORANTHENE	207-08-9	99.9	200.0	198.2	+/-	15.47	LB85440
BENZOIC ACID	65-85-0	99.9	200.0	221.1	+/-	16.62	LB85791
BENZYL ALCOHOL	100-51-6	99.9	200.0	216.0	+/-	1.33	LB48374
BENZYL BUTYL PHTHALATE	85-68-7	98.6	200.0	198.7	+/-	21.33	LB60340
BIS (2-CHLOROETHOXY) METHANE	111-91-1	98.1	200.0	216.6	+/-	5.36	LB46081
BIS (2-CHLOROETHYL) ETHER	111-44-4	99.9	200.0	226.8	+/-	25.66	LB84286
BIS (2-CHLOROISOPROPYL) ETHER	108-60-1	96.8	200.0	215.1	+/-	15.09	LB95928
BIS (2-ETHYLHEXYL) PHTHALATE	117-81-7	99.7	200.0	197.2	+/-	20.97	LB58359
BIS-2-ETHYLHEXYL ADIPATE	103-23-1	99.7	200.0	195.2	+/-	22.97	LB31993
CARBAZOLE	86-74-8	98.2	200.0	196.8	+/-	11.18	LB80615

(1) Listed in alphabetical order.
(2) Determined by capillary GC-FID, unless otherwise noted.
a) HPLC UV-254NM
(3) NIST traceable weights are used to verify balance calibration with the preparation of each lot. Concentration of analyte in solution is ug/ml +/- 0.5%, uncertainty based upon balance and Class A volumetric glassware. Weights are corrected for analytes less than 98% pure.
(4) Determined by chromatographic analysis against an independently prepared reference lot. Mean of replicate injections.
(5) These products coelute and are not quantified in the final mix.

Duane Funk

Duane Funk
Quality Manager

SUPELCO Analytical
595 North Harrison Road
Bellefonte, PA 16823-0048 USA
Phone (814) 359-3441

Certificate of Analysis

DESCRIPTION: HC 8270 LCS Spike Mix

CATALOG NO.: 40032-U
LOT NO.: LB97647

MFG DATE: Jan-2013
EXPIRATION DATE: Jan-2014

SOLVENT: METHANOL:BENZ:DCM (80:1.25:18.75)

ANALYTE (1)	CAS NUMBER	PERCENT PURITY(2)	WEIGHT(3) CONCENTRATION	ANALYTICAL(4) CONCENTRATION		STD DEV	SUPELCO LOT NO
CHRYSENE	218-01-9	98.9	200.0	199.8	+/-	13.59	LB92051
DI-N-BUTYL PHTHALATE	84-74-2	99.5	200.0	196.8	+/-	13.79	LB64921
DI-N-OCTYL PHTHALATE	117-84-0	99.9	200.0	195.6	+/-	23.53	LB88733
DIBENZ (A,H) ANTHRACENE	53-70-3	99.9	200.0	218.8	+/-	5.52	LB87229
DIBENZOFURAN	132-64-9	98.9	200.0	200.0	+/-	35.56	LB78814
DIETHYL PHTHALATE	84-66-2	99.2	200.0	199.0	+/-	12.61	LB60384
DIMETHYL PHTHALATE	131-11-3	99.9	200.0	202.9	+/-	12.42	LB30494
FLUORANTHENE	206-44-0	98.4	200.0	199.6	+/-	12.33	LB83499
FLUORENE	86-73-7	99.1	200.0	205.2	+/-	7.66	LB89630
HEXACHLOROBENZENE	118-74-1	99.9	200.0	200.0	+/-	11.37	LB88881
HEXACHLOROBUTADIENE	87-68-3	98.5	200.0	222.8	+/-	17.35	LB75566
HEXACHLOROCYCLOPENTADIENE	77-47-4	98.8	200.0	230.2	+/-	9.30	LB95525
HEXACHLOROETHANE	67-72-1	99.9	200.0	217.2	+/-	6.90	LB29072
INDENO (1,2,3-CD) PYRENE	193-39-5	99.9	200.0	219.0	+/-	9.02	LB90242
ISOPHORONE	78-59-1	99.1	200.0	214.5	+/-	1.61	LB45460
N-NITROSODI-N-PROPYLAMINE	621-64-7	99.9	200.0	196.8	+/-	12.90	LB89233
N-NITROSODIMETHYLAMINE	62-75-9	99.9	200.0	222.9	+/-	27.48	LB93267
N-NITROSODIPHENYLAMINE	86-30-6	96.58	200.0	196.8	+/-	12.90	LB17295
NAPHTHALENE	91-20-3	99.9	200.0	220.9	+/-	14.12	LB83148

(1) Listed in alphabetical order.
(2) Determined by capillary GC-FID, unless otherwise noted.
a) HPLC UV-254NM
(3) NIST traceable weights are used to verify balance calibration with the preparation of each lot. Concentration of analyte in solution is ug/ml +/- 0.5%, uncertainty based upon balance and Class A volumetric glassware. Weights are corrected for analytes less than 98% pure.
(4) Determined by chromatographic analysis against an independently prepared reference lot. Mean of replicate injections.
(5) These products coelute and are not quantified in the final mix.

Duane Funk

Duane Funk
Quality Manager

SUPELCO Analytical
595 North Harrison Road
Bellefonte, PA 16823-0048 USA
Phone (814) 359-3441

Certificate of Analysis

DESCRIPTION: HC 8270 LCS Spike Mix

CATALOG NO.: 40032-U
LOT NO.: LB97647

MFG DATE: Jan-2013
EXPIRATION DATE: Jan-2014

SOLVENT: METHANOL:BENZ:DCM (80:1.25:18.75)

ANALYTE (1)	CAS NUMBER	PERCENT PURITY(2)	WEIGHT(3) CONCENTRATION	ANALYTICAL(4) CONCENTRATION		STD DEV	SUPELCO LOT NO
NITROBENZENE	98-95-3	99.9	200.0	218.4	+/-	10.53	LB47070
PENTACHLOROPHENOL	87-86-5	99.9	200.0	200.0	+/-	23.60	LB75554
PHENANTHRENE	85-01-8	99.0	200.0	199.0	+/-	10.87	LB92396
PHENOL	108-95-2	99.9	200.0	214.4	+/-	9.80	LB57703
PYRENE	129-00-0	97.5	200.0	199.5	+/-	12.65	LB70761
PYRIDINE (LOW WATER)	110-86-1	99.9	200.0	228.1	+/-	25.84	LB55487
1-METHYLNAPHTHALENE	90-12-0	98.6	200.1	216.6	+/-	4.49	LB86459
1,2-DICHLOROBENZENE	95-50-1	99.9	200.0	219.8	+/-	18.38	LA96474
1,2,-DINITROBENZENE	528-29-0	99.9	200.0	200.0	+/-	21.24	LB89413
1,2,4-TRICHLOROBENZENE	120-82-1	99.5	200.0	210.3	+/-	20.69	LB48083
1,3-DICHLOROBENZENE	541-73-1	99.9	200.0	227.0	+/-	25.92	LB68066
1,3-DINITROBENZENE	99-65-0	99.9 (a)	200.0	200.9	+/-	15.86	LB80492
1,4-DICHLOROBENZENE	106-46-7	99.9	200.0	223.5	+/-	24.02	LB83282
1,4-DINITROBENZENE	100-25-4	99.9	200.0	209.2	+/-	25.69	LB86704
2-CHLORONAPHTHALENE	91-58-7	99.9	200.0	213.6	+/-	0.99	LB86449
2-CHLOROPHENOL	95-57-8	99.6	200.0	212.0	+/-	7.43	LB83266
2-METHYL-4,6-DINITROPHENOL	534-52-1	99.9	200.0	197.8	+/-	26.09	LB31592
2-METHYLNAPHTHALENE	91-57-6	98.3	200.0	215.0	+/-	6.53	LB44448
2-METHYLPHENOL	95-48-7	99.8	200.0	209.7	+/-	5.52	LB30223

(1) Listed in alphabetical order.

(2) Determined by capillary GC-FID, unless otherwise noted.
a) HPLC UV-254NM

(3) NIST traceable weights are used to verify balance calibration with the preparation of each lot. Concentration of analyte in solution is ug/ml +/- 0.5%, uncertainty based upon balance and Class A volumetric glassware. Weights are corrected for analytes less than 98% pure.

(4) Determined by chromatographic analysis against an independently prepared reference lot. Mean of replicate injections.

(5) These products coelute and are not quantified in the final mix.

Duane Funk

Duane Funk
Quality Manager

SUPELCO Analytical
595 North Harrison Road
Bellefonte, PA 16823-0048 USA
Phone (814) 359-3441

Certificate of Analysis

DESCRIPTION: HC 8270 LCS Spike Mix

CATALOG NO.: 40032-U
LOT NO.: LB97647

MFG DATE: Jan-2013
EXPIRATION DATE: Jan-2014

SOLVENT: METHANOL:BENZ:DCM (80:1.25:18.75)

ANALYTE (1)	CAS NUMBER	PERCENT PURITY(2)	WEIGHT(3) CONCENTRATION	ANALYTICAL(4) CONCENTRATION		STD DEV	SUPELCO LOT NO
2-NITROANILINE	88-74-4	99.9	200.0	202.9	+/-	26.92	LB49936
2-NITROPHENOL	88-75-5	99.9	200.0	224.6	+/-	5.26	LB44736
2,3,4,6-TETRACHLOROPHENOL	58-90-2	99.9	200.0	199.2	+/-	14.62	LB91612
2,3,5,6-TETRACHLOROPHENOL	935-95-5	99.9	200.0	203.3	+/-	18.03	LB57701
2,4-DICHLOROPHENOL	120-83-2	98.8	200.0	213.7	+/-	4.36	LB76837
2,4-DIMETHYLPHENOL	105-67-9	99.9	200.0	207.6	+/-	3.47	LB88935
2,4-DINITROPHENOL	51-28-5	99.9	200.0	205.3	+/-	5.77	LB92092
2,4-DINITROTOLUENE	121-14-2	96.0	200.0	201.5	+/-	18.66	LB46632
2,4,5-TRICHLOROPHENOL	95-95-4	99.9	200.0	214.8	+/-	16.41	LB35288
2,4,6-TRICHLOROPHENOL	88-06-2	99.9	200.0	208.4	+/-	13.50	LB65559
2,6-DINITROTOLUENE	606-20-2	99.9	200.0	211.3	+/-	5.06	LB79891
3-METHYLPHENOL (5)	108-39-4	99.9	200.0	*****			LB83715
3-NITROANILINE	99-09-2	99.9	200.0	210.9	+/-	5.79	LB73829
3,3-DICHLOROBENZIDINE	91-94-1	99.9	200.0	196.9	+/-	19.49	LB94134
4-BROMOPHENYLPHENYL ETHER	101-55-3	98.5	200.0	198.8	+/-	10.69	LB85575
4-CHLORO-3-METHYLPHENOL	59-50-7	99.9	200.0	207.9	+/-	14.23	LB83265
4-CHLOROANILINE	106-47-8	99.9	200.0	214.8	+/-	4.76	LB82916
4-CHLOROPHENYLPHENYL ETHER	7005-72-3	99.9	200.0	202.5	+/-	10.21	LB72185
4-METHYLPHENOL (5)	106-44-5	99.9	200.0	*****			LB32518

(1) Listed in alphabetical order.
(2) Determined by capillary GC-FID, unless otherwise noted.
a) HPLC UV-254NM
(3) NIST traceable weights are used to verify balance calibration with the preparation of each lot. Concentration of analyte in solution is ug/ml +/- 0.5%, uncertainty based upon balance and Class A volumetric glassware. Weights are corrected for analytes less than 98% pure.
(4) Determined by chromatographic analysis against an independently prepared reference lot. Mean of replicate injections.
(5) These products coelute and are not quantified in the final mix.

Duane Funk

Duane Funk
Quality Manager

SUPELCO Analytical
595 North Harrison Road
Bellefonte, PA 16823-0048 USA
Phone (814) 359-3441

Certificate of Analysis

DESCRIPTION: HC 8270 LCS Spike Mix

CATALOG NO.: 40032-U
LOT NO.: LB97647

MFG DATE: Jan-2013
EXPIRATION DATE: Jan-2014

SOLVENT: METHANOL:BENZ:DCM (80:1.25:18.75)

ANALYTE (1)	CAS NUMBER	PERCENT PURITY(2)	WEIGHT(3) CONCENTRATION	ANALYTICAL(4) CONCENTRATION		STD DEV	SUPELCO LOT NO
4-NITROANILINE	100-01-6	99.9	200.0	194.1	+/-	19.49	LB42566
4-NITROPHENOL	100-02-7	99.9	200.0	195.1	+/-	24.69	LB83255

(1) Listed in alphabetical order.
(2) Determined by capillary GC-FID, unless otherwise noted.
a) HPLC UV-254NM
(3) NIST traceable weights are used to verify balance calibration with the preparation of each lot. Concentration of analyte in solution is ug/ml +/- 0.5%, uncertainty based upon balance and Class A volumetric glassware. Weights are corrected for analytes less than 98% pure.
(4) Determined by chromatographic analysis against an independently prepared reference lot. Mean of replicate injections.
(5) These products coelute and are not quantified in the final mix.

Duane Funk

Duane Funk
Quality Manager

SUPELCO Analytical
595 North Harrison Road
Bellefonte, PA 16823-0048 USA
Phone (814) 359-3441

Certificate of Analysis

DESCRIPTION: HC 8270 LCS Spike Mix

CATALOG NO.: 40032-U
LOT NO.: LB97647

MFG DATE: Jan-2013
EXPIRATION DATE: Jan-2014

SOLVENT: METHANOL:BENZ:DCM (80:1.25:18.75)

ANALYTE (1)	CAS NUMBER	PERCENT PURITY(2)	WEIGHT(3) CONCENTRATION	ANALYTICAL(4)		STD DEV	SUPELCO LOT NO
ACENAPHTHENE	83-32-9	99.9	200.0	196.5	+/-	23.01	LB82590
ACENAPHTHYLENE	208-96-8	99.9	200.0	204.1	+/-	20.55	LB84923
ANILINE	62-53-3	99.9	200.0	221.6	+/-	13.21	LA41596
ANTHRACENE	120-12-7	99.5	200.0	199.6	+/-	11.32	LB77576
AZOBENZENE	103-33-3	99.9	200.0	202.7	+/-	9.46	LB91797
BENZO (A) ANTHRACENE	56-55-3	99.9 (a)	200.0	200.1	+/-	13.34	LB89579
BENZO (A) PYRENE	50-32-8	99.9 (a)	200.0	200.4	+/-	15.09	LB90586
BENZO (B) FLUORANTHENE	205-99-2	97.3	200.0	200.8	+/-	13.97	LB96148
BENZO (G,H,I) PERYLENE	191-24-2	99.3	200.0	217.3	+/-	3.46	LB92103
BENZO (K) FLUORANTHENE	207-08-9	99.9	200.0	198.2	+/-	15.47	LB85440
BENZOIC ACID	65-85-0	99.9	200.0	221.1	+/-	16.62	LB85791
BENZYL ALCOHOL	100-51-6	99.9	200.0	216.0	+/-	1.33	LB48374
BENZYL BUTYL PHTHALATE	85-68-7	98.6	200.0	198.7	+/-	21.33	LB60340
BIS (2-CHLOROETHOXY) METHANE	111-91-1	98.1	200.0	216.6	+/-	5.36	LB46081
BIS (2-CHLOROETHYL) ETHER	111-44-4	99.9	200.0	226.8	+/-	25.66	LB84286
BIS (2-CHLOROISOPROPYL) ETHER	108-60-1	96.8	200.0	215.1	+/-	15.09	LB95928
BIS (2-ETHYLHEXYL) PHTHALATE	117-81-7	99.7	200.0	197.2	+/-	20.97	LB58359
BIS-2-ETHYLHEXYL ADIPATE	103-23-1	99.7	200.0	195.2	+/-	22.97	LB31993
CARBAZOLE	86-74-8	98.2	200.0	196.8	+/-	11.18	LB80615

(1) Listed in alphabetical order.
(2) Determined by capillary GC-FID, unless otherwise noted.
a) HPLC UV-254NM
(3) NIST traceable weights are used to verify balance calibration with the preparation of each lot. Concentration of analyte in solution is ug/ml +/- 0.5%, uncertainty based upon balance and Class A volumetric glassware. Weights are corrected for analytes less than 98% pure.
(4) Determined by chromatographic analysis against an independently prepared reference lot. Mean of replicate injections.
(5) These products coelute and are not quantified in the final mix.

Duane Funk

Duane Funk
Quality Manager

SUPELCO Analytical
595 North Harrison Road
Bellefonte, PA 16823-0048 USA
Phone (814) 359-3441

Certificate of Analysis

DESCRIPTION: HC 8270 LCS Spike Mix

CATALOG NO.: 40032-U
LOT NO.: LB97647

MFG DATE: Jan-2013
EXPIRATION DATE: Jan-2014

SOLVENT: METHANOL:BENZ:DCM (80:1.25:18.75)

ANALYTE (1)	CAS NUMBER	PERCENT PURITY(2)	WEIGHT(3) CONCENTRATION	ANALYTICAL(4) CONCENTRATION		STD DEV	SUPELCO LOT NO
CHRYSENE	218-01-9	98.9	200.0	199.8	+/-	13.59	LB92051
DI-N-BUTYL PHTHALATE	84-74-2	99.5	200.0	196.8	+/-	13.79	LB64921
DI-N-OCTYL PHTHALATE	117-84-0	99.9	200.0	195.6	+/-	23.53	LB88733
DIBENZ (A,H) ANTHRACENE	53-70-3	99.9	200.0	218.8	+/-	5.52	LB87229
DIBENZOFURAN	132-64-9	98.9	200.0	200.0	+/-	35.56	LB78814
DIETHYL PHTHALATE	84-66-2	99.2	200.0	199.0	+/-	12.61	LB60384
DIMETHYL PHTHALATE	131-11-3	99.9	200.0	202.9	+/-	12.42	LB30494
FLUORANTHENE	206-44-0	98.4	200.0	199.6	+/-	12.33	LB83499
FLUORENE	86-73-7	99.1	200.0	205.2	+/-	7.66	LB89630
HEXACHLOROBENZENE	118-74-1	99.9	200.0	200.0	+/-	11.37	LB88881
HEXACHLOROBUTADIENE	87-68-3	98.5	200.0	222.8	+/-	17.35	LB75566
HEXACHLOROCYCLOPENTADIENE	77-47-4	98.8	200.0	230.2	+/-	9.30	LB95525
HEXACHLOROETHANE	67-72-1	99.9	200.0	217.2	+/-	6.90	LB29072
INDENO (1,2,3-CD) PYRENE	193-39-5	99.9	200.0	219.0	+/-	9.02	LB90242
ISOPHORONE	78-59-1	99.1	200.0	214.5	+/-	1.61	LB45460
N-NITROSODI-N-PROPYLAMINE	621-64-7	99.9	200.0	196.8	+/-	12.90	LB89233
N-NITROSODIMETHYLAMINE	62-75-9	99.9	200.0	222.9	+/-	27.48	LB93267
N-NITROSODIPHENYLAMINE	86-30-6	96.58	200.0	196.8	+/-	12.90	LB17295
NAPHTHALENE	91-20-3	99.9	200.0	220.9	+/-	14.12	LB83148

(1) Listed in alphabetical order.
(2) Determined by capillary GC-FID, unless otherwise noted.
a) HPLC UV-254NM
(3) NIST traceable weights are used to verify balance calibration with the preparation of each lot. Concentration of analyte in solution is ug/ml +/- 0.5%, uncertainty based upon balance and Class A volumetric glassware. Weights are corrected for analytes less than 98% pure.
(4) Determined by chromatographic analysis against an independently prepared reference lot. Mean of replicate injections.
(5) These products coelute and are not quantified in the final mix.

Duane Funk

Duane Funk
Quality Manager

SUPELCO Analytical
595 North Harrison Road
Bellefonte, PA 16823-0048 USA
Phone (814) 359-3441

Certificate of Analysis

DESCRIPTION: HC 8270 LCS Spike Mix

CATALOG NO.: 40032-U
LOT NO.: LB97647

MFG DATE: Jan-2013
EXPIRATION DATE: Jan-2014

SOLVENT: METHANOL:BENZ:DCM (80:1.25:18.75)

ANALYTE (1)	CAS NUMBER	PERCENT PURITY(2)	WEIGHT(3) CONCENTRATION	ANALYTICAL(4) CONCENTRATION		STD DEV	SUPELCO LOT NO
NITROBENZENE	98-95-3	99.9	200.0	218.4	+/-	10.53	LB47070
PENTACHLOROPHENOL	87-86-5	99.9	200.0	200.0	+/-	23.60	LB75554
PHENANTHRENE	85-01-8	99.0	200.0	199.0	+/-	10.87	LB92396
PHENOL	108-95-2	99.9	200.0	214.4	+/-	9.80	LB57703
PYRENE	129-00-0	97.5	200.0	199.5	+/-	12.65	LB70761
PYRIDINE (LOW WATER)	110-86-1	99.9	200.0	228.1	+/-	25.84	LB55487
1-METHYLNAPHTHALENE	90-12-0	98.6	200.1	216.6	+/-	4.49	LB86459
1,2-DICHLOROBENZENE	95-50-1	99.9	200.0	219.8	+/-	18.38	LA96474
1,2,-DINITROBENZENE	528-29-0	99.9	200.0	200.0	+/-	21.24	LB89413
1,2,4-TRICHLOROBENZENE	120-82-1	99.5	200.0	210.3	+/-	20.69	LB48083
1,3-DICHLOROBENZENE	541-73-1	99.9	200.0	227.0	+/-	25.92	LB68066
1,3-DINITROBENZENE	99-65-0	99.9 (a)	200.0	200.9	+/-	15.86	LB80492
1,4-DICHLOROBENZENE	106-46-7	99.9	200.0	223.5	+/-	24.02	LB83282
1,4-DINITROBENZENE	100-25-4	99.9	200.0	209.2	+/-	25.69	LB86704
2-CHLORONAPHTHALENE	91-58-7	99.9	200.0	213.6	+/-	0.99	LB86449
2-CHLOROPHENOL	95-57-8	99.6	200.0	212.0	+/-	7.43	LB83266
2-METHYL-4,6-DINITROPHENOL	534-52-1	99.9	200.0	197.8	+/-	26.09	LB31592
2-METHYLNAPHTHALENE	91-57-6	98.3	200.0	215.0	+/-	6.53	LB44448
2-METHYLPHENOL	95-48-7	99.8	200.0	209.7	+/-	5.52	LB30223

(1) Listed in alphabetical order.

(2) Determined by capillary GC-FID, unless otherwise noted.
a) HPLC UV-254NM

(3) NIST traceable weights are used to verify balance calibration with the preparation of each lot. Concentration of analyte in solution is ug/ml +/- 0.5%, uncertainty based upon balance and Class A volumetric glassware. Weights are corrected for analytes less than 98% pure.

(4) Determined by chromatographic analysis against an independently prepared reference lot. Mean of replicate injections.

(5) These products coelute and are not quantified in the final mix.

Duane Funk

Duane Funk
Quality Manager

SUPELCO Analytical
595 North Harrison Road
Bellefonte, PA 16823-0048 USA
Phone (814) 359-3441

Certificate of Analysis

DESCRIPTION: HC 8270 LCS Spike Mix

CATALOG NO.: 40032-U
LOT NO.: LB97647

MFG DATE: Jan-2013
EXPIRATION DATE: Jan-2014

SOLVENT: METHANOL:BENZ:DCM (80:1.25:18.75)

ANALYTE (1)	CAS NUMBER	PERCENT PURITY(2)	WEIGHT(3) CONCENTRATION	ANALYTICAL(4) CONCENTRATION		STD DEV	SUPELCO LOT NO
2-NITROANILINE	88-74-4	99.9	200.0	202.9	+/-	26.92	LB49936
2-NITROPHENOL	88-75-5	99.9	200.0	224.6	+/-	5.26	LB44736
2,3,4,6-TETRACHLOROPHENOL	58-90-2	99.9	200.0	199.2	+/-	14.62	LB91612
2,3,5,6-TETRACHLOROPHENOL	935-95-5	99.9	200.0	203.3	+/-	18.03	LB57701
2,4-DICHLOROPHENOL	120-83-2	98.8	200.0	213.7	+/-	4.36	LB76837
2,4-DIMETHYLPHENOL	105-67-9	99.9	200.0	207.6	+/-	3.47	LB88935
2,4-DINITROPHENOL	51-28-5	99.9	200.0	205.3	+/-	5.77	LB92092
2,4-DINITROTOLUENE	121-14-2	96.0	200.0	201.5	+/-	18.66	LB46632
2,4,5-TRICHLOROPHENOL	95-95-4	99.9	200.0	214.8	+/-	16.41	LB35288
2,4,6-TRICHLOROPHENOL	88-06-2	99.9	200.0	208.4	+/-	13.50	LB65559
2,6-DINITROTOLUENE	606-20-2	99.9	200.0	211.3	+/-	5.06	LB79891
3-METHYLPHENOL (5)	108-39-4	99.9	200.0	*****			LB83715
3-NITROANILINE	99-09-2	99.9	200.0	210.9	+/-	5.79	LB73829
3,3-DICHLOROBENZIDINE	91-94-1	99.9	200.0	196.9	+/-	19.49	LB94134
4-BROMOPHENYLPHENYL ETHER	101-55-3	98.5	200.0	198.8	+/-	10.69	LB85575
4-CHLORO-3-METHYLPHENOL	59-50-7	99.9	200.0	207.9	+/-	14.23	LB83265
4-CHLOROANILINE	106-47-8	99.9	200.0	214.8	+/-	4.76	LB82916
4-CHLOROPHENYLPHENYL ETHER	7005-72-3	99.9	200.0	202.5	+/-	10.21	LB72185
4-METHYLPHENOL (5)	106-44-5	99.9	200.0	*****			LB32518

(1) Listed in alphabetical order.
(2) Determined by capillary GC-FID, unless otherwise noted.
a) HPLC UV-254NM
(3) NIST traceable weights are used to verify balance calibration with the preparation of each lot. Concentration of analyte in solution is ug/ml +/- 0.5%, uncertainty based upon balance and Class A volumetric glassware. Weights are corrected for analytes less than 98% pure.
(4) Determined by chromatographic analysis against an independently prepared reference lot. Mean of replicate injections.
(5) These products coelute and are not quantified in the final mix.

Duane Funk

Duane Funk
Quality Manager

SUPELCO Analytical
595 North Harrison Road
Bellefonte, PA 16823-0048 USA
Phone (814) 359-3441

Certificate of Analysis

DESCRIPTION: HC 8270 LCS Spike Mix

CATALOG NO.: 40032-U
LOT NO.: LB97647

MFG DATE: Jan-2013
EXPIRATION DATE: Jan-2014

SOLVENT: METHANOL:BENZ:DCM (80:1.25:18.75)

ANALYTE (1)	CAS NUMBER	PERCENT PURITY(2)	WEIGHT(3) CONCENTRATION	ANALYTICAL(4) CONCENTRATION		STD DEV	SUPELCO LOT NO
4-NITROANILINE	100-01-6	99.9	200.0	194.1	+/-	19.49	LB42566
4-NITROPHENOL	100-02-7	99.9	200.0	195.1	+/-	24.69	LB83255

(1) Listed in alphabetical order.
(2) Determined by capillary GC-FID, unless otherwise noted.
a) HPLC UV-254NM
(3) NIST traceable weights are used to verify balance calibration with the preparation of each lot. Concentration of analyte in solution is ug/ml +/- 0.5%, uncertainty based upon balance and Class A volumetric glassware. Weights are corrected for analytes less than 98% pure.
(4) Determined by chromatographic analysis against an independently prepared reference lot. Mean of replicate injections.
(5) These products coelute and are not quantified in the final mix.

Duane Funk

Duane Funk
Quality Manager

SUPELCO Analytical
595 North Harrison Road
Bellefonte, PA 16823-0048 USA
Phone (814) 359-3441

Certificate of Analysis

DESCRIPTION: HC 8270 LCS Spike Mix

CATALOG NO.: 40032-U
LOT NO.: LB97647

MFG DATE: Jan-2013
EXPIRATION DATE: Jan-2014

SOLVENT: METHANOL:BENZ:DCM (80:1.25:18.75)

ANALYTE (1)	CAS NUMBER	PERCENT PURITY(2)	WEIGHT(3) CONCENTRATION	ANALYTICAL(4)		STD DEV	SUPELCO LOT NO
ACENAPHTHENE	83-32-9	99.9	200.0	196.5	+/-	23.01	LB82590
ACENAPHTHYLENE	208-96-8	99.9	200.0	204.1	+/-	20.55	LB84923
ANILINE	62-53-3	99.9	200.0	221.6	+/-	13.21	LA41596
ANTHRACENE	120-12-7	99.5	200.0	199.6	+/-	11.32	LB77576
AZOBENZENE	103-33-3	99.9	200.0	202.7	+/-	9.46	LB91797
BENZO (A) ANTHRACENE	56-55-3	99.9 (a)	200.0	200.1	+/-	13.34	LB89579
BENZO (A) PYRENE	50-32-8	99.9 (a)	200.0	200.4	+/-	15.09	LB90586
BENZO (B) FLUORANTHENE	205-99-2	97.3	200.0	200.8	+/-	13.97	LB96148
BENZO (G,H,I) PERYLENE	191-24-2	99.3	200.0	217.3	+/-	3.46	LB92103
BENZO (K) FLUORANTHENE	207-08-9	99.9	200.0	198.2	+/-	15.47	LB85440
BENZOIC ACID	65-85-0	99.9	200.0	221.1	+/-	16.62	LB85791
BENZYL ALCOHOL	100-51-6	99.9	200.0	216.0	+/-	1.33	LB48374
BENZYL BUTYL PHTHALATE	85-68-7	98.6	200.0	198.7	+/-	21.33	LB60340
BIS (2-CHLOROETHOXY) METHANE	111-91-1	98.1	200.0	216.6	+/-	5.36	LB46081
BIS (2-CHLOROETHYL) ETHER	111-44-4	99.9	200.0	226.8	+/-	25.66	LB84286
BIS (2-CHLOROISOPROPYL) ETHER	108-60-1	96.8	200.0	215.1	+/-	15.09	LB95928
BIS (2-ETHYLHEXYL) PHTHALATE	117-81-7	99.7	200.0	197.2	+/-	20.97	LB58359
BIS-2-ETHYLHEXYL ADIPATE	103-23-1	99.7	200.0	195.2	+/-	22.97	LB31993
CARBAZOLE	86-74-8	98.2	200.0	196.8	+/-	11.18	LB80615

(1) Listed in alphabetical order.
(2) Determined by capillary GC-FID, unless otherwise noted.
a) HPLC UV-254NM
(3) NIST traceable weights are used to verify balance calibration with the preparation of each lot. Concentration of analyte in solution is ug/ml +/- 0.5%, uncertainty based upon balance and Class A volumetric glassware. Weights are corrected for analytes less than 98% pure.
(4) Determined by chromatographic analysis against an independently prepared reference lot. Mean of replicate injections.
(5) These products coelute and are not quantified in the final mix.

Duane Funk

Duane Funk
Quality Manager

SUPELCO Analytical
595 North Harrison Road
Bellefonte, PA 16823-0048 USA
Phone (814) 359-3441

Certificate of Analysis

DESCRIPTION: HC 8270 LCS Spike Mix

CATALOG NO.: 40032-U
LOT NO.: LB97647

MFG DATE: Jan-2013
EXPIRATION DATE: Jan-2014

SOLVENT: METHANOL:BENZ:DCM (80:1.25:18.75)

ANALYTE (1)	CAS NUMBER	PERCENT PURITY(2)	WEIGHT(3) CONCENTRATION	ANALYTICAL(4) CONCENTRATION		STD DEV	SUPELCO LOT NO
CHRYSENE	218-01-9	98.9	200.0	199.8	+/-	13.59	LB92051
DI-N-BUTYL PHTHALATE	84-74-2	99.5	200.0	196.8	+/-	13.79	LB64921
DI-N-OCTYL PHTHALATE	117-84-0	99.9	200.0	195.6	+/-	23.53	LB88733
DIBENZ (A,H) ANTHRACENE	53-70-3	99.9	200.0	218.8	+/-	5.52	LB87229
DIBENZOFURAN	132-64-9	98.9	200.0	200.0	+/-	35.56	LB78814
DIETHYL PHTHALATE	84-66-2	99.2	200.0	199.0	+/-	12.61	LB60384
DIMETHYL PHTHALATE	131-11-3	99.9	200.0	202.9	+/-	12.42	LB30494
FLUORANTHENE	206-44-0	98.4	200.0	199.6	+/-	12.33	LB83499
FLUORENE	86-73-7	99.1	200.0	205.2	+/-	7.66	LB89630
HEXACHLOROBENZENE	118-74-1	99.9	200.0	200.0	+/-	11.37	LB88881
HEXACHLOROBUTADIENE	87-68-3	98.5	200.0	222.8	+/-	17.35	LB75566
HEXACHLOROCYCLOPENTADIENE	77-47-4	98.8	200.0	230.2	+/-	9.30	LB95525
HEXACHLOROETHANE	67-72-1	99.9	200.0	217.2	+/-	6.90	LB29072
INDENO (1,2,3-CD) PYRENE	193-39-5	99.9	200.0	219.0	+/-	9.02	LB90242
ISOPHORONE	78-59-1	99.1	200.0	214.5	+/-	1.61	LB45460
N-NITROSODI-N-PROPYLAMINE	621-64-7	99.9	200.0	196.8	+/-	12.90	LB89233
N-NITROSODIMETHYLAMINE	62-75-9	99.9	200.0	222.9	+/-	27.48	LB93267
N-NITROSODIPHENYLAMINE	86-30-6	96.58	200.0	196.8	+/-	12.90	LB17295
NAPHTHALENE	91-20-3	99.9	200.0	220.9	+/-	14.12	LB83148

(1) Listed in alphabetical order.
(2) Determined by capillary GC-FID, unless otherwise noted.
a) HPLC UV-254NM
(3) NIST traceable weights are used to verify balance calibration with the preparation of each lot. Concentration of analyte in solution is ug/ml +/- 0.5%, uncertainty based upon balance and Class A volumetric glassware. Weights are corrected for analytes less than 98% pure.
(4) Determined by chromatographic analysis against an independently prepared reference lot. Mean of replicate injections.
(5) These products coelute and are not quantified in the final mix.

Duane Funk

Duane Funk
Quality Manager

SUPELCO Analytical
595 North Harrison Road
Bellefonte, PA 16823-0048 USA
Phone (814) 359-3441

Certificate of Analysis

DESCRIPTION: HC 8270 LCS Spike Mix

CATALOG NO.: 40032-U
LOT NO.: LB97647

MFG DATE: Jan-2013
EXPIRATION DATE: Jan-2014

SOLVENT: METHANOL:BENZ:DCM (80:1.25:18.75)

ANALYTE (1)	CAS NUMBER	PERCENT PURITY(2)	WEIGHT(3) CONCENTRATION	ANALYTICAL(4) CONCENTRATION		STD DEV	SUPELCO LOT NO
NITROBENZENE	98-95-3	99.9	200.0	218.4	+/-	10.53	LB47070
PENTACHLOROPHENOL	87-86-5	99.9	200.0	200.0	+/-	23.60	LB75554
PHENANTHRENE	85-01-8	99.0	200.0	199.0	+/-	10.87	LB92396
PHENOL	108-95-2	99.9	200.0	214.4	+/-	9.80	LB57703
PYRENE	129-00-0	97.5	200.0	199.5	+/-	12.65	LB70761
PYRIDINE (LOW WATER)	110-86-1	99.9	200.0	228.1	+/-	25.84	LB55487
1-METHYLNAPHTHALENE	90-12-0	98.6	200.1	216.6	+/-	4.49	LB86459
1,2-DICHLOROBENZENE	95-50-1	99.9	200.0	219.8	+/-	18.38	LA96474
1,2,-DINITROBENZENE	528-29-0	99.9	200.0	200.0	+/-	21.24	LB89413
1,2,4-TRICHLOROBENZENE	120-82-1	99.5	200.0	210.3	+/-	20.69	LB48083
1,3-DICHLOROBENZENE	541-73-1	99.9	200.0	227.0	+/-	25.92	LB68066
1,3-DINITROBENZENE	99-65-0	99.9 (a)	200.0	200.9	+/-	15.86	LB80492
1,4-DICHLOROBENZENE	106-46-7	99.9	200.0	223.5	+/-	24.02	LB83282
1,4-DINITROBENZENE	100-25-4	99.9	200.0	209.2	+/-	25.69	LB86704
2-CHLORONAPHTHALENE	91-58-7	99.9	200.0	213.6	+/-	0.99	LB86449
2-CHLOROPHENOL	95-57-8	99.6	200.0	212.0	+/-	7.43	LB83266
2-METHYL-4,6-DINITROPHENOL	534-52-1	99.9	200.0	197.8	+/-	26.09	LB31592
2-METHYLNAPHTHALENE	91-57-6	98.3	200.0	215.0	+/-	6.53	LB44448
2-METHYLPHENOL	95-48-7	99.8	200.0	209.7	+/-	5.52	LB30223

(1) Listed in alphabetical order.

(2) Determined by capillary GC-FID, unless otherwise noted.
a) HPLC UV-254NM

(3) NIST traceable weights are used to verify balance calibration with the preparation of each lot. Concentration of analyte in solution is ug/ml +/- 0.5%, uncertainty based upon balance and Class A volumetric glassware. Weights are corrected for analytes less than 98% pure.

(4) Determined by chromatographic analysis against an independently prepared reference lot. Mean of replicate injections.

(5) These products coelute and are not quantified in the final mix.

Duane Funk

Duane Funk
Quality Manager

SUPELCO Analytical
595 North Harrison Road
Bellefonte, PA 16823-0048 USA
Phone (814) 359-3441

Certificate of Analysis

DESCRIPTION: HC 8270 LCS Spike Mix

CATALOG NO.: 40032-U
LOT NO.: LB97647

MFG DATE: Jan-2013
EXPIRATION DATE: Jan-2014

SOLVENT: METHANOL:BENZ:DCM (80:1.25:18.75)

ANALYTE (1)	CAS NUMBER	PERCENT PURITY(2)	WEIGHT(3) CONCENTRATION	ANALYTICAL(4) CONCENTRATION		STD DEV	SUPELCO LOT NO
2-NITROANILINE	88-74-4	99.9	200.0	202.9	+/-	26.92	LB49936
2-NITROPHENOL	88-75-5	99.9	200.0	224.6	+/-	5.26	LB44736
2,3,4,6-TETRACHLOROPHENOL	58-90-2	99.9	200.0	199.2	+/-	14.62	LB91612
2,3,5,6-TETRACHLOROPHENOL	935-95-5	99.9	200.0	203.3	+/-	18.03	LB57701
2,4-DICHLOROPHENOL	120-83-2	98.8	200.0	213.7	+/-	4.36	LB76837
2,4-DIMETHYLPHENOL	105-67-9	99.9	200.0	207.6	+/-	3.47	LB88935
2,4-DINITROPHENOL	51-28-5	99.9	200.0	205.3	+/-	5.77	LB92092
2,4-DINITROTOLUENE	121-14-2	96.0	200.0	201.5	+/-	18.66	LB46632
2,4,5-TRICHLOROPHENOL	95-95-4	99.9	200.0	214.8	+/-	16.41	LB35288
2,4,6-TRICHLOROPHENOL	88-06-2	99.9	200.0	208.4	+/-	13.50	LB65559
2,6-DINITROTOLUENE	606-20-2	99.9	200.0	211.3	+/-	5.06	LB79891
3-METHYLPHENOL (5)	108-39-4	99.9	200.0	*****			LB83715
3-NITROANILINE	99-09-2	99.9	200.0	210.9	+/-	5.79	LB73829
3,3-DICHLOROBENZIDINE	91-94-1	99.9	200.0	196.9	+/-	19.49	LB94134
4-BROMOPHENYLPHENYL ETHER	101-55-3	98.5	200.0	198.8	+/-	10.69	LB85575
4-CHLORO-3-METHYLPHENOL	59-50-7	99.9	200.0	207.9	+/-	14.23	LB83265
4-CHLOROANILINE	106-47-8	99.9	200.0	214.8	+/-	4.76	LB82916
4-CHLOROPHENYLPHENYL ETHER	7005-72-3	99.9	200.0	202.5	+/-	10.21	LB72185
4-METHYLPHENOL (5)	106-44-5	99.9	200.0	*****			LB32518

(1) Listed in alphabetical order.
(2) Determined by capillary GC-FID, unless otherwise noted.
a) HPLC UV-254NM
(3) NIST traceable weights are used to verify balance calibration with the preparation of each lot. Concentration of analyte in solution is ug/ml +/- 0.5%, uncertainty based upon balance and Class A volumetric glassware. Weights are corrected for analytes less than 98% pure.
(4) Determined by chromatographic analysis against an independently prepared reference lot. Mean of replicate injections.
(5) These products coelute and are not quantified in the final mix.

Duane Funk

Duane Funk
Quality Manager

SUPELCO Analytical
595 North Harrison Road
Bellefonte, PA 16823-0048 USA
Phone (814) 359-3441

Certificate of Analysis

DESCRIPTION: HC 8270 LCS Spike Mix

CATALOG NO.: 40032-U
LOT NO.: LB97647

MFG DATE: Jan-2013
EXPIRATION DATE: Jan-2014

SOLVENT: METHANOL:BENZ:DCM (80:1.25:18.75)

ANALYTE (1)	CAS NUMBER	PERCENT PURITY(2)	WEIGHT(3) CONCENTRATION	ANALYTICAL(4) CONCENTRATION		STD DEV	SUPELCO LOT NO
4-NITROANILINE	100-01-6	99.9	200.0	194.1	+/-	19.49	LB42566
4-NITROPHENOL	100-02-7	99.9	200.0	195.1	+/-	24.69	LB83255

(1) Listed in alphabetical order.
(2) Determined by capillary GC-FID, unless otherwise noted.
a) HPLC UV-254NM
(3) NIST traceable weights are used to verify balance calibration with the preparation of each lot. Concentration of analyte in solution is ug/ml +/- 0.5%, uncertainty based upon balance and Class A volumetric glassware. Weights are corrected for analytes less than 98% pure.
(4) Determined by chromatographic analysis against an independently prepared reference lot. Mean of replicate injections.
(5) These products coelute and are not quantified in the final mix.

Duane Funk

Duane Funk
Quality Manager

SUPELCO Analytical
595 North Harrison Road
Bellefonte, PA 16823-0048 USA
Phone (814) 359-3441

Certificate of Analysis

DESCRIPTION: HC 8270 LCS Spike Mix

CATALOG NO.: 40032-U
LOT NO.: LB97647

MFG DATE: Jan-2013
EXPIRATION DATE: Jan-2014

SOLVENT: METHANOL:BENZ:DCM (80:1.25:18.75)

ANALYTE (1)	CAS NUMBER	PERCENT PURITY(2)	WEIGHT(3) CONCENTRATION	ANALYTICAL(4)		STD DEV	SUPELCO LOT NO
ACENAPHTHENE	83-32-9	99.9	200.0	196.5	+/-	23.01	LB82590
ACENAPHTHYLENE	208-96-8	99.9	200.0	204.1	+/-	20.55	LB84923
ANILINE	62-53-3	99.9	200.0	221.6	+/-	13.21	LA41596
ANTHRACENE	120-12-7	99.5	200.0	199.6	+/-	11.32	LB77576
AZOBENZENE	103-33-3	99.9	200.0	202.7	+/-	9.46	LB91797
BENZO (A) ANTHRACENE	56-55-3	99.9 (a)	200.0	200.1	+/-	13.34	LB89579
BENZO (A) PYRENE	50-32-8	99.9 (a)	200.0	200.4	+/-	15.09	LB90586
BENZO (B) FLUORANTHENE	205-99-2	97.3	200.0	200.8	+/-	13.97	LB96148
BENZO (G,H,I) PERYLENE	191-24-2	99.3	200.0	217.3	+/-	3.46	LB92103
BENZO (K) FLUORANTHENE	207-08-9	99.9	200.0	198.2	+/-	15.47	LB85440
BENZOIC ACID	65-85-0	99.9	200.0	221.1	+/-	16.62	LB85791
BENZYL ALCOHOL	100-51-6	99.9	200.0	216.0	+/-	1.33	LB48374
BENZYL BUTYL PHTHALATE	85-68-7	98.6	200.0	198.7	+/-	21.33	LB60340
BIS (2-CHLOROETHOXY) METHANE	111-91-1	98.1	200.0	216.6	+/-	5.36	LB46081
BIS (2-CHLOROETHYL) ETHER	111-44-4	99.9	200.0	226.8	+/-	25.66	LB84286
BIS (2-CHLOROISOPROPYL) ETHER	108-60-1	96.8	200.0	215.1	+/-	15.09	LB95928
BIS (2-ETHYLHEXYL) PHTHALATE	117-81-7	99.7	200.0	197.2	+/-	20.97	LB58359
BIS-2-ETHYLHEXYL ADIPATE	103-23-1	99.7	200.0	195.2	+/-	22.97	LB31993
CARBAZOLE	86-74-8	98.2	200.0	196.8	+/-	11.18	LB80615

(1) Listed in alphabetical order.
(2) Determined by capillary GC-FID, unless otherwise noted.
a) HPLC UV-254NM
(3) NIST traceable weights are used to verify balance calibration with the preparation of each lot. Concentration of analyte in solution is ug/ml +/- 0.5%, uncertainty based upon balance and Class A volumetric glassware. Weights are corrected for analytes less than 98% pure.
(4) Determined by chromatographic analysis against an independently prepared reference lot. Mean of replicate injections.
(5) These products coelute and are not quantified in the final mix.

Duane Funk

Duane Funk
Quality Manager

SUPELCO Analytical
595 North Harrison Road
Bellefonte, PA 16823-0048 USA
Phone (814) 359-3441

Certificate of Analysis

DESCRIPTION: HC 8270 LCS Spike Mix

CATALOG NO.: 40032-U
LOT NO.: LB97647

MFG DATE: Jan-2013
EXPIRATION DATE: Jan-2014

SOLVENT: METHANOL:BENZ:DCM (80:1.25:18.75)

ANALYTE (1)	CAS NUMBER	PERCENT PURITY(2)	WEIGHT(3) CONCENTRATION	ANALYTICAL(4) CONCENTRATION		STD DEV	SUPELCO LOT NO
CHRYSENE	218-01-9	98.9	200.0	199.8	+/-	13.59	LB92051
DI-N-BUTYL PHTHALATE	84-74-2	99.5	200.0	196.8	+/-	13.79	LB64921
DI-N-OCTYL PHTHALATE	117-84-0	99.9	200.0	195.6	+/-	23.53	LB88733
DIBENZ (A,H) ANTHRACENE	53-70-3	99.9	200.0	218.8	+/-	5.52	LB87229
DIBENZOFURAN	132-64-9	98.9	200.0	200.0	+/-	35.56	LB78814
DIETHYL PHTHALATE	84-66-2	99.2	200.0	199.0	+/-	12.61	LB60384
DIMETHYL PHTHALATE	131-11-3	99.9	200.0	202.9	+/-	12.42	LB30494
FLUORANTHENE	206-44-0	98.4	200.0	199.6	+/-	12.33	LB83499
FLUORENE	86-73-7	99.1	200.0	205.2	+/-	7.66	LB89630
HEXACHLOROBENZENE	118-74-1	99.9	200.0	200.0	+/-	11.37	LB88881
HEXACHLOROBUTADIENE	87-68-3	98.5	200.0	222.8	+/-	17.35	LB75566
HEXACHLOROCYCLOPENTADIENE	77-47-4	98.8	200.0	230.2	+/-	9.30	LB95525
HEXACHLOROETHANE	67-72-1	99.9	200.0	217.2	+/-	6.90	LB29072
INDENO (1,2,3-CD) PYRENE	193-39-5	99.9	200.0	219.0	+/-	9.02	LB90242
ISOPHORONE	78-59-1	99.1	200.0	214.5	+/-	1.61	LB45460
N-NITROSODI-N-PROPYLAMINE	621-64-7	99.9	200.0	196.8	+/-	12.90	LB89233
N-NITROSODIMETHYLAMINE	62-75-9	99.9	200.0	222.9	+/-	27.48	LB93267
N-NITROSODIPHENYLAMINE	86-30-6	96.58	200.0	196.8	+/-	12.90	LB17295
NAPHTHALENE	91-20-3	99.9	200.0	220.9	+/-	14.12	LB83148

(1) Listed in alphabetical order.
(2) Determined by capillary GC-FID, unless otherwise noted.
a) HPLC UV-254NM
(3) NIST traceable weights are used to verify balance calibration with the preparation of each lot. Concentration of analyte in solution is ug/ml +/- 0.5%, uncertainty based upon balance and Class A volumetric glassware. Weights are corrected for analytes less than 98% pure.
(4) Determined by chromatographic analysis against an independently prepared reference lot. Mean of replicate injections.
(5) These products coelute and are not quantified in the final mix.

Duane Funk

Duane Funk
Quality Manager

SUPELCO Analytical
595 North Harrison Road
Bellefonte, PA 16823-0048 USA
Phone (814) 359-3441

Certificate of Analysis

DESCRIPTION: HC 8270 LCS Spike Mix

CATALOG NO.: 40032-U
LOT NO.: LB97647

MFG DATE: Jan-2013
EXPIRATION DATE: Jan-2014

SOLVENT: METHANOL:BENZ:DCM (80:1.25:18.75)

ANALYTE (1)	CAS NUMBER	PERCENT PURITY(2)	WEIGHT(3) CONCENTRATION	ANALYTICAL(4) CONCENTRATION		STD DEV	SUPELCO LOT NO
NITROBENZENE	98-95-3	99.9	200.0	218.4	+/-	10.53	LB47070
PENTACHLOROPHENOL	87-86-5	99.9	200.0	200.0	+/-	23.60	LB75554
PHENANTHRENE	85-01-8	99.0	200.0	199.0	+/-	10.87	LB92396
PHENOL	108-95-2	99.9	200.0	214.4	+/-	9.80	LB57703
PYRENE	129-00-0	97.5	200.0	199.5	+/-	12.65	LB70761
PYRIDINE (LOW WATER)	110-86-1	99.9	200.0	228.1	+/-	25.84	LB55487
1-METHYLNAPHTHALENE	90-12-0	98.6	200.1	216.6	+/-	4.49	LB86459
1,2-DICHLOROBENZENE	95-50-1	99.9	200.0	219.8	+/-	18.38	LA96474
1,2,-DINITROBENZENE	528-29-0	99.9	200.0	200.0	+/-	21.24	LB89413
1,2,4-TRICHLOROBENZENE	120-82-1	99.5	200.0	210.3	+/-	20.69	LB48083
1,3-DICHLOROBENZENE	541-73-1	99.9	200.0	227.0	+/-	25.92	LB68066
1,3-DINITROBENZENE	99-65-0	99.9 (a)	200.0	200.9	+/-	15.86	LB80492
1,4-DICHLOROBENZENE	106-46-7	99.9	200.0	223.5	+/-	24.02	LB83282
1,4-DINITROBENZENE	100-25-4	99.9	200.0	209.2	+/-	25.69	LB86704
2-CHLORONAPHTHALENE	91-58-7	99.9	200.0	213.6	+/-	0.99	LB86449
2-CHLOROPHENOL	95-57-8	99.6	200.0	212.0	+/-	7.43	LB83266
2-METHYL-4,6-DINITROPHENOL	534-52-1	99.9	200.0	197.8	+/-	26.09	LB31592
2-METHYLNAPHTHALENE	91-57-6	98.3	200.0	215.0	+/-	6.53	LB44448
2-METHYLPHENOL	95-48-7	99.8	200.0	209.7	+/-	5.52	LB30223

(1) Listed in alphabetical order.

(2) Determined by capillary GC-FID, unless otherwise noted.
a) HPLC UV-254NM

(3) NIST traceable weights are used to verify balance calibration with the preparation of each lot. Concentration of analyte in solution is ug/ml +/- 0.5%, uncertainty based upon balance and Class A volumetric glassware. Weights are corrected for analytes less than 98% pure.

(4) Determined by chromatographic analysis against an independently prepared reference lot. Mean of replicate injections.

(5) These products coelute and are not quantified in the final mix.

Duane Funk

Duane Funk
Quality Manager

SUPELCO Analytical
595 North Harrison Road
Bellefonte, PA 16823-0048 USA
Phone (814) 359-3441

Certificate of Analysis

DESCRIPTION: HC 8270 LCS Spike Mix

CATALOG NO.: 40032-U
LOT NO.: LB97647

MFG DATE: Jan-2013
EXPIRATION DATE: Jan-2014

SOLVENT: METHANOL:BENZ:DCM (80:1.25:18.75)

ANALYTE (1)	CAS NUMBER	PERCENT PURITY(2)	WEIGHT(3) CONCENTRATION	ANALYTICAL(4) CONCENTRATION		STD DEV	SUPELCO LOT NO
2-NITROANILINE	88-74-4	99.9	200.0	202.9	+/-	26.92	LB49936
2-NITROPHENOL	88-75-5	99.9	200.0	224.6	+/-	5.26	LB44736
2,3,4,6-TETRACHLOROPHENOL	58-90-2	99.9	200.0	199.2	+/-	14.62	LB91612
2,3,5,6-TETRACHLOROPHENOL	935-95-5	99.9	200.0	203.3	+/-	18.03	LB57701
2,4-DICHLOROPHENOL	120-83-2	98.8	200.0	213.7	+/-	4.36	LB76837
2,4-DIMETHYLPHENOL	105-67-9	99.9	200.0	207.6	+/-	3.47	LB88935
2,4-DINITROPHENOL	51-28-5	99.9	200.0	205.3	+/-	5.77	LB92092
2,4-DINITROTOLUENE	121-14-2	96.0	200.0	201.5	+/-	18.66	LB46632
2,4,5-TRICHLOROPHENOL	95-95-4	99.9	200.0	214.8	+/-	16.41	LB35288
2,4,6-TRICHLOROPHENOL	88-06-2	99.9	200.0	208.4	+/-	13.50	LB65559
2,6-DINITROTOLUENE	606-20-2	99.9	200.0	211.3	+/-	5.06	LB79891
3-METHYLPHENOL (5)	108-39-4	99.9	200.0	*****			LB83715
3-NITROANILINE	99-09-2	99.9	200.0	210.9	+/-	5.79	LB73829
3,3-DICHLOROBENZIDINE	91-94-1	99.9	200.0	196.9	+/-	19.49	LB94134
4-BROMOPHENYLPHENYL ETHER	101-55-3	98.5	200.0	198.8	+/-	10.69	LB85575
4-CHLORO-3-METHYLPHENOL	59-50-7	99.9	200.0	207.9	+/-	14.23	LB83265
4-CHLOROANILINE	106-47-8	99.9	200.0	214.8	+/-	4.76	LB82916
4-CHLOROPHENYLPHENYL ETHER	7005-72-3	99.9	200.0	202.5	+/-	10.21	LB72185
4-METHYLPHENOL (5)	106-44-5	99.9	200.0	*****			LB32518

(1) Listed in alphabetical order.
(2) Determined by capillary GC-FID, unless otherwise noted.
a) HPLC UV-254NM
(3) NIST traceable weights are used to verify balance calibration with the preparation of each lot. Concentration of analyte in solution is ug/ml +/- 0.5%, uncertainty based upon balance and Class A volumetric glassware. Weights are corrected for analytes less than 98% pure.
(4) Determined by chromatographic analysis against an independently prepared reference lot. Mean of replicate injections.
(5) These products coelute and are not quantified in the final mix.

Duane Funk

Duane Funk
Quality Manager

SUPELCO Analytical
595 North Harrison Road
Bellefonte, PA 16823-0048 USA
Phone (814) 359-3441

Certificate of Analysis

DESCRIPTION: HC 8270 LCS Spike Mix

CATALOG NO.: 40032-U
LOT NO.: LB97647

MFG DATE: Jan-2013
EXPIRATION DATE: Jan-2014

SOLVENT: METHANOL:BENZ:DCM (80:1.25:18.75)

ANALYTE (1)	CAS NUMBER	PERCENT PURITY(2)	WEIGHT(3) CONCENTRATION	ANALYTICAL(4) CONCENTRATION		STD DEV	SUPELCO LOT NO
4-NITROANILINE	100-01-6	99.9	200.0	194.1	+/-	19.49	LB42566
4-NITROPHENOL	100-02-7	99.9	200.0	195.1	+/-	24.69	LB83255

(1) Listed in alphabetical order.
(2) Determined by capillary GC-FID, unless otherwise noted.
a) HPLC UV-254NM
(3) NIST traceable weights are used to verify balance calibration with the preparation of each lot. Concentration of analyte in solution is ug/ml +/- 0.5%, uncertainty based upon balance and Class A volumetric glassware. Weights are corrected for analytes less than 98% pure.
(4) Determined by chromatographic analysis against an independently prepared reference lot. Mean of replicate injections.
(5) These products coelute and are not quantified in the final mix.

Duane Funk

Duane Funk
Quality Manager

SUPELCO Analytical
595 North Harrison Road
Bellefonte, PA 16823-0048 USA
Phone (814) 359-3441

Preliminary Report

TestAmerica Denver
LCS, Lab Control Sample Report

Data File:	\\Denchrom\ChromData\SMS_Y\20130416-10621.b\Y4017.D		
Lims ID:	8270LCS080_048	Client ID:	
Inject. Date:	16-Apr-2013 10:02:30	Dil. Factor:	1.0000
Sample Type:	LCS		
Sample ID:	8270LCS_048		
Misc. Info.:	STD VER =STD VER		
Operator:	hoffmanm	Instrument ID:	SMS_Y
Injection Vol:	0.5 ul	ALS Bottle#:	6
Lims Batch ID:	10621	Lims Sample ID:	6
Detector:	MS SCAN		
Method:	\\Denchrom\ChromData\SMS_Y\20130416-10621.b\SMSY_8270C.m		
Method Label:	8270C / 625		
Last Update:	16-Apr-2013 11:57:22	Calib Date:	10-Apr-2013 11:08:30
Quant Method:	Internal Standard	Quant By:	Initial Calibration
Last ICal File:	\\Denchrom\ChromData\SMS_Y\20130410-10454.b\Y3869.D		
Limit Group:	MSSV - 8270C_625		
Integrator:	RTE	ID Type:	Deconvolution ID
Column Type:	VF-5ms	Column Dia:	0.50 mm
Process Host:	DENPC246		

Compound	Amount Added	Amount Recovered	%Rec
27 1,4-Dioxane	80.0	37.6	46.97
28 N-Nitrosodimethylamine	80.0	58.7	73.33
29 Pyridine	80.0	60.4	75.46
40 Phenol	80.0	69.4	86.72
43 Aniline	80.0	61.4	76.79
45 Bis(2-chloroethyl)ether	80.0	64.7	80.93
48 2-Chlorophenol	80.0	66.5	83.12
49 1,3-Dichlorobenzene	80.0	55.1	68.88
50 1,4-Dichlorobenzene	80.0	56.9	71.14
51 Benzyl alcohol	80.0	71.3	89.16
52 1,2-Dichlorobenzene	80.0	58.5	73.12
54 2-Methylphenol	80.0	68.1	85.16
55 2,2'-oxybis[1-chloropropane]	80.0	61.1	76.38
58 3-Methylphenol	160.0	142.6	89.15
59 4-Methylphenol	160.0	142.6	89.15
60 3 & 4 Methylphenol	160.0	142.6	89.15
61 N-Nitrosodi-n-propylamine	80.0	71.4	89.23
66 Hexachloroethane	80.0	58.5	73.16
67 Nitrobenzene	80.0	66.8	83.47
71 Isophorone	80.0	74.1	92.63

Preliminary Report

Data File: \\Denchrom\ChromData\SMS_Y\20130416-10621.b\Y4017.D

Compound	Amount Added	Amount Recovered	%Rec
73 2,4-Dimethylphenol	80.0	71.3	89.14
74 2-Nitrophenol	80.0	75.8	94.74
77 Benzoic acid	80.0	79.1	98.84
78 Bis(2-chloroethoxy)methane	80.0	70.6	88.19
82 2,4-Dichlorophenol	80.0	73.6	91.99
84 1,2,4-Trichlorobenzene	80.0	65.1	81.41
87 Naphthalene	80.0	67.2	83.97
88 4-Chloroaniline	80.0	72.7	90.94
91 Hexachlorobutadiene	80.0	61.2	76.52
97 4-Chloro-3-methylphenol	80.0	79.7	99.59
101 2-Methylnaphthalene	80.0	68.5	85.67
103 1-Methylnaphthalene	80.0	72.7	90.81
105 Hexachlorocyclopentadiene	80.0	81.7	102.14
108 2,4,6-Trichlorophenol	80.0	78.2	97.77
110 2,4,5-Trichlorophenol	80.0	81.6	101.97
114 2-Chloronaphthalene	80.0	74.4	92.98
116 2-Nitroaniline	80.0	86.2	107.71
119 Dimethyl phthalate	80.0	79.7	99.63
121 2,6-Dinitrotoluene	80.0	83.8	104.74
122 Acenaphthylene	80.0	79.7	99.68
123 3-Nitroaniline	80.0	82.7	103.34
124 Acenaphthene	80.0	75.5	94.34
126 2,4-Dinitrophenol	80.0	75.8	94.77
127 4-Nitrophenol	80.0	88.0	110.06
130 2,4-Dinitrotoluene	80.0	91.2	113.95
132 Dibenzofuran	80.0	76.8	96.03
139 Diethyl phthalate	80.0	81.4	101.69
142 4-Chlorophenyl phenyl ether	80.0	78.8	98.51
143 Fluorene	80.0	76.7	95.82
146 4-Nitroaniline	80.0	92.6	115.71
147 4,6-Dinitro-2-methylphenol	80.0	84.0	105.00
150 N-Nitrosodiphenylamine	68.3	67.4	98.73
151 1,2-Diphenylhydrazine	80.9	81.9	101.30
164 4-Bromophenyl phenyl ether	80.0	80.6	100.69
165 Hexachlorobenzene	80.0	77.0	96.20

Preliminary Report

Data File: \\Denchrom\ChromData\SMS_Y\20130416-10621.b\Y4017.D

Compound	Amount Added	Amount Recovered	%Rec
171 Pentachlorophenol	80.0	81.1	101.41
176 Phenanthrene	80.0	78.0	97.55
177 Anthracene	80.0	79.6	99.56
178 Carbazole	80.0	80.1	100.16
181 Di-n-butyl phthalate	80.0	85.4	106.79
188 Fluoranthene	80.0	80.3	100.40
191 Pyrene	80.0	78.3	97.88
198 Butyl benzyl phthalate	80.0	84.5	105.61
203 Bis(2-ethylhexyl) phthalate	80.0	85.2	106.47
205 3,3'-Dichlorobenzidine	80.0	77.3	96.61
206 Benzo[a]anthracene	80.0	79.1	98.88
207 Chrysene	80.0	76.1	95.07
209 Di-n-octyl phthalate	80.0	82.2	102.79
211 Benzo[b]fluoranthene	80.0	79.0	98.74
212 Benzo[k]fluoranthene	80.0	75.6	94.55
215 Benzo[a]pyrene	80.0	75.0	93.75
221 Dibenz(a,h)anthracene	80.0	59.8	74.80
222 Indeno[1,2,3-cd]pyrene	80.0	75.9	94.81
223 Benzo[g,h,i]perylene	80.0	71.9	89.90

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

8270Surrogate_00058

Reagent ID: 8270Surrogate_00058

		Expiration Date:	05/07/2014
Description:	8270 Surrogate 100/150 ug/ml	Laboratory:	TestAmerica Denver
No. of Bottles:	4	Prepared By:	Jones, Brad
Storage Location:	North Prep	Solvent:	ACETONE
Reagent Volume:	1000.000 mL	Solvent Lot:	Acetone_00046
Creation Date:	05/07/2013		
Container(s):	2038557, 2038558, 2038559, 2038560		
Comment:	Take 100 mL 8270 surrogate stock and dilute to 1000 mL in Acetone. One year expiration date. Split into 4x250mL bottles. Requires solvent exchange to MeCl2 prior to subr n for verification.		

Reagent Analyte Information

Analyte	Source ID	Source Expiration Date	Source Conc.	Source Conc. Units	Final Conc.	Final Conc. Units
2,4,6 - Tribromophenol	8270SurrStock_00063	05/31/2015	1500.000	ug/mL	150.00000	ug/mL
2,4,6-Tribromophenol	8270SurrStock_00063	05/31/2015	1500.000	ug/mL	150.00000	ug/mL
2-Fluorobiphenyl	8270SurrStock_00063	05/31/2015	1000.000	ug/mL	100.00000	ug/mL
2-Fluorophenol	8270SurrStock_00063	05/31/2015	1500.000	ug/mL	150.00000	ug/mL
Nitrobenzene-d5	8270SurrStock_00063	05/31/2015	1000.000	ug/mL	100.00000	ug/mL
Phenol-d5	8270SurrStock_00063	05/31/2015	1500.000	ug/mL	150.00000	ug/mL
Phenol-d6	8270SurrStock_00063	05/31/2015	1500.000	ug/mL	150.00000	ug/mL
Terphenyl-d14	8270SurrStock_00063	05/31/2015	1000.000	ug/mL	100.00000	ug/mL
2,4,6 - Tribromophenol	8270SurrStock_00064	05/31/2015	1500.000	ug/mL	150.00000	ug/mL
2,4,6-Tribromophenol	8270SurrStock_00064	05/31/2015	1500.000	ug/mL	150.00000	ug/mL
2-Fluorobiphenyl	8270SurrStock_00064	05/31/2015	1000.000	ug/mL	100.00000	ug/mL
2-Fluorophenol	8270SurrStock_00064	05/31/2015	1500.000	ug/mL	150.00000	ug/mL
Nitrobenzene-d5	8270SurrStock_00064	05/31/2015	1000.000	ug/mL	100.00000	ug/mL
Phenol-d5	8270SurrStock_00064	05/31/2015	1500.000	ug/mL	150.00000	ug/mL
Phenol-d6	8270SurrStock_00064	05/31/2015	1500.000	ug/mL	150.00000	ug/mL
Terphenyl-d14	8270SurrStock_00064	05/31/2015	1000.000	ug/mL	100.00000	ug/mL

Exchanged 1 mL 8270Surrogate_00058 with $MeCl_2$. Used pipette I 5-8-13

Source Reagents

Reagent	Description	Type	Expiration	Vendor	Vendor Lot #	Vendor Cat Lot #	Volume Used	Volume Units
8270SurrStock_00063	1000/1500 ug/ml	ASTD	05/31/15	Supelco	LB92759	861142	90.00000	mL
8270SurrStock_00064	1000/1500 ug/ml	ASTD	05/31/15	Supelco	LB92759	861142	10.00000	mL

Preliminary Report

TestAmerica Denver

Recovery Report

Data File:	\\Denchrom\ChromData\SMS_K\20130513-11567.b\K1474.D		
Lims ID:	8270Surrogate_00058	Client ID:	
Inject. Date:	13-May-2013 13:02:30	Dil. Factor:	1.0000
Sample Type:	Client		
Sample ID:	8270Surrogate_00058		
Misc. Info.:			
Operator:	KIEKELD	Instrument ID:	SMS_K
Injection Vol:	0.5 ul	ALS Bottle#:	5
Lims Batch ID:	11567	Lims Sample ID:	6
Detector:	MS SCAN		
Method:	\\Denchrom\ChromData\SMS_K\20130513-11567.b\SMSK_8270C.m		
Method Label:	8270C / 625		
Last Update:	13-May-2013 13:33:48	Calib Date:	29-Apr-2013 16:29:30
Quant Method:	Internal Standard	Quant By:	Initial Calibration
Last ICal File:	\\Denchrom\ChromData\SMS_K\20130429-11069.b\K1231.D		
Limit Group:	MSSV - 8270C_625		
Integrator:	RTE	ID Type:	Deconvolution ID
Column Type:	VF-5ms	Column Dia:	0.50 mm
Process Host:	DENPC307		

Compound	Amount Added	Amount Recovered	% Rec.
$ 7 2-Fluorophenol	150.0	135.7	90.48
$ 8 Phenol-d5	150.0	138.8	92.50
$ 9 Nitrobenzene-d5	100.0	90.9	90.93
$ 11 2-Fluorobiphenyl	100.0	90.5	90.52
$ 12 2,4,6-Tribromophenol	150.0	143.8	95.86
$ 13 Terphenyl-d14	100.0	97.2	97.19

Certificate of Composition

DESCRIPTION: Semi-Volatile Acid/Base Surrogate Spike (High)

CATALOG NO.: 861142 MFG DATE: May-2012

LOT NO.: LB92759 EXPIRATION DATE: May-2015

SOLVENT: METHYLENE CHLORIDE

ANALYTE (1)	CAS NUMBER	PERCENT PURITY (2)	WEIGHT CONCENTRATION (3)	SUPELCO LOT NO
NITROBENZENE-D5	4165-60-0	99.9	1000	LB47918
P-TERPHENYL-D14	1718-51-0	99.9	1000	LB83130
PHENOL-D6	13127-88-3	99.9	1500	LB85441
1,2-DICHLOROBENZENE-D4	2199-69-1	99.9	1000	LB83146
2-CHLOROPHENOL D4	93951-73-6	99.4	1500	LB74323
2-FLUOROBIPHENYL	321-60-8	99.9	1000	LB83498
2-FLUOROPHENOL	367-12-4	99.9	1500	LB83825
2,4,6-TRIBROMOPHENOL	118-79-6	99.9	1500	LB81262

(1) Listed in alphabetical order.

(2) Determined by capillary GC-FID, unless otherwise noted.

(3) NIST traceable weights are used to verify balance calibration with the preparation of each lot. Concentration of analyte in solution is ug/ml +/- 0.5%, uncertainty based upon balance and Class A volumetric glassware. Weights are corrected for analytes less than 98% pure.

Elwood Doughty
QA Manager

SUPELCO®
Analytical
595 North Harrison Road • Bellefonte, PA
16823-0048 USA • Phone (814) 359-3441

Certificate of Composition

DESCRIPTION: Semi-Volatile Acid/Base Surrogate Spike (High)

CATALOG NO.: 861142 MFG DATE: May-2012

LOT NO.: LB92759 EXPIRATION DATE: May-2015

SOLVENT: METHYLENE CHLORIDE

ANALYTE (1)	CAS NUMBER	PERCENT PURITY (2)	WEIGHT CONCENTRATION (3)	SUPELCO LOT NO
NITROBENZENE-D5	4165-60-0	99.9	1000	LB47918
P-TERPHENYL-D14	1718-51-0	99.9	1000	LB83130
PHENOL-D6	13127-88-3	99.9	1500	LB85441
1,2-DICHLOROBENZENE-D4	2199-69-1	99.9	1000	LB83146
2-CHLOROPHENOL D4	93951-73-6	99.4	1500	LB74323
2-FLUOROBIPHENYL	321-60-8	99.9	1000	LB83498
2-FLUOROPHENOL	367-12-4	99.9	1500	LB83825
2,4,6-TRIBROMOPHENOL	118-79-6	99.9	1500	LB81262

(1) Listed in alphabetical order.

(2) Determined by capillary GC-FID, unless otherwise noted.

(3) NIST traceable weights are used to verify balance calibration with the preparation of each lot. Concentration of analyte in solution is ug/ml +/- 0.5%, uncertainty based upon balance and Class A volumetric glassware. Weights are corrected for analytes less than 98% pure.

Elwood Doughty
QA Manager

SUPELCO®
Analytical
595 North Harrison Road • Bellefonte, PA
16823-0048 USA • Phone (814) 359-3441

Certificate of Composition

DESCRIPTION: Semi-Volatile Acid/Base Surrogate Spike (High)

CATALOG NO.: 861142 MFG DATE: May-2012

LOT NO.: LB92759 EXPIRATION DATE: May-2015

SOLVENT: METHYLENE CHLORIDE

ANALYTE (1)	CAS NUMBER	PERCENT PURITY (2)	WEIGHT CONCENTRATION (3)	SUPELCO LOT NO
NITROBENZENE-D5	4165-60-0	99.9	1000	LB47918
P-TERPHENYL-D14	1718-51-0	99.9	1000	LB83130
PHENOL-D6	13127-88-3	99.9	1500	LB85441
1,2-DICHLOROBENZENE-D4	2199-69-1	99.9	1000	LB83146
2-CHLOROPHENOL D4	93951-73-6	99.4	1500	LB74323
2-FLUOROBIPHENYL	321-60-8	99.9	1000	LB83498
2-FLUOROPHENOL	367-12-4	99.9	1500	LB83825
2,4,6-TRIBROMOPHENOL	118-79-6	99.9	1500	LB81262

(1) Listed in alphabetical order.

(2) Determined by capillary GC-FID, unless otherwise noted.

(3) NIST traceable weights are used to verify balance calibration with the preparation of each lot. Concentration of analyte in solution is ug/ml +/- 0.5%, uncertainty based upon balance and Class A volumetric glassware. Weights are corrected for analytes less than 98% pure.

Elwood Doughty
QA Manager

SUPELCO®
Analytical
595 North Harrison Road • Bellefonte, PA
16823-0048 USA • Phone (814) 359-3441

Sample Name: 1820001@100 Acquired: 12/31/2012 16:16:15 Type: Unk
Method: 6500_026(v6) Mode: CONC Corr. Factor: 1.000000
User: bowenh Custom ID1: Custom ID2: Custom ID3:
Comment:

Elem	Ag3280	Al1670	As1890	B_2089	Ba4554
Line	328.068 {103}	167.079 {502}	189.042 {478}	208.959 {461}	455.403 { 74}
Units	ppm	ppm	ppm	ppm	ppm
Avg	W .98576	-.00262	.00096	.00085	.48416
Stddev	.00031	.00022	.00050	.00032	.00078
%RSD	.03148	8.4811	51.793	38.051	.16185
#1	.98598	-.00247	.00061	.00107	.48361
#2	.98554	-.00278	.00131	.00062	.48472
Check ?	Chk Warn	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit	.10000				
Low Limit	-.01000				

Elem	Be3130	Bi2230	Ca3179	Cd2288	Co2286
Line	313.042 {108}	223.061 {451}	317.933 {106}	228.802 {447}	228.616 {447}
Units	ppm	ppm	ppm	ppm	ppm
Avg	.46411	.00100	.01370	.96566	.51059
Stddev	.00154	.00169	.00299	.00051	.00028
%RSD	.33269	169.91	21.834	.05278	.05438
#1	.46302	.00219	.01582	.96530	.51079
#2	.46520	-.00020	.01159	.96602	.51040
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit					
Low Limit					

Elem	Cr2055	Cu3247	Fe2599	K_7664	Li6707
Line	205.552 {464}	324.754 {104}	259.940 {130}	766.490 { 44}	670.784 { 50}
Units	ppm	ppm	ppm	ppm	ppm
Avg	.49135	.50784	.00631	.01660	.00180
Stddev	.00037	.00025	.00113	.03373	.00114
%RSD	.07541	.04991	17.850	203.19	63.149
#1	.49109	.50802	.00551	.04045	.00261
#2	.49162	.50766	.00710	-.00725	.00100
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit					
Low Limit					

Sample Name: 1820001@100 Acquired: 12/31/2012 16:16:15 Type: Unk
Method: 6500_026(v6) Mode: CONC Corr. Factor: 1.000000
User: bowenh Custom ID1: Custom ID2: Custom ID3:
Comment:

Elem	Mg2790	Mn2576	Mo2020	Na5895	Ni2316
Line	279.079 {121}2	257.610 {131}	202.030 {467}	589.592 { 57}	231.604 {446}
Units	ppm	ppm	ppm	ppm	ppm
Avg	.00774	.48747	-.00114	.03252	1.0206
Stddev	.00209	.00117	.00006	.01128	.0020
%RSD	27.010	.24010	5.3116	34.677	.19237
#1	.00922	.48830	-.00119	.04050	1.0192
#2	.00627	.48665	-.00110	.02455	1.0220
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit					
Low Limit					

Elem	P_1782	Pb2203	S_1820	Sb2068	Se1960
Line	178.284 {489}	220.353 {453}	182.034 {485}	206.833 {463}	196.090 {472}
Units	ppm	ppm	ppm	ppm	ppm
Avg	.00033	1.0484	-.00253	.00450	-.00206
Stddev	.00088	.0027	.00056	.00110	.00288
%RSD	267.83	.25817	22.245	24.441	139.93
#1	-.00029	1.0503	-.00213	.00528	-.00410
#2	.00095	1.0465	-.00293	.00372	-.00002
Check ?	Chk Pass	Chk Pass	None	Chk Pass	Chk Pass
High Limit					
Low Limit					

Elem	Si2881	Sn1899	Sr4077	Th2837	Ti3349
Line	288.158 {117}	189.989 {477}	407.771 { 83}	283.730 {119}	334.904 {101}
Units	ppm	ppm	ppm	ppm	ppm
Avg	.01929	.00041	.00020	.00173	.00008
Stddev	.00644	.00056	.00002	.00159	.00030
%RSD	33.398	135.69	11.552	91.746	386.46
#1	.01474	.00002	.00022	.00061	-.00013
#2	.02385	.00081	.00019	.00285	.00029
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit					
Low Limit					

Sample Name: 1820001@100 Acquired: 12/31/2012 16:16:15 Type: Unk
Method: 6500_026(v6) Mode: CONC Corr. Factor: 1.000000
User: bowenh Custom ID1: Custom ID2: Custom ID3:
Comment:

Elem	Tl1908	U_3701	V_2924	Zn2062	Zr3391
Line	190.856 {477}	370.152 { 91}	292.402 {115}	206.200 {163}	339.198 { 99}
Units	ppm	ppm	ppm	ppm	ppm
Avg	.00093	-.00249	.46654	.96356	-.00319
Stddev	.00028	.01573	.00158	.00003	.00128
%RSD	29.614	631.31	.33822	.00326	40.253
#1	.00113	.00863	.46766	.96358	-.00228
#2	.00074	-.01361	.46543	.96353	-.00410
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit					
Low Limit					

Int. Std.	Y_2243	Y_3600	Y_3774
Line	224.306 {450}	360.073 { 94}	377.433 { 89}
Units	Cts/S	Cts/S	Cts/S
Avg	6883.0	84549.	6537.3
Stddev	8.3	237.	35.0
%RSD	.12068	.28055	.53563
#1	6877.1	84381.	6562.1
#2	6888.9	84717.	6512.6

1820001

ID: ANALYTES B_00006
Exp:12/01/13 Prpd:HEB Opn:12/27/12
ICP ANALYTES B SPEX

SPEXertificate®

Certificate of Reference Material

ACCREDITED
Reference Materials Producer
CERT #2495.01
Chemical Testing
CERT #2495.02

Catalog Number: INT-B1 **Lot No.** 7-166YPY

Description: Analytes B

Matrix: 5% HNO_3

This **ASSURANCE®** Certified Reference Material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICP-OES, DCP, AA, ICP-MS, and XRF. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

The CRM is prepared from high purity single element concentrates of individual elements using Class A laboratory ware to give precise concentrations. See side 2 for details of certification.

Instrumental Analysis by ICP Spectrometer:

Analyte	Labeled	Measured	Uncertainty	SRM	Analyte	Labeled	Measured	Uncertainty	SRM
Ag	100 mg/L	99.4 mg/L	±0.5 mg/L	3151*	Be	50 mg/L	49.7 mg/L	±0.3 mg/L	3105a*
Cd	100 mg/L	98.2 mg/L	±0.5 mg/L	3108*	Co	50 mg/L	50.3 mg/L	±0.3 mg/L	3113*
Ni	100 mg/L	99.9 mg/L	±0.5 mg/L	3136*	Cr	50 mg/L	49.8 mg/L	±0.3 mg/L	3112a*
Pb	100 mg/L	99.7 mg/L	±0.5 mg/L	3128*	Cu	50 mg/L	50.3 mg/L	±0.3 mg/L	3114*
Zn	100 mg/L	100 mg/L	±0.5 mg/L	3168a*	Mn	50 mg/L	49.5 mg/L	±0.3 mg/L	3132*
Ba	50 mg/L	49.2 mg/L	±0.3 mg/L	3104a*	V	50 mg/L	49.8 mg/L	±0.3 mg/L	3165*

* - indicates NIST SRM † - indicates SPEX CertiPrep CRM (when NIST SRM is not available)

SPEX CertiPrep Reference Multi: Lot# 22-145JB,42-11AS,33-87AS,10-186JB

Balances are calibrated regularly with weight sets traceable to NIST#s 32856, 32867 and others. This CRM is guaranteed stable and accurate to ±0.5% of the certified (measured) value. This includes uncertainty components due to preparation, measurement, homogeneity, short-term and long-term stability as well as transpiration loss. No measured concentration of any individual component exceeds ±2% of the labeled value. This guarantee is valid for a period of one year from the date of certification only when the material is kept tightly capped and stored under ambient laboratory conditions.

Date of Certification: DEC 2012 Certifying Officer: Vanaja Sivakumar

05/29/2013

ERA

A Waters Company

Certificate of Analysis

PRODUCT:	1000 mg/L Hexavalent Chromium
CATALOG NUMBER:	019
LOT NUMBER:	160412
ISSUE DATE:	April 23, 2012
REVISION DATE:	Original
STARTING MATERIAL:	Potassium Dichromate ($K_2Cr_2O_7$)
CERTIFIED CONCENTRATION[1]:	1000 mg/L
UNCERTAINTY[2]:	0.6%
MATRIX:	18 megohm deionized water
DENSITY:	0.9999 ± 0.0008 g/mL at 22.0°C and 768 mm Hg
TRACEABILITY[3]:	100%
NIST/SRM:	SRM 136f Potassium Dichromate
VERIFICATION METHOD:	Spectrophotometry
STORAGE:	Store at 20-25°C

1. The **Certified Concentration** is the actual made-to concentration confirmed by ERA analytical verification.

2. The stated **Uncertainty** is the total propagated uncertainty at the 95% confidence interval. The uncertainty is based on the preparation and internal analytical verification of the product by ERA, multiplied by a coverage factor which is equal to the student t factor at a 95% confidence interval at n-1 degrees of freedom. The uncertainty applies to the product as supplied and does not take into account any required or optional dilutions and/or preparations the laboratory may perform while using this product.

3. Traceability Recovery = ((% Recovery certified standard)/(% Recovery NIST SRM))*100.

   The traceability data shown were compiled by analyzing the ERA standards or their associated stock solutions against the applicable NIST SRMs.

This standard **expires 4/2015**. The certified values are monitored and purchasers will be notified of any significant changes resulting in recertification or withdrawal of this certified reference material during the period of validity of this certificate.

This product is intended to be used as either a calibration standard or a quality control check of the entire analytical process for the analytes/matrix included in the standard.

If you have any questions or need technical assistance, please call ERA technical assistance at 1-800-372-0122 or email to info@eraqc.com

Certifying Officer: Tom Widera

ACCREDITED
REFERENCE MATERIAL PRODUCER
CERT # 1539.03

16341 Table Mtn Pkwy, Golden, CO 80403 800-372-0122 fax: 303-421-0159 www.eraqc.com

HACH COMPANY

P.O.Box 389
Loveland, CO 80539
(970) 669-3050

An ISO 9001 Certified Company

Certificate of Analysis

COMMODITY:**Chromium Reference Standard Solution 1000**
COMMODITY NUMBER: **14664-42** MANUFACTURE DATE: **11/7/2012** DATE OF ANALYSIS: **11/7/2012**
LOT NUMBER: **A2314**

TEST	*SPECIFICATIONS*	*RESULTS*
Hexavalent Chromium Concentration	995 to 1005 ppm	1001.1 ppm
pH of the solution	12 to 14	12.3

The expiration date is Nov 2017

The item 1466442 is traceable to NIST standards SRM 136f Potassium Dichromate LOT N/A.

Certified by _____
Scott Als
Analytical Services Chemist

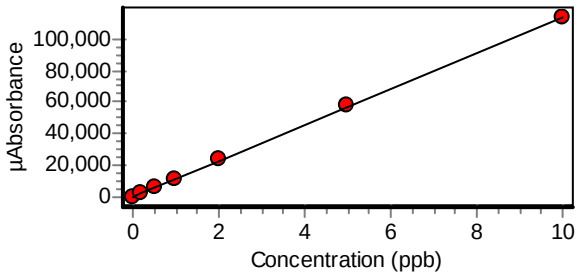
Report Generated By CETAC QuickTrace
Analyst: FredetteN
Worksheet file: C:\Program Files\QuickTrace\Worksheets\March 2013\130327taa.wsz
Date Started: 3/27/2013 3:33:21 PM
Comment:

Results

Sample Name	Type	Date/Time	Conc (ppb)	µAbs	%RSD	Flags	Wt.	Vol.	ODF
Cal Blank	STD	03/27/13 04:25:38 pm	0.000	-32	5.91		1.00	1.00	1.00
Std1	STD	03/27/13 04:27:55 pm	0.200	2286	0.26		1.00	1.00	1.00
Std2	STD	03/27/13 04:30:14 pm	0.500	5710	0.16		1.00	1.00	1.00
Std3	STD	03/27/13 04:32:33 pm	1.000	11245	0.17		1.00	1.00	1.00
Std4	STD	03/27/13 04:34:52 pm	2.000	23360	0.27		1.00	1.00	1.00
Std5	STD	03/27/13 04:37:12 pm	5.000	57703	0.19		1.00	1.00	1.00
Std6	STD	03/27/13 04:39:33 pm	10.000	113077	0.15		1.00	1.00	1.00

Calibration

Equation: A = 197.151 + 11335.260C
R2: 0.99987
SEE: 518.6737
Flags:



ICV 1960038	ICV	03/27/13 04:42:50 pm	4.117	46859	0.18		1.00	1.00	1.00
% Recovery 102.91									
ICB	ICB	03/27/13 04:45:08 pm	-0.022	-49	6.58		1.00	1.00	1.00
CRA 1960040	CRDL	03/27/13 04:47:25 pm	0.188	2325	0.23		1.00	1.00	1.00
% Recovery 93.87									

Sample Name	Type	Date/Time	Conc (ppb)	µAbs	%RSD	Flags	Wt.	Vol. ODF
CCV 1960039	CCV	03/27/13 04:49:46 pm	5.027	57183	0.16		1.00	1.00
% Recovery 100.55							1.00	
CCB	CCB	03/27/13 04:52:03 pm	-0.022	-55	8.49		1.00	1.00
							1.00	
MB 280-166853/1-A	UNK	03/27/13 04:54:20 pm	-0.018	-8	3.97		1.00	1.00
							1.00	
LCS 280-166853/2-A	UNK	03/27/13 04:56:37 pm	4.950	56312	0.30		1.00	1.00
							1.00	
280-40327-D-1-D	UNK	03/27/13 04:58:55 pm	-0.013	48	4.81		1.00	1.00
							1.00	
280-40327-D-1-E MS	UNK	03/27/13 05:01:13 pm	4.867	55360	0.13		1.00	1.00
							1.00	
280-40327-D-1-F MSD	UNK	03/27/13 05:03:31 pm	4.911	55863	0.12		1.00	1.00
							1.00	
280-39957-G-1-K	UNK	03/27/13 05:05:50 pm	-0.020	-26	9.25		1.00	1.00
							1.00	
MB 280-166447/1-A	UNK	03/27/13 05:08:09 pm	-0.019	-17	18.31		1.00	1.00
							1.00	
LCS 280-166447/2-A	UNK	03/27/13 05:10:28 pm	4.928	56060	0.17		1.00	1.00
							1.00	
280-40014-B-1-B	UNK	03/27/13 05:12:48 pm	-0.020	-29	10.84		1.00	1.00
							1.00	
280-40049-AG-13-A	UNK	03/27/13 05:15:07 pm	-0.018	-4	132.73		1.00	1.00
							1.00	
CCV 1960039	CCV	03/27/13 05:17:27 pm	4.997	56835	0.20		1.00	1.00
% Recovery 99.93							1.00	
CCB	CCB	03/27/13 05:19:45 pm	-0.021	-42	2.84		1.00	1.00
							1.00	
280-40049-AG-13-A sd@5	UNK	03/27/13 05:22:05 pm	-0.020	-27	8.27		1.00	1.00
							1.00	
280-40049-AG-13-B MS	UNK	03/27/13 05:24:25 pm	4.257	48450	0.31		1.00	1.00
							1.00	
280-40049-AG-13-C MSD	UNK	03/27/13 05:26:42 pm	4.318	49147	0.47		1.00	1.00
							1.00	

Sample Name	Type	Date/Time	Conc (ppb)	µAbs	%RSD	Flags	Wt.	Vol.	ODF
280-40049-U-15-A	UNK	03/27/13 05:28:59 pm	-0.044	-298	1.63		1.00	1.00	1.00
280-40049-U-15-B MS	UNK	03/27/13 05:31:16 pm	2.413	27546	0.31		1.00	1.00	1.00
280-40049-U-15-C MSD	UNK	03/27/13 05:33:34 pm	2.374	27108	0.42		1.00	1.00	1.00
280-40049-K-17-A	UNK	03/27/13 05:35:52 pm	-0.031	-159	1.50		1.00	1.00	1.00
280-40049-K-18-B	UNK	03/27/13 05:38:10 pm	-0.018	-11	85.68		1.00	1.00	1.00
280-40049-H-19-C	UNK	03/27/13 05:40:29 pm	-0.017	4	162.51		1.00	1.00	1.00
280-40082-J-2-B	UNK	03/27/13 05:42:47 pm	-0.016	20	21.25		1.00	1.00	1.00
CCV 1960039 % Recovery 100.32	CCV	03/27/13 05:45:08 pm	5.016	57054	0.16		1.00	1.00	1.00
CCB	CCB	03/27/13 05:47:25 pm	-0.021	-46	2.36		1.00	1.00	1.00
280-40161-B-2-A	UNK	03/27/13 05:49:44 pm	-0.011	75	6.66		1.00	1.00	1.00
280-40161-B-5-A	UNK	03/27/13 05:52:03 pm	-0.018	-6	45.75		1.00	1.00	1.00
280-40161-B-7-A	UNK	03/27/13 05:54:23 pm	-0.017	-1	269.29		1.00	1.00	1.00
MB 280-166442/1-A	UNK	03/27/13 05:56:43 pm	-0.018	-6	36.78		1.00	1.00	1.00
LCS 280-166442/2-A	UNK	03/27/13 05:59:00 pm	4.836	55013	0.25		1.00	1.00	1.00
280-40014-A-1-H	UNK	03/27/13 06:01:17 pm	-0.018	-11	45.00		1.00	1.00	1.00
280-40014-A-2-C	UNK	03/27/13 06:03:34 pm	-0.018	-10	42.75		1.00	1.00	1.00
280-40049-AB-13-J	UNK	03/27/13 06:05:52 pm	-0.016	17	15.37		1.00	1.00	1.00

Sample Name	Type	Date/Time	Conc (ppb)	µAbs	%RSD	Flags	Wt.	Vol.	ODF
280-40049-AB-13-J sd@5	UNK	03/27/13 06:08:10 pm	-0.021	-43	7.84		1.00	1.00	1.00
280-40049-AB-13-K MS	UNK	03/27/13 06:10:28 pm	4.253	48405	0.52		1.00	1.00	1.00
CCV 1960039	CCV	03/27/13 06:12:48 pm	4.991	56774	0.36		1.00	1.00	1.00
% Recovery 99.82									
CCB	CCB	03/27/13 06:15:05 pm	-0.024	-73	3.95		1.00	1.00	1.00
280-40049-AB-13-L MSD	UNK	03/27/13 06:17:24 pm	4.184	47628	0.25		1.00	1.00	1.00
280-40049-P-15-G	UNK	03/27/13 06:19:43 pm	-0.041	-266	1.02		1.00	1.00	1.00
280-40049-P-15-H MS	UNK	03/27/13 06:22:02 pm	2.369	27049	0.26		1.00	1.00	1.00
280-40049-P-15-I MSD	UNK	03/27/13 06:24:21 pm	2.303	26306	0.73		1.00	1.00	1.00
280-40049-H-16-B	UNK	03/27/13 06:26:41 pm	-0.038	-237	0.69		1.00	1.00	1.00
280-40049-H-17-A	UNK	03/27/13 06:29:01 pm	-0.006	131	0.89		1.00	1.00	1.00
280-40049-H-18-B	UNK	03/27/13 06:31:18 pm	-0.015	24	38.23		1.00	1.00	1.00
280-40049-H-19-B	UNK	03/27/13 06:33:35 pm	-0.016	21	35.93		1.00	1.00	1.00
280-40049-H-20-B	UNK	03/27/13 06:35:53 pm	-0.018	-4	58.28		1.00	1.00	1.00
280-40082-I-2-F	UNK	03/27/13 06:38:10 pm	-0.014	43	9.30		1.00	1.00	1.00
CCV 1960039	CCV	03/27/13 06:40:30 pm	4.966	56486	0.16		1.00	1.00	1.00
% Recovery 99.32									
CCB	CCB	03/27/13 06:42:48 pm	-0.025	-90	1.08		1.00	1.00	1.00
280-40082-E-4-B	UNK	03/27/13 06:45:06 pm	-0.023	-60	9.71		1.00	1.00	1.00

Sample Name	Type	Date/Time	Conc (ppb)	µAbs	%RSD	Flags	Wt.	Vol.	ODF
280-40160-I-1-C	UNK	03/27/13 06:47:24 pm	0.003	236	2.12		1.00	1.00	1.00
280-40161-C-1-C	UNK	03/27/13 06:49:42 pm	-0.016	13	14.22		1.00	1.00	1.00
280-40161-C-2-C	UNK	03/27/13 06:52:01 pm	-0.010	82	0.82		1.00	1.00	1.00
280-40161-C-4-C	UNK	03/27/13 06:54:20 pm	-0.021	-43	7.15		1.00	1.00	1.00
280-40161-C-5-C	UNK	03/27/13 06:56:40 pm	-0.020	-27	30.98		1.00	1.00	1.00
280-40161-C-7-C	UNK	03/27/13 06:59:00 pm	-0.021	-37	6.13		1.00	1.00	1.00
280-40161-C-9-C	UNK	03/27/13 07:01:19 pm	-0.022	-55	2.33		1.00	1.00	1.00
MB 280-166821/1-A	UNK	03/27/13 07:03:37 pm	-0.022	-52	0.32		1.00	1.00	1.00
LCS 280-166821/2-A	UNK	03/27/13 07:05:55 pm	4.797	54571	0.22		1.00	1.00	1.00
CCV 1960039 % Recovery 98.24	CCV	03/27/13 07:08:15 pm	4.912	55877	0.24		1.00	1.00	1.00
CCB	CCB	03/27/13 07:10:32 pm	-0.026	-100	2.25		1.00	1.00	1.00
280-40184-A-1-D	UNK	03/27/13 07:12:50 pm	-0.022	-48	2.35		1.00	1.00	1.00
280-40184-A-1-E MS	UNK	03/27/13 07:15:07 pm	4.836	55014	0.29		1.00	1.00	1.00
280-40184-A-1-F MSD	UNK	03/27/13 07:17:25 pm	4.743	53956	0.79		1.00	1.00	1.00
280-40184-A-2-B	UNK	03/27/13 07:19:44 pm	-0.020	-33	11.53		1.00	1.00	1.00
280-40184-A-3-B	UNK	03/27/13 07:22:02 pm	-0.023	-60	2.02		1.00	1.00	1.00
280-40184-A-4-B	UNK	03/27/13 07:24:21 pm	-0.022	-47	1.10		1.00	1.00	1.00

Sample Name	Type	Date/Time	Conc (ppb)	µAbs	%RSD	Flags	Wt.	Vol.	ODF
280-40184-A-5-B	UNK	03/27/13 07:26:40 pm	-0.022	-54	6.69		1.00	1.00	1.00
280-40184-A-6-B	UNK	03/27/13 07:28:59 pm	-0.022	-55	6.57		1.00	1.00	1.00
280-40306-C-1-A	UNK	03/27/13 07:31:19 pm	-0.015	23	4.08		1.00	1.00	1.00
280-40306-C-2-A	UNK	03/27/13 07:33:39 pm	0.041	664	0.52		1.00	1.00	1.00
CCV 1960039	CCV	03/27/13 07:35:59 pm	4.854	55220	0.23		1.00	1.00	1.00
% Recovery 97.08									
CCB	CCB	03/27/13 07:38:16 pm	-0.024	-80	2.44		1.00	1.00	1.00
280-40306-C-3-A	UNK	03/27/13 07:40:34 pm	-0.018	-2	101.74		1.00	1.00	1.00
280-40306-C-4-A	UNK	03/27/13 07:42:52 pm	-0.019	-16	8.72		1.00	1.00	1.00
280-40306-C-5-A	UNK	03/27/13 07:45:11 pm	-0.019	-16	19.92		1.00	1.00	1.00
280-40197-A-4-C	UNK	03/27/13 07:47:29 pm	-0.019	-21	13.41		1.00	1.00	1.00
280-40197-A-6-C	UNK	03/27/13 07:49:47 pm	-0.019	-16	23.40		1.00	1.00	1.00
LB 280-166444/1-G	UNK	03/27/13 07:52:05 pm	-0.008	111	1.97		1.00	1.00	1.00
LCS 280-166444/2-G	UNK	03/27/13 07:54:24 pm	5.167	58763	1.03		1.00	1.00	1.00
280-40243-A-1-I	UNK	03/27/13 07:56:42 pm	-0.010	85	0.42		1.00	1.00	1.00
280-40244-A-1-C	UNK	03/27/13 07:59:02 pm	-0.019	-18	7.64		1.00	1.00	1.00
280-40244-A-2-D	UNK	03/27/13 08:01:21 pm	-0.020	-35	3.70		1.00	1.00	1.00
CCV 1960039	CCV	03/27/13 08:03:41 pm	4.855	55230	1.07		1.00	1.00	1.00
% Recovery 97.10									

Sample Name	Type	Date/Time	Conc (ppb)	µAbs	%RSD	Flags	Wt.	Vol.	ODF
CCB	CCB	03/27/13 08:05:58 pm	-0.022	-49	5.02		1.00	1.00	1.00
280-40248-A-2-E	UNK	03/27/13 08:08:18 pm	-0.015	31	4.62		1.00	1.00	1.00
280-40248-A-3-G	UNK	03/27/13 08:10:38 pm	-0.019	-17	14.98		1.00	1.00	1.00
280-40248-A-4-E	UNK	03/27/13 08:12:56 pm	-0.019	-18	12.38		1.00	1.00	1.00
280-40279-C-1-G	UNK	03/27/13 08:15:15 pm	-0.011	68	3.20		1.00	1.00	1.00
280-40280-E-1-L	UNK	03/27/13 08:17:33 pm	0.031	552	0.90		1.00	1.00	1.00
280-40280-E-1-L sd@5	UNK	03/27/13 08:19:51 pm	-0.010	88	3.48		1.00	1.00	1.00
280-40280-E-1-M MS	UNK	03/27/13 08:22:10 pm	0.528	6183	6.93	s	1.00	1.00	1.00
280-40280-E-1-N MSD	UNK	03/27/13 08:24:28 pm	0.419	4948	0.66		1.00	1.00	1.00
LB 280-165163/1-F	UNK	03/27/13 08:26:47 pm	-0.018	-11	17.24		1.00	1.00	1.00
LCS 280-165163/2-F	UNK	03/27/13 08:29:06 pm	5.417	61594	0.16		1.00	1.00	1.00
CCV 1960039 % Recovery 97.26	CCV	03/27/13 08:31:26 pm	4.863	55323	0.16		1.00	1.00	1.00
CCB	CCB	03/27/13 08:33:43 pm	-0.023	-69	5.93		1.00	1.00	1.00
280-39981-A-3-L	UNK	03/27/13 08:36:02 pm	-0.021	-45	3.19		1.00	1.00	1.00
280-39981-A-3-L sd@5	UNK	03/27/13 08:38:22 pm	-0.022	-54	4.13		1.00	1.00	1.00
280-39981-A-3-M MS	UNK	03/27/13 08:40:41 pm	5.320	60503	0.76		1.00	1.00	1.00
280-39981-A-3-N MSD	UNK	03/27/13 08:43:01 pm	5.063	57586	0.22		1.00	1.00	1.00

Sample Name	Type	Date/Time	Conc (ppb)	µAbs	%RSD	Flags	Wt.	Vol.	ODF
LB 280-165617/1-F	UNK	03/27/13 08:45:20 pm	-0.021	-40	2.47		1.00	1.00	1.00
LCS 280-165617/2-G	UNK	03/27/13 08:47:38 pm	5.143	58494	0.25		1.00	1.00	1.00
280-40034-E-1-R	UNK	03/27/13 08:49:57 pm	-0.023	-61	4.10		1.00	1.00	1.00
280-40034-E-1-R sd@5	UNK	03/27/13 08:52:16 pm	-0.022	-52	2.89		1.00	1.00	1.00
280-40034-E-1-S MS	UNK	03/27/13 08:54:34 pm	5.429	61742	0.12		1.00	1.00	1.00
280-40034-E-1-T MSD	UNK	03/27/13 08:56:53 pm	4.987	56730	0.09		1.00	1.00	1.00
CCV 1960039 % Recovery 96.45	CCV	03/27/13 08:59:13 pm	4.822	54859	0.21		1.00	1.00	1.00
CCB	CCB	03/27/13 09:01:30 pm	-0.024	-75	1.31		1.00	1.00	1.00
LB3 280-166282/1-D	UNK	03/27/13 09:03:49 pm	-0.019	-20	19.27		1.00	1.00	1.00
LCS 280-166282/2-D	UNK	03/27/13 09:06:08 pm	4.799	54591	0.22		1.00	1.00	1.00
280-40195-A-1-G	UNK	03/27/13 09:08:27 pm	-0.021	-38	4.21		1.00	1.00	1.00
280-40195-A-2-G	UNK	03/27/13 09:10:46 pm	-0.021	-41	4.99		1.00	1.00	1.00
280-40195-A-2-G sd@5	UNK	03/27/13 09:13:06 pm	-0.022	-52	3.51		1.00	1.00	1.00
280-40195-A-2-H MS	UNK	03/27/13 09:15:26 pm	4.834	54987	0.17		1.00	1.00	1.00
280-40195-A-2-I MSD	UNK	03/27/13 09:17:45 pm	4.844	55109	0.11		1.00	1.00	1.00
MB 280-166437/1-A	UNK	03/27/13 09:20:04 pm	-0.024	-71	3.35		1.00	1.00	1.00
LCS 280-166437/2-A	UNK	03/27/13 09:22:23 pm	4.806	54675	1.12		1.00	1.00	1.00

Sample Name	Type	Date/Time	Conc (ppb)	µAbs	%RSD	Flags	Wt.	Vol.	ODF
LCSD 280-166437/3-A	UNK	03/27/13 09:24:42 pm	4.819	54821	0.28		1.00	1.00	1.00
CCV 1960039	CCV	03/27/13 09:27:02 pm	4.821	54841	0.25		1.00	1.00	1.00
% Recovery 96.41									
CCB	CCB	03/27/13 09:29:19 pm	-0.022	-51	5.89		1.00	1.00	1.00
280-40247-A-1-B	UNK	03/27/13 09:31:38 pm	-0.008	106	2.25		1.00	1.00	1.00
280-40247-A-2-B	UNK	03/27/13 09:33:57 pm	0.069	984	0.14		1.00	1.00	1.00
280-40247-A-3-B	UNK	03/27/13 09:36:16 pm	0.004	247	1.05		1.00	1.00	1.00
280-40247-A-4-B	UNK	03/27/13 09:38:35 pm	0.067	958	0.19		1.00	1.00	1.00
280-40247-A-5-B	UNK	03/27/13 09:40:54 pm	0.006	264	0.48		1.00	1.00	1.00
280-40247-A-6-B	UNK	03/27/13 09:43:13 pm	-0.009	96	3.31		1.00	1.00	1.00
280-40247-A-7-B	UNK	03/27/13 09:45:33 pm	0.016	383	1.77		1.00	1.00	1.00
280-40247-A-8-B	UNK	03/27/13 09:47:53 pm	0.127	1640	0.20		1.00	1.00	1.00
280-40247-A-9-B	UNK	03/27/13 09:50:12 pm	-0.003	167	1.37		1.00	1.00	1.00
CCV 1960039	CCV	03/27/13 09:52:32 pm	4.832	54963	0.19		1.00	1.00	1.00
% Recovery 96.63									
CCB	CCB	03/27/13 09:54:49 pm	-0.023	-59	2.76		1.00	1.00	1.00
Ultra stock @ 5ppb	UNK	03/27/13 09:57:08 pm	4.874	55449	0.17		1.00	1.00	1.00
Inorganic Venture stock @ 4ppb	UNK	03/27/13 09:59:28 pm	4.033	45915	0.24		1.00	1.00	1.00
CCV 1960039	CCV	03/27/13 10:01:48 pm	4.949	56291	0.34		1.00	1.00	1.00
% Recovery 98.97									

Sample Name	Type	Date/Time	Conc (ppb)	µAbs	%RSD	Flags	Wt.	Vol. ODF
CCB	CCB	03/27/13 10:04:05 pm	-0.023	-68	3.74		1.00 1.00	1.00

Analysis Parameters

Instrument M-7500 Mercury Analyzer

Conditions

Gas flow (mL/min)	Sample Uptake (s)	Rinse (s)	Read delay (s)	Replicates (#)	Replicate time (s)	Pump speed (%)	Wavelength (nm)
100	40.00	90.00	63.00	4	1.50	50	253.65

Instrumental Zero

Zero before first sample: No

Zero periodically: Yes

Before each calibration.

Baseline Correction

#1 Start time (s)	#1 End time (s)	#2 Start time (s)	#2 End time (s)
20.00	24.00		

Standby Mode

Enabled: Yes

Standby Options: pump slow

Autodilution

Enabled: No

Condition:

Tube # range:

If no autodilution tubes remaining

Calibration

Settings

Algorithm	Through blank	Weighted fit	Cal. Type	Racalibration rate	Reslope rate	Reslope standard
Linear	No	No	Normal	0	0	N/A

Limits

Calibration slope		Reslope		Coeff. of Determination
Lower (%)	Upper (%)	Lower (%)	Upper (%)	
20	150	75	125	0.99500

Error action: Flag and continue

QC

GLP Override: Yes

QC Tests

CCB

Concentration (ppb)
0.1000

Failure flag: Q

Error action for manually inserted QC: Stop analysis

ICB

Concentration (ppb)
0.0500

Failure flag: Z

Error action for manually inserted QC: Stop analysis

CCV

Concentration (ppb)	Low Limit %	High Limit %
5.0000	80.0000	120.0000

Failure flag: Q

Error action for manually inserted QC: Stop analysis

ICV

Concentration (ppb)	Low Limit %	High Limit %
4.0000	94.6000	110.4000

Failure flag: Q

Error action for manually inserted QC: Stop analysis

CRDL

Concentration (ppb)	Low Limit %	High Limit %
0.2000	50.0000	150.0000

Failure flag: Y

Error action for manually inserted QC: Stop analysis

INORGANIC VENTURES™
300 Technology Drive
Christiansburg, VA 24073 • USA
inorganicventures.com

CERTIFICATE OF ANALYSIS

tel: 800.669.6799 • 540.585.3030
fax: 540.585.3012
info@inorganicventures.com

1.0 **INORGANIC VENTURES** is an ISO Guide 34 "General Requirements for the Competence of Reference Material Producers" and ISO 9001 registered manufacturer. Our manufacturing laboratory is accredited to ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories."

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 DESCRIPTION OF CRM — 100 µg/mL Mercury in 10% (v/v) HCl

Catalog Number:	MSHG-100PPM
Lot Number:	F2-HG02098
Starting Material:	Hg metal
Starting Material Purity (%):	99.9991
Starting Material Lot No:	R307HGA1
Matrix:	10% (v/v) HCl

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 99.83 ± 0.48 µg/mL

Certified Density: 1.021 g/mL (measured at 20 ± 1°C)

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.

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

($\bar{x}$) = mean

x_i = individual results

n = number of measurements

Uncertainty (±) = $2\,[\,\Sigma(s_i)^2\,]^{1/2}$

2 = the coverage factor.

$[\,\Sigma(s_i)^2\,]^{1/2}$ = The square root of the sum of the squares of the most common errors (where 's' stands for the standard deviation) from instrumental measurement, density, NIST SRM uncertainty, weighing, dilution to volume, homogeneity, long term stability and short term stability.

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

- "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)
- This product is Traceable to NIST via an unbroken chain of comparisons to the following NIST SRMs:

4.1 ELEMENT	METHOD	NIST SRM#	SRM LOT#
Hg	ICP Assay	3133	061204
Hg	EDTA	928	928

4.2 **BALANCE CALIBRATION** - All analytical balances are calibrated yearly by an accredited calibration laboratory and are traceable to a class E 2 analytical weight set with NIST Traceability. All balances are checked daily using an in-house procedure. The weights used for testing are annually compared to master weights and are traceable to the National Institute of Standards and Technology (NIST).

4.3 **THERMOMETER CALIBRATION** - All thermometers are NIST traceable through thermometers that are calibrated by an A2LA accredited calibration laboratory.

4.4 **GLASSWARE CALIBRATION** - An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM's.

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

Standard solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag	< 0.0020020	M	Cu	< 0.0060050	M	La	< 0.0005000	M	Pr	< 0.0003000	M	Ta	< 0.0070060
O	Al	< 0.0000900	M	Dy	< 0.0060050	O	Li	< 0.0000200	M	Pt	< 0.0020020	M	Tb	< 0.0003000
M	As	< 0.0100080	M	Er	< 0.0050040	M	Lu	< 0.0004000	M	Rb	< 0.0010010	M	Te	< 0.0300250
M	Au	< 0.0030030	M	Eu	< 0.0030030	O	Mg	< 0.0000300	M	Re	< 0.0010010	M	Th	< 0.0010010
M	B	< 0.0700590	O	Fe	< 0.0011000	M	Mn	< 0.0040030	M	Rh	< 0.0010010	M	Ti	< 0.0500420
M	Ba	< 0.0100080	M	Ga	< 0.0010010	M	Mo	< 0.0020020	M	Ru	< 0.0020020	O	Tl	< 0.0060000
M	Be	< 0.0005000	M	Gd	< 0.0010010	O	Na	< 0.0001000	O	S	0.0011030	M	Tm	< 0.0004000
M	Bi	< 0.0004000	O	Ge	< 0.0180000	M	Nb	< 0.0005000	M	Sb	< 0.0005000	M	U	< 0.0020020
O	Ca	0.0000300	M	Hf	< 0.0020020	M	Nd	< 0.0020020	M	Sc	< 0.0100080	M	V	< 0.0020020
O	Cd	< 0.0046000	s	Hg		O	Ni	< 0.0010000	M	Se	< 0.0080070	M	W	< 0.0100080
M	Ce	< 0.0050040	M	Ho	< 0.0005000	n	Os		O	Si	< 0.0034000	M	Y	< 0.0400330
M	Co	< 0.0030030	M	In	< 0.0100080	O	P	< 0.0026000	M	Sm	< 0.0010010	M	Yb	< 0.0010010
M	Cr	< 0.0050040	M	Ir	< 0.0050040	M	Pb	< 0.0030030	M	Sn	< 0.0050040	M	Zn	< 0.0200170
M	Cs	< 0.0003000	O	K	< 0.0020000	O	Pd	< 0.0038000	M	Sr	< 0.0005000	M	Zr	< 0.0050040

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
HPLC, IC, TLC, ISE, IR, NMR, UV/VIS, MS, Capillary Electrophoresis, Potentiometry, Wet Chemistry and Voltammetry
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact Technical Staff

This CRM was manufactured using 18 megohm doubly deionized water that has been filtered through a 0.2 micron filter.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 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	Type	Interferences (underlined indicates severe)
ICP-OES 184.950 nm	0.03 / 0.005 µg/mL	1	atom	
ICP-OES 194.227 nm	0.03 / 0.005 µg/mL	1	ion	V
ICP-OES 253.652 nm	0.1 / 0.03 µg/mL	1	atom	Ta, Co, Th ,Rh , Fe, U
ICP-MS 202 amu	9 ppt	n/a	M+	186W16O

Uranium Note: If uranium is present in this standard, it is natural abundance unless specified in Section 3.0.

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Safety Data sheet for information regarding this CRM.

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration
- SAI Global File Number 010105

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration"
- Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 "General Requirements for the Competence of Reference Material Producers"
- Reference Materials Production - Accredited A2LA Certificate Number 883.02

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission
- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission
- Reporting Defects and Non-Compliance

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Manufacturer concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

11.3 Chemical Stability - Studies have been conducted on this or similar CRMs and it has been demonstrated that this CRM is chemically stable for a period of not less than two years provided the "Storage & Handling" conditions are followed that are described in section 7.0.

Certification Date: **September 25, 2012**

Expiration Date: EXPIRES 01 APR 2014

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Stephan Blaakman
Product Documentation Technician

Certificate Approved By: Brian Alexander
PhD., Quality Control Supervisor

Certifying Officer: Paul Gaines
PhD., Senior Technical Director

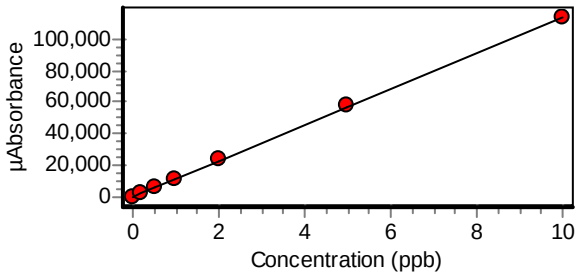
Report Generated By CETAC QuickTrace
Analyst: FredetteN
Worksheet file: C:\Program Files\QuickTrace\Worksheets\March 2013\130327taa.wsz
Date Started: 3/27/2013 3:33:21 PM
Comment:

Results

Sample Name	Type	Date/Time	Conc (ppb)	µAbs	%RSD	Flags	Wt.	Vol.	ODF
Cal Blank	STD	03/27/13 04:25:38 pm	0.000	-32	5.91		1.00	1.00	1.00
Std1	STD	03/27/13 04:27:55 pm	0.200	2286	0.26		1.00	1.00	1.00
Std2	STD	03/27/13 04:30:14 pm	0.500	5710	0.16		1.00	1.00	1.00
Std3	STD	03/27/13 04:32:33 pm	1.000	11245	0.17		1.00	1.00	1.00
Std4	STD	03/27/13 04:34:52 pm	2.000	23360	0.27		1.00	1.00	1.00
Std5	STD	03/27/13 04:37:12 pm	5.000	57703	0.19		1.00	1.00	1.00
Std6	STD	03/27/13 04:39:33 pm	10.000	113077	0.15		1.00	1.00	1.00

Calibration

Equation: A = 197.151 + 11335.260C
R2: 0.99987
SEE: 518.6737
Flags:



ICV 1960038	ICV	03/27/13 04:42:50 pm	4.117	46859	0.18		1.00	1.00	1.00
% Recovery 102.91									
ICB	ICB	03/27/13 04:45:08 pm	-0.022	-49	6.58		1.00	1.00	1.00
CRA 1960040	CRDL	03/27/13 04:47:25 pm	0.188	2325	0.23		1.00	1.00	1.00
% Recovery 93.87									

Sample Name	Type	Date/Time	Conc (ppb)	µAbs	%RSD	Flags	Wt.	Vol. ODF
CCV 1960039	CCV	03/27/13 04:49:46 pm	5.027	57183	0.16		1.00	1.00
% Recovery 100.55							1.00	
CCB	CCB	03/27/13 04:52:03 pm	-0.022	-55	8.49		1.00	1.00
							1.00	
MB 280-166853/1-A	UNK	03/27/13 04:54:20 pm	-0.018	-8	3.97		1.00	1.00
							1.00	
LCS 280-166853/2-A	UNK	03/27/13 04:56:37 pm	4.950	56312	0.30		1.00	1.00
							1.00	
280-40327-D-1-D	UNK	03/27/13 04:58:55 pm	-0.013	48	4.81		1.00	1.00
							1.00	
280-40327-D-1-E MS	UNK	03/27/13 05:01:13 pm	4.867	55360	0.13		1.00	1.00
							1.00	
280-40327-D-1-F MSD	UNK	03/27/13 05:03:31 pm	4.911	55863	0.12		1.00	1.00
							1.00	
280-39957-G-1-K	UNK	03/27/13 05:05:50 pm	-0.020	-26	9.25		1.00	1.00
							1.00	
MB 280-166447/1-A	UNK	03/27/13 05:08:09 pm	-0.019	-17	18.31		1.00	1.00
							1.00	
LCS 280-166447/2-A	UNK	03/27/13 05:10:28 pm	4.928	56060	0.17		1.00	1.00
							1.00	
280-40014-B-1-B	UNK	03/27/13 05:12:48 pm	-0.020	-29	10.84		1.00	1.00
							1.00	
280-40049-AG-13-A	UNK	03/27/13 05:15:07 pm	-0.018	-4	132.73		1.00	1.00
							1.00	
CCV 1960039	CCV	03/27/13 05:17:27 pm	4.997	56835	0.20		1.00	1.00
% Recovery 99.93							1.00	
CCB	CCB	03/27/13 05:19:45 pm	-0.021	-42	2.84		1.00	1.00
							1.00	
280-40049-AG-13-A sd@5	UNK	03/27/13 05:22:05 pm	-0.020	-27	8.27		1.00	1.00
							1.00	
280-40049-AG-13-B MS	UNK	03/27/13 05:24:25 pm	4.257	48450	0.31		1.00	1.00
							1.00	
280-40049-AG-13-C MSD	UNK	03/27/13 05:26:42 pm	4.318	49147	0.47		1.00	1.00
							1.00	

Sample Name	Type	Date/Time	Conc (ppb)	µAbs	%RSD	Flags	Wt.	Vol.	ODF
280-40049-U-15-A	UNK	03/27/13 05:28:59 pm	-0.044	-298	1.63		1.00	1.00	1.00
280-40049-U-15-B MS	UNK	03/27/13 05:31:16 pm	2.413	27546	0.31		1.00	1.00	1.00
280-40049-U-15-C MSD	UNK	03/27/13 05:33:34 pm	2.374	27108	0.42		1.00	1.00	1.00
280-40049-K-17-A	UNK	03/27/13 05:35:52 pm	-0.031	-159	1.50		1.00	1.00	1.00
280-40049-K-18-B	UNK	03/27/13 05:38:10 pm	-0.018	-11	85.68		1.00	1.00	1.00
280-40049-H-19-C	UNK	03/27/13 05:40:29 pm	-0.017	4	162.51		1.00	1.00	1.00
280-40082-J-2-B	UNK	03/27/13 05:42:47 pm	-0.016	20	21.25		1.00	1.00	1.00
CCV 1960039 % Recovery 100.32	CCV	03/27/13 05:45:08 pm	5.016	57054	0.16		1.00	1.00	1.00
CCB	CCB	03/27/13 05:47:25 pm	-0.021	-46	2.36		1.00	1.00	1.00
280-40161-B-2-A	UNK	03/27/13 05:49:44 pm	-0.011	75	6.66		1.00	1.00	1.00
280-40161-B-5-A	UNK	03/27/13 05:52:03 pm	-0.018	-6	45.75		1.00	1.00	1.00
280-40161-B-7-A	UNK	03/27/13 05:54:23 pm	-0.017	-1	269.29		1.00	1.00	1.00
MB 280-166442/1-A	UNK	03/27/13 05:56:43 pm	-0.018	-6	36.78		1.00	1.00	1.00
LCS 280-166442/2-A	UNK	03/27/13 05:59:00 pm	4.836	55013	0.25		1.00	1.00	1.00
280-40014-A-1-H	UNK	03/27/13 06:01:17 pm	-0.018	-11	45.00		1.00	1.00	1.00
280-40014-A-2-C	UNK	03/27/13 06:03:34 pm	-0.018	-10	42.75		1.00	1.00	1.00
280-40049-AB-13-J	UNK	03/27/13 06:05:52 pm	-0.016	17	15.37		1.00	1.00	1.00

Sample Name	Type	Date/Time	Conc (ppb)	µAbs	%RSD	Flags	Wt.	Vol.	ODF
280-40049-AB-13-J sd@5	UNK	03/27/13 06:08:10 pm	-0.021	-43	7.84		1.00	1.00	1.00
280-40049-AB-13-K MS	UNK	03/27/13 06:10:28 pm	4.253	48405	0.52		1.00	1.00	1.00
CCV 1960039	CCV	03/27/13 06:12:48 pm	4.991	56774	0.36		1.00	1.00	1.00
% Recovery 99.82									
CCB	CCB	03/27/13 06:15:05 pm	-0.024	-73	3.95		1.00	1.00	1.00
280-40049-AB-13-L MSD	UNK	03/27/13 06:17:24 pm	4.184	47628	0.25		1.00	1.00	1.00
280-40049-P-15-G	UNK	03/27/13 06:19:43 pm	-0.041	-266	1.02		1.00	1.00	1.00
280-40049-P-15-H MS	UNK	03/27/13 06:22:02 pm	2.369	27049	0.26		1.00	1.00	1.00
280-40049-P-15-I MSD	UNK	03/27/13 06:24:21 pm	2.303	26306	0.73		1.00	1.00	1.00
280-40049-H-16-B	UNK	03/27/13 06:26:41 pm	-0.038	-237	0.69		1.00	1.00	1.00
280-40049-H-17-A	UNK	03/27/13 06:29:01 pm	-0.006	131	0.89		1.00	1.00	1.00
280-40049-H-18-B	UNK	03/27/13 06:31:18 pm	-0.015	24	38.23		1.00	1.00	1.00
280-40049-H-19-B	UNK	03/27/13 06:33:35 pm	-0.016	21	35.93		1.00	1.00	1.00
280-40049-H-20-B	UNK	03/27/13 06:35:53 pm	-0.018	-4	58.28		1.00	1.00	1.00
280-40082-I-2-F	UNK	03/27/13 06:38:10 pm	-0.014	43	9.30		1.00	1.00	1.00
CCV 1960039	CCV	03/27/13 06:40:30 pm	4.966	56486	0.16		1.00	1.00	1.00
% Recovery 99.32									
CCB	CCB	03/27/13 06:42:48 pm	-0.025	-90	1.08		1.00	1.00	1.00
280-40082-E-4-B	UNK	03/27/13 06:45:06 pm	-0.023	-60	9.71		1.00	1.00	1.00

Sample Name	Type	Date/Time	Conc (ppb)	µAbs	%RSD	Flags	Wt.	Vol.	ODF
280-40160-I-1-C	UNK	03/27/13 06:47:24 pm	0.003	236	2.12		1.00	1.00	1.00
280-40161-C-1-C	UNK	03/27/13 06:49:42 pm	-0.016	13	14.22		1.00	1.00	1.00
280-40161-C-2-C	UNK	03/27/13 06:52:01 pm	-0.010	82	0.82		1.00	1.00	1.00
280-40161-C-4-C	UNK	03/27/13 06:54:20 pm	-0.021	-43	7.15		1.00	1.00	1.00
280-40161-C-5-C	UNK	03/27/13 06:56:40 pm	-0.020	-27	30.98		1.00	1.00	1.00
280-40161-C-7-C	UNK	03/27/13 06:59:00 pm	-0.021	-37	6.13		1.00	1.00	1.00
280-40161-C-9-C	UNK	03/27/13 07:01:19 pm	-0.022	-55	2.33		1.00	1.00	1.00
MB 280-166821/1-A	UNK	03/27/13 07:03:37 pm	-0.022	-52	0.32		1.00	1.00	1.00
LCS 280-166821/2-A	UNK	03/27/13 07:05:55 pm	4.797	54571	0.22		1.00	1.00	1.00
CCV 1960039 % Recovery 98.24	CCV	03/27/13 07:08:15 pm	4.912	55877	0.24		1.00	1.00	1.00
CCB	CCB	03/27/13 07:10:32 pm	-0.026	-100	2.25		1.00	1.00	1.00
280-40184-A-1-D	UNK	03/27/13 07:12:50 pm	-0.022	-48	2.35		1.00	1.00	1.00
280-40184-A-1-E MS	UNK	03/27/13 07:15:07 pm	4.836	55014	0.29		1.00	1.00	1.00
280-40184-A-1-F MSD	UNK	03/27/13 07:17:25 pm	4.743	53956	0.79		1.00	1.00	1.00
280-40184-A-2-B	UNK	03/27/13 07:19:44 pm	-0.020	-33	11.53		1.00	1.00	1.00
280-40184-A-3-B	UNK	03/27/13 07:22:02 pm	-0.023	-60	2.02		1.00	1.00	1.00
280-40184-A-4-B	UNK	03/27/13 07:24:21 pm	-0.022	-47	1.10		1.00	1.00	1.00

Sample Name	Type	Date/Time	Conc (ppb)	µAbs	%RSD	Flags	Wt.	Vol.	ODF
280-40184-A-5-B	UNK	03/27/13 07:26:40 pm	-0.022	-54	6.69		1.00	1.00	1.00
280-40184-A-6-B	UNK	03/27/13 07:28:59 pm	-0.022	-55	6.57		1.00	1.00	1.00
280-40306-C-1-A	UNK	03/27/13 07:31:19 pm	-0.015	23	4.08		1.00	1.00	1.00
280-40306-C-2-A	UNK	03/27/13 07:33:39 pm	0.041	664	0.52		1.00	1.00	1.00
CCV 1960039	CCV	03/27/13 07:35:59 pm	4.854	55220	0.23		1.00	1.00	1.00
% Recovery 97.08									
CCB	CCB	03/27/13 07:38:16 pm	-0.024	-80	2.44		1.00	1.00	1.00
280-40306-C-3-A	UNK	03/27/13 07:40:34 pm	-0.018	-2	101.74		1.00	1.00	1.00
280-40306-C-4-A	UNK	03/27/13 07:42:52 pm	-0.019	-16	8.72		1.00	1.00	1.00
280-40306-C-5-A	UNK	03/27/13 07:45:11 pm	-0.019	-16	19.92		1.00	1.00	1.00
280-40197-A-4-C	UNK	03/27/13 07:47:29 pm	-0.019	-21	13.41		1.00	1.00	1.00
280-40197-A-6-C	UNK	03/27/13 07:49:47 pm	-0.019	-16	23.40		1.00	1.00	1.00
LB 280-166444/1-G	UNK	03/27/13 07:52:05 pm	-0.008	111	1.97		1.00	1.00	1.00
LCS 280-166444/2-G	UNK	03/27/13 07:54:24 pm	5.167	58763	1.03		1.00	1.00	1.00
280-40243-A-1-I	UNK	03/27/13 07:56:42 pm	-0.010	85	0.42		1.00	1.00	1.00
280-40244-A-1-C	UNK	03/27/13 07:59:02 pm	-0.019	-18	7.64		1.00	1.00	1.00
280-40244-A-2-D	UNK	03/27/13 08:01:21 pm	-0.020	-35	3.70		1.00	1.00	1.00
CCV 1960039	CCV	03/27/13 08:03:41 pm	4.855	55230	1.07		1.00	1.00	1.00
% Recovery 97.10									

Sample Name	Type	Date/Time	Conc (ppb)	µAbs	%RSD	Flags	Wt.	Vol.	ODF
CCB	CCB	03/27/13 08:05:58 pm	-0.022	-49	5.02		1.00	1.00	1.00
280-40248-A-2-E	UNK	03/27/13 08:08:18 pm	-0.015	31	4.62		1.00	1.00	1.00
280-40248-A-3-G	UNK	03/27/13 08:10:38 pm	-0.019	-17	14.98		1.00	1.00	1.00
280-40248-A-4-E	UNK	03/27/13 08:12:56 pm	-0.019	-18	12.38		1.00	1.00	1.00
280-40279-C-1-G	UNK	03/27/13 08:15:15 pm	-0.011	68	3.20		1.00	1.00	1.00
280-40280-E-1-L	UNK	03/27/13 08:17:33 pm	0.031	552	0.90		1.00	1.00	1.00
280-40280-E-1-L sd@5	UNK	03/27/13 08:19:51 pm	-0.010	88	3.48		1.00	1.00	1.00
280-40280-E-1-M MS	UNK	03/27/13 08:22:10 pm	0.528	6183	6.93	s	1.00	1.00	1.00
280-40280-E-1-N MSD	UNK	03/27/13 08:24:28 pm	0.419	4948	0.66		1.00	1.00	1.00
LB 280-165163/1-F	UNK	03/27/13 08:26:47 pm	-0.018	-11	17.24		1.00	1.00	1.00
LCS 280-165163/2-F	UNK	03/27/13 08:29:06 pm	5.417	61594	0.16		1.00	1.00	1.00
CCV 1960039 % Recovery 97.26	CCV	03/27/13 08:31:26 pm	4.863	55323	0.16		1.00	1.00	1.00
CCB	CCB	03/27/13 08:33:43 pm	-0.023	-69	5.93		1.00	1.00	1.00
280-39981-A-3-L	UNK	03/27/13 08:36:02 pm	-0.021	-45	3.19		1.00	1.00	1.00
280-39981-A-3-L sd@5	UNK	03/27/13 08:38:22 pm	-0.022	-54	4.13		1.00	1.00	1.00
280-39981-A-3-M MS	UNK	03/27/13 08:40:41 pm	5.320	60503	0.76		1.00	1.00	1.00
280-39981-A-3-N MSD	UNK	03/27/13 08:43:01 pm	5.063	57586	0.22		1.00	1.00	1.00

Sample Name	Type	Date/Time	Conc (ppb)	µAbs	%RSD	Flags	Wt.	Vol.	ODF
LB 280-165617/1-F	UNK	03/27/13 08:45:20 pm	-0.021	-40	2.47		1.00	1.00	1.00
LCS 280-165617/2-G	UNK	03/27/13 08:47:38 pm	5.143	58494	0.25		1.00	1.00	1.00
280-40034-E-1-R	UNK	03/27/13 08:49:57 pm	-0.023	-61	4.10		1.00	1.00	1.00
280-40034-E-1-R sd@5	UNK	03/27/13 08:52:16 pm	-0.022	-52	2.89		1.00	1.00	1.00
280-40034-E-1-S MS	UNK	03/27/13 08:54:34 pm	5.429	61742	0.12		1.00	1.00	1.00
280-40034-E-1-T MSD	UNK	03/27/13 08:56:53 pm	4.987	56730	0.09		1.00	1.00	1.00
CCV 1960039 % Recovery 96.45	CCV	03/27/13 08:59:13 pm	4.822	54859	0.21		1.00	1.00	1.00
CCB	CCB	03/27/13 09:01:30 pm	-0.024	-75	1.31		1.00	1.00	1.00
LB3 280-166282/1-D	UNK	03/27/13 09:03:49 pm	-0.019	-20	19.27		1.00	1.00	1.00
LCS 280-166282/2-D	UNK	03/27/13 09:06:08 pm	4.799	54591	0.22		1.00	1.00	1.00
280-40195-A-1-G	UNK	03/27/13 09:08:27 pm	-0.021	-38	4.21		1.00	1.00	1.00
280-40195-A-2-G	UNK	03/27/13 09:10:46 pm	-0.021	-41	4.99		1.00	1.00	1.00
280-40195-A-2-G sd@5	UNK	03/27/13 09:13:06 pm	-0.022	-52	3.51		1.00	1.00	1.00
280-40195-A-2-H MS	UNK	03/27/13 09:15:26 pm	4.834	54987	0.17		1.00	1.00	1.00
280-40195-A-2-I MSD	UNK	03/27/13 09:17:45 pm	4.844	55109	0.11		1.00	1.00	1.00
MB 280-166437/1-A	UNK	03/27/13 09:20:04 pm	-0.024	-71	3.35		1.00	1.00	1.00
LCS 280-166437/2-A	UNK	03/27/13 09:22:23 pm	4.806	54675	1.12		1.00	1.00	1.00

Sample Name	Type	Date/Time	Conc (ppb)	µAbs	%RSD	Flags	Wt.	Vol.	ODF
LCSD 280-166437/3-A	UNK	03/27/13 09:24:42 pm	4.819	54821	0.28		1.00	1.00	1.00
CCV 1960039	CCV	03/27/13 09:27:02 pm	4.821	54841	0.25		1.00	1.00	1.00
% Recovery 96.41									
CCB	CCB	03/27/13 09:29:19 pm	-0.022	-51	5.89		1.00	1.00	1.00
280-40247-A-1-B	UNK	03/27/13 09:31:38 pm	-0.008	106	2.25		1.00	1.00	1.00
280-40247-A-2-B	UNK	03/27/13 09:33:57 pm	0.069	984	0.14		1.00	1.00	1.00
280-40247-A-3-B	UNK	03/27/13 09:36:16 pm	0.004	247	1.05		1.00	1.00	1.00
280-40247-A-4-B	UNK	03/27/13 09:38:35 pm	0.067	958	0.19		1.00	1.00	1.00
280-40247-A-5-B	UNK	03/27/13 09:40:54 pm	0.006	264	0.48		1.00	1.00	1.00
280-40247-A-6-B	UNK	03/27/13 09:43:13 pm	-0.009	96	3.31		1.00	1.00	1.00
280-40247-A-7-B	UNK	03/27/13 09:45:33 pm	0.016	383	1.77		1.00	1.00	1.00
280-40247-A-8-B	UNK	03/27/13 09:47:53 pm	0.127	1640	0.20		1.00	1.00	1.00
280-40247-A-9-B	UNK	03/27/13 09:50:12 pm	-0.003	167	1.37		1.00	1.00	1.00
CCV 1960039	CCV	03/27/13 09:52:32 pm	4.832	54963	0.19		1.00	1.00	1.00
% Recovery 96.63									
CCB	CCB	03/27/13 09:54:49 pm	-0.023	-59	2.76		1.00	1.00	1.00
Ultra stock @ 5ppb	UNK	03/27/13 09:57:08 pm	4.874	55449	0.17		1.00	1.00	1.00
Inorganic Venture stock @ 4ppb	UNK	03/27/13 09:59:28 pm	4.033	45915	0.24		1.00	1.00	1.00
CCV 1960039	CCV	03/27/13 10:01:48 pm	4.949	56291	0.34		1.00	1.00	1.00
% Recovery 98.97									

Sample Name	Type	Date/Time	Conc (ppb)	µAbs	%RSD	Flags	Wt.	Vol.	ODF
CCB	CCB	03/27/13 10:04:05 pm	-0.023	-68	3.74		1.00	1.00	1.00

Analysis Parameters

Instrument M-7500 Mercury Analyzer

Conditions

Gas flow (mL/min)	Sample Uptake (s)	Rinse (s)	Read delay (s)	Replicates (#)	Replicate time (s)	Pump speed (%)	Wavelength (nm)
100	40.00	90.00	63.00	4	1.50	50	253.65

Instrumental Zero

Zero before first sample: No

Zero periodically: Yes

Before each calibration.

Baseline Correction

#1 Start time (s)	#1 End time (s)	#2 Start time (s)	#2 End time (s)
20.00	24.00		

Standby Mode

Enabled: Yes

Standby Options: pump slow

Autodilution

Enabled: No

Condition:

Tube # range:

If no autodilution tubes remaining

Calibration

Settings

Algorithm	Through blank	Weighted fit	Cal. Type	Racalibration rate	Reslope rate	Reslope standard
Linear	No	No	Normal	0	0	N/A

Limits

Calibration slope		Reslope		Coeff. of Determination
Lower (%)	Upper (%)	Lower (%)	Upper (%)	
20	150	75	125	0.99500

Error action: Flag and continue

QC

GLP Override: Yes

QC Tests

CCB

Concentration (ppb)
0.1000

Failure flag: Q

Error action for manually inserted QC: Stop analysis

ICB

Concentration (ppb)
0.0500

Failure flag: Z

Error action for manually inserted QC: Stop analysis

CCV

Concentration (ppb)	Low Limit %	High Limit %
5.0000	80.0000	120.0000

Failure flag: Q

Error action for manually inserted QC: Stop analysis

ICV

Concentration (ppb)	Low Limit %	High Limit %
4.0000	94.6000	110.4000

Failure flag: Q

Error action for manually inserted QC: Stop analysis

CRDL

Concentration (ppb)	Low Limit %	High Limit %
0.2000	50.0000	150.0000

Failure flag: Y

Error action for manually inserted QC: Stop analysis

ULTRA SCIENTIFIC
Analytical Solutions

Certificate of Analysis

*** ULTRAgrade™ Solution**
Mercury ICP Standard
1000 µg/mL

Catalog Number: ICP-080
Lot Number: P00139
Job Number: J00014228
Lot Issue Date: 02/10/2012
Expiration Date: 03/31/2019

Starting Material:	Mercuric Nitrate
Starting Material Purity:	99.999%
Starting Material Lot No.:	NT04717
Matrix:	2% nitric acid in low TOC water (< 50 ppb)
Atomic Weight Hg:	200.61

* light sensitive

Certified Value: 1002 ± 2 µg/mL

This Certified Reference Material (CRM) was manufactured and verified in accordance with ULTRA's ISO 9001 registered quality system. The analyte concentrations were verified by our ISO 17025 accredited laboratory to be within ± 2.5%, when compared to calibration standards independently prepared using NIST SRM(s). The certified value and uncertainty value at the 95% confidence level for each analyte is determined gravimetrically.

Classical Wet Assay Method: Theoretical, based on gravimetric measurements

Confirmation by Inductively Coupled Plasma Spectroscopy (ICP / ICP-MS) vs. NIST SRM 3133

ULTRA uses purified acids, 18 megohm double deionized water, calibrated Class A glassware and cleaned bottles in the manufacture of ULTRAgrade standards. Balances used in the manufacture of this standard are calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z-540-1 and ISO 9001.

Trace Metallic Impurities in Solution Standard in µg/mL:

*	Al	<0.005	ND	*	Ga	<0.005	ND	n	Nb			n	S				
*	Sb	<0.005	ND	n	Ge			n	Os			n	Ta				
*	As	<0.005	ND	n	Au			*	Pd	<0.005	ND	n	Te				
*	Ba	<0.005	ND	n	Hf			*	P	<0.005	ND	n	Tb				
*	Be	<0.005	ND	n	Ho			*	Pt	<0.005	ND	*	Tl	<0.005	ND		
*	Bi	<0.005	ND	*	In	<0.005	ND	*	K	<0.005	ND	n	Th				
*	B	<0.005	ND	n	Ir			n	Pr			n	Tm				
*	Cd	<0.005	ND	*	Fe	<0.005	ND	n	Re			*	Sn	<0.005	ND		
*	Ca	<0.005	ND	*	La	<0.005	ND	n	Rh			*	Ti	<0.005	ND		
n	Ce			*	Pb	<0.005	ND	n	Rb			n	W				
n	Cs			*	Li	<0.005	ND	n	Ru			n	U				
*	Cr	<0.005	ND	n	Lu			n	Sm			*	V	<0.005	ND		
*	Co	<0.005	ND	*	Mg	<0.005	ND	n	Sc			n	Yb				
*	Cu	<0.005	ND	*	Mn	<0.005	ND	*	Se	<0.005	ND	n	Y				
n	Dy			s	Hg			*	Si	<0.005	ND	*	Zn	<0.005	ND		
*	Er	<0.005	ND	*	Mo	<0.005	ND	*	Ag	<0.005	ND	n	Zr				
*	Eu	<0.005	ND	n	Nd			*	Na	<0.005	ND						
*	Gd	<0.005	ND	*	Ni	<0.005	ND	*	Sr	<0.005	ND						

* - element checked for
ND - not detected

i - spectral interference
D - detected

n - not checked for
s - solution standard element

Density of Solution (measured at 20.00°C ± 0.05°C): 1.0102 g/mL

ACCREDITED

ISO 17025:2005
Accredited
A2LA
Cert. No. 0851.01

ISO 9001:2000
Registered
TUV USA, Inc.
Cert. No. 06-1004

William J. Leary
Quality Assurance Manager

250 Smith Street, North Kingstown, RI 02852 USA
Ph: 401-294-9400 * Fax: 401-295-2330
www.ultrasci.com

05/29/2013

Sample Name: x1998782@100 Acquired: 4/19/2013 14:50:02 Type: Unk
Method: 6500_026(v6) Mode: CONC Corr. Factor: 1.000000
User: bowenh Custom ID1: Custom ID2: Custom ID3:
Comment:

Elem	Ag3280	Al1670	As1890	B_2089	Ba4554	Be3130	Bi2230	Ca3179	Cd2288
Line	328.068 {103}	167.079 {502}	189.042 {478}	208.959 {461}	455.403 { 74}	313.042 {108}	223.061 {451}	317.933 {106}	228.802 {447}
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	**-.00012**	**-.00014**	**.00203**	**.00611**	**-.00002**	**.00001**	**-.00306**	**.03403**	**-.00007**
Stddev	.00019	.00032	.00075	.00063	.00104	.00009	.00097	.00170	.00001
%RSD	160.19	220.98	36.953	10.230	5652.9	1293.4	31.725	4.9896	7.3736
#1	.00002	-.00037	.00150	.00655	-.00075	-.00006	-.00374	.03283	-.00008
#2	-.00025	.00008	.00256	.00567	.00071	.00007	-.00237	.03523	-.00007
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit									
Low Limit									

Elem	Co2286	Cr2055	Cu3247	Fe2599	K_7664	Li6707	Mg2790	Mn2576	Mo2020
Line	228.616 {447}	205.552 {464}	324.754 {104}	259.940 {130}	766.490 { 44}	670.784 { 50}	279.079 {121}2	257.610 {131}	202.030 {467}
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	**-.00019**	**-.00002**	**.00020**	**.00021**	**.02742**	**.00182**	**.02179**	**.00002**	**.00382**
Stddev	.00015	.00009	.00023	.00695	.02699	.00010	.00030	.00003	.00038
%RSD	78.321	382.03	114.55	3342.6	98.426	5.3766	1.3944	125.94	9.8637
#1	-.00029	-.00008	.00004	.00512	.00834	.00175	.02200	.00004	.00356
#2	-.00008	.00004	.00036	-.00470	.04650	.00189	.02157	.00000	.00409
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit									
Low Limit									

Elem	Na5895	Ni2316	P_1782	Pb2203	S_1820	Sb2068	Se1960	Si2881	Sn1899
Line	589.592 { 57}	231.604 {446}	178.284 {489}	220.353 {453}	182.034 {485}	206.833 {463}	196.090 {472}	288.158 {117}	189.989 {477}
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	**.58901**	**.00219**	**.00196**	**.00078**	**.32890**	**.00268**	**.00755**	**.02412**	**.00068**
Stddev	.02305	.00011	.00145	.00121	.00049	.00054	.00155	.01988	.00043
%RSD	3.9127	5.2412	74.242	154.44	.14967	20.254	20.482	82.435	62.471
#1	.60531	.00227	.00299	.00163	.32855	.00306	.00646	.03818	.00038
#2	.57271	.00211	.00093	-.00007	.32925	.00230	.00865	.01006	.00099
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	None	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit									
Low Limit									

Elem	Sr4077	Th2837	Ti3349	Tl1908	U_3701	V_2924	Zn2062	Zr3391
Line	407.771 { 83}	283.730 {119}	334.904 {101}	190.856 {477}	370.152 { 91}	292.402 {115}	206.200 {163}	339.198 { 99}
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	**.00182**	**-.00014**	**.00021**	**W 10.657**	**-.01411**	**.00018**	**.00200**	**-.00115**
Stddev	.00022	.00135	.00010	.021	.01121	.00022	.00033	.00221
%RSD	12.276	959.47	47.090	.19426	79.433	117.98	16.554	191.90
#1	.00198	.00081	.00028	10.642	-.00619	.00034	.00223	.00041
#2	.00166	-.00109	.00014	10.671	-.02204	.00003	.00176	-.00271
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Warn	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit				5.0000				
Low Limit				-.01000				

Int. Std.	Y_2243	Y_3600	Y_3774
Line	224.306 {450}	360.073 { 94}	377.433 { 89}
Units	Cts/S	Cts/S	Cts/S
Avg	**6957.9**	**89083.**	**2528.7**
Stddev	30.1	67.	22.6
%RSD	.43232	.07553	.89254
#1	6979.2	89036.	2512.8
#2	6936.6	89131.	2544.7

HIGH-PURITY STANDARDS
www.highpuritystandards.com

P.O. Box 41727
Charleston, SC 29423
Phone (843) 767-7900
Fax (843) 767-7906

Certificate of Analysis

Product Description:

1998782
ID: ICP ISAB 1B_00005
Exp:04/11/14 Prpd:HEB Opn:04/18/13
ICP ICSAB STD 1 SOL B H

Name:	ICS-AB STD #1
Part Number:	**SM-606-037** Solution B
Lot Number:	**1309814**
Matrix:	2% HNO_3
Purity:	99.99%

Certified Values:

Element	(mg/L)	SRM ID	SRM Lot#
Tl	1000 ± 5	3158	993012

The Certified values are based on gravimetric and volumetric preparation, and verified against SRM 3100 series developed by National Institute of Standards and Technology (NIST) via inductively coupled plasma optical emission spectrometry (ICP-OES) using an internal laboratory developed method. The uncertainty in the certified value is calculated for a 95% confidence interval and coverage factor *k* is about 2
* Refer to Traceability Information, Section d

Preparation Information:

The standard is generally prepared from single element standard solutions that are ISO Guide 34 certified reference materials. Highest purity source materials were purchased from qualified vendors per ISO 9001:2008 guidelines and assayed by ICP-OES for conformity prior to use. Sub-boiling distilled high-purity acid has been used to place the materials in solution and to stabilize the standard. The matrix is as noted above in 18 megaohm deionized water.

Traceability Information:

The traceability of this standard is maintained through an unbroken chain of comparisons to appropriate standards with suitable procedure and measurement uncertainties. The maintenance of the base and derived units of International System of Units (SI) with traceability of measurement results (contemporary metrology) to SI ensures their comparability over time as follows.

a. **Standard Weight and Analytical Balance**
The standard weights (NBS weights Inventory No 20231A) are calibrated every two years by South Carolina Metrology Laboratory that is a participant in "NIST Weights and Measures Measurement Assurance Program" with a certificate of measurement traceability to NIST primary standards.
The balances are calibrated yearly by the ISO 17025 accredited metrology service, and are verified weekly by an in-house method using standard weights.

b. **Volumetric Device**
The calibration of volumetric vessels is checked annually using the NBS 602 method.

c. **Thermometer**
The standard thermometers are calibrated every year by the ISO 17025 accredited metrology service. The thermometers used in-house are verified against the standard thermometers yearly.

d. **Calibration Standards**
The Calibration Standards are traceable to SRM 3100 Series Spectrometric Standard Solutions or second sources.

Packaging and Storage Conditions:

The standard is packaged in a pre-cleaned polyethylene bottle. To maintain the integrity of this product, the solution should be kept tightly capped and stored under normal laboratory conditions.

Refer to Material Safety Datasheet (MSDS) for hazardous information.

Expiration Information:

The expiry date is guaranteed to be valid for twelve months from the shipping date provided. For this reason, standards from the same lot may have different expiration dates.

Preparation Date:	**April 8, 2013**
Shipped Date:	**April 11, 2013**
Expiration Date:	**April 11, 2014**
Certificate Issue Date:	**April 8, 2013**

Quality Information:

ISO/IEC 17025:2005 Accreditation
Certificate Number AT-1529

Vanny T. Yib,
Inorganic Laboratory Manager

Angel Sellers
Quality Manager

Sample Name: x1998781@100 Acquired: 4/19/2013 14:47:39 Type: Unk
Method: 6500_026(v6) Mode: CONC Corr. Factor: 1.000000
User: bowenh Custom ID1: Custom ID2: Custom ID3:
Comment:

Elem	Ag3280	Al1670	As1890	B_2089	Ba4554	Be3130	Bi2230	Ca3179	Cd2288
Line	328.068 {103}	167.079 {502}	189.042 {478}	208.959 {461}	455.403 { 74}	313.042 {108}	223.061 {451}	317.933 {106}	228.802 {447}
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	.00050	-.00018	2.0213	1.9820	-.00027	-.00004	-.00036	.00378	.00212
Stddev	.00021	.00002	.0050	.0026	.00016	.00002	.00046	.00558	.00008
%RSD	42.547	10.801	.24923	.13026	60.883	68.305	127.63	147.68	3.9707
#1	.00035	-.00016	2.0177	1.9802	-.00038	-.00005	-.00003	.00773	.00218
#2	.00065	-.00019	2.0248	1.9838	-.00015	-.00002	-.00068	-.00017	.00206
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit									
Low Limit									

Elem	Co2286	Cr2055	Cu3247	Fe2599	K_7664	Li6707	Mg2790	Mn2576	Mo2020
Line	228.616 {447}	205.552 {464}	324.754 {104}	259.940 {130}	766.490 { 44}	670.784 { 50}	279.079 {121}2	257.610 {131}	202.030 {467}
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	.00031	-.00012	.00055	.00062	50.140	1.0051	.00119	-.00003	.99449
Stddev	.00018	.00005	.00012	.00006	.300	.0046	.00278	.00001	.00030
%RSD	56.468	38.328	21.536	10.444	.59750	.45364	233.37	48.274	.03006
#1	.00044	-.00009	.00063	.00066	50.352	1.0083	-.00077	-.00004	.99470
#2	.00019	-.00015	.00046	.00057	49.929	1.0018	.00315	-.00002	.99428
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit									
Low Limit									

Elem	Na8183	Ni2316	P_1782	Pb2203	S_1820	Sb2068	Se1960	Si2881	Sn1899
Line	818.326 { 41}	231.604 {446}	178.284 {489}	220.353 {453}	182.034 {485}	206.833 {463}	196.090 {472}	288.158 {117}	189.989 {477}
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	49.388	-.00043	1.9814	-.00014	-.00586	1.0058	W 5.1427	.04861	.00082
Stddev	.247	.00032	.0072	.00022	.00064	.0061	.0170	.00683	.00043
%RSD	.49916	74.349	.36452	164.60	10.969	.60361	.33085	14.061	52.391
#1	49.563	-.00066	1.9763	-.00029	-.00631	1.0015	5.1307	.04378	.00052
#2	49.214	-.00021	1.9865	.00002	-.00540	1.0101	5.1547	.05344	.00113
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	None	Chk Pass	Chk Warn	Chk Pass	Chk Pass
High Limit							5.0000		
Low Limit							-.00500		

Elem	Sr4077	Th2837	Ti3349	Tl1908	U_3701	V_2924	Zn2062	Zr3391
Line	407.771 { 83}	283.730 {119}	334.904 {101}	190.856 {477}	370.152 { 91}	292.402 {115}	206.200 {163}	339.198 { 99}
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	.99778	.00032	.00035	.00047	.00492	.00020	.00184	-.00337
Stddev	.00537	.00300	.00013	.00151	.04355	.00062	.00020	.00279
%RSD	.53792	925.63	36.823	322.19	884.33	300.82	11.134	82.869
#1	1.0016	-.00180	.00026	.00153	.03572	-.00023	.00169	-.00534
#2	.99398	.00244	.00044	-.00060	-.02587	.00064	.00198	-.00139
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit								
Low Limit								

Int. Std.	Y_2243	Y_3600	Y_3774
Line	224.306 {450}	360.073 { 94}	377.433 { 89}
Units	Cts/S	Cts/S	Cts/S
Avg	6890.2	88175.	2530.1
Stddev	5.0	426.	18.3
%RSD	.07239	.48318	.72516
#1	6886.7	87873.	2517.1
#2	6893.7	88476.	2543.1

HIGH-PURITY STANDARDS
www.highpuritystandards.com

P.O. Box 41727
Charleston, SC 29423
Phone (843) 767-7900
Fax (843) 767-7906

Certificate of Analysis

Product Description:

Name:	ICS-AB STD #1
Part Number:	**SM-606-037**
	Solution A
Lot Number:	**1309813**
Matrix:	20% HCl
Purity:	99.96% - 99.9999%

1998781
ID: ICP ISAB STD1_00005
Exp:04/11/14 Prpd:HEB Opn:04/18/13
ICAP ICSAB STD 1 SOL A

Certified Values:

Element	(mg/L)	SRM ID	SRM Lot#	Element	(mg/L)	SRM ID	SRM Lot#
Sb	100.0 ± 0.6	3102a	061229	P	200.0 ± 1.2	3139a	060717
As	200 ± 2	3103a	100818	K	5000 ± 25	3141a	051220
B	200.0 ± 1.2	3107	070514	Se	500 ± 5	3149	100901
Li	100.0 ± 0.6	3129a	100714	Na	5000 ± 25	3152a	010728
Mo	100.0 ± 0.6	3134	891307	Sr	100.0 ± 0.5	3153a	990906

The Certified values are based on gravimetric and volumetric preparation, and verified against SRM 3100 series developed by National Institute of Standards and Technology (NIST) via inductively coupled plasma optical emission spectrometry (ICP-OES) using an internal laboratory developed method. The uncertainty in the certified value is calculated for a 95% confidence interval and coverage factor *k* is about 2
* Refer to Traceability Information, Section d

Preparation Information:

The standard is generally prepared from single element standard solutions that are ISO Guide 34 certified reference materials. Highest purity source materials were purchased from qualified vendors per ISO 9001:2008 guidelines and assayed by ICP-OES for conformity prior to use. Sub-boiling distilled high-purity acid has been used to place the materials in solution and to stabilize the standard. The matrix is as noted above in 18 megaohm deionized water.

Traceability Information:

The traceability of this standard is maintained through an unbroken chain of comparisons to appropriate standards with suitable procedure and measurement uncertainties. The maintenance of the base and derived units of International System of Units (SI) with traceability of measurement results (contemporary metrology) to SI ensures their comparability over time as follows.

a. **Standard Weight and Analytical Balance**
The standard weights (NBS weights Inventory No 20231A) are calibrated every two years by South Carolina Metrology Laboratory that is a participant in "NIST Weights and Measures Measurement Assurance Program" with a certificate of measurement traceability to NIST primary standards.
The balances are calibrated yearly by the ISO 17025 accredited metrology service, and are verified weekly by an in-house method using standard weights.

High-Purity Standards is certified to ISO 9001:2008 and accredited to ISO/IEC 17025:2005 and ISO Guide 34:2009.

b. **Volumetric Device**
The calibration of volumetric vessels is checked annually using the NBS 602 method.

c. **Thermometer**
The standard thermometers are calibrated every year by the ISO 17025 accredited metrology service. The thermometers used in-house are verified against the standard thermometers yearly.

d. **Calibration Standards**
The Calibration Standards are traceable to SRM 3100 Series Spectrometric Standard Solutions or second sources.

Packaging and Storage Conditions:

The standard is packaged in a pre-cleaned polyethylene bottle. To maintain the integrity of this product, the solution should be kept tightly capped and stored under normal laboratory conditions.

Refer to Material Safety Datasheet (MSDS) for hazardous information.

Expiration Information:

The expiry date is guaranteed to be valid for twelve months from the shipping date provided. For this reason, standards from the same lot may have different expiration dates.

Preparation Date:	**April 8, 2013**
Shipped Date:	**April 11, 2013**
Expiration Date:	**April 11, 2014**
Certificate Issue Date:	**April 8, 2013**

Quality Information:

ACLASS ACCREDITED TESTING

ISO/IEC 17025:2005 Accreditation
Certificate Number AT-1529

Vanny T. Yib,
Inorganic Laboratory Manager

Angel Sellers
Quality Manager

Sample Name: x1998783@100 Acquired: 4/19/2013 14:52:29 Type: Unk
Method: 6500_026(v6) Mode: CONC Corr. Factor: 1.000000
User: bowenh Custom ID1: Custom ID2: Custom ID3:
Comment:

Elem	Ag3280	Al1670	As1890	B_2089	Ba4554	Be3130	Bi2230	Ca3179	Cd2288
Line	328.068 {103}	167.079 {502}	189.042 {478}	208.959 {461}	455.403 { 74}	313.042 {108}	223.061 {451}	317.933 {106}	228.802 {447}
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	**-.00084**	**-.00030**	**.00215**	**.00404**	**-.00028**	**-.00016**	**-.00836**	**.00475**	**-.00015**
Stddev	.00098	.00009	.00071	.00020	.00046	.00005	.00033	.00142	.00017
%RSD	117.42	28.992	33.081	4.8702	163.50	30.928	3.9090	29.846	111.72
#1	-.00153	-.00036	.00265	.00417	.00004	-.00012	-.00813	.00575	-.00003
#2	-.00014	-.00024	.00164	.00390	-.00061	-.00019	-.00859	.00374	-.00027
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit									
Low Limit									

Elem	Co2286	Cr2055	Cu3247	Fe2599	K_7664	Li6707	Mg2790	Mn2576	Mo2020
Line	228.616 {447}	205.552 {464}	324.754 {104}	259.940 {130}	766.490 { 44}	670.784 { 50}	279.079 {121}2	257.610 {131}	202.030 {467}
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	**.00018**	**-.00012**	**.00033**	**-.00214**	**-.11983**	**.00221**	**-.00018**	**-.00002**	**.00010**
Stddev	.00008	.00005	.00004	.00379	.02555	.00064	.00164	.00001	.00009
%RSD	44.323	40.820	13.439	177.21	21.322	28.917	908.31	65.938	97.981
#1	.00012	-.00009	.00036	.00054	-.13790	.00266	-.00134	-.00003	.00003
#2	.00023	-.00016	.00030	-.00482	-.10176	.00176	.00098	-.00001	.00016
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit									
Low Limit									

Elem	Na5895	Ni2316	P_1782	Pb2203	S_1820	Sb2068	Se1960	Si2881	Sn1899
Line	589.592 { 57}	231.604 {446}	178.284 {489}	220.353 {453}	182.034 {485}	206.833 {463}	196.090 {472}	288.158 {117}	189.989 {477}
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	**-.08468**	**-.00009**	**.00175**	**.00019**	**-.00309**	**.00330**	**-.00225**	**.04270**	**9.7859**
Stddev	.01128	.00022	.00127	.00015	.00019	.00023	.00003	.00828	.0111
%RSD	13.327	254.50	72.709	81.343	6.1232	6.8292	1.3922	19.395	.11352
#1	-.09266	-.00024	.00264	.00008	-.00296	.00314	-.00227	.03684	9.7780
#2	-.07670	.00007	.00085	.00030	-.00322	.00346	-.00223	.04855	9.7937
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	None	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit									
Low Limit									

Elem	Sr4077	Th2837	Ti3349	Tl1908	U_3701	V_2924	Zn2062	Zr3391
Line	407.771 { 83}	283.730 {119}	334.904 {101}	190.856 {477}	370.152 { 91}	292.402 {115}	206.200 {163}	339.198 { 99}
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	**.00012**	**-.00145**	**.94066**	**.00593**	**.01310**	**.00021**	**.00133**	**-.00050**
Stddev	.00013	.00024	.00050	.00147	.02461	.00016	.00017	.00244
%RSD	106.31	16.205	.05296	24.815	187.92	77.147	12.620	488.20
#1	.00003	-.00162	.94102	.00489	.03050	.00009	.00121	.00123
#2	.00021	-.00129	.94031	.00697	-.00431	.00032	.00145	-.00223
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit								
Low Limit								

Int. Std.	Y_2243	Y_3600	Y_3774
Line	224.306 {450}	360.073 { 94}	377.433 { 89}
Units	Cts/S	Cts/S	Cts/S
Avg	**6872.4**	**88430.**	**2503.7**
Stddev	25.1	304.	8.4
%RSD	.36516	.34386	.33432
#1	6890.2	88215.	2497.8
#2	6854.7	88645.	2509.6

HIGH-PURITY STANDARDS
www.highpuritystandards.com

P.O. Box 41727
Charleston, SC 29423
Phone (843) 767-7900
Fax (843) 767-7906

Certificate of Analysis

1998783
ID: ICP ISAB STD2_00005
Exp:04/11/14 Prpd:HEB Opn:04/18/13
ICP ICSAB STD 2 HP

Product Description:

Name:	ICS-AB STD #2
Part Number:	**SM-606-038**
Lot Number:	**1309815**
Matrix:	20% HCl
Purity:	99.98% - 99.9999%

Certified Values:

Element	(mg/L)	SRM ID	SRM Lot#	Element	(mg/L)	SRM ID	SRM Lot#
Sn	1000 ± 6	3161a	070330	Ti	100.0 ± 0.6	3162a	060808

The Certified values are based on gravimetric and volumetric preparation, and verified against SRM 3100 series developed by National Institute of Standards and Technology (NIST) via inductively coupled plasma optical emission spectrometry (ICP-OES) using an internal laboratory developed method. The uncertainty in the certified value is calculated for a 95% confidence interval and coverage factor *k* is about 2
* Refer to Traceability Information, Section d

Preparation Information:

The standard is generally prepared from single element standard solutions that are ISO Guide 34 certified reference materials. Highest purity source materials were purchased from qualified vendors per ISO 9001:2008 guidelines and assayed by ICP-OES for conformity prior to use. Sub-boiling distilled high-purity acid has been used to place the materials in solution and to stabilize the standard. The matrix is as noted above in 18 megaohm deionized water.

Traceability Information:

The traceability of this standard is maintained through an unbroken chain of comparisons to appropriate standards with suitable procedure and measurement uncertainties. The maintenance of the base and derived units of International System of Units (SI) with traceability of measurement results (contemporary metrology) to SI ensures their comparability over time as follows.

a. **Standard Weight and Analytical Balance**
The standard weights (NBS weights Inventory No 20231A) are calibrated every two years by South Carolina Metrology Laboratory that is a participant in "NIST Weights and Measures Measurement Assurance Program" with a certificate of measurement traceability to NIST primary standards.
The balances are calibrated yearly by the ISO 17025 accredited metrology service, and are verified weekly by an in-house method using standard weights.

b. **Volumetric Device**
The calibration of volumetric vessels is checked annually using the NBS 602 method.

High-Purity Standards is certified to ISO 9001:2008 and accredited to ISO/IEC 17025:2005 and ISO Guide 34:2009.

c. **Thermometer**
The standard thermometers are calibrated every year by the ISO 17025 accredited metrology service. The thermometers used in-house are verified against the standard thermometers yearly.

d. **Calibration Standards**
The Calibration Standards are traceable to SRM 3100 Series Spectrometric Standard Solutions or second sources.

Packaging and Storage Conditions:

The standard is packaged in a pre-cleaned polyethylene bottle. To maintain the integrity of this product, the solution should be kept tightly capped and stored under normal laboratory conditions.

Refer to Material Safety Datasheet (MSDS) for hazardous information.

Expiration Information:

The expiry date is guaranteed to be valid for twelve months from the shipping date provided. For this reason, standards from the same lot may have different expiration dates.

Preparation Date:	**April 8, 2013**
Shipped Date:	**April 11, 2013**
Expiration Date:	**April 11, 2014**
Certificate Issue Date:	**April 8, 2013**

Quality Information:

ISO/IEC 17025:2005 Accreditation
Certificate Number AT-1529

Vanny T. Yib,
Inorganic Laboratory Manager

Angel Sellers
Quality Manager

INORGANIC™ VENTURES

300 Technology Drive
Christiansburg, VA 24073 · USA
inorganicventures.com

tel: 800.669.6799 · 540.585.3030
fax: 540.585.3012
info@inorganicventures.com

CERTIFICATE OF ANALYSIS

1.0 **INORGANIC VENTURES** is an ISO Guide 34 "General Requirements for the Competence of Reference Material Producers" and ISO 9001 registered manufacturer. Our manufacturing laboratory is accredited to ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories."

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 **DESCRIPTION OF CRM** **Custom Solution**

Catalog No.: STLDEN-SPK-2A

Lot Number: **G2-MEB455133**

Matrix: 3% HNO3(v/v), 0.5% HF(v/v)

2007016
ID: ICP SPK 2A_00059
Exp:05/01/14 Prpd:HEB Opn:04/23/13
ICP PREP SPIKE 2A IV

1,000 µg/mL ea:
Si,

200 µg/mL ea:
Sn,

100 µg/mL ea:
B, Mo, Ti,

50 µg/mL ea:
Sb, Zr

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

ELEMENT	CERTIFIED VALUE	ELEMENT	CERTIFIED VALUE	ELEMENT	CERTIFIED VALUE
Antimony, Sb	50.00 ± 0.38 µg/mL	Boron, B	100.0 ± 0.7 µg/mL	Molybdenum, Mo	100.0 ± 0.7 µg/mL
Silicon, Si	1,000 ± 7 µg/mL	Tin, Sn	200.0 ± 1.4 µg/mL	Titanium, Ti	100.0 ± 0.7 µg/mL
Zirconium, Zr	50.00 ± 0.33 µg/mL				

Certified Density: 1.021 g/mL (measured at 20 ± 1° C)

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.

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

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

$$\text{Uncertainty } (\pm) = 2\,[\,\Sigma(s_i)^2\,]^{1/2}$$

2 = the coverage factor.
$[\,\Sigma(s_i)^2\,]^{1/2}$ = The square root of the sum of the squares of the most common errors (where 's' stands for the standard deviation) from instrumental measurement, density, NIST SRM uncertainty, weighing, dilution to volume, homogeneity, long term stability and short term stability.

4.0 TRACEBILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

· "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

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

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a NIST SRM/RM. See section 4.2 for balance traceability.

4.1 ASSAY INFORMATION

ELEMENT	METHOD	NIST SRM#	SRM LOT#
B	ICP Assay	3107	070514
Mo	Calculated		See Sec. 4.2
Mo	ICP Assay	3134	891307
Sb	Calculated		See Sec. 4.2
Sb	ICP Assay	3102A	061229
Si	Calculated		See Sec. 4.2
Si	ICP Assay	3150	071204
Sn	Calculated		See Sec. 4.2
Sn	ICP Assay	3161a	070330
Ti	ICP Assay	3162a	060808
Zr	Calculated		See Sec. 4.2
Zr	ICP Assay	3169	071226

4.2 BALANCE CALIBRATION - All analytical balances are calibrated yearly by an accredited calibration laboratory and are traceable to a class E 2 analytical weight set with NIST Traceability. All balances are checked daily using an in-house procedure. The weights used for testing are annually compared to master weights and are traceable to the National Institute of Standards and Technology (NIST).

4.3 THERMOMETER CALIBRATION - All thermometers are NIST traceable through thermometers that are calibrated by an A2LA accredited calibration laboratory.

4.4 GLASSWARE CALIBRATION - An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM's.

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

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
HPLC, IC, TLC, ISE, IR, NMR, UV/VIS, MS, Capillary Electrophoresis, Potentiometry, Wet Chemistry and Voltammetry
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact Technical Staff

This CRM was manufactured using 18 megohm doubly deionized water that has been filtered through a 0.2 micron filter.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep **Tightly** sealed when not in use. Store and use at 20 ± 4°C. **Do Not** pipette from the container. **Do Not** return portions removed from pipetting to container.

Element Specific Information - For specific information regarding any element: Contact technical staff.

Uranium Note: If uranium is present in this standard, it is natural abundance unless specified in Section 3.0.

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

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Safety Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous.

Inorganic Ventures homogeneity data indicate that the end user should take a minimum sample size of 0.2mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration
- SAI Global File Number 010105

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration"
- Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 "General Requirements for the Competence of Reference Material Producers"
- Reference Materials Production - Accredited A2LA Certificate Number 883.02

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission
- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission
- Reporting Defects and Non-Compliance

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies of chemically-stable solutions performed at the manufacturer's facility show a CRM shelf-life of twenty one months for solutions packaged in 125-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Manufacturer concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

11.3 Chemical Stability - Studies have been conducted on this or similar CRMs and it has been demonstrated that this CRM is chemically stable for a period of not less than two years provided the "Storage & Handling" conditions are followed that are described in section 7.0.

Certification Date: January 14, 2013

Expiration Date: EXPIRES 01 JAN 2014

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Donna Senn
Product Documentation Technician

Certificate Approved By: Brian Alexander
PhD., Technical Process Director

Certifying Officer: Paul Gaines
PhD., Senior Technical Director

INORGANIC VENTURES™
300 Technology Drive
Christiansburg, VA 24073 · USA
inorganicventures.com

tel: 800.669.6799 · 540.585.3030
fax: 540.585.3012
info@inorganicventures.com

CERTIFICATE OF ANALYSIS

1.0 **INORGANIC VENTURES** is an ISO Guide 34 "General Requirements for the Competence of Reference Material Producers" and ISO 9001 registered manufacturer. Our manufacturing laboratory is accredited to ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories."

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 **DESCRIPTION OF CRM**

	Custom Solution
Catalog No.:	STLDEN-SPK-3A
Lot Number:	**G2-MEB465153**
Matrix:	3% HNO3(v/v)

2007019
ID: ICP SPK 3A_00061
Exp:05/01/14 Prpd:HEB Opn:04/23/13
ICP PREP SPIKE 3A IV

5,000 µg/mL ea:
Ca, K, Mg, Na,

1,000 µg/mL ea:
P,

200 µg/mL ea:
Al, Ba, Bi, Se, Tl, U,

100 µg/mL ea:
As, Fe, Li, Sr, Th,

50 µg/mL ea:
Co, Mn, Ni, Pb, V, Zn,

25 µg/mL ea:
Cu,

20 µg/mL ea:
Cr3,

10 µg/mL ea:
Cd,

5 µg/mL ea:
Ag, Be

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

ELEMENT	CERTIFIED VALUE	ELEMENT	CERTIFIED VALUE	ELEMENT	CERTIFIED VALUE
Aluminum, Al	200.1 ± 1.3 µg/mL	Arsenic, As	100.0 ± 0.7 µg/mL	Barium, Ba	200.0 ± 1.3 µg/mL
Beryllium, Be	5.004 ± 0.034 µg/mL	Bismuth, Bi	200.0 ± 1.3 µg/mL	Cadmium, Cd	10.00 ± 0.07 µg/mL
Calcium, Ca	5,000 ± 35 µg/mL	Chromium+3, Cr3	20.02 ± 0.13 µg/mL	Cobalt, Co	49.99 ± 0.33 µg/mL
Copper, Cu	24.98 ± 0.17 µg/mL	Iron, Fe	100.0 ± 0.6 µg/mL	Lead, Pb	49.99 ± 0.33 µg/mL
Lithium, Li	100.0 ± 0.7 µg/mL	Magnesium, Mg	5,000 ± 33 µg/mL	Manganese, Mn	50.02 ± 0.32 µg/mL
Nickel, Ni	49.99 ± 0.33 µg/mL	Phosphorus, P	1,000 ± 7 µg/mL	Potassium, K	5,000 ± 37 µg/mL
Selenium, Se	200.0 ± 1.3 µg/mL	Silver, Ag	4.996 ± 0.032 µg/mL	Sodium, Na	5,000 ± 34 µg/mL
Strontium, Sr	100.1 ± 0.6 µg/mL	Thallium, Tl	200.0 ± 1.3 µg/mL	Thorium, Th	100.0 ± 0.7 µg/mL
Uranium, U	200.0 ± 1.4 µg/mL	Vanadium, V	49.98 ± 0.35 µg/mL	Zinc, Zn	50.04 ± 0.33 µg/mL

Certified Density: 1.083 g/mL (measured at 20 ° C)

05/29/2013

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.

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

Uncertainty $(\pm) = 2\,[\,\Sigma(s_i)^2\,]^{1/2}$

($\bar{x}$) = mean

x_i = individual results

n = number of measurements

2 = the coverage factor.

$[\,\Sigma(s_i)^2\,]^{1/2}$ = The square root of the sum of the squares of the most common errors (where 's' stands for the standard deviation) from instrumental measurement, density, NIST SRM uncertainty, weighing, dilution to volume, homogeneity, long term stability and short term stability.

Certified Abundance: The 235U in this standard is depleted. The Certified abundances in Atom % are as follows:

IV's Certified Abundance

Isotope		Atom%
Uranium	238U	99.6 ± 0.1
	235U	0.42 ± 0.05

4.0 TRACEBILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

· "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

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

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a NIST SRM/RM. See section 4.2 for balance traceability.

ELEMENT	METHOD	NIST SRM#	SRM LOT#
Ag	ICP Assay	3151	992212
Ag	Volhard	999b	999b
Al	ICP Assay	3101a	060502
Al	EDTA	928	928
As	Calculated		See Sec. 4.2
As	ICP Assay	3103a	010713
Ba	Gravimetric		See Sec. 4.2
Ba	ICP Assay	3104a	070222
Be	Calculated		See Sec. 4.2
Be	ICP Assay	3105a	892707
Bi	Calculated		See Sec. 4.2
Bi	ICP Assay	3106	991212
Ca	ICP Assay	3109a	050825
Ca	EDTA	928	928
Cd	ICP Assay	3108	060531
Cd	EDTA	928	928
Co	ICP Assay	3113	00630
Co	EDTA	928	928
Cr3	Calculated		See Sec. 4.2
Cr3	ICP Assay	3112a	030730
Cu	ICP Assay	3114	011017
Cu	EDTA	928	928
Fe	ICP Assay	3126a	051031
Fe	EDTA	928	928
K	Gravimetric		See Sec. 4.2
K	ICP Assay	3141a	051220
Li	Gravimetric		See Sec. 4.2
Li	ICP Assay	3129a	100714
Mg	ICP Assay	3131a	050302
Mg	EDTA	928	928
Mn	ICP Assay	3132	050429
Mn	EDTA	928	928
Na	Gravimetric		See Sec. 4.2
Na	ICP Assay	3152a	010728
Ni	ICP Assay	3136	000612
Ni	EDTA	928	928
P	ICP Assay	3139a	060717
P	Acidimetric	84L	84L
Pb	ICP Assay	3128	101026
Pb	EDTA	928	928
Se	Calculated		See Sec. 4.2
Se	ICP Assay	3149	992106
Sr	ICP Assay	3153a	990906
Sr	EDTA	928	928
Th	ICP Assay	3159	992912

Th	EDTA	928	928
Tl	Calculated		See Sec. 4.2
Tl	ICP Assay	3158	993012
U	Calculated		See Sec. 4.2
U	ICP Assay	3164	891509
V	ICP Assay	3165	992706
V	EDTA	928	928
Zn	ICP Assay	3168a	080123
Zn	EDTA	928	928

4.2 BALANCE CALIBRATION - All analytical balances are calibrated yearly by an accredited calibration laboratory and are traceable to a class E 2 analytical weight set with NIST Traceability. All balances are checked daily using an in-house procedure. The weights used for testing are annually compared to master weights and are traceable to the National Institute of Standards and Technology (NIST).

4.3 THERMOMETER CALIBRATION - All thermometers are NIST traceable through thermometers that are calibrated by an A2LA accredited calibration laboratory.

4.4 GLASSWARE CALIBRATION - An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM's.

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

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
HPLC, IC, TLC, ISE, IR, NMR, UV/VIS, MS, Capillary Electrophoresis, Potentiometry, Wet Chemistry and Voltammetry
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact Technical Staff

This CRM was manufactured using 18 megohm doubly deionized water that has been filtered through a 0.2 micron filter.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep **Tightly** sealed when not in use. Store and use at 20 ± 4°C. **Do Not** pipette from the container. **Do Not** return portions removed from pipetting to container.

Element Specific Information - For specific information regarding any element: Contact technical staff.

Uranium Note: If uranium is present in this standard, it is natural abundance unless specified in Section 3.0.

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 enclosed Material Safety Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous.

Inorganic Ventures homogeneity data indicate that the end user should take a minimum sample size of 0.2mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration
- SAI Global File Number 010105

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration"
- Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 "General Requirements for the Competence of Reference Material Producers"
- Reference Materials Production - Accredited A2LA Certificate Number 883.02

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission
- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission
- Reporting Defects and Non-Compliance

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies of chemically-stable solutions performed at the manufacturer's facility show a CRM shelf-life of twenty one months for solutions packaged in 125-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Manufacturer concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

11.3 Chemical Stability - Studies have been conducted on this or similar CRMs and it has been demonstrated that this CRM is chemically stable for a period of not less than two years provided the "Storage & Handling" conditions are followed that are described in section 7.0.

Certification Date: March 20, 2013

Expiration Date: EXPIRES 01 MAY 2014

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Zach Saunders
Product Documentation Technician

Certificate Approved By: Brian Alexander
PhD., Technical Process Director

Certifying Officer: Paul Gaines
PhD., Senior Technical Director

Sample Name: X1806909@100 Acquired: 12/26/2012 17:05:36 Type: Unk
Method: 6500_025(v35) Mode: CONC Corr. Factor: 1.000000
User: ltrudell Custom ID1: Custom ID2: Custom ID3:
Comment:

Elem	Ag3280	Al3092	As1890	B_2089	Ba4554
Line	328.068 {103}	309.271 {109}	189.042 {478}	208.959 {461}	455.403 { 74}
Units	ppm	ppm	ppm	ppm	ppm
Avg	-.00020	50.198	.00238	.00083	.00082
Stddev	.00146	.349	.00004	.00025	.00023
%RSD	721.07	.69445	1.6852	30.761	28.467
#1	-.00124	49.952	.00235	.00065	.00065
#2	.00083	50.445	.00241	.00101	.00098
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit					
Low Limit					

Elem	Be3130	Bi2230	Ca3179	Cd2288	Co2286
Line	313.042 {108}	223.061 {451}	317.933 {106}	228.802 {447}	228.616 {447}
Units	ppm	ppm	ppm	ppm	ppm
Avg	-.00013	-.00170	45.642	.00055	-.00010
Stddev	.00007	.00105	.429	.00001	.00019
%RSD	50.899	61.437	.93890	1.7547	195.18
#1	-.00018	-.00096	45.339	.00056	-.00024
#2	-.00008	-.00244	45.945	.00054	.00004
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit					
Low Limit					

Elem	Cr2055	Cu3247	Fe2599	K_7664	Li6707
Line	205.552 {464}	324.754 {104}	259.940 {130}	766.490 { 44}	670.784 { 50}
Units	ppm	ppm	ppm	ppm	ppm
Avg	.00034	-.00269	17.743	.00869	.00236
Stddev	.00027	.00001	.158	.03518	.00216
%RSD	80.058	.48589	.89263	404.87	91.408
#1	.00053	-.00268	17.631	-.01619	.00083
#2	.00015	-.00270	17.855	.03356	.00389
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit					
Low Limit					

Sample Name: X1806909@100 Acquired: 12/26/2012 17:05:36 Type: Unk
Method: 6500_025(v35) Mode: CONC Corr. Factor: 1.000000
User: ltrudell Custom ID1: Custom ID2: Custom ID3:
Comment:

Elem	Mg2790	Mn2576	Mo2020	Na5895	Ni2316
Line	279.079 {121}2	257.610 {131}	202.030 {467}	589.592 { 57}	231.604 {446}
Units	ppm	ppm	ppm	ppm	ppm
Avg	45.420	.00003	-.00009	.25839	-.00037
Stddev	.075	.00006	.00023	.01146	.00012
%RSD	.16413	226.75	253.04	4.4355	32.513
#1	45.367	.00007	.00007	.26650	-.00028
#2	45.472	-.00002	-.00025	.25029	-.00045
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit					
Low Limit					

Elem	P_1782	Pb2203	S_1820	Sb2068	Se1960
Line	178.284 {489}	220.353 {453}	182.034 {485}	206.833 {463}	196.090 {472}
Units	ppm	ppm	ppm	ppm	ppm
Avg	-.00811	.00068	.01262	.00101	-.00197
Stddev	.00044	.00051	.00212	.00185	.00836
%RSD	5.4414	75.013	16.780	183.51	424.60
#1	-.00780	.00105	.01411	-.00030	-.00788
#2	-.00843	.00032	.01112	.00231	.00394
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit					
Low Limit					

Elem	Si2881	SiO2	Sn1899	Sr4077	Th2837
Line	288.158 {117}	288.158 {117}2	189.989 {477}	407.771 { 83}	283.730 {119}
Units	ppm	ppm	ppm	ppm	ppm
Avg	.00549	.01175	-.00022	.00025	.00177
Stddev	.00029	.00061	.00058	.00018	.00011
%RSD	5.2308	5.2308	261.14	74.000	6.1527
#1	.00570	.01219	.00019	.00038	.00185
#2	.00529	.01132	-.00063	.00012	.00170
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit					
Low Limit					

Sample Name: X1806909@100 Acquired: 12/26/2012 17:05:36 Type: Unk
Method: 6500_025(v35) Mode: CONC Corr. Factor: 1.000000
User: ltrudell Custom ID1: Custom ID2: Custom ID3:
Comment:

Elem	Ti3349	Tl1908	U_3701	V_2924	Zn2062
Line	334.904 {101}	190.856 {477}	370.152 { 91}	292.402 {115}	206.200 {163}
Units	ppm	ppm	ppm	ppm	ppm
Avg	-.00059	-.00036	.02290	.00100	.00132
Stddev	.00002	.00040	.01322	.00020	.00030
%RSD	2.9784	110.90	57.744	19.621	22.478
#1	-.00060	-.00008	.03225	.00086	.00153
#2	-.00057	-.00065	.01355	.00113	.00111
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit					
Low Limit					

Elem	Zr3391
Line	339.198 { 99}
Units	ppm
Avg	-.00242
Stddev	.00289
%RSD	119.80
#1	-.00037
#2	-.00446
Check ?	Chk Pass
High Limit	
Low Limit	

Int. Std.	Y_2243	Y_3600	Y_3774
Line	224.306 {450}	360.073 { 94}	377.433 { 89}
Units	Cts/S	Cts/S	Cts/S
Avg	6106.6	62134.	4937.4
Stddev	26.8	494.	13.9
%RSD	.43837	.79436	.28174
#1	6087.7	62483.	4947.2
#2	6125.6	61785.	4927.5

INORGANIC VENTURES™
300 Technology Drive
Christiansburg, VA 24073 • USA
inorganicventures.com
tel: 800.669.6799 • 540.585.3030
fax: 540.585.3012
info@inorganicventures.com

CERTIFICATE OF ANALYSIS

1.0 **INORGANIC VENTURES** is an ISO Guide 34 "General Requirements for the Competence of Reference Material Producers" and ISO 9001 registered manufacturer. Our manufacturing laboratory is accredited to ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories."

ACCREDITED Testing Laboratory Certificate 883.01
ACCREDITED Reference Material Producer Certificate 883.02

2.0 **DESCRIPTION OF CRM** Stock Solution

Catalog No.: CLPP-ICS-A

Lot Number: **F2-MEB414132**

Matrix: 2% HNO3(v/v)

1809609
ID: Icp stk ICSA_00007
Exp:01/01/14 Prpd:HEB Opn:12/19/12
ICP stock ICSA solution

5,000 µg/mL ea:
Al, Ca, Mg,

2,000 µg/mL ea:
Fe

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ELEMENT	CERTIFIED VALUE	ELEMENT	CERTIFIED VALUE	ELEMENT	CERTIFIED VALUE
Aluminum, Al	5,000 ± 35 µg/mL	Calcium, Ca	5,000 ± 32 µg/mL	Iron, Fe	2,000 ± 10 µg/mL
Magnesium, Mg	5,000 ± 33 µg/mL				

Certified Density: 1.085 g/mL (measured at 20 ± 1° C)

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.

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

$$\text{Uncertainty } (\pm) = 2\,[\,\Sigma(s_i)^2\,]^{1/2}$$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
2 = the coverage factor.
$[\,\Sigma(s_i)^2\,]^{1/2}$ = The square root of the sum of the squares of the most common errors (where 's' stands for the standard deviation) from instrumental measurement, density, NIST SRM uncertainty, weighing, dilution to volume, homogeneity, long term stability and short term stability.

4.0 TRACEBILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

· "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

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

4.1 ASSAY INFORMATION

ELEMENT	METHOD	NIST SRM#	SRM LOT#	ELEMENT	METHOD	NIST SRM#	SRM LOT#
Al	ICP Assay	3101a	060502	Al	EDTA	928	928
Ca	ICP Assay	3109a	050825	Ca	EDTA	928	928
Fe	ICP Assay	3126a	051031	Fe	EDTA	928	928
Mg	ICP Assay	3131a	050302	Mg	EDTA	928	928

4.2 BALANCE CALIBRATION - All analytical balances are calibrated yearly by an A2LA accredited calibration laboratory and are traceable to a class E 2 analytical weight set with NIST Traceability. All balances are checked daily using an in-house procedure. The weights used for testing are annually compared to master weights and are traceable to the National Institute of Standards and Technology (NIST).

4.3 THERMOMETER CALIBRATION - All thermometers are NIST traceable through thermometers that are calibrated by an A2LA accredited calibration laboratory.

4.4 GLASSWARE CALIBRATION - An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM's.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

s	Al		M	Dy	< 0.006003	O	Li	0.016000	M	Pr	< 0.000300	M	Te	< 0.030013
M	Sb	< 0.000500	M	Er	< 0.005002	M	Lu	< 0.000400	M	Re	< 0.001000	M	Tb	< 0.000300
M	As	< 0.010004	M	Eu	< 0.003001	s	Mg		M	Rh	< 0.001000	M	Tl	< 0.001000
O	Ba	< 0.000300	M	Gd	< 0.001000	O	Mn	< 0.000030	M	Rb	< 0.001000	M	Th	< 0.001000
O	Be	< 0.000600	M	Ga	< 0.001000	O	Hg	< 0.015000	M	Ru	< 0.002001	M	Tm	< 0.000400
M	Bi	0.007003	i	Ge		M	Mo	< 0.002001	M	Sm	< 0.001000	M	Sn	< 0.005002
O	B	< 0.000600	O	Au	< 0.003000	M	Nd	< 0.002001	O	Sc	< 0.000023	O	Ti	< 0.001300
M	Cd	< 0.003001	M	Hf	< 0.002001	O	Ni	< 0.002300	O	Se	< 0.050000	M	W	< 0.010004
s	Ca		M	Ho	< 0.000500	M	Nb	< 0.000500	O	Si	< 0.003400	M	U	< 0.002001
O	Ce	< 0.006000	M	In	< 0.010004	n	Os		O	Ag	< 0.006700	O	V	< 0.002700
M	Cs	< 0.000300	M	Ir	< 0.005002	M	Pd	< 0.005002	O	Na	0.020000	M	Yb	< 0.001000
O	Cr	< 0.001500	s	Fe		O	P	< 0.002500	O	Sr	0.017000	O	Y	< 0.000700
O	Co	< 0.001200	M	La	< 0.000500	M	Pt	< 0.002001	O	S	< 0.025000	M	Zn	0.090040
O	Cu	< 0.003000	M	Pb	0.012005	O	K	< 0.005000	M	Ta	< 0.007003	M	Zr	< 0.005002

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
HPLC, IC, TLC, ISE, IR, NMR, UV/VIS, MS, Capillary Electrophoresis, Potentiometry, Wet Chemistry and Voltammetry
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact Technical Staff

This CRM was manufactured using 18 megohm doubly deionized water that has been filtered through a 0.2 micron filter.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep **Tightly** sealed when not in use. Store and use at 20 ± 4°C. **Do Not** pipette from the container. **Do Not** return portions removed from pipetting to container.

Element Specific Information - For specific information regarding any element: Contact technical staff.

Uranium Note: If uranium is present in this standard, it is natural abundance unless specified in Section 3.0.

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Safety Data sheet for information regarding this CRM.

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration
- QMI File Number 010105

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration"
- Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 "General Requirements for the Competence of Reference Material Producers"
- Reference Materials Production - Accredited A2LA Certificate Number 883.02

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission
- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission
- Reporting Defects and Non-Compliance

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies of chemically-stable solutions performed at the manufacturer's facility show a CRM shelf-life of twenty one months for solutions packaged in 125-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Manufacturer concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

11.3 Chemical Stability - Studies have been conducted on this or similar CRMs and it has been demonstrated that this CRM is chemically stable for a period of not less than two years provided the "Storage & Handling" conditions are followed that are described in section 7.0.

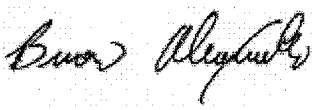
Certification Date: May 03, 2012

Expiration Date: EXPIRES 01 JAN 2014

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Stephan Blaakman
Product Documentation Technician

Certificate Approved By: Brian Alexander
PhD., Quality Control Supervisor



Certifying Officer: Paul Gaines
PhD., Senior Technical Director

Analytical Reference Materials

8270 Internal Standard

Catalog # 567684

Lot # A093676

110 Benner Circle Bellefonte, PA 16823-8812
(814) 353-1300

FOR LABORATORY USE ONLY. READ MSDS PRIOR TO USE.

RAW MATERIAL TEST INFORMATION AVAILABLE UPON REQUEST

MANUFACTURED UNDER RESTEK'S ISO 9001 REGISTERED QUALITY SYSTEM

RESTEK

110 Benner Circle
Bellefonte, PA 16823-8812
Tel: (800)356-1688
Fax: (814)353-1309

www.restek.com

ISO Guide 34 Accredited
Reference Material Producer
Certificate #3222.01

ISO/IEC 17025 Accredited
Testing Laboratory
Certificate #3222.02

Certificate of Analysis

FOR LABORATORY USE ONLY-READ MSDS PRIOR TO USE.

This Reference Material is intended for Laboratory Use Only as a standard for the qualitative and/or quantitative determination of the analyte(s) listed.

Catalog No. : 567684 **Lot No.:** A093676

Description : 8270 Internal Standard

8270 Internal Standard 2,000µg/mL, Methylene Chloride, 5mL/ampul

Container Size : 5 mL **Pkg Amt:** > 5 mL

Expiration Date : February 2018 **Storage:** 10°C or colder

Handling: Sonication required. Mix is photosensitive.

C E R T I F I E D V A L U E S

Elution Order	Compound	Grav. Conc. (weight/volume)	Expanded Uncertainty (95% C.L.; K=2)		
1	1,4-Dichlorobenzene-d4	2,000.0 µg/mL	+/- 11.6282	µg/mL	Gravimetric
	CAS # 3855-82-1		+/- 92.7158	µg/mL	Unstressed
	Purity 99%		+/- 101.3766	µg/mL	Stressed
2	Naphthalene-d8	2,000.0 µg/mL	+/- 11.6282	µg/mL	Gravimetric
	CAS # 1146-65-2		+/- 92.7158	µg/mL	Unstressed
	Purity 99%		+/- 101.3766	µg/mL	Stressed
3	Acenaphthene-d10	2,000.0 µg/mL	+/- 11.6282	µg/mL	Gravimetric
	CAS # 15067-26-2		+/- 92.7163	µg/mL	Unstressed
	Purity 97%		+/- 101.3771	µg/mL	Stressed
4	Phenanthrene-d10	2,000.0 µg/mL	+/- 11.6282	µg/mL	Gravimetric
	CAS # 1517-22-2		+/- 92.7158	µg/mL	Unstressed
	Purity 99%		+/- 101.3766	µg/mL	Stressed
5	Chrysene-d12	2,000.0 µg/mL	+/- 11.6281	µg/mL	Gravimetric
	CAS # 1719-03-5		+/- 92.7150	µg/mL	Unstressed
	Purity 98%		+/- 101.3758	µg/mL	Stressed
6	Perylene-d12	2,000.0 µg/mL	+/- 11.6282	µg/mL	Gravimetric
	CAS # 1520-96-3		+/- 92.7158	µg/mL	Unstressed
	Purity 99%		+/- 101.3766	µg/mL	Stressed

Solvent: Methylene Chloride
CAS # 75-09-2
Purity 99%

Column:
30m x .25mm x .25um
Rtx-5 (cat.#10223)

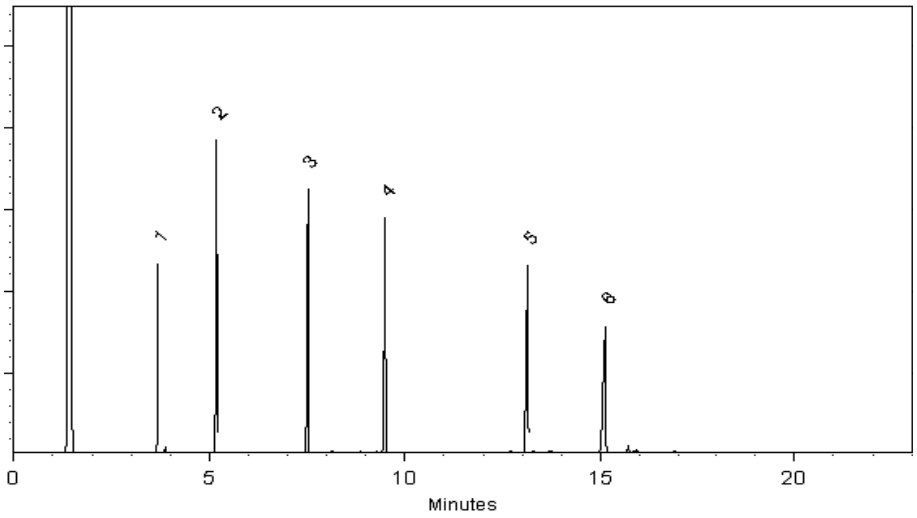
Carrier Gas:
hydrogen-constant pressure 10 psi.

Temp. Program:
75°C (hold 1 min.) to 330°C
@ 20°C/min. (hold 10 min.)

Inj. Temp:
250°C

Det. Temp:
330°C

Det. Type:
FID



Jodi E. Breon - QA Analyst

Date Passed: 27-Feb-2013 **Balance:** 1128342313

Manufactured under Restek's ISO 9001:2008 Registered Quality System Certificate #FM 80397

General Certified Reference Material Notes

Expiration Notes:

- Expiration date of the unopened ampul stored at the recommended storage condition is the last day of the month listed in the expiration date field.
- Uncertainty, concentration, and expiration of the CRM are based on the unopened product being stored according to the recommended condition found in the storage field.

Purity Notes:

- Purity and/or chemical identity are determined by one or more of the following techniques: GC/FID, HPLC, GC/μECD, GC/MS, LC/MS, RI, and/or melting point.
- Compounds with a listed purity of less than 99% have been weight corrected to compensate for impurities and/or salts. A correction factor is used to calculate the amount of compound necessary to achieve the desired concentration of the parent compound in solution.
- Purity of isomeric compounds is reported as the sum of the isomers.
- Purity values are rounded to the nearest whole number.

Certified Uncertainty Value Notes:

- The uncertainties are determined in accordance with ISO Guides 34 and 35. The certified combined stressed uncertainty value (includes gravimetric uncertainty, homogeneity between-ampul uncertainty, storage stability uncertainty and shipping stability uncertainty and were combined using the following formula:

$$U_{combined\ stressed} = k\sqrt{U^2_{gravimetric} + U^2_{homogeneity} + U^2_{storage\ stability} + U^2_{shipping\ stability}}$$

  k is a coverage factor of 2, which gives a level of confidence of approximately 95%.
- It is important to note that the shipping stability uncertainty was obtained under temperature extremes for specific time intervals; therefore, the certified combined stressed uncertainty value should only be applied to the product if it was stored at non-standard temperature conditions up to and including 7 days. Contact Restek Technical Service at www.restek.com/Contact-Us for use recommendations if your shipment was in-transit for more than 7 days at non-standard temperature conditions.
- Apply the certified combined unstressed uncertainty value if the product was received under standard shipping conditions. Apply the certified combined stressed uncertainty value if the product was received under non-standard conditions as specified below.

Label Conditions	Standard Conditions	Non-Standard Conditions
25°C Nominal (Room Temperature)	< 60°C	≥ 60°C up to 7 days
10°C or colder (Refrigerate)	< 40°C	≥ 40°C up to 7 days
0°C or colder (Freezer)	< 25°C	≥ 25°C up to 7 days

- Separate (not combined) uncertainty values for gravimetric uncertainty are also displayed on the certificate, if needed, separate homogeneity between-ampul uncertainty, storage stability uncertainty and shipping stability uncertainty values are available by contacting Restek Technical Service at www.restek.com/Contact-Us.
- The packaged amount is the minimum sample size for which uncertainty is valid. The ampules are over-filled to ensure that the minimum packaged amount can be sufficiently transferred.

Manufacturing Notes:

- Concentration is based upon gravimetric preparation using either a balance whose calibration has been verified daily using NIST traceable weights, and/or dilutions with Class A glassware.

Handling Notes:

- Samples should be transferred into deactivated vials for handling and storage. Restek supplies deactivated vials along with most standards packed in 2 mL ampules. Due to space constraints, Restek does not supply vials for larger volume ampules. Restek sells DMDCS for the purpose of glassware deactivation as catalog number 31840, which includes complete instructions. Restek will also deactivate larger volume vials from our inventory as a custom ordered item. Contact your Restek sales or customer service representative for details.
- If any undissolved material is visible inside the ampul, sonicate the unopened ampul until the material is completely dissolved.

RESTEK

Chemical Standard Batch Sheet
Lot #: A093676

Catalog #: 567684	**Target:** 2000 ug/mL	
Description: 8270 Internal Standard		
Solvent: Methylene Chloride	**Solvent Lot:** 127788	**Final Volume:** 3,000 ml

Made by: Matt Hepfer	**Date:** 2/21/2013 8:40:29AM			
Tested by: Diane Shaffer	**Date:** 2/26/2013 5:33:26PM			
Pass	**By:** Jodi Breon		**Date:** 2/27/2013 10:27:25A	
Packaged by: Alexandria Pavkovich / Kendra Swope	**Date:** 2/25/2013 11:10:21A	**No. Units:** 536	**Pkg Size:**	5 mL
Balance Used: BEDEARMBALPC1 XP205	**Serial #:** 1128342313			

Compound	CAS	Storage Location	Lot #	Purity	Target Conc(ug/mL)	Target	Actual	Calc Conc(ug/mL)
1,4-Dichlorobenzene-d4	3855-82-1	R0487	PR-18488	0.99	2,000.00	6,000.00 mg	6,000.00 mg	2,000.0
Acenaphthene-d10	15067-26-2	R0622	PR-21070	0.97	2,000.00	6,185.57 mg	6,185.60 mg	2,000.0
Perylene-d12	1520-96-3	R0625	PR-16756	0.99	2,000.00	6,000.00 mg	6,000.00 mg	2,000.0
Phenanthrene-d10	1517-22-2	R0626	PR-23065	0.99	2,000.00	6,000.00 mg	6,000.00 mg	2,000.0
Chrysene-d12	1719-03-5	R0629	PR-19986	0.98	2,000.00	6,122.45 mg	6,122.40 mg	2,000.0
Naphthalene-d8	1146-65-2	R0637	PR-20449	0.99	2,000.00	6,000.00 mg	6,000.00 mg	2,000.0

QA Report: 8270 Internal Standard (Cat.#567684)

	Runs of Lot # A092941						Runs of Lot # A093676							
COMPONENT	Run #1	Run #2	Run #3	AVG	STD DEV	% RSD	Run #1	Run #2	Run #3	AVG	STD DEV	% RSD	%D MEAN	P/F
1,4-Dichlorobenzene-d4	1707725	1691509	1832715	1743983	77271	4.43	1818667	1695868	1666128	1726888	80862	4.68	0.98	PASS
Naphthalene-d8	3234819	3204806	3466056	3301894	142959	4.33	3529518	3279008	3219085	3342537	164679	4.93	-1.23	PASS
Acenaphthene-d10	3221545	3195302	3426436	3281094	126552	3.86	3494536	3259946	3199625	3318036	155801	4.70	-1.13	PASS
Phenanthrene-d10	3330464	3301583	3508286	3380111	111938	3.31	3604992	3371788	3312856	3429879	154489	4.50	-1.47	PASS
Chrysene-d12	3408655	3362327	3549037	3440006	97223	2.83	3689863	3452532	3401636	3514677	153835	4.38	-2.17	PASS
Perylene-d12	3240766	3212984	3292620	3248790	40420	1.24	3452007	3281176	3242641	3325275	111432	3.35	-2.35	PASS

Certificate of Analysis

Acids Surrogate Standard Mixture

Product Number: ISM-290N **Page:** 1 of 1

Lot Number: CH-2873 **Lot Issue Date:** 16-Sep-2011 **Expiration Date:** 30-Sep-2014

This Certified Reference Material (RM) was manufactured and verified in accordance with ULTRA's ISO 9001 registered quality system, and the analyte concentrations were verified by our ISO 17025 accredited laboratory. The true value and uncertainty value at the 95% confidence level for each analyte, determined gravimetrically, is listed below.

Analyte	CAS#	Analyte Lot	True Value
2-fluorophenol	000367-12-4	RM03347	2004 ± 10 µg/mL
phenol-d5	004165-62-2	RM02038	2005 ± 10 µg/mL
2,4,6-tribromophenol	000118-79-6	RM01307	2004 ± 10 µg/mL

Matrix: methanol (methyl alcohol)

Storage: Store at Room Temperature (18-25° C)

ULTRA uses balances calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z-540-1 and ISO 9001, and calibrated Class A glassware in the manufacturing of these standards.

ACCREDITED
ISO 17025:2005 Accredited A2LA Cert. No. 0851-01

ISO 9001:2008 Registered TUV USA, Inc. Cert. No. 09-1009

250 Smith Street, North Kingstown, RI 02852 USA
401-294-9400 Fax: 295-2330
wwww.ultrasci.com

William J. Leary
Quality Assurance Manager

05/29/2013

Certificate of Composition

4x/mL
REC 1/28/13

DESCRIPTION: TEST AMERICA

QUOTE 21612606 LOT NO.: LB97402 MFG DATE: Dec-2012

EXP 12/31/13

SOLVENT: METHANOL

ANALYTE (1)	CAS NUMBER	PERCENT PURITY (2)	WEIGHT CONCENTRATION (3)	SUPELCO LOT NO
PROPYLENE OXIDE	75-56-9	99.9	10004 +/- 50.0	LB79736

(1) Listed in alphabetical order.

(2) Determined by capillary GC-FID, unless otherwise noted.

(3) NIST traceable weights are used to verify balance calibration with the preparation of each lot. Concentration of analyte in solution is ug/ml +/- 0.5%, uncertainty based upon balance and Class A volumetric glassware. Weights are corrected for analytes less than 98% pure.

Duane Funk

Duane Funk
Quality Manager

SUPELCO Analytical
595 North Harrison Road
Bellefonte, PA 16823-0048 USA
Phone (814) 359-3441

Certificate of Composition

4x/mL
REC 1/28/13

DESCRIPTION: TEST AMERICA

QUOTE 21612606 LOT NO.: LB97402 MFG DATE: Dec-2012

EXP 12/31/13

SOLVENT: METHANOL

ANALYTE (1)	CAS NUMBER	PERCENT PURITY (2)	WEIGHT CONCENTRATION (3)	SUPELCO LOT NO
PROPYLENE OXIDE	75-56-9	99.9	10004 +/- 50.0	LB79736

(1) Listed in alphabetical order.

(2) Determined by capillary GC-FID, unless otherwise noted.

(3) NIST traceable weights are used to verify balance calibration with the preparation of each lot. Concentration of analyte in solution is ug/ml +/- 0.5%, uncertainty based upon balance and Class A volumetric glassware. Weights are corrected for analytes less than 98% pure.

Duane Funk

Duane Funk
Quality Manager

SUPELCO Analytical
595 North Harrison Road
Bellefonte, PA 16823-0048 USA
Phone (814) 359-3441

Rcd 4/2/13 JM

Certificate of Analysis

DESCRIPTION: Ethylene Oxide

CATALOG NO.: 48838 MFG DATE: Feb-2013

LOT NO.: LB98333 EXPIRATION DATE: Feb-2014

SOLVENT: METHANOL

ANALYTE	CAS NUMBER	PERCENT PURITY(1)	WEIGHT(2) CONCENTRATION	ANALYTICAL(3) CONCENTRATION	STD DEV	SUPELCO LOT NO
ETHYLENE OXIDE	75-21-8	99.9	50000	51345	+/- 336.3	LB95261

(1) Determined by capillary GC-FID, unless otherwise noted.

(2) NIST traceable weights are used to verify balance calibration with the preparation of each lot. Concentration of analyte in solution is ug/ml +/- 0.5%, uncertainty based upon balance and Class A volumetric glassware. Weights are corrected for analytes less than 98% pure.

(3) Determined by chromatographic analysis against an independently prepared reference lot. Mean of replicate injections.

Duane Funk

Duane Funk
Quality Manager

SUPELCO®
Solutions within.™
595 North Harrison Road
Bellefonte, PA 16823-0048 USA
Phone (814) 359-3441

x4
3/25/13 DM

RESTEK

110 Benner Circle
Bellefonte, PA 16823-8812
Tel: (800)356-1688
Fax: (814)353-1309

www.restek.com

ACCREDITED
ISO Guide 34 Accredited
Reference Material Producer
Certificate #3222.01

ilac-MRA

ACCREDITED
ISO/IEC 17025 Accredited
Testing Laboratory
Certificate #3222.02

Certificate of Analysis

FOR LABORATORY USE ONLY-READ MSDS PRIOR TO USE.

This Reference Material is intended for Laboratory Use Only as a standard for the qualitative and/or quantitative determination of the analyte(s) listed.

Catalog No. : 567641.sec **Lot No.:** A093733

Description : 8260 List 1 / Std #1 MegaMix

8260 List 1 / Std #1 MegaMix 1,000-50,000 µg/ml, P&T Methanol, 1 ml/ampul

Container Size : 2 mL **Pkg Amt:** > 1 mL

Expiration Date : February 2016 **Storage:** 0°C or colder

CERTIFIED VALUES

Elution Order	Compound	Grav. Conc. (weight/volume)	Expanded Uncertainty (95% C.L.; K=2)		
1	Diethyl ether (ethyl ether)	2,000.0 µg/mL	+/- 11.6282	µg/mL	Gravimetric
	CAS # 60-29-7.SEC		+/- 44.2531	µg/mL	Unstressed
	Purity 99%		+/- 44.4335	µg/mL	Stressed
2	1,1,2-Trichlorotrifluoroethane (CFC-113)	2,000.0 µg/mL	+/- 11.6282	µg/mL	Gravimetric
	CAS # 76-13-1.SEC		+/- 44.2531	µg/mL	Unstressed
	Purity 99%		+/- 44.4335	µg/mL	Stressed
3	1,1-Dichloroethene	2,000.0 µg/mL	+/- 11.6282	µg/mL	Gravimetric
	CAS # 75-35-4.SEC		+/- 44.2531	µg/mL	Unstressed
	Purity 99%		+/- 44.4335	µg/mL	Stressed
4	tert-Butanol (TBA)	20,000.0 µg/mL	+/- 116.2756	µg/mL	Gravimetric
	CAS # 75-65-0.SEC		+/- 442.5291	µg/mL	Unstressed
	Purity 99%		+/- 444.3332	µg/mL	Stressed
5	Iodomethane (methyl iodide)	2,000.0 µg/mL	+/- 11.6284	µg/mL	Gravimetric
	CAS # 74-88-4.SEC		+/- 44.2540	µg/mL	Unstressed
	Purity 97%		+/- 44.4344	µg/mL	Stressed
6	Allyl chloride (3-chloropropene)	2,000.0 µg/mL	+/- 11.6281	µg/mL	Gravimetric
	CAS # 107-05-1.SEC		+/- 44.2527	µg/mL	Unstressed
	Purity 98%		+/- 44.4331	µg/mL	Stressed
7	Methyl acetate	10,000.0 µg/mL	+/- 58.1378	µg/mL	Gravimetric
	CAS # 79-20-9.SEC		+/- 221.2646	µg/mL	Unstressed
	Purity 99%		+/- 222.1666	µg/mL	Stressed
8	Carbon disulfide	2,000.0 µg/mL	+/- 11.6281	µg/mL	Gravimetric
	CAS # 75-15-0.SEC		+/- 44.2527	µg/mL	Unstressed
	Purity 98%		+/- 44.4331	µg/mL	Stressed
9	Methylene chloride (dichloromethane)	2,000.0 µg/mL	+/- 11.6282	µg/mL	Gravimetric
	CAS # 75-09-2.SEC		+/- 44.2531	µg/mL	Unstressed
	Purity 99%		+/- 44.4335	µg/mL	Stressed

10	Acrylonitrile	20,000.0	µg/mL	+/-	116.2756	µg/mL	Gravimetric
	CAS # 107-13-1.SEC			+/-	442.5291	µg/mL	Unstressed
	Purity 99%			+/-	444.3332	µg/mL	Stressed
11	Methyl-tert-butyl ether (MTBE)	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 1634-04-4.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed
12	cis-1,2-Dichloroethene	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 156-59-2.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed
13	n-Hexane (C6)	2,000.1	µg/mL	+/-	11.6286	µg/mL	Gravimetric
	CAS # 110-54-3.SEC			+/-	44.2549	µg/mL	Unstressed
	Purity 98%			+/-	44.4353	µg/mL	Stressed
14	1,1-Dichloroethane	2,000.0	µg/mL	+/-	11.6284	µg/mL	Gravimetric
	CAS # 75-34-3.SEC			+/-	44.2540	µg/mL	Unstressed
	Purity 97%			+/-	44.4344	µg/mL	Stressed
15	2,2-Dichloropropane	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 594-20-7.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed
16	trans-1,2-Dichloroethene	2,000.0	µg/mL	+/-	11.6284	µg/mL	Gravimetric
	CAS # 156-60-5.SEC			+/-	44.2540	µg/mL	Unstressed
	Purity 97%			+/-	44.4344	µg/mL	Stressed
17	Chloroform	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 67-66-3.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed
18	Isobutanol (2-Methyl-1-propanol)	50,000.0	µg/mL	+/-	290.6891	µg/mL	Gravimetric
	CAS # 78-83-1.SEC			+/-	1,106.3228	µg/mL	Unstressed
	Purity 99%			+/-	1,110.8331	µg/mL	Stressed
19	Bromochloromethane	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 74-97-5.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed
20	Tetrahydrofuran	4,000.0	µg/mL	+/-	23.2563	µg/mL	Gravimetric
	CAS # 109-99-9.SEC			+/-	88.5061	µg/mL	Unstressed
	Purity 99%			+/-	88.8670	µg/mL	Stressed
21	1,1,1-Trichloroethane	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 71-55-6.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed
22	Cyclohexane	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 110-82-7.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed
23	1,1-Dichloropropene	2,010.5	µg/mL	+/-	11.6890	µg/mL	Gravimetric
	CAS # 563-58-6.SEC			+/-	44.4847	µg/mL	Unstressed
	Purity 98%			+/-	44.6661	µg/mL	Stressed
24	Carbon tetrachloride	2,000.1	µg/mL	+/-	11.6286	µg/mL	Gravimetric
	CAS # 56-23-5.SEC			+/-	44.2549	µg/mL	Unstressed
	Purity 98%			+/-	44.4353	µg/mL	Stressed
25	n-Heptane (C7)	2,000.1	µg/mL	+/-	11.6288	µg/mL	Gravimetric
	CAS # 142-82-5.SEC			+/-	44.2553	µg/mL	Unstressed
	Purity 99%			+/-	44.4357	µg/mL	Stressed
26	Benzene	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 71-43-2.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed
27	1,2-Dichloroethane	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 107-06-2.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed
28	Trichloroethene	2,000.1	µg/mL	+/-	11.6286	µg/mL	Gravimetric
	CAS # 79-01-6.SEC			+/-	44.2549	µg/mL	Unstressed
	Purity 98%			+/-	44.4353	µg/mL	Stressed

29	Methylcyclohexane	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 108-87-2.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed
30	1,2-Dichloropropane	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 78-87-5.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed
31	1,4-Dioxane	40,000.0	µg/mL	+/-	232.5513	µg/mL	Gravimetric
	CAS # 123-91-1.SEC			+/-	885.0582	µg/mL	Unstressed
	Purity 99%			+/-	888.6665	µg/mL	Stressed
32	Dibromomethane	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 74-95-3.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed
33	Bromodichloromethane	2,000.1	µg/mL	+/-	11.6290	µg/mL	Gravimetric
	CAS # 75-27-4.SEC			+/-	44.2562	µg/mL	Unstressed
	Purity 97%			+/-	44.4366	µg/mL	Stressed
34	cis-1,3-Dichloropropene	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 10061-01-5.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed
35	Toluene	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 108-88-3.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed
36	Ethyl methacrylate	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 97-63-2.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed
37	trans-1,3-Dichloropropene	2,000.0	µg/mL	+/-	11.6281	µg/mL	Gravimetric
	CAS # 10061-02-6.SEC			+/-	44.2527	µg/mL	Unstressed
	Purity 98%			+/-	44.4331	µg/mL	Stressed
38	1,1,2-Trichloroethane	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 79-00-5.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed
39	1,3-Dichloropropane	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 142-28-9.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed
40	Tetrachloroethene	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 127-18-4.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed
41	Dibromochloromethane	2,000.1	µg/mL	+/-	11.6290	µg/mL	Gravimetric
	CAS # 124-48-1.SEC			+/-	44.2562	µg/mL	Unstressed
	Purity 97%			+/-	44.4366	µg/mL	Stressed
42	1,2-Dibromoethane (EDB)	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 106-93-4.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed
43	Chlorobenzene	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 108-90-7.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed
44	1,1,1,2-Tetrachloroethane	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 630-20-6.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed
45	m-Xylene	1,000.0	µg/mL	+/-	5.8141	µg/mL	Gravimetric
	CAS # 108-38-3.SEC			+/-	22.1265	µg/mL	Unstressed
	Purity 99%			+/-	22.2167	µg/mL	Stressed
46	p-Xylene	1,000.0	µg/mL	+/-	5.8141	µg/mL	Gravimetric
	CAS # 106-42-3.SEC			+/-	22.1265	µg/mL	Unstressed
	Purity 99%			+/-	22.2167	µg/mL	Stressed
47	o-Xylene	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 95-47-6.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed

48	Ethylbenzene	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 100-41-4.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed
49	Styrene	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 100-42-5.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed
50	Isopropylbenzene (cumene)	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 98-82-8.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed
51	Bromoform	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 75-25-2.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed
52	1,1,2,2-Tetrachloroethane	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 79-34-5.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed
53	1,2,3-Trichloropropane	2,000.0	µg/mL	+/-	11.6281	µg/mL	Gravimetric
	CAS # 96-18-4.SEC			+/-	44.2527	µg/mL	Unstressed
	Purity 98%			+/-	44.4331	µg/mL	Stressed
54	trans-1,4-Dichloro-2-butene	2,000.0	µg/mL	+/-	11.6284	µg/mL	Gravimetric
	CAS # 110-57-6.SEC			+/-	44.2540	µg/mL	Unstressed
	Purity 97%			+/-	44.4344	µg/mL	Stressed
55	n-Propylbenzene	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 103-65-1.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed
56	Bromobenzene	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 108-86-1.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed
57	1,3,5-Trimethylbenzene	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 108-67-8.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed
58	2-Chlorotoluene	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 95-49-8.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed
59	4-Chlorotoluene	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 106-43-4.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed
60	tert-Butylbenzene	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 98-06-6.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed
61	1,2,4-Trimethylbenzene	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 95-63-6.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed
62	sec-Butylbenzene	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 135-98-8.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed
63	4-Isopropyltoluene (p-cymene)	2,000.1	µg/mL	+/-	11.6285	µg/mL	Gravimetric
	CAS # 99-87-6.SEC			+/-	44.2545	µg/mL	Unstressed
	Purity 96%			+/-	44.4349	µg/mL	Stressed
64	1,3-Dichlorobenzene	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 541-73-1.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed
65	1,4-Dichlorobenzene	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 106-46-7.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed
66	n-Butylbenzene	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 104-51-8.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed

67	1,2-Dichlorobenzene	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 95-50-1.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed
68	1,2-Dibromo-3-chloropropane	2,000.0	µg/mL	+/-	11.6284	µg/mL	Gravimetric
	CAS # 96-12-8.SEC			+/-	44.2540	µg/mL	Unstressed
	Purity 97%			+/-	44.4344	µg/mL	Stressed
69	1,2,4-Trichlorobenzene	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 120-82-1.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed
70	Hexachlorobutadiene	2,000.0	µg/mL	+/-	11.6284	µg/mL	Gravimetric
	CAS # 87-68-3.SEC			+/-	44.2540	µg/mL	Unstressed
	Purity 97%			+/-	44.4344	µg/mL	Stressed
71	Naphthalene	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 91-20-3.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed
72	1,2,3-Trichlorobenzene	2,000.0	µg/mL	+/-	11.6282	µg/mL	Gravimetric
	CAS # 87-61-6.SEC			+/-	44.2531	µg/mL	Unstressed
	Purity 99%			+/-	44.4335	µg/mL	Stressed

Solvent: P&T Methanol
CAS # 67-56-1
Purity 99%

Column:
60m x .25mm x 1.4um
Rtx-502.2 (cat.#10916)

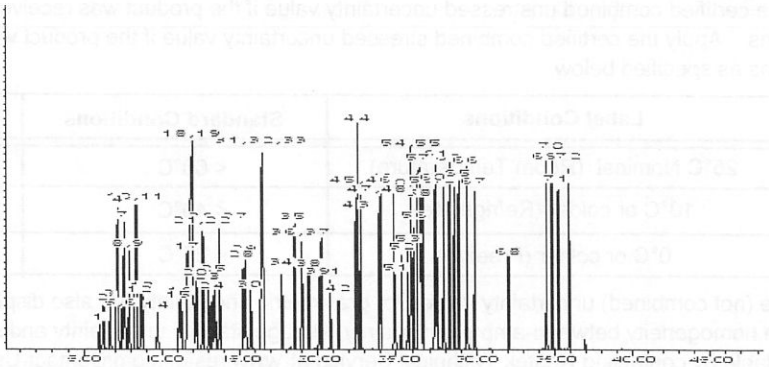
Carrier Gas:
helium-constant pressure 30 psi

Temp. Program:
40°C (hold 6 min.) to 240°C
@ 6°C/min. (hold 10 min.)

Inj. Temp:
200°C

Det. Temp:
250°C

Det. Type:
MSD



Jennifer L. Pollino - QC Analyst

Date Passed: 01-Mar-2013 **Balance:** 1127510105

Manufactured under Restek's ISO 9001:2008
Registered Quality System
Certificate #FM 80397

General Certified Reference Material Notes

Expiration Notes:

- Expiration date of the unopened ampul stored at the recommended storage condition is the last day of the month listed in the expiration date field.
- Uncertainty, concentration, and expiration of the CRM are based on the unopened product being stored according to the recommended condition found in the storage field.

Purity Notes:

- Purity and/or chemical identity are determined by one or more of the following techniques: GC/FID, HPLC, GC/μECD, GC/MS, LC/MS, RI, and/or melting point.
- Compounds with a listed purity of less than 99% have been weight corrected to compensate for impurities and/or salts. A correction factor is used to calculate the amount of compound necessary to achieve the desired concentration of the parent compound in solution.
- Purity of isomeric compounds is reported as the sum of the isomers.
- Purity values are rounded to the nearest whole number.

Certified Uncertainty Value Notes:

- The uncertainties are determined in accordance with ISO Guides 34 and 35. The certified combined stressed uncertainty value (includes gravimetric uncertainty, homogeneity between-ampul uncertainty, storage stability uncertainty and shipping stability uncertainty and were combined using the following formula:

$$U_{combined\ stressed} = k\sqrt{U^2_{gravimetric} + U^2_{homogeneity} + U^2_{storage\ stability} + U^2_{shipping\ stability}}$$

  k is a coverage factor of 2, which gives a level of confidence of approximately 95%.
- It is important to note that the shipping stability uncertainty was obtained under temperature extremes for specific time intervals; therefore, the certified combined stressed uncertainty value should only be applied to the product if it was stored at non-standard temperature conditions up to and including 7 days. Contact Restek Technical Service at www.restek.com/Contact-Us for use recommendations if your shipment was in-transit for more than 7 days at non-standard temperature conditions.
- Apply the certified combined unstressed uncertainty value if the product was received under standard shipping conditions. Apply the certified combined stressed uncertainty value if the product was received under non-standard conditions as specified below.

Label Conditions	Standard Conditions	Non-Standard Conditions
25°C Nominal (Room Temperature)	< 60°C	≥ 60°C up to 7 days
10°C or colder (Refrigerate)	< 40°C	≥ 40°C up to 7 days
0°C or colder (Freezer)	< 25°C	≥ 25°C up to 7 days

- Separate (not combined) uncertainty values for gravimetric uncertainty are also displayed on the certificate, if needed, separate homogeneity between-ampul uncertainty, storage stability uncertainty and shipping stability uncertainty values are available by contacting Restek Technical Service at www.restek.com/Contact-Us.
- The packaged amount is the minimum sample size for which uncertainty is valid. The ampules are over-filled to ensure that the minimum packaged amount can be sufficiently transferred.

Manufacturing Notes:

- Concentration is based upon gravimetric preparation using either a balance whose calibration has been verified daily using NIST traceable weights, and/or dilutions with Class A glassware.

Handling Notes:

- Samples should be transferred into deactivated vials for handling and storage. Restek supplies deactivated vials along with most standards packed in 2 mL ampules. Due to space constraints, Restek does not supply vials for larger volume ampules. Restek sells DMDCS for the purpose of glassware deactivation as catalog number 31840, which includes complete instructions. Restek will also deactivate larger volume vials from our inventory as a custom ordered item. Contact your Restek sales or customer service representative for details.
- If any undissolved material is visible inside the ampul, sonicate the unopened ampul until the material is completely dissolved.

12/26/12
x2

RESTEK

110 Benner Circle
Bellefonte, PA 16823-8812
Tel: (800)356-1688
Fax: (814)353-1309

www.restek.com

ACCREDITED
ISO Guide 34 Accredited
Reference Material Producer
Certificate #3222.01

ilac-MRA

ACCREDITED
ISO/IEC 17025 Accredited
Testing Laboratory
Certificate #3222.02

Certificate of Composition

FOR LABORATORY USE ONLY-READ MSDS PRIOR TO USE.

This Reference Material is intended for Laboratory Use Only as a standard for the qualitative and/or quantitative determination of the analyte(s) listed.

Catalog No. : 567650 **Lot No.:** A092213

Description : 8260/624 Surrogate Mix

8260/624 Surrogate Mix 2500 ug/ml, P&T Methanol, 5 ml/ampul

Container Size : 5 mL **Pkg Amt:** > 5 mL

Expiration Date : December 2017 **Storage:** 0°C or colder

CERTIFIED VALUES

Elution Order	Compound	Grav. Conc. (weight/volume)	Expanded Uncertainty (95% C.L.; K=2)		
1	Dibromofluoromethane	2,500.0 µg/mL	+/- 14.6714	µg/mL	Gravimetric
	CAS # 1868-53-7		+/- 30.2004	µg/mL	Unstressed
	Purity 99%		+/- 34.0606	µg/mL	Stressed
2	1,2-Dichloroethane-d4	2,500.0 µg/mL	+/- 14.6714	µg/mL	Gravimetric
	CAS # 17060-07-0		+/- 30.2004	µg/mL	Unstressed
	Purity 99%		+/- 34.0606	µg/mL	Stressed
3	Toluene-d8	2,500.0 µg/mL	+/- 14.6714	µg/mL	Gravimetric
	CAS # 2037-26-5		+/- 30.2004	µg/mL	Unstressed
	Purity 99%		+/- 34.0606	µg/mL	Stressed
4	1-Bromo-4-fluorobenzene (BFB)	2,500.0 µg/mL	+/- 14.6714	µg/mL	Gravimetric
	CAS # 460-00-4		+/- 30.2004	µg/mL	Unstressed
	Purity 99%		+/- 34.0606	µg/mL	Stressed

Solvent: P&T Methanol
CAS # 67-56-1
Purity 99%

Column:
105m x .53mm x 3.0um
Rtx-502.2 (cat.#10910)

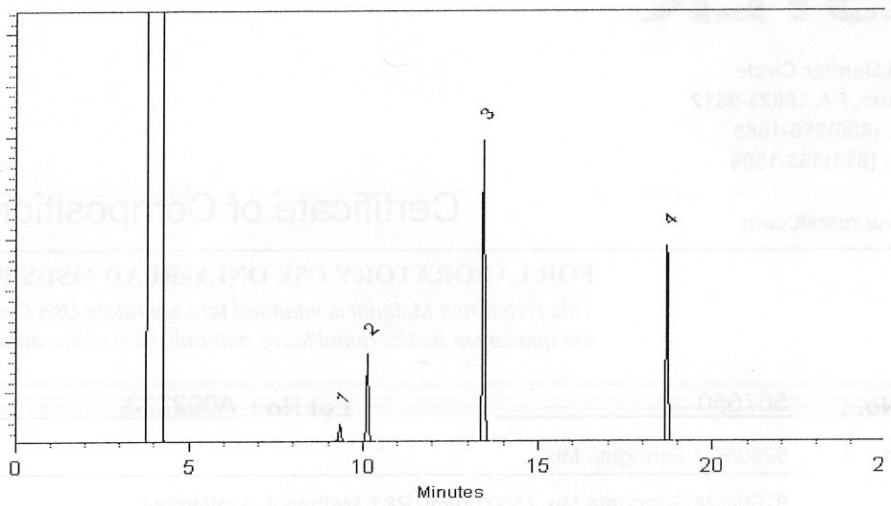
Carrier Gas:
hydrogen-constant pressure 11.0 psi.

Temp. Program:
40°C (hold 2 min.) to 240°C
@ 8°C/min. (hold 5 min.)

Inj. Temp:
200°C

Det. Temp:
250°C

Det. Type:
FID



Jennifer L. Pollino - QC Analyst

Date Passed: 05-Dec-2012 **Balance:** 1125113331

Manufactured under Restek's ISO 9001:2008
Registered Quality System
Certificate #FM 80397

General Certified Reference Material Notes

Expiration Notes:

- Expiration date of the unopened ampul stored at the recommended storage condition is the last day of the month listed in the expiration date field.
- Uncertainty, concentration, and expiration of the CRM are based on the unopened product being stored according to the recommended condition found in the storage field.

Purity Notes:

- Purity and/or chemical identity are determined by one or more of the following techniques: GC/FID, HPLC, GC/μECD, GC/MS, LC/MS, RI, and/or melting point.
- Compounds with a listed purity of less than 99% have been weight corrected to compensate for impurities and/or salts. A correction factor is used to calculate the amount of compound necessary to achieve the desired concentration of the parent compound in solution.
- Purity of isomeric compounds is reported as the sum of the isomers.
- Purity values are rounded to the nearest whole number.

Certified Uncertainty Value Notes:

- The uncertainties are determined in accordance with ISO Guides 34 and 35. The certified combined stressed uncertainty value (includes gravimetric uncertainty, homogeneity between-ampul uncertainty, storage stability uncertainty and shipping stability uncertainty and were combined using the following formula:

$$U_{combined\ stressed} = k\sqrt{U^2_{gravimetric} + U^2_{homogeneity} + U^2_{storage\ stability} + U^2_{shipping\ stability}}$$

  k is a coverage factor of 2, which gives a level of confidence of approximately 95%.
- It is important to note that the shipping stability uncertainty was obtained under temperature extremes for specific time intervals; therefore, the certified combined stressed uncertainty value should only be applied to the product if it was stored at non-standard temperature conditions up to and including 7 days. Contact Restek Technical Service at www.restek.com/Contact-Us for use recommendations if your shipment was in-transit for more than 7 days at non-standard temperature conditions.
- Apply the certified combined unstressed uncertainty value if the product was received under standard shipping conditions. Apply the certified combined stressed uncertainty value if the product was received under non-standard conditions as specified below.

Label Conditions	Standard Conditions	Non-Standard Conditions
25°C Nominal (Room Temperature)	< 60°C	≥ 60°C up to 7 days
10°C or colder (Refrigerate)	< 40°C	≥ 40°C up to 7 days
0°C or colder (Freezer)	< 25°C	≥ 25°C up to 7 days

- Separate (not combined) uncertainty values for gravimetric uncertainty are also displayed on the certificate, if needed, separate homogeneity between-ampul uncertainty, storage stability uncertainty and shipping stability uncertainty values are available by contacting Restek Technical Service at www.restek.com/Contact-Us.
- The packaged amount is the minimum sample size for which uncertainty is valid. The ampules are over-filled to ensure that the minimum packaged amount can be sufficiently transferred.

Manufacturing Notes:

- Concentration is based upon gravimetric preparation using either a balance whose calibration has been verified daily using NIST traceable weights, and/or dilutions with Class A glassware.

Handling Notes:

- Samples should be transferred into deactivated vials for handling and storage. Restek supplies deactivated vials along with most standards packed in 2 mL ampules. Due to space constraints, Restek does not supply vials for larger volume ampules. Restek sells DMDCS for the purpose of glassware deactivation as catalog number 31840, which includes complete instructions. Restek will also deactivate larger volume vials from our inventory as a custom ordered item. Contact your Restek sales or customer service representative for details.
- If any undissolved material is visible inside the ampul, sonicate the unopened ampul until the material is completely dissolved.

× 16
5/7/13

RESTEK

110 Benner Circle
Bellefonte, PA 16823-8812
Tel: (800)356-1688
Fax: (814)353-1309

www.restek.com

ACCREDITED
ISO Guide 34 Accredited
Reference Material Producer
Certificate #3222.01

ilac-MRA

ACCREDITED
ISO/IEC 17025 Accredited
Testing Laboratory
Certificate #3222.02

Certificate of Analysis

FOR LABORATORY USE ONLY-READ MSDS PRIOR TO USE.

This Reference Material is intended for Laboratory Use Only as a standard for the qualitative and/or quantitative determination of the analyte(s) listed.

Catalog No. : 567650 **Lot No.:** A093505

Description : 8260 Surrogate Standard

8260 Surrogate Standard 2,500 ug/ml, P&T Methanol, 5 ml/ampul

Container Size : 5 mL **Pkg Amt:** > 5 mL

Expiration Date : February 2018 **Storage:** 0°C or colder

CERTIFIED VALUES

Elution Order	Compound	Grav. Conc. (weight/volume)	Expanded Uncertainty (95% C.L.; K=2)		
1	Dibromofluoromethane	2,500.0 µg/mL	+/- 14.5352	µg/mL	Gravimetric
	CAS # 1868-53-7		+/- 30.1344	µg/mL	Unstressed
	Purity 99%		+/- 34.0022	µg/mL	Stressed
2	1,2-Dichloroethane-d4	2,500.0 µg/mL	+/- 14.5352	µg/mL	Gravimetric
	CAS # 17060-07-0		+/- 30.1344	µg/mL	Unstressed
	Purity 99%		+/- 34.0022	µg/mL	Stressed
3	Toluene-d8	2,500.0 µg/mL	+/- 14.5352	µg/mL	Gravimetric
	CAS # 2037-26-5		+/- 30.1344	µg/mL	Unstressed
	Purity 99%		+/- 34.0022	µg/mL	Stressed
4	1-Bromo-4-fluorobenzene (BFB)	2,500.0 µg/mL	+/- 14.5352	µg/mL	Gravimetric
	CAS # 460-00-4		+/- 30.1344	µg/mL	Unstressed
	Purity 99%		+/- 34.0022	µg/mL	Stressed

Solvent: P&T Methanol
CAS # 67-56-1
Purity 99%

Column:
105m x .53mm x 3.0um
Rtx-502.2 (cat.#10910)

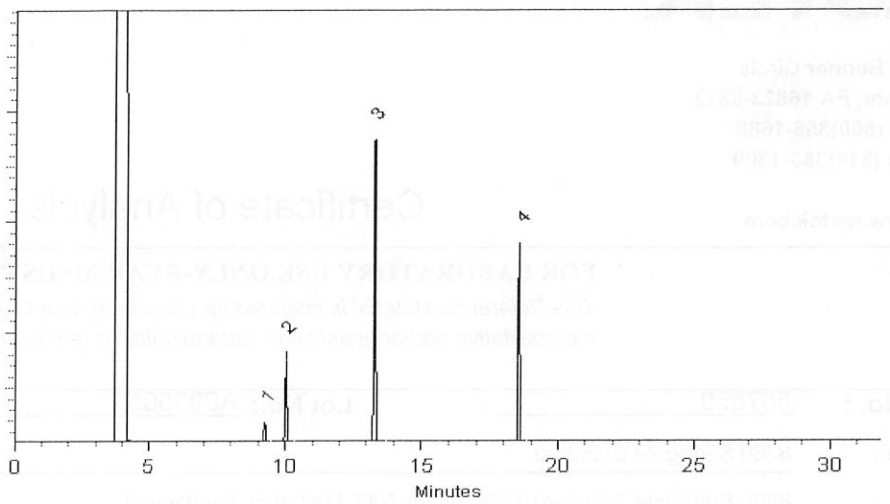
Carrier Gas:
hydrogen-constant pressure 11.0 psi.

Temp. Program:
40°C (hold 2 min.) to 240°C
@ 8°C/min. (hold 5 min.)

Inj. Temp:
200°C

Det. Temp:
250°C

Det. Type:
FID



Diane Shaffer - QAAnalyst

Date Passed: 15-Feb-2013 **Balance:** B251644995

Manufactured under Restek's ISO 9001:2008
Registered Quality System
Certificate #FM 80397

General Certified Reference Material Notes

Expiration Notes:

- Expiration date of the unopened ampul stored at the recommended storage condition is the last day of the month listed in the expiration date field.
- Uncertainty, concentration, and expiration of the CRM are based on the unopened product being stored according to the recommended condition found in the storage field.

Purity Notes:

- Purity and/or chemical identity are determined by one or more of the following techniques: GC/FID, HPLC, GC/μECD, GC/MS, LC/MS, RI, and/or melting point.
- Compounds with a listed purity of less than 99% have been weight corrected to compensate for impurities and/or salts. A correction factor is used to calculate the amount of compound necessary to achieve the desired concentration of the parent compound in solution.
- Purity of isomeric compounds is reported as the sum of the isomers.
- Purity values are rounded to the nearest whole number.

Certified Uncertainty Value Notes:

- The uncertainties are determined in accordance with ISO Guides 34 and 35. The certified combined stressed uncertainty value (includes gravimetric uncertainty, homogeneity between-ampul uncertainty, storage stability uncertainty and shipping stability uncertainty and were combined using the following formula:

$$U_{combined\ stressed} = k\sqrt{U^2_{gravimetric} + U^2_{homogeneity} + U^2_{storage\ stability} + U^2_{shipping\ stability}}$$

  k is a coverage factor of 2, which gives a level of confidence of approximately 95%.
- It is important to note that the shipping stability uncertainty was obtained under temperature extremes for specific time intervals; therefore, the certified combined stressed uncertainty value should only be applied to the product if it was stored at non-standard temperature conditions up to and including 7 days. Contact Restek Technical Service at www.restek.com/Contact-Us for use recommendations if your shipment was in-transit for more than 7 days at non-standard temperature conditions.
- Apply the certified combined unstressed uncertainty value if the product was received under standard shipping conditions. Apply the certified combined stressed uncertainty value if the product was received under non-standard conditions as specified below.

Label Conditions	Standard Conditions	Non-Standard Conditions
25°C Nominal (Room Temperature)	< 60°C	≥ 60°C up to 7 days
10°C or colder (Refrigerate)	< 40°C	≥ 40°C up to 7 days
0°C or colder (Freezer)	< 25°C	≥ 25°C up to 7 days

- Separate (not combined) uncertainty values for gravimetric uncertainty are also displayed on the certificate, if needed, separate homogeneity between-ampul uncertainty, storage stability uncertainty and shipping stability uncertainty values are available by contacting Restek Technical Service at www.restek.com/Contact-Us.
- The packaged amount is the minimum sample size for which uncertainty is valid. The ampules are over-filled to ensure that the minimum packaged amount can be sufficiently transferred.

Manufacturing Notes:

- Concentration is based upon gravimetric preparation using either a balance whose calibration has been verified daily using NIST traceable weights, and/or dilutions with Class A glassware.

Handling Notes:

- Samples should be transferred into deactivated vials for handling and storage. Restek supplies deactivated vials along with most standards packed in 2 mL ampules. Due to space constraints, Restek does not supply vials for larger volume ampules. Restek sells DMDCS for the purpose of glassware deactivation as catalog number 31840, which includes complete instructions. Restek will also deactivate larger volume vials from our inventory as a custom ordered item. Contact your Restek sales or customer service representative for details.
- If any undissolved material is visible inside the ampul, sonicate the unopened ampul until the material is completely dissolved.

5/14/13 x8

RESTEK CERTIFIED REFERENCE MATERIAL

110 Benner Circle
Bellefonte, PA 16823-8812
Tel: (800)356-1688
Fax: (814)353-1309

www.restek.com

Gravimetric Certificate

ACCREDITED
ISO Guide 34 Accredited
Reference Material Producer
Certificate #3222.01

ACCREDITED
ISO/IEC 17025 Accredited
Testing Laboratory
Certificate #3222.02

FOR LABORATORY USE ONLY-READ SDS PRIOR TO USE.

This Reference Material is intended for Laboratory Use Only as a standard for the qualitative and/or quantitative determination of the analyte(s) listed.

Catalog No. : 568034.sec **Lot No.:** A094981

Description : Denver Main Add Ons Standard

Denver Main Add Ons Standard 1,000-30,000 µg/ml, P&T Methanol/Water (90:10), 1 ml/ampul

Container Size : 2 mL **Pkg Amt:** > 1 mL

Expiration Date : October 31, 2014 **Storage:** 0°C or colder

CERTIFIED VALUES

Component #	Compound	Grav. Conc. (weight/volume)	Expanded Uncertainty (95% C.L.; K=2)	
1	1-Chlorohexane	999.6 µg/mL	+/- 10.0697 µg/mL	Gravimetric
	CAS # 544-10-5.SEC (Lot 1376600)		+/- 80.2594 µg/mL	Unstressed
	Purity 98%		+/- 80.2983 µg/mL	Stressed
2	2-Butanol (sec-butyl alcohol)	30,044.0 µg/mL	+/- 278.0328 µg/mL	Gravimetric
	CAS # 78-92-2.SEC (Lot 3S7SC)		+/- 2,409.3134 µg/mL	Unstressed
	Purity 99%		+/- 2,410.4839 µg/mL	Stressed
3	2-Pentanone	4,004.0 µg/mL	+/- 37.2350 µg/mL	Gravimetric
	CAS # 107-87-9.SEC (Lot OGH01)		+/- 321.1131 µg/mL	Unstressed
	Purity 99%		+/- 321.2690 µg/mL	Stressed

Solvent: P&T Methanol/Water (90:10)
CAS # 67-56-1/7732-18-5
Purity 99%

Michael J Maye

Date Mixed: 24-Apr-2013 **Balance:** 1128353505

Manufactured under Restek's ISO 9001:2008
Registered Quality System
Certificate #FM 80397

General Certified Reference Material Notes

Expiration Notes:

- Expiration date valid for unopened ampul stored in compliance with the recommended conditions.
- Uncertainty, concentration, and expiration of the CRM are based on the unopened product being stored according to the recommended condition found in the storage field.

Purity Notes:

- Purity and/or chemical identity are determined by one or more of the following techniques: GC/FID, HPLC, GC/μECD, GC/MS, LC/MS, RI, and/or melting point.
- Compounds with a listed purity of less than 99% have been weight corrected to compensate for impurities and/or salts. A correction factor is used to calculate the amount of compound necessary to achieve the desired concentration of the parent compound in solution.
- Purity of isomeric compounds is reported as the sum of the isomers.
- Purity values are rounded to the nearest whole number.

Certified Uncertainty Value Notes:

- The uncertainties are determined in accordance with ISO Guides 34 and 35. The certified combined stressed uncertainty value (includes gravimetric uncertainty, homogeneity between-ampul uncertainty, storage stability uncertainty and shipping stability uncertainty and were combined using the following formula:

$$U_{combined\ stressed} = k\sqrt{U^2_{gravimetric} + U^2_{homogeneity} + U^2_{storage\ stability} + U^2_{shipping\ stability}}$$

  k is a coverage factor of 2, which gives a level of confidence of approximately 95%.
- It is important to note that the shipping stability uncertainty was obtained under temperature extremes for specific time intervals; therefore, the certified combined stressed uncertainty value should only be applied to the product if it was stored at non-standard temperature conditions up to and including 7 days. Contact Restek Technical Service at www.restek.com/Contact-Us for use recommendations if your shipment was in-transit for more than 7 days at non-standard temperature conditions.
- Apply the certified combined unstressed uncertainty value if the product was received under standard shipping conditions. Apply the certified combined stressed uncertainty value if the product was received under non-standard conditions as specified below.

Label Conditions	Standard Conditions	Non-Standard Conditions
25°C Nominal (Room Temperature)	< 60°C	≥ 60°C up to 7 days
10°C or colder (Refrigerate)	< 40°C	≥ 40°C up to 7 days
0°C or colder (Freezer)	< 25°C	≥ 25°C up to 7 days

- Separate (not combined) uncertainty values for gravimetric uncertainty are also displayed on the certificate, if needed, separate homogeneity between-ampul uncertainty, storage stability uncertainty and shipping stability uncertainty values are available by contacting Restek Technical Service at www.restek.com/Contact-Us.
- The packaged amount is the minimum sample size for which uncertainty is valid. The ampules are over-filled to ensure that the minimum packaged amount can be sufficiently transferred.

Manufacturing Notes:

- Concentration is based upon gravimetric preparation using either a balance whose calibration has been verified daily using NIST traceable weights, and/or dilutions with Class A glassware.

Handling Notes:

- Samples should be transferred into deactivated vials for handling and storage. Restek supplies deactivated vials along with most standards packed in 2 mL ampules. Due to space constraints, Restek does not supply vials for larger volume ampules. Restek sells DMDCS for the purpose of glassware deactivation as catalog number 31840, which includes complete instructions. Restek will also deactivate larger volume vials from our inventory as a custom ordered item. Contact your Restek sales or customer service representative for details.
- If any undissolved material is visible inside the ampul, sonicate the unopened ampul until the material is completely dissolved.

DM 12/21/12

Certificate of Analysis

DESCRIPTION: 8260 Internal Standards Mix 2

CATALOG NO.: 861184 MFG DATE: Mar-2012

LOT NO.: LB91482 EXPIRATION DATE: Mar-2015

SOLVENT: METHANOL

ANALYTE (1)	CAS NUMBER	PERCENT PURITY(2)	WEIGHT(3) CONCENTRATION	ANALYTICAL(4) CONCENTRATION		STD DEV	SUPELCO LOT NO
CHLOROBENZENE-D5	3114-55-4	99.9	250.1	246.5	+/-	0.23	LB81159
FLUOROBENZENE	462-06-6	99.9	250.1	246.5	+/-	0.19	LB86106
1,4-DICHLOROBENZENE-D4	3855-82-1	98.7	250.1	249.7	+/-	0.30	LB82415

(1) Listed in alphabetical order.

(2) Determined by capillary GC-FID, unless otherwise noted.

(3) NIST traceable weights are used to verify balance calibration with the preparation of each lot. Concentration of analyte in solution is ug/ml +/- 0.5%, uncertainty based upon balance and Class A volumetric glassware. Weights are corrected for analytes less than 98% pure.

(4) Determined by chromatographic analysis against an independently prepared reference lot. Mean of replicate injections.

Elwood Doughty
Quality Control Supervisor

SUPELCO Analytical
595 North Harrison Road
Bellefonte, PA 16823-0048 USA
Phone (814) 359-3441

Rec 12/31/12 -DY X 5

125 Market Street
New Haven, CT 06513
USA

AccuStandard® Inc.

Tel (203)786-5290
Fax (203)786-5287
www.AccuStandard.com

CERTIFICATE OF ANALYSIS

Catalog No: S-635-1S
Description: 1,2-Dichloro-1,1,2-trifluoroethane

Lot: 212121140
Solvent: Methanol

Date Certified: Dec 11, 2012
Expiration: Dec 11, 2022
Sample Size: 1 mL
Storage Condition: Freeze (<-10° C)
Hazards: POISON

[X] Included on ISO/IEC 17025 Scope of Accreditation
[X] Included on ISO Guide 34 Scope of Accreditation

Component	CAS #	Purity % (GC/FID)	Prepared Concentration[1] (µg/mL)	Certified Analyte Concentration[2] (µg/mL)
1,2-Dichloro-1,1,2-trifluoroethane	354-23-4	99	2000	1980

AccuStandard follows U.S. conventions in reporting numerical values on both certificates and labels:

A comma (,) is used to separate units of one-thousand or greater.
A period (.) is used as a decimal place marker.

1. All weights are traceable through NIST, Test No.822-275872-11
2. Certified Analyte Concentration = Purity x Prepared Concentration. The Uncertainty associated with the gravimetric values reported on this certificate is ±0.24%. The CRM Uncertainty calculated for this product is ±5%. These values are the expanded uncertainty and represent an estimated standard deviation equal to the positive square root of the total variation of the uncertainty of components. A normal distribution is assumed and a coverage factor of K=2 is chosen using approximately a 95% confidence level.
3. A product with a suffix (-1A, -2B, etc. or -01, -02, etc.) on its lot# has had its expiration date extended and is identical to the same lot# without the suffix.

For use in routine laboratory analysis.

See reverse side for additional information
Refer to the MSDS for additional safety information

Certified by: R. Cooper
Russ Cooper, QC Manager

Sample Name	Type	Date/Time	Conc (ppb)	µAbs	%RSD	Flags	Wt.	Vol.	ODF
LB 280-165617/1-F	UNK	03/27/13 08:45:20 pm	-0.021	-40	2.47		1.00	1.00	1.00
LCS 280-165617/2-G	UNK	03/27/13 08:47:38 pm	5.143	58494	0.25		1.00	1.00	1.00
280-40034-E-1-R	UNK	03/27/13 08:49:57 pm	-0.023	-61	4.10		1.00	1.00	1.00
280-40034-E-1-R sd@5	UNK	03/27/13 08:52:16 pm	-0.022	-52	2.89		1.00	1.00	1.00
280-40034-E-1-S MS	UNK	03/27/13 08:54:34 pm	5.429	61742	0.12		1.00	1.00	1.00
280-40034-E-1-T MSD	UNK	03/27/13 08:56:53 pm	4.987	56730	0.09		1.00	1.00	1.00
CCV 1960039 % Recovery 96.45	CCV	03/27/13 08:59:13 pm	4.822	54859	0.21		1.00	1.00	1.00
CCB	CCB	03/27/13 09:01:30 pm	-0.024	-75	1.31		1.00	1.00	1.00
LB3 280-166282/1-D	UNK	03/27/13 09:03:49 pm	-0.019	-20	19.27		1.00	1.00	1.00
LCS 280-166282/2-D	UNK	03/27/13 09:06:08 pm	4.799	54591	0.22		1.00	1.00	1.00
280-40195-A-1-G	UNK	03/27/13 09:08:27 pm	-0.021	-38	4.21		1.00	1.00	1.00
280-40195-A-2-G	UNK	03/27/13 09:10:46 pm	-0.021	-41	4.99		1.00	1.00	1.00
280-40195-A-2-G sd@5	UNK	03/27/13 09:13:06 pm	-0.022	-52	3.51		1.00	1.00	1.00
280-40195-A-2-H MS	UNK	03/27/13 09:15:26 pm	4.834	54987	0.17		1.00	1.00	1.00
280-40195-A-2-I MSD	UNK	03/27/13 09:17:45 pm	4.844	55109	0.11		1.00	1.00	1.00
MB 280-166437/1-A	UNK	03/27/13 09:20:04 pm	-0.024	-71	3.35		1.00	1.00	1.00
LCS 280-166437/2-A	UNK	03/27/13 09:22:23 pm	4.806	54675	1.12		1.00	1.00	1.00

Sample Name	Type	Date/Time	Conc (ppb)	µAbs	%RSD	Flags	Wt.	Vol.	ODF
LCSD 280-166437/3-A	UNK	03/27/13 09:24:42 pm	4.819	54821	0.28		1.00	1.00	1.00
CCV 1960039	CCV	03/27/13 09:27:02 pm	4.821	54841	0.25		1.00	1.00	1.00
% Recovery 96.41									
CCB	CCB	03/27/13 09:29:19 pm	-0.022	-51	5.89		1.00	1.00	1.00
280-40247-A-1-B	UNK	03/27/13 09:31:38 pm	-0.008	106	2.25		1.00	1.00	1.00
280-40247-A-2-B	UNK	03/27/13 09:33:57 pm	0.069	984	0.14		1.00	1.00	1.00
280-40247-A-3-B	UNK	03/27/13 09:36:16 pm	0.004	247	1.05		1.00	1.00	1.00
280-40247-A-4-B	UNK	03/27/13 09:38:35 pm	0.067	958	0.19		1.00	1.00	1.00
280-40247-A-5-B	UNK	03/27/13 09:40:54 pm	0.006	264	0.48		1.00	1.00	1.00
280-40247-A-6-B	UNK	03/27/13 09:43:13 pm	-0.009	96	3.31		1.00	1.00	1.00
280-40247-A-7-B	UNK	03/27/13 09:45:33 pm	0.016	383	1.77		1.00	1.00	1.00
280-40247-A-8-B	UNK	03/27/13 09:47:53 pm	0.127	1640	0.20		1.00	1.00	1.00
280-40247-A-9-B	UNK	03/27/13 09:50:12 pm	-0.003	167	1.37		1.00	1.00	1.00
CCV 1960039	CCV	03/27/13 09:52:32 pm	4.832	54963	0.19		1.00	1.00	1.00
% Recovery 96.63									
CCB	CCB	03/27/13 09:54:49 pm	-0.023	-59	2.76		1.00	1.00	1.00
Ultra stock @ 5ppb	UNK	03/27/13 09:57:08 pm	4.874	55449	0.17		1.00	1.00	1.00
Inorganic Venture stock @ 4ppb	UNK	03/27/13 09:59:28 pm	4.033	45915	0.24		1.00	1.00	1.00
CCV 1960039	CCV	03/27/13 10:01:48 pm	4.949	56291	0.34		1.00	1.00	1.00
% Recovery 98.97									

Sample Name	Type	Date/Time	Conc (ppb)	µAbs	%RSD	Flags	Wt.	Vol.	ODF
CCB	CCB	03/27/13 10:04:05 pm	-0.023	-68	3.74		1.00	1.00	1.00

Analysis Parameters

Instrument M-7500 Mercury Analyzer

Conditions

Gas flow (mL/min)	Sample Uptake (s)	Rinse (s)	Read delay (s)	Replicates (#)	Replicate time (s)	Pump speed (%)	Wavelength (nm)
100	40.00	90.00	63.00	4	1.50	50	253.65

Instrumental Zero

Zero before first sample: No

Zero periodically: Yes

Before each calibration.

Baseline Correction

#1 Start time (s)	#1 End time (s)	#2 Start time (s)	#2 End time (s)
20.00	24.00		

Standby Mode

Enabled: Yes

Standby Options: pump slow

Autodilution

Enabled: No

Condition:

Tube # range:

If no autodilution tubes remaining

Calibration

Settings

Algorithm	Through blank	Weighted fit	Cal. Type	Racalibration rate	Reslope rate	Reslope standard
Linear	No	No	Normal	0	0	N/A

Limits

Calibration slope		Reslope		Coeff. of Determination
Lower (%)	Upper (%)	Lower (%)	Upper (%)	
20	150	75	125	0.99500

Error action: Flag and continue

QC

GLP Override: Yes

QC Tests

CCB

Concentration (ppb)
0.1000

Failure flag: Q

Error action for manually inserted QC: Stop analysis

ICB

Concentration (ppb)
0.0500

Failure flag: Z

Error action for manually inserted QC: Stop analysis

CCV

Concentration (ppb)	Low Limit %	High Limit %
5.0000	80.0000	120.0000

Failure flag: Q

Error action for manually inserted QC: Stop analysis

ICV

Concentration (ppb)	Low Limit %	High Limit %
4.0000	94.6000	110.4000

Failure flag: Q

Error action for manually inserted QC: Stop analysis

CRDL

Concentration (ppb)	Low Limit %	High Limit %
0.2000	50.0000	150.0000

Failure flag: Y

Error action for manually inserted QC: Stop analysis

ULTRA SCIENTIFIC
Analytical Solutions

Certificate of Analysis

*** ULTRAgrade™ Solution**
Mercury ICP Standard
1000 µg/mL

Catalog Number: ICP-080
Lot Number: P00139
Job Number: J00014228
Lot Issue Date: 02/10/2012
Expiration Date: 03/31/2019

Starting Material:	Mercuric Nitrate
Starting Material Purity:	99.999%
Starting Material Lot No.:	NT04717
Matrix:	2% nitric acid in low TOC water (< 50 ppb)
Atomic Weight Hg:	200.61

* light sensitive

Certified Value: 1002 ± 2 µg/mL

This Certified Reference Material (CRM) was manufactured and verified in accordance with ULTRA's ISO 9001 registered quality system. The analyte concentrations were verified by our ISO 17025 accredited laboratory to be within ± 2.5%, when compared to calibration standards independently prepared using NIST SRM(s). The certified value and uncertainty value at the 95% confidence level for each analyte is determined gravimetrically.

Classical Wet Assay Method: Theoretical, based on gravimetric measurements

Confirmation by Inductively Coupled Plasma Spectroscopy (ICP / ICP-MS) vs. NIST SRM 3133

ULTRA uses purified acids, 18 megohm double deionized water, calibrated Class A glassware and cleaned bottles in the manufacture of ULTRAgrade standards. Balances used in the manufacture of this standard are calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z-540-1 and ISO 9001.

Trace Metallic Impurities in Solution Standard in µg/mL:

*	Al	<0.005	ND	*	Ga	<0.005	ND	n	Nb			n	S		
*	Sb	<0.005	ND	n	Ge			n	Os			n	Ta		
*	As	<0.005	ND	n	Au			*	Pd	<0.005	ND	n	Te		
*	Ba	<0.005	ND	n	Hf			*	P	<0.005	ND	n	Tb		
*	Be	<0.005	ND	n	Ho			*	Pt	<0.005	ND	*	Tl	<0.005	ND
*	Bi	<0.005	ND	*	In	<0.005	ND	*	K	<0.005	ND	n	Th		
*	B	<0.005	ND	n	Ir			n	Pr			n	Tm		
*	Cd	<0.005	ND	*	Fe	<0.005	ND	n	Re			*	Sn	<0.005	ND
*	Ca	<0.005	ND	*	La	<0.005	ND	n	Rh			*	Ti	<0.005	ND
n	Ce			*	Pb	<0.005	ND	n	Rb			n	W		
n	Cs			*	Li	<0.005	ND	n	Ru			n	U		
*	Cr	<0.005	ND	n	Lu			n	Sm			*	V	<0.005	ND
*	Co	<0.005	ND	*	Mg	<0.005	ND	n	Sc			n	Yb		
*	Cu	<0.005	ND	*	Mn	<0.005	ND	*	Se	<0.005	ND	n	Y		
n	Dy			s	Hg			*	Si	<0.005	ND	*	Zn	<0.005	ND
*	Er	<0.005	ND	*	Mo	<0.005	ND	*	Ag	<0.005	ND	n	Zr		
*	Eu	<0.005	ND	n	Nd			*	Na	<0.005	ND				
*	Gd	<0.005	ND	*	Ni	<0.005	ND	*	Sr	<0.005	ND				

* - element checked for
ND - not detected

i - spectral interference
D - detected

n - not checked for
s - solution standard element

Density of Solution (measured at 20.00°C ± 0.05°C): 1.0102 g/mL

ACCREDITED

ISO 17025:2005
Accredited
A2LA
Cert. No. 0851.01

ISO 9001:2000
Registered
TUV USA, Inc.
Cert. No. 06-1004

William J. Leary
Quality Assurance Manager

250 Smith Street, North Kingstown, RI 02852 USA
Ph: 401-294-9400 * Fax: 401-295-2330
www.ultrasci.com

Sample Name: x1998782@100 Acquired: 4/19/2013 14:50:02 Type: Unk
Method: 6500_026(v6) Mode: CONC Corr. Factor: 1.000000
User: bowenh Custom ID1: Custom ID2: Custom ID3:
Comment:

Elem	Ag3280	Al1670	As1890	B_2089	Ba4554	Be3130	Bi2230	Ca3179	Cd2288
Line	328.068 {103}	167.079 {502}	189.042 {478}	208.959 {461}	455.403 { 74}	313.042 {108}	223.061 {451}	317.933 {106}	228.802 {447}
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	**-.00012**	**-.00014**	**.00203**	**.00611**	**-.00002**	**.00001**	**-.00306**	**.03403**	**-.00007**
Stddev	.00019	.00032	.00075	.00063	.00104	.00009	.00097	.00170	.00001
%RSD	160.19	220.98	36.953	10.230	5652.9	1293.4	31.725	4.9896	7.3736
#1	.00002	-.00037	.00150	.00655	-.00075	-.00006	-.00374	.03283	-.00008
#2	-.00025	.00008	.00256	.00567	.00071	.00007	-.00237	.03523	-.00007
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit									
Low Limit									

Elem	Co2286	Cr2055	Cu3247	Fe2599	K_7664	Li6707	Mg2790	Mn2576	Mo2020
Line	228.616 {447}	205.552 {464}	324.754 {104}	259.940 {130}	766.490 { 44}	670.784 { 50}	279.079 {121}2	257.610 {131}	202.030 {467}
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	**-.00019**	**-.00002**	**.00020**	**.00021**	**.02742**	**.00182**	**.02179**	**.00002**	**.00382**
Stddev	.00015	.00009	.00023	.00695	.02699	.00010	.00030	.00003	.00038
%RSD	78.321	382.03	114.55	3342.6	98.426	5.3766	1.3944	125.94	9.8637
#1	-.00029	-.00008	.00004	.00512	.00834	.00175	.02200	.00004	.00356
#2	-.00008	.00004	.00036	-.00470	.04650	.00189	.02157	.00000	.00409
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit									
Low Limit									

Elem	Na5895	Ni2316	P_1782	Pb2203	S_1820	Sb2068	Se1960	Si2881	Sn1899
Line	589.592 { 57}	231.604 {446}	178.284 {489}	220.353 {453}	182.034 {485}	206.833 {463}	196.090 {472}	288.158 {117}	189.989 {477}
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	**.58901**	**.00219**	**.00196**	**.00078**	**.32890**	**.00268**	**.00755**	**.02412**	**.00068**
Stddev	.02305	.00011	.00145	.00121	.00049	.00054	.00155	.01988	.00043
%RSD	3.9127	5.2412	74.242	154.44	.14967	20.254	20.482	82.435	62.471
#1	.60531	.00227	.00299	.00163	.32855	.00306	.00646	.03818	.00038
#2	.57271	.00211	.00093	-.00007	.32925	.00230	.00865	.01006	.00099
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	None	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit									
Low Limit									

Elem	Sr4077	Th2837	Ti3349	Tl1908	U_3701	V_2924	Zn2062	Zr3391
Line	407.771 { 83}	283.730 {119}	334.904 {101}	190.856 {477}	370.152 { 91}	292.402 {115}	206.200 {163}	339.198 { 99}
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	**.00182**	**-.00014**	**.00021**	**W 10.657**	**-.01411**	**.00018**	**.00200**	**-.00115**
Stddev	.00022	.00135	.00010	.021	.01121	.00022	.00033	.00221
%RSD	12.276	959.47	47.090	.19426	79.433	117.98	16.554	191.90
#1	.00198	.00081	.00028	10.642	-.00619	.00034	.00223	.00041
#2	.00166	-.00109	.00014	10.671	-.02204	.00003	.00176	-.00271
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Warn	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit				5.0000				
Low Limit				-.01000				

Int. Std.	Y_2243	Y_3600	Y_3774
Line	224.306 {450}	360.073 { 94}	377.433 { 89}
Units	Cts/S	Cts/S	Cts/S
Avg	**6957.9**	**89083.**	**2528.7**
Stddev	30.1	67.	22.6
%RSD	.43232	.07553	.89254
#1	6979.2	89036.	2512.8
#2	6936.6	89131.	2544.7

HIGH-PURITY STANDARDS
www.highpuritystandards.com

P.O. Box 41727
Charleston, SC 29423
Phone (843) 767-7900
Fax (843) 767-7906

Certificate of Analysis

Product Description:

1998782
ID: ICP ISAB 1B_00005
Exp:04/11/14 Prpd:HEB Opn:04/18/13
ICP ICSAB STD 1 SOL B H

Name:	ICS-AB STD #1
Part Number:	**SM-606-037**
	Solution B
Lot Number:	**1309814**
Matrix:	2% HNO_3
Purity:	99.99%

Certified Values:

Element	(mg/L)	SRM ID	SRM Lot#
Tl	1000 ± 5	3158	993012

The Certified values are based on gravimetric and volumetric preparation, and verified against SRM 3100 series developed by National Institute of Standards and Technology (NIST) via inductively coupled plasma optical emission spectrometry (ICP-OES) using an internal laboratory developed method. The uncertainty in the certified value is calculated for a 95% confidence interval and coverage factor *k* is about 2
* Refer to Traceability Information, Section d

Preparation Information:

The standard is generally prepared from single element standard solutions that are ISO Guide 34 certified reference materials. Highest purity source materials were purchased from qualified vendors per ISO 9001:2008 guidelines and assayed by ICP-OES for conformity prior to use. Sub-boiling distilled high-purity acid has been used to place the materials in solution and to stabilize the standard. The matrix is as noted above in 18 megaohm deionized water.

Traceability Information:

The traceability of this standard is maintained through an unbroken chain of comparisons to appropriate standards with suitable procedure and measurement uncertainties. The maintenance of the base and derived units of International System of Units (SI) with traceability of measurement results (contemporary metrology) to SI ensures their comparability over time as follows.

a. **Standard Weight and Analytical Balance**
The standard weights (NBS weights Inventory No 20231A) are calibrated every two years by South Carolina Metrology Laboratory that is a participant in "NIST Weights and Measures Measurement Assurance Program" with a certificate of measurement traceability to NIST primary standards.
The balances are calibrated yearly by the ISO 17025 accredited metrology service, and are verified weekly by an in-house method using standard weights.

b. **Volumetric Device**
The calibration of volumetric vessels is checked annually using the NBS 602 method.

High-Purity Standards is certified to ISO 9001:2008 and accredited to ISO/IEC 17025:2005 and ISO Guide 34:2009.

c. **Thermometer**
The standard thermometers are calibrated every year by the ISO 17025 accredited metrology service. The thermometers used in-house are verified against the standard thermometers yearly.

d. **Calibration Standards**
The Calibration Standards are traceable to SRM 3100 Series Spectrometric Standard Solutions or second sources.

Packaging and Storage Conditions:

The standard is packaged in a pre-cleaned polyethylene bottle. To maintain the integrity of this product, the solution should be kept tightly capped and stored under normal laboratory conditions.

Refer to Material Safety Datasheet (MSDS) for hazardous information.

Expiration Information:

The expiry date is guaranteed to be valid for twelve months from the shipping date provided. For this reason, standards from the same lot may have different expiration dates.

Preparation Date:	**April 8, 2013**
Shipped Date:	**April 11, 2013**
Expiration Date:	**April 11, 2014**
Certificate Issue Date:	**April 8, 2013**

Quality Information:

ISO/IEC 17025:2005 Accreditation
Certificate Number AT-1529

Vanny T. Yib,
Inorganic Laboratory Manager

Angel Sellers
Quality Manager

Sample Name: x1998781@100 Acquired: 4/19/2013 14:47:39 Type: Unk
Method: 6500_026(v6) Mode: CONC Corr. Factor: 1.000000
User: bowenh Custom ID1: Custom ID2: Custom ID3:
Comment:

Elem	Ag3280	Al1670	As1890	B_2089	Ba4554	Be3130	Bi2230	Ca3179	Cd2288
Line	328.068 {103}	167.079 {502}	189.042 {478}	208.959 {461}	455.403 { 74}	313.042 {108}	223.061 {451}	317.933 {106}	228.802 {447}
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	.00050	-.00018	2.0213	1.9820	-.00027	-.00004	-.00036	.00378	.00212
Stddev	.00021	.00002	.0050	.0026	.00016	.00002	.00046	.00558	.00008
%RSD	42.547	10.801	.24923	.13026	60.883	68.305	127.63	147.68	3.9707
#1	.00035	-.00016	2.0177	1.9802	-.00038	-.00005	-.00003	.00773	.00218
#2	.00065	-.00019	2.0248	1.9838	-.00015	-.00002	-.00068	-.00017	.00206
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit									
Low Limit									

Elem	Co2286	Cr2055	Cu3247	Fe2599	K_7664	Li6707	Mg2790	Mn2576	Mo2020
Line	228.616 {447}	205.552 {464}	324.754 {104}	259.940 {130}	766.490 { 44}	670.784 { 50}	279.079 {121}2	257.610 {131}	202.030 {467}
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	.00031	-.00012	.00055	.00062	50.140	1.0051	.00119	-.00003	.99449
Stddev	.00018	.00005	.00012	.00006	.300	.0046	.00278	.00001	.00030
%RSD	56.468	38.328	21.536	10.444	.59750	.45364	233.37	48.274	.03006
#1	.00044	-.00009	.00063	.00066	50.352	1.0083	-.00077	-.00004	.99470
#2	.00019	-.00015	.00046	.00057	49.929	1.0018	.00315	-.00002	.99428
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit									
Low Limit									

Elem	Na8183	Ni2316	P_1782	Pb2203	S_1820	Sb2068	Se1960	Si2881	Sn1899
Line	818.326 { 41}	231.604 {446}	178.284 {489}	220.353 {453}	182.034 {485}	206.833 {463}	196.090 {472}	288.158 {117}	189.989 {477}
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	49.388	-.00043	1.9814	-.00014	-.00586	1.0058	W 5.1427	.04861	.00082
Stddev	.247	.00032	.0072	.00022	.00064	.0061	.0170	.00683	.00043
%RSD	.49916	74.349	.36452	164.60	10.969	.60361	.33085	14.061	52.391
#1	49.563	-.00066	1.9763	-.00029	-.00631	1.0015	5.1307	.04378	.00052
#2	49.214	-.00021	1.9865	.00002	-.00540	1.0101	5.1547	.05344	.00113
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	None	Chk Pass	Chk Warn	Chk Pass	Chk Pass
High Limit							5.0000		
Low Limit							-.00500		

Elem	Sr4077	Th2837	Ti3349	Tl1908	U_3701	V_2924	Zn2062	Zr3391
Line	407.771 { 83}	283.730 {119}	334.904 {101}	190.856 {477}	370.152 { 91}	292.402 {115}	206.200 {163}	339.198 { 99}
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	.99778	.00032	.00035	.00047	.00492	.00020	.00184	-.00337
Stddev	.00537	.00300	.00013	.00151	.04355	.00062	.00020	.00279
%RSD	.53792	925.63	36.823	322.19	884.33	300.82	11.134	82.869
#1	1.0016	-.00180	.00026	.00153	.03572	-.00023	.00169	-.00534
#2	.99398	.00244	.00044	-.00060	-.02587	.00064	.00198	-.00139
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit								
Low Limit								

Int. Std.	Y_2243	Y_3600	Y_3774
Line	224.306 {450}	360.073 { 94}	377.433 { 89}
Units	Cts/S	Cts/S	Cts/S
Avg	6890.2	88175.	2530.1
Stddev	5.0	426.	18.3
%RSD	.07239	.48318	.72516
#1	6886.7	87873.	2517.1
#2	6893.7	88476.	2543.1

HIGH-PURITY STANDARDS
www.highpuritystandards.com

P.O. Box 41727
Charleston, SC 29423
Phone (843) 767-7900
Fax (843) 767-7906

Certificate of Analysis

Product Description:

Name:	ICS-AB STD #1
Part Number:	**SM-606-037**
	Solution A
Lot Number:	**1309813**
Matrix:	20% HCl
Purity:	99.96% - 99.9999%

1998781
ID: ICP ISAB STD1_00005
Exp:04/11/14 Prpd:HEB Opn:04/18/13
ICAP ICSAB STD 1 SOL A

Certified Values:

Element	(mg/L)	SRM ID	SRM Lot#	Element	(mg/L)	SRM ID	SRM Lot#
Sb	100.0 ± 0.6	3102a	061229	P	200.0 ± 1.2	3139a	060717
As	200 ± 2	3103a	100818	K	5000 ± 25	3141a	051220
B	200.0 ± 1.2	3107	070514	Se	500 ± 5	3149	100901
Li	100.0 ± 0.6	3129a	100714	Na	5000 ± 25	3152a	010728
Mo	100.0 ± 0.6	3134	891307	Sr	100.0 ± 0.5	3153a	990906

The Certified values are based on gravimetric and volumetric preparation, and verified against SRM 3100 series developed by National Institute of Standards and Technology (NIST) via inductively coupled plasma optical emission spectrometry (ICP-OES) using an internal laboratory developed method. The uncertainty in the certified value is calculated for a 95% confidence interval and coverage factor *k* is about 2
* Refer to Traceability Information, Section d

Preparation Information:

The standard is generally prepared from single element standard solutions that are ISO Guide 34 certified reference materials. Highest purity source materials were purchased from qualified vendors per ISO 9001:2008 guidelines and assayed by ICP-OES for conformity prior to use. Sub-boiling distilled high-purity acid has been used to place the materials in solution and to stabilize the standard. The matrix is as noted above in 18 megaohm deionized water.

Traceability Information:

The traceability of this standard is maintained through an unbroken chain of comparisons to appropriate standards with suitable procedure and measurement uncertainties. The maintenance of the base and derived units of International System of Units (SI) with traceability of measurement results (contemporary metrology) to SI ensures their comparability over time as follows.

a. **Standard Weight and Analytical Balance**
The standard weights (NBS weights Inventory No 20231A) are calibrated every two years by South Carolina Metrology Laboratory that is a participant in "NIST Weights and Measures Measurement Assurance Program" with a certificate of measurement traceability to NIST primary standards.
The balances are calibrated yearly by the ISO 17025 accredited metrology service, and are verified weekly by an in-house method using standard weights.

High-Purity Standards is certified to ISO 9001:2008 and accredited to ISO/IEC 17025:2005 and ISO Guide 34:2009.

b. **Volumetric Device**
The calibration of volumetric vessels is checked annually using the NBS 602 method.

c. **Thermometer**
The standard thermometers are calibrated every year by the ISO 17025 accredited metrology service. The thermometers used in-house are verified against the standard thermometers yearly.

d. **Calibration Standards**
The Calibration Standards are traceable to SRM 3100 Series Spectrometric Standard Solutions or second sources.

Packaging and Storage Conditions:

The standard is packaged in a pre-cleaned polyethylene bottle. To maintain the integrity of this product, the solution should be kept tightly capped and stored under normal laboratory conditions.

Refer to Material Safety Datasheet (MSDS) for hazardous information.

Expiration Information:

The expiry date is guaranteed to be valid for twelve months from the shipping date provided. For this reason, standards from the same lot may have different expiration dates.

Preparation Date:	**April 8, 2013**
Shipped Date:	**April 11, 2013**
Expiration Date:	**April 11, 2014**
Certificate Issue Date:	**April 8, 2013**

Quality Information:

ISO/IEC 17025:2005 Accreditation
Certificate Number AT-1529

Vanny T. Yib,
Inorganic Laboratory Manager

Angel Sellers
Quality Manager

Sample Name: x1998783@100 Acquired: 4/19/2013 14:52:29 Type: Unk
Method: 6500_026(v6) Mode: CONC Corr. Factor: 1.000000
User: bowenh Custom ID1: Custom ID2: Custom ID3:
Comment:

Elem	Ag3280	Al1670	As1890	B_2089	Ba4554	Be3130	Bi2230	Ca3179	Cd2288
Line	328.068 {103}	167.079 {502}	189.042 {478}	208.959 {461}	455.403 { 74}	313.042 {108}	223.061 {451}	317.933 {106}	228.802 {447}
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	**-.00084**	**-.00030**	**.00215**	**.00404**	**-.00028**	**-.00016**	**-.00836**	**.00475**	**-.00015**
Stddev	.00098	.00009	.00071	.00020	.00046	.00005	.00033	.00142	.00017
%RSD	117.42	28.992	33.081	4.8702	163.50	30.928	3.9090	29.846	111.72
#1	-.00153	-.00036	.00265	.00417	.00004	-.00012	-.00813	.00575	-.00003
#2	-.00014	-.00024	.00164	.00390	-.00061	-.00019	-.00859	.00374	-.00027
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit									
Low Limit									

Elem	Co2286	Cr2055	Cu3247	Fe2599	K_7664	Li6707	Mg2790	Mn2576	Mo2020
Line	228.616 {447}	205.552 {464}	324.754 {104}	259.940 {130}	766.490 { 44}	670.784 { 50}	279.079 {121}2	257.610 {131}	202.030 {467}
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	**.00018**	**-.00012**	**.00033**	**-.00214**	**-.11983**	**.00221**	**-.00018**	**-.00002**	**.00010**
Stddev	.00008	.00005	.00004	.00379	.02555	.00064	.00164	.00001	.00009
%RSD	44.323	40.820	13.439	177.21	21.322	28.917	908.31	65.938	97.981
#1	.00012	-.00009	.00036	.00054	-.13790	.00266	-.00134	-.00003	.00003
#2	.00023	-.00016	.00030	-.00482	-.10176	.00176	.00098	-.00001	.00016
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit									
Low Limit									

Elem	Na5895	Ni2316	P_1782	Pb2203	S_1820	Sb2068	Se1960	Si2881	Sn1899
Line	589.592 { 57}	231.604 {446}	178.284 {489}	220.353 {453}	182.034 {485}	206.833 {463}	196.090 {472}	288.158 {117}	189.989 {477}
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	**-.08468**	**-.00009**	**.00175**	**.00019**	**-.00309**	**.00330**	**-.00225**	**.04270**	**9.7859**
Stddev	.01128	.00022	.00127	.00015	.00019	.00023	.00003	.00828	.0111
%RSD	13.327	254.50	72.709	81.343	6.1232	6.8292	1.3922	19.395	.11352
#1	-.09266	-.00024	.00264	.00008	-.00296	.00314	-.00227	.03684	9.7780
#2	-.07670	.00007	.00085	.00030	-.00322	.00346	-.00223	.04855	9.7937
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	None	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit									
Low Limit									

Elem	Sr4077	Th2837	Ti3349	Tl1908	U_3701	V_2924	Zn2062	Zr3391
Line	407.771 { 83}	283.730 {119}	334.904 {101}	190.856 {477}	370.152 { 91}	292.402 {115}	206.200 {163}	339.198 { 99}
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	**.00012**	**-.00145**	**.94066**	**.00593**	**.01310**	**.00021**	**.00133**	**-.00050**
Stddev	.00013	.00024	.00050	.00147	.02461	.00016	.00017	.00244
%RSD	106.31	16.205	.05296	24.815	187.92	77.147	12.620	488.20
#1	.00003	-.00162	.94102	.00489	.03050	.00009	.00121	.00123
#2	.00021	-.00129	.94031	.00697	-.00431	.00032	.00145	-.00223
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit								
Low Limit								

Int. Std.	Y_2243	Y_3600	Y_3774
Line	224.306 {450}	360.073 { 94}	377.433 { 89}
Units	Cts/S	Cts/S	Cts/S
Avg	**6872.4**	**88430.**	**2503.7**
Stddev	25.1	304.	8.4
%RSD	.36516	.34386	.33432
#1	6890.2	88215.	2497.8
#2	6854.7	88645.	2509.6

HIGH-PURITY STANDARDS
www.highpuritystandards.com

P.O. Box 41727
Charleston, SC 29423
Phone (843) 767-7900
Fax (843) 767-7906

Certificate of Analysis

1998783
ID: ICP ISAB STD2_00005
Exp:04/11/14 Prpd:HEB Opn:04/18/13
ICP ICSAB STD 2 HP

Product Description:

Name:	ICS-AB STD #2
Part Number:	**SM-606-038**
Lot Number:	**1309815**
Matrix:	20% HCl
Purity:	99.98% - 99.9999%

Certified Values:

Element	(mg/L)	SRM ID	SRM Lot#	Element	(mg/L)	SRM ID	SRM Lot#
Sn	1000 ± 6	3161a	070330	Ti	100.0 ± 0.6	3162a	060808

The Certified values are based on gravimetric and volumetric preparation, and verified against SRM 3100 series developed by National Institute of Standards and Technology (NIST) via inductively coupled plasma optical emission spectrometry (ICP-OES) using an internal laboratory developed method. The uncertainty in the certified value is calculated for a 95% confidence interval and coverage factor *k* is about 2
* Refer to Traceability Information, Section d

Preparation Information:

The standard is generally prepared from single element standard solutions that are ISO Guide 34 certified reference materials. Highest purity source materials were purchased from qualified vendors per ISO 9001:2008 guidelines and assayed by ICP-OES for conformity prior to use. Sub-boiling distilled high-purity acid has been used to place the materials in solution and to stabilize the standard. The matrix is as noted above in 18 megaohm deionized water.

Traceability Information:

The traceability of this standard is maintained through an unbroken chain of comparisons to appropriate standards with suitable procedure and measurement uncertainties. The maintenance of the base and derived units of International System of Units (SI) with traceability of measurement results (contemporary metrology) to SI ensures their comparability over time as follows.

a. **Standard Weight and Analytical Balance**
The standard weights (NBS weights Inventory No 20231A) are calibrated every two years by South Carolina Metrology Laboratory that is a participant in "NIST Weights and Measures Measurement Assurance Program" with a certificate of measurement traceability to NIST primary standards.
The balances are calibrated yearly by the ISO 17025 accredited metrology service, and are verified weekly by an in-house method using standard weights.

b. **Volumetric Device**
The calibration of volumetric vessels is checked annually using the NBS 602 method.

High-Purity Standards is certified to ISO 9001:2008 and accredited to ISO/IEC 17025:2005 and ISO Guide 34:2009.

c. **Thermometer**
The standard thermometers are calibrated every year by the ISO 17025 accredited metrology service. The thermometers used in-house are verified against the standard thermometers yearly.

d. **Calibration Standards**
The Calibration Standards are traceable to SRM 3100 Series Spectrometric Standard Solutions or second sources.

Packaging and Storage Conditions:

The standard is packaged in a pre-cleaned polyethylene bottle. To maintain the integrity of this product, the solution should be kept tightly capped and stored under normal laboratory conditions.

Refer to Material Safety Datasheet (MSDS) for hazardous information.

Expiration Information:

The expiry date is guaranteed to be valid for twelve months from the shipping date provided. For this reason, standards from the same lot may have different expiration dates.

Preparation Date:	**April 8, 2013**
Shipped Date:	**April 11, 2013**
Expiration Date:	**April 11, 2014**
Certificate Issue Date:	**April 8, 2013**

Quality Information:

ISO/IEC 17025:2005 Accreditation
Certificate Number AT-1529

Vanny T. Yib,
Inorganic Laboratory Manager

Angel Sellers
Quality Manager

Sample Name: 1477995@10 Acquired: 6/20/2012 13:53:19 Type: Unk
Method: 6500_026(v3) Mode: CONC Corr. Factor: 1.000000
User: bowenh Custom ID1: Custom ID2: Custom ID3:
Comment:

Elem	Ag3280	Al3092	As1890	B_2089	Ba4554	Be3130	Bi2230	Ca3179	Cd2288	Co2286
Line	328.068 {103}	309.271 {109}	189.042 {478}	208.959 {461}	455.403 { 74}	313.042 {108}	223.061 {451}	317.933 {106}	228.802 {447}	228.616 {447}
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	W **1.0127**	**10.116**	**.00544**	**9.9060**	**.48849**	**.09641**	**.00072**	**19.100**	**.51436**	**.49889**
Stddev	.0000	.113	.00223	.0135	.00270	.00007	.00200	.088	.00125	.00069
%RSD	.00071	1.1152	40.955	.13665	.55325	.07533	277.44	.46278	.24292	.13856
#1	1.0127	10.036	.00387	9.8965	.48658	.09636	-.00070	19.037	.51348	.49840
#2	1.0127	10.195	.00702	9.9156	.49040	.09646	.00214	19.162	.51525	.49938
Check ?	Chk Warn	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit	.10000									
Low Limit	-.01000									

Elem	Cr2055	Cu3247	Fe2599	K_7664	Li6707	Mg2790	Mn2576	Mo2020	Na8183	Ni2316
Line	205.552 {464}	324.754 {104}	259.940 {130}	766.490 { 44}	670.784 { 50}	279.079 {121}2	257.610 {131}	202.030 {467}	818.326 { 41}	231.604 {446}
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	**.98049**	**.98067**	**2.9032**	**97.694**	**.97921**	**19.188**	**.29718**	**.00113**	**101.44**	**.98679**
Stddev	.00101	.00010	.0036	.335	.00948	.006	.00014	.00013	.92	.00135
%RSD	.10253	.01028	.12293	.34295	.96794	.03372	.04613	11.397	.90278	.13694
#1	.98120	.98059	2.9007	97.457	.97251	19.183	.29709	.00123	100.79	.98584
#2	.97978	.98074	2.9057	97.931	.98592	19.192	.29728	.00104	102.08	.98775
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit										
Low Limit										

Elem	P_1782	Pb2203	S_1820	Sb2068	Se1960	Si2881	Sn1899	Sr4077	Th2837	Ti3349
Line	178.284 {489}	220.353 {453}	182.034 {485}	206.833 {463}	196.090 {472}	288.158 {117}	189.989 {477}	407.771 { 83}	283.730 {119}	334.904 {101}
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	F **95.046**	**-.00104**	**.00376**	**-.00315**	**-.00199**	**.08867**	**.00172**	**.48731**	**.99650**	**.00122**
Stddev	.025	.00033	.00526	.00034	.00510	.00143	.00107	.00114	.00010	.00030
%RSD	.02597	31.530	139.73	10.873	256.41	1.6108	62.150	.23475	.00980	24.176
#1	95.028	-.00127	.00004	-.00340	.00162	.08968	.00096	.48650	.99657	.00101
#2	95.063	-.00081	.00748	-.00291	-.00559	.08766	.00247	.48812	.99643	.00143
Check ?	Chk Fail	Chk Pass	None	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit	50.000									
Low Limit	-2.0000									

Elem	Tl1908	U_3701	V_2924	Zn2062	Zr3391
Line	190.856 {477}	370.152 { 91}	292.402 {115}	206.200 {163}	339.198 { 99}
Units	ppm	ppm	ppm	ppm	ppm
Avg	**.01052**	**6.2259**	**.99494**	**1.0085**	**-.00874**
Stddev	.00174	.0052	.00209	.0015	.00350
%RSD	16.569	.08379	.21030	.15374	40.012
#1	.01175	6.2296	.99346	1.0074	-.00627
#2	.00928	6.2223	.99642	1.0096	-.01122
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit					
Low Limit					

Int. Std.	Y_2243	Y_3600	Y_3774
Line	224.306 {450}	360.073 { 94}	377.433 { 89}
Units	Cts/S	Cts/S	Cts/S
Avg	**4138.6**	**57670.**	**2277.0**
Stddev	2.7	28.	3.6
%RSD	.06642	.04853	.15719
#1	4136.7	57690.	2279.6
#2	4140.5	57650.	2274.5

INORGANIC VENTURES™
300 Technology Drive
Christiansburg, VA 24073 • USA
inorganicventures.com

CERTIFICATE OF ANALYSIS

tel: 800.669.6799 • 540.585.3030
fax: 540.585.3012
info@inorganicventures.com

1.0 **INORGANIC VENTURES** is an ISO Guide 34 "General Requirements for the Competence of Reference Material Producers" and ISO 9001 registered manufacturer. Our manufacturing laboratory is accredited to ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories."

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 **DESCRIPTION OF CRM** Custom Solution

Catalog No.: STLDEN-RL-3A

Lot Number: **F2-MEB425130**

Matrix: 1.4% HNO3(v/v)

1477995
ID: ICP RL STD3A_00004
Exp. 01/01/13 Prod. Hist. Open 05/19/12
ICP RL STD 3A

1,000 µg/mL ea:
K, Na, P,

200 µg/mL ea:
Ca, Mg,

100 µg/mL ea:
Al, B,

60 µg/mL ea:
U,

30 µg/mL ea:
Fe,

10 µg/mL ea:
Ag, Cr3, Cu, Li, Ni, Th, V, Zn,

5 µg/mL ea:
Ba, Cd, Co, Sr,

3 µg/mL ea:
Mn,

1 µg/mL ea:
Be

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ELEMENT	CERTIFIED VALUE	ELEMENT	CERTIFIED VALUE	ELEMENT	CERTIFIED VALUE
Aluminum, Al	100.0 ± 0.8 µg/mL	Barium, Ba	5.003 ± 0.037 µg/mL	Beryllium, Be	1.000 ± 0.010 µg/mL
Boron, B	100.0 ± 0.7 µg/mL	Cadmium, Cd	5.003 ± 0.033 µg/mL	Calcium, Ca	200.0 ± 1.4 µg/mL
Chromium+3, Cr3	10.00 ± 0.06 µg/mL	Cobalt, Co	5.003 ± 0.033 µg/mL	Copper, Cu	10.00 ± 0.06 µg/mL
Iron, Fe	30.00 ± 0.19 µg/mL	Lithium, Li	10.00 ± 0.06 µg/mL	Magnesium, Mg	200.1 ± 1.3 µg/mL
Manganese, Mn	2.999 ± 0.020 µg/mL	Nickel, Ni	10.00 ± 0.06 µg/mL	Phosphorus, P	1,000 ± 7 µg/mL
Potassium, K	1,000 ± 7 µg/mL	Silver, Ag	10.00 ± 0.06 µg/mL	Sodium, Na	1,000 ± 7 µg/mL
Strontium, Sr	5.004 ± 0.033 µg/mL	Thorium, Th	10.00 ± 0.05 µg/mL	Uranium, U	59.99 ± 0.46 µg/mL
Vanadium, V	10.00 ± 0.06 µg/mL	Zinc, Zn	10.00 ± 0.06 µg/mL		

Certified Density: 1.018 g/mL (measured at 20 ± 1° C)

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.

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

$(\bar{x})$ = mean

x_i = individual results

n = number of measurements

Uncertainty $(\pm) = 2\,[\,\Sigma(s_i)^2\,]^{1/2}$

2 = the coverage factor.

$[\,\Sigma(s_i)^2\,]^{1/2}$ = The square root of the sum of the squares of the most common errors (where 's' stands for the standard deviation) from instrumental measurement, density, NIST SRM uncertainty, weighing, dilution to volume, homogeneity, long term stability and short term stability.

Certified Abundance: The 235U in this standard is depleted. The Certified abundances in Atom % are as follows:

IV's Certified Abundance

Isotope	Atom%
Uranium 238U	99.6 ± 0.1
235U	0.42 ± 0.05

4.0 TRACEBILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

· "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

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

4.1 ASSAY INFORMATION

ELEMENT	METHOD	NIST SRM#	SRM LOT#
Ag	ICP Assay	3151	992212
Al	ICP Assay	3101a	060502
B	ICP Assay	3107	070514
Ba	ICP Assay	3104a	070222
Be	ICP Assay	3105a	892707
Ca	EDTA	928	928
Cd	EDTA	928	928
Co	EDTA	928	928
Cr3	ICP Assay	3112a	030730
Cu	EDTA	928	928
Fe	EDTA	928	928
K	ICP Assay	3141a	051220
Li	ICP Assay	3129a	000505
Mg	EDTA	928	928
Mn	EDTA	928	928
Na	ICP Assay	3152a	010728
Ni	EDTA	928	928
P	Acidimetric	84L	84L
Sr	EDTA	928	928
Th	EDTA	928	928
U	ICP Assay	3164	891509
V	EDTA	928	928
Zn	EDTA	928	928

ELEMENT	METHOD	NIST SRM#	SRM LOT#
Ag	Volhard	999b	999b
Al	EDTA	928	928
Ba	Gravimetric		See Sec. 4.2
Be	Calculated		See Sec. 4.2
Ca	ICP Assay	3109a	050825
Cd	ICP Assay	3108	060531
Co	ICP Assay	3113	00630
Cr3	Calculated		See Sec. 4.2
Cu	ICP Assay	3114	011017
Fe	ICP Assay	3126a	051031
K	Gravimetric		See Sec. 4.2
Li	Gravimetric		See Sec. 4.2
Mg	ICP Assay	3131a	050302
Mn	ICP Assay	3132	050429
Na	Gravimetric		See Sec. 4.2
Ni	ICP Assay	3136	000612
P	ICP Assay	3139a	060717
Sr	ICP Assay	3153a	990906
Th	ICP Assay	3159	992912
U	Calculated		See Sec. 4.2
V	ICP Assay	3165	992706
Zn	ICP Assay	3168a	080123

4.2 BALANCE CALIBRATION - All analytical balances are calibrated yearly by an A2LA accredited calibration laboratory and are traceable to a class E 2 analytical weight set with NIST Traceability. All balances are checked daily using an in-house procedure. The weights used for testing are annually compared to master weights and are traceable to the National Institute of Standards and Technology (NIST).

4.3 THERMOMETER CALIBRATION - All thermometers are NIST traceable through thermometers that are calibrated by an A2LA accredited calibration laboratory.

4.4 GLASSWARE CALIBRATION - An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM's.

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

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
HPLC, IC, TLC, ISE, IR, NMR, UV/VIS, MS, Capillary Electrophoresis, Potentiometry, Wet Chemistry and Voltammetry
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact Technical Staff

This CRM was manufactured using 18 megohm doubly deionized water that has been filtered through a 0.2 micron filter.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep **Tightly** sealed when not in use. Store and use at 20 ± 4°C. **Do Not** pipette from the container. **Do Not** return portions removed from pipetting to container.

Element Specific Information - For specific information regarding any element: Contact technical staff.

Uranium Note: If uranium is present in this standard, it is natural abundance unless specified in Section 3.0.

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 enclosed Material Safety Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous.

Inorganic Ventures homogeneity data indicate that the end user should take a minimum sample size of 0.2mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration
- QMI File Number 010105

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration"
- Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 "General Requirements for the Competence of Reference Material Producers"
- Reference Materials Production - Accredited A2LA Certificate Number 883.02

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission
- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission
- Reporting Defects and Non-Compliance

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies of chemically-stable solutions performed at the manufacturer's facility show a CRM shelf-life of twenty one months for solutions packaged in 125-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Manufacturer concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

11.3 Chemical Stability - Studies have been conducted on this or similar CRMs and it has been demonstrated that this CRM is chemically stable for a period of not less than two years provided the "Storage & Handling" conditions are followed that are described in section 7.0.

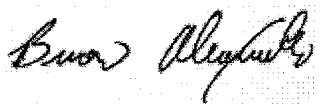
Certification Date: June 13, 2012

Expiration Date: EXPIRES 01 2013

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Donna Senn
Product Documentation Technician

Certificate Approved By: Brian Alexander
PhD., Quality Control Supervisor



Certifying Officer: Paul Gaines
PhD., Senior Technical Director

Sample Name: 1477979 Acquired: 6/20/2012 13:48:19 Type: Unk
Method: 6500_026(v3) Mode: CONC Corr. Factor: 1.000000
User: bowenh Custom ID1: Custom ID2: Custom ID3:
Comment:

Elem	Ag3280	Al1670	As1890	B_2089	Ba4554	Be3130	Bi2230	Ca3179	Cd2288	Co2286
Line	328.068 {103}	167.079 {502}	189.042 {478}	208.959 {461}	455.403 { 74}	313.042 {108}	223.061 {451}	317.933 {106}	228.802 {447}	228.616 {447}
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	**.00050**	**-.00091**	**9.8195**	**.00429**	**-.00054**	**.00005**	**.00391**	**-.00281**	**.01989**	**.00004**
Stddev	.00032	.00012	.0281	.00080	.00009	.00005	.00360	.00415	.00023	.00014
%RSD	64.089	13.382	.28633	18.741	17.089	108.18	92.015	147.64	1.1408	351.48
#1	.00028	-.00083	9.7996	.00372	-.00048	.00009	.00645	-.00574	.01973	.00014
#2	.00073	-.00100	9.8394	.00485	-.00061	.00001	.00137	.00012	.02005	-.00006
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit										
Low Limit										

Elem	Cr2055	Cu3247	Fe2599	K_7664	Li6707	Mg2790	Mn2576	Mo2020	Na5895	Ni2316
Line	205.552 {464}	324.754 {104}	259.940 {130}	766.490 { 44}	670.784 { 50}	279.079 {121}2	257.610 {131}	202.030 {467}	589.592 { 57}	231.604 {446}
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	**-.00057**	**-.00007**	**-.00515**	**-.01000**	**.00104**	**.01051**	**.00054**	**-.00043**	**.08006**	**.00170**
Stddev	.00004	.00013	.00535	.04051	.00202	.00041	.00001	.00016	.00949	.00036
%RSD	7.7955	176.90	103.94	404.89	194.40	3.9034	1.3039	36.741	11.853	20.895
#1	-.00060	-.00017	-.00137	.01864	-.00039	.01080	.00055	-.00032	.08677	.00145
#2	-.00054	.00002	-.00894	-.03865	.00247	.01022	.00054	-.00054	.07335	.00196
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit										
Low Limit										

Elem	P_1782	Pb2203	S_1820	Sb2068	Se1960	Si2881	Sn1899	Sr4077	Th2837	Ti3349
Line	178.284 {489}	220.353 {453}	182.034 {485}	206.833 {463}	196.090 {472}	288.158 {117}	189.989 {477}	407.771 { 83}	283.730 {119}	334.904 {101}
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	**-.00082**	**3.1646**	**.01489**	W **10.118**	W **10.106**	**.03634**	**.00039**	**.00025**	**.00060**	**-.00025**
Stddev	.00092	.0001	.00099	.026	.033	.00664	.00071	.00014	.00225	.00023
%RSD	111.81	.00177	6.6199	.25699	.33022	18.269	179.98	55.838	375.76	89.846
#1	-.00017	3.1646	.01558	10.099	10.083	.03165	-.00011	.00015	.00219	-.00042
#2	-.00147	3.1646	.01419	10.136	10.130	.04104	.00090	.00034	-.00099	-.00009
Check ?	Chk Pass	Chk Pass	None	Chk Warn	Chk Warn	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit				2.0000	5.0000					
Low Limit				-.01000	-.00500					

Elem	Tl1908	U_3701	V_2924	Zn2062	Zr3391
Line	190.856 {477}	370.152 { 91}	292.402 {115}	206.200 {163}	339.198 { 99}
Units	ppm	ppm	ppm	ppm	ppm
Avg	W **10.938**	**-.02560**	**.00043**	**.00149**	**-.00037**
Stddev	.006	.02227	.00059	.00010	.00141
%RSD	.05538	86.969	137.18	6.6225	381.60
#1	10.934	-.04135	.00085	.00142	.00063
#2	10.943	-.00986	.00001	.00156	-.00137
Check ?	Chk Warn	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit	5.0000				
Low Limit	-.01000				

Int. Std.	Y_2243	Y_3600	Y_3774
Line	224.306 {450}	360.073 { 94}	377.433 { 89}
Units	Cts/S	Cts/S	Cts/S
Avg	**4404.3**	**61935.**	**2341.0**
Stddev	9.7	164.	2.1
%RSD	.22089	.26462	.08965
#1	4411.2	62051.	2342.5
#2	4397.4	61819.	2339.5

INORGANIC VENTURES™
300 Technology Drive
Christiansburg, VA 24073 • USA
inorganicventures.com
tel: 800.669.6799 • 540.585.3030
fax: 540.585.3012
info@inorganicventures.com

CERTIFICATE OF ANALYSIS

1.0 **INORGANIC VENTURES** is an ISO Guide 34 "General Requirements for the Competence of Reference Material Producers" and ISO 9001 registered manufacturer. Our manufacturing laboratory is accredited to ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories."

ACCREDITED Testing Laboratory Certificate 883.01
ACCREDITED Reference Material Producer Certificate 883.02

2.0 **DESCRIPTION OF CRM**

	Custom Solution
Catalog No.:	STLDEN-RL-1A
Lot Number:	**E2-MEB381083**
Matrix:	tr. HF, 2% HNO3(v/v)

1477979
ID: ICP RLSTD 1A_00005
ICP RL STD 1A

10 mg/L ea:
As, Sb, Se, Tl,

3 mg/L ea:
Pb

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

ELEMENT	CERTIFIED VALUE	ELEMENT	CERTIFIED VALUE	ELEMENT	CERTIFIED VALUE
Antimony, Sb	**10.00 ± 0.05 mg/L**	**Arsenic, As**	**10.00 ± 0.04 mg/L**	**Lead, Pb**	**3.004 ± 0.007 mg/L**
Selenium, Se	**10.00 ± 0.04 mg/L**	**Thallium, Tl**	**10.00 ± 0.04 mg/L**		

Certified Density: 1.011 g/mL (measured at 20 ± 1° C)

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.

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors (Most common are the errors from instrumental measurement, weighing, dilution to volume and the fixed error reported on the NIST SRM certificate of analysis)

4.0 **TRACEBILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

· "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)
· This product is Traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRMs are available, the term 'in-house std.' is specified.

4.1 ASSAY INFORMATION

ELEMENT	METHOD	NIST SRM#	SRM LOT#
As	Calculated		See Sec. 4.2
Pb	ICP Assay	3128	030721
Sb	Calculated		See Sec. 4.2
Se	Calculated		See Sec. 4.2
Tl	Calculated		See Sec. 4.2

ELEMENT	METHOD	NIST SRM#	SRM LOT#
As	ICP Assay	3103a	010713
Pb	EDTA	928	928
Sb	ICP Assay	3102A	061229
Se	ICP Assay	3149	992106
Tl	ICP Assay	3158	993012

4.2 **BALANCE CALIBRATION** - All analytical balances are calibrated yearly by an A2LA accredited calibration laboratory and are traceable to a class E 2 analytical weight set with NIST Traceability. All balances are checked daily using an in-house procedure. The weights used for testing are annually compared to master weights and are traceable to the National Institute of Standards and Technology (NIST).

4.3 **THERMOMETER CALIBRATION** - All thermometers are NIST traceable through thermometers that are calibrated by an A2LA accredited calibration laboratory.

4.4 **GLASSWARE CALIBRATION** - An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM's.

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

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
HPLC, IC, TLC, ISE, IR, NMR, UV/VIS, MS, Capillary Electrophoresis, Potentiometry, Wet Chemistry and Voltammetry
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact Technical Staff

This CRM was manufactured using 18 megohm doubly deionized water that has been filtered through a 0.2 micron filter.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep **Tightly** sealed when not in use. Store and use at 20 ± 4°C. **Do Not** pipette from the container. **Do Not** return portions removed from pipetting to container.

Element Specific Information - For specific information regarding any element: Contact technical staff.

Uranium Note: If uranium is present in this standard, it is natural abundance unless specified in Section 3.0.

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

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Safety Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 **ISO 9001 Quality Management System Registration**
- QMI File Number 010105

10.2 **ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration"**
- Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 **ISO/IEC Guide 34 "General Requirements for the Competence of Reference Material Producers"**
- Reference Materials Production - Accredited A2LA Certificate Number 883.02

10.4 **10CFR50 Appendix B - Nuclear Regulatory Commission**
- Domestic Licensing of Production and Utilization Facilities

10.5 **10CFR21 - Nuclear Regulatory Commission**
- Reporting Defects and Non-Compliance

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies of chemically-stable solutions performed at the manufacturer's facility show a CRM shelf-life of twenty one months for solutions packaged in 125-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Manufacturer concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

11.3 Chemical Stability - Studies have been conducted on this or similar CRMs and it has been demonstrated that this CRM is chemically stable for a period of not less than two years provided the "Storage & Handling" conditions are followed that are described in section 7.0.

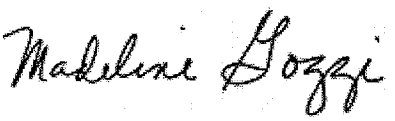
Certification Date: June 22, 2011

Expiration Date: EXPIRES 01 JUL 2013

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Danny Feeny
Product Documentation Technician

Certificate Approved By: Madeline Gozzi
Quality Control Supervisor



Certifying Officer: Paul Gaines
PhD., Senior Technical Director

INORGANIC™ VENTURES
300 Technology Drive
Christiansburg, VA 24073 · USA
inorganicventures.com
tel: 800.669.6799 · 540.585.3030
fax: 540.585.3012
info@inorganicventures.com

CERTIFICATE OF ANALYSIS

1.0 **INORGANIC VENTURES** is an ISO Guide 34 "General Requirements for the Competence of Reference Material Producers" and ISO 9001 registered manufacturer. Our manufacturing laboratory is accredited to ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories."

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 **DESCRIPTION OF CRM** **Custom Solution**

Catalog No.: STLDEN-SPK-2A

Lot Number: **G2-MEB455133**

Matrix: 3% HNO3(v/v), 0.5% HF(v/v)

2007016
ID: ICP SPK 2A_00059
Exp:05/01/14 Prpd:HEB Opn:04/23/13
ICP PREP SPIKE 2A IV

1,000 µg/mL ea:
Si,

200 µg/mL ea:
Sn,

100 µg/mL ea:
B, Mo, Ti,

50 µg/mL ea:
Sb, Zr

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

ELEMENT	CERTIFIED VALUE	ELEMENT	CERTIFIED VALUE	ELEMENT	CERTIFIED VALUE
Antimony, Sb	50.00 ± 0.38 µg/mL	Boron, B	100.0 ± 0.7 µg/mL	Molybdenum, Mo	100.0 ± 0.7 µg/mL
Silicon, Si	1,000 ± 7 µg/mL	Tin, Sn	200.0 ± 1.4 µg/mL	Titanium, Ti	100.0 ± 0.7 µg/mL
Zirconium, Zr	50.00 ± 0.33 µg/mL				

Certified Density: 1.021 g/mL (measured at 20 ± 1° C)

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.

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

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

$$\text{Uncertainty } (\pm) = 2\,[\,\Sigma(s_i)^2\,]^{1/2}$$

2 = the coverage factor.
$[\,\Sigma(s_i)^2\,]^{1/2}$ = The square root of the sum of the squares of the most common errors (where 's' stands for the standard deviation) from instrumental measurement, density, NIST SRM uncertainty, weighing, dilution to volume, homogeneity, long term stability and short term stability.

4.0 TRACEBILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

· "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

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

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a NIST SRM/RM. See section 4.2 for balance traceability.

4.1 ASSAY INFORMATION

ELEMENT	METHOD	NIST SRM#	SRM LOT#
B	ICP Assay	3107	070514
Mo	Calculated		See Sec. 4.2
Mo	ICP Assay	3134	891307
Sb	Calculated		See Sec. 4.2
Sb	ICP Assay	3102A	061229
Si	Calculated		See Sec. 4.2
Si	ICP Assay	3150	071204
Sn	Calculated		See Sec. 4.2
Sn	ICP Assay	3161a	070330
Ti	ICP Assay	3162a	060808
Zr	Calculated		See Sec. 4.2
Zr	ICP Assay	3169	071226

4.2 BALANCE CALIBRATION - All analytical balances are calibrated yearly by an accredited calibration laboratory and are traceable to a class E 2 analytical weight set with NIST Traceability. All balances are checked daily using an in-house procedure. The weights used for testing are annually compared to master weights and are traceable to the National Institute of Standards and Technology (NIST).

4.3 THERMOMETER CALIBRATION - All thermometers are NIST traceable through thermometers that are calibrated by an A2LA accredited calibration laboratory.

4.4 GLASSWARE CALIBRATION - An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM's.

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

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
HPLC, IC, TLC, ISE, IR, NMR, UV/VIS, MS, Capillary Electrophoresis, Potentiometry, Wet Chemistry and Voltammetry
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact Technical Staff

This CRM was manufactured using 18 megohm doubly deionized water that has been filtered through a 0.2 micron filter.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep **Tightly** sealed when not in use. Store and use at 20 ± 4°C. **Do Not** pipette from the container. **Do Not** return portions removed from pipetting to container.

Element Specific Information - For specific information regarding any element: Contact technical staff.

Uranium Note: If uranium is present in this standard, it is natural abundance unless specified in Section 3.0.

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

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Safety Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous.

Inorganic Ventures homogeneity data indicate that the end user should take a minimum sample size of 0.2mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration
- SAI Global File Number 010105

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration"
- Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 "General Requirements for the Competence of Reference Material Producers"
- Reference Materials Production - Accredited A2LA Certificate Number 883.02

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission
- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission
- Reporting Defects and Non-Compliance

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies of chemically-stable solutions performed at the manufacturer's facility show a CRM shelf-life of twenty one months for solutions packaged in 125-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Manufacturer concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

11.3 Chemical Stability - Studies have been conducted on this or similar CRMs and it has been demonstrated that this CRM is chemically stable for a period of not less than two years provided the "Storage & Handling" conditions are followed that are described in section 7.0.

Certification Date: January 14, 2013

Expiration Date: EXPIRES 01 JAN 2014

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Donna Senn
Product Documentation Technician

Certificate Approved By: Brian Alexander
PhD., Technical Process Director

Certifying Officer: Paul Gaines
PhD., Senior Technical Director

INORGANIC VENTURES™
300 Technology Drive
Christiansburg, VA 24073 · USA
inorganicventures.com

CERTIFICATE OF ANALYSIS

tel: 800.669.6799 · 540.585.3030
fax: 540.585.3012
info@inorganicventures.com

1.0 **INORGANIC VENTURES** is an ISO Guide 34 "General Requirements for the Competence of Reference Material Producers" and ISO 9001 registered manufacturer. Our manufacturing laboratory is accredited to ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories."

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 **DESCRIPTION OF CRM** **Custom Solution**

Catalog No.: STLDEN-SPK-3A

Lot Number: **G2-MEB465153**

Matrix: 3% HNO3(v/v)

2007019
ID: ICP SPK 3A_00061
Exp:05/01/14 Prpd:HEB Opn:04/23/13
ICP PREP SPIKE 3A IV

5,000 µg/mL ea:
Ca, K, Mg, Na,

1,000 µg/mL ea:
P,

200 µg/mL ea:
Al, Ba, Bi, Se, Tl, U,

100 µg/mL ea:
As, Fe, Li, Sr, Th,

50 µg/mL ea:
Co, Mn, Ni, Pb, V, Zn,

25 µg/mL ea:
Cu,

20 µg/mL ea:
Cr3,

10 µg/mL ea:
Cd,

5 µg/mL ea:
Ag, Be

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ELEMENT	CERTIFIED VALUE	ELEMENT	CERTIFIED VALUE	ELEMENT	CERTIFIED VALUE
Aluminum, Al	200.1 ± 1.3 µg/mL	Arsenic, As	100.0 ± 0.7 µg/mL	Barium, Ba	200.0 ± 1.3 µg/mL
Beryllium, Be	5.004 ± 0.034 µg/mL	Bismuth, Bi	200.0 ± 1.3 µg/mL	Cadmium, Cd	10.00 ± 0.07 µg/mL
Calcium, Ca	5,000 ± 35 µg/mL	Chromium+3, Cr3	20.02 ± 0.13 µg/mL	Cobalt, Co	49.99 ± 0.33 µg/mL
Copper, Cu	24.98 ± 0.17 µg/mL	Iron, Fe	100.0 ± 0.6 µg/mL	Lead, Pb	49.99 ± 0.33 µg/mL
Lithium, Li	100.0 ± 0.7 µg/mL	Magnesium, Mg	5,000 ± 33 µg/mL	Manganese, Mn	50.02 ± 0.32 µg/mL
Nickel, Ni	49.99 ± 0.33 µg/mL	Phosphorus, P	1,000 ± 7 µg/mL	Potassium, K	5,000 ± 37 µg/mL
Selenium, Se	200.0 ± 1.3 µg/mL	Silver, Ag	4.996 ± 0.032 µg/mL	Sodium, Na	5,000 ± 34 µg/mL
Strontium, Sr	100.1 ± 0.6 µg/mL	Thallium, Tl	200.0 ± 1.3 µg/mL	Thorium, Th	100.0 ± 0.7 µg/mL
Uranium, U	200.0 ± 1.4 µg/mL	Vanadium, V	49.98 ± 0.35 µg/mL	Zinc, Zn	50.04 ± 0.33 µg/mL

Certified Density: 1.083 g/mL (measured at 20 ° C)

05/29/2013

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.

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

Uncertainty $(\pm) = 2\,[\,\Sigma(s_i)^2\,]^{1/2}$

($\bar{x}$) = mean

x_i = individual results

n = number of measurements

2 = the coverage factor.

$[\,\Sigma(s_i)^2\,]^{1/2}$ = The square root of the sum of the squares of the most common errors (where 's' stands for the standard deviation) from instrumental measurement, density, NIST SRM uncertainty, weighing, dilution to volume, homogeneity, long term stability and short term stability.

Certified Abundance: The 235U in this standard is depleted. The Certified abundances in Atom % are as follows:

IV's Certified Abundance

Isotope		Atom%
Uranium	238U	99.6 ± 0.1
	235U	0.42 ± 0.05

4.0 TRACEBILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

· "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

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

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a NIST SRM/RM. See section 4.2 for balance traceability.

ELEMENT	METHOD	NIST SRM#	SRM LOT#
Ag	ICP Assay	3151	992212
Ag	Volhard	999b	999b
Al	ICP Assay	3101a	060502
Al	EDTA	928	928
As	Calculated		See Sec. 4.2
As	ICP Assay	3103a	010713
Ba	Gravimetric		See Sec. 4.2
Ba	ICP Assay	3104a	070222
Be	Calculated		See Sec. 4.2
Be	ICP Assay	3105a	892707
Bi	Calculated		See Sec. 4.2
Bi	ICP Assay	3106	991212
Ca	ICP Assay	3109a	050825
Ca	EDTA	928	928
Cd	ICP Assay	3108	060531
Cd	EDTA	928	928
Co	ICP Assay	3113	00630
Co	EDTA	928	928
Cr3	Calculated		See Sec. 4.2
Cr3	ICP Assay	3112a	030730
Cu	ICP Assay	3114	011017
Cu	EDTA	928	928
Fe	ICP Assay	3126a	051031
Fe	EDTA	928	928
K	Gravimetric		See Sec. 4.2
K	ICP Assay	3141a	051220
Li	Gravimetric		See Sec. 4.2
Li	ICP Assay	3129a	100714
Mg	ICP Assay	3131a	050302
Mg	EDTA	928	928
Mn	ICP Assay	3132	050429
Mn	EDTA	928	928
Na	Gravimetric		See Sec. 4.2
Na	ICP Assay	3152a	010728
Ni	ICP Assay	3136	000612
Ni	EDTA	928	928
P	ICP Assay	3139a	060717
P	Acidimetric	84L	84L
Pb	ICP Assay	3128	101026
Pb	EDTA	928	928
Se	Calculated		See Sec. 4.2
Se	ICP Assay	3149	992106
Sr	ICP Assay	3153a	990906
Sr	EDTA	928	928
Th	ICP Assay	3159	992912

Th	EDTA	928	928
Tl	Calculated		See Sec. 4.2
Tl	ICP Assay	3158	993012
U	Calculated		See Sec. 4.2
U	ICP Assay	3164	891509
V	ICP Assay	3165	992706
V	EDTA	928	928
Zn	ICP Assay	3168a	080123
Zn	EDTA	928	928

4.2 BALANCE CALIBRATION - All analytical balances are calibrated yearly by an accredited calibration laboratory and are traceable to a class E 2 analytical weight set with NIST Traceability. All balances are checked daily using an in-house procedure. The weights used for testing are annually compared to master weights and are traceable to the National Institute of Standards and Technology (NIST).

4.3 THERMOMETER CALIBRATION - All thermometers are NIST traceable through thermometers that are calibrated by an A2LA accredited calibration laboratory.

4.4 GLASSWARE CALIBRATION - An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM's.

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

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
HPLC, IC, TLC, ISE, IR, NMR, UV/VIS, MS, Capillary Electrophoresis, Potentiometry, Wet Chemistry and Voltammetry
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact Technical Staff

This CRM was manufactured using 18 megohm doubly deionized water that has been filtered through a 0.2 micron filter.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep **Tightly** sealed when not in use. Store and use at 20 ± 4°C. **Do Not** pipette from the container. **Do Not** return portions removed from pipetting to container.

Element Specific Information - For specific information regarding any element: Contact technical staff.

Uranium Note: If uranium is present in this standard, it is natural abundance unless specified in Section 3.0.

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 enclosed Material Safety Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous.

Inorganic Ventures homogeneity data indicate that the end user should take a minimum sample size of 0.2mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration
- SAI Global File Number 010105

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration"
- Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 "General Requirements for the Competence of Reference Material Producers"
- Reference Materials Production - Accredited A2LA Certificate Number 883.02

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission
- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission
- Reporting Defects and Non-Compliance

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies of chemically-stable solutions performed at the manufacturer's facility show a CRM shelf-life of twenty one months for solutions packaged in 125-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Manufacturer concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

11.3 Chemical Stability - Studies have been conducted on this or similar CRMs and it has been demonstrated that this CRM is chemically stable for a period of not less than two years provided the "Storage & Handling" conditions are followed that are described in section 7.0.

Certification Date: March 20, 2013

Expiration Date: EXPIRES 01 MAY 2014

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Zach Saunders
Product Documentation Technician

Certificate Approved By: Brian Alexander
PhD., Technical Process Director

Certifying Officer: Paul Gaines
PhD., Senior Technical Director

Sample Name: X1806909@100 Acquired: 12/26/2012 17:05:36 Type: Unk
Method: 6500_025(v35) Mode: CONC Corr. Factor: 1.000000
User: ltrudell Custom ID1: Custom ID2: Custom ID3:
Comment:

Elem	Ag3280	Al3092	As1890	B_2089	Ba4554
Line	328.068 {103}	309.271 {109}	189.042 {478}	208.959 {461}	455.403 { 74}
Units	ppm	ppm	ppm	ppm	ppm
Avg	-.00020	50.198	.00238	.00083	.00082
Stddev	.00146	.349	.00004	.00025	.00023
%RSD	721.07	.69445	1.6852	30.761	28.467
#1	-.00124	49.952	.00235	.00065	.00065
#2	.00083	50.445	.00241	.00101	.00098
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit					
Low Limit					

Elem	Be3130	Bi2230	Ca3179	Cd2288	Co2286
Line	313.042 {108}	223.061 {451}	317.933 {106}	228.802 {447}	228.616 {447}
Units	ppm	ppm	ppm	ppm	ppm
Avg	-.00013	-.00170	45.642	.00055	-.00010
Stddev	.00007	.00105	.429	.00001	.00019
%RSD	50.899	61.437	.93890	1.7547	195.18
#1	-.00018	-.00096	45.339	.00056	-.00024
#2	-.00008	-.00244	45.945	.00054	.00004
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit					
Low Limit					

Elem	Cr2055	Cu3247	Fe2599	K_7664	Li6707
Line	205.552 {464}	324.754 {104}	259.940 {130}	766.490 { 44}	670.784 { 50}
Units	ppm	ppm	ppm	ppm	ppm
Avg	.00034	-.00269	17.743	.00869	.00236
Stddev	.00027	.00001	.158	.03518	.00216
%RSD	80.058	.48589	.89263	404.87	91.408
#1	.00053	-.00268	17.631	-.01619	.00083
#2	.00015	-.00270	17.855	.03356	.00389
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit					
Low Limit					

Sample Name: X1806909@100 Acquired: 12/26/2012 17:05:36 Type: Unk
Method: 6500_025(v35) Mode: CONC Corr. Factor: 1.000000
User: ltrudell Custom ID1: Custom ID2: Custom ID3:
Comment:

Elem	Mg2790	Mn2576	Mo2020	Na5895	Ni2316
Line	279.079 {121}2	257.610 {131}	202.030 {467}	589.592 { 57}	231.604 {446}
Units	ppm	ppm	ppm	ppm	ppm
Avg	45.420	.00003	-.00009	.25839	-.00037
Stddev	.075	.00006	.00023	.01146	.00012
%RSD	.16413	226.75	253.04	4.4355	32.513
#1	45.367	.00007	.00007	.26650	-.00028
#2	45.472	-.00002	-.00025	.25029	-.00045
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit					
Low Limit					

Elem	P_1782	Pb2203	S_1820	Sb2068	Se1960
Line	178.284 {489}	220.353 {453}	182.034 {485}	206.833 {463}	196.090 {472}
Units	ppm	ppm	ppm	ppm	ppm
Avg	-.00811	.00068	.01262	.00101	-.00197
Stddev	.00044	.00051	.00212	.00185	.00836
%RSD	5.4414	75.013	16.780	183.51	424.60
#1	-.00780	.00105	.01411	-.00030	-.00788
#2	-.00843	.00032	.01112	.00231	.00394
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit					
Low Limit					

Elem	Si2881	SiO2	Sn1899	Sr4077	Th2837
Line	288.158 {117}	288.158 {117}2	189.989 {477}	407.771 { 83}	283.730 {119}
Units	ppm	ppm	ppm	ppm	ppm
Avg	.00549	.01175	-.00022	.00025	.00177
Stddev	.00029	.00061	.00058	.00018	.00011
%RSD	5.2308	5.2308	261.14	74.000	6.1527
#1	.00570	.01219	.00019	.00038	.00185
#2	.00529	.01132	-.00063	.00012	.00170
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit					
Low Limit					

Sample Name: X1806909@100 Acquired: 12/26/2012 17:05:36 Type: Unk
Method: 6500_025(v35) Mode: CONC Corr. Factor: 1.000000
User: ltrudell Custom ID1: Custom ID2: Custom ID3:
Comment:

Elem	Ti3349	Tl1908	U_3701	V_2924	Zn2062
Line	334.904 {101}	190.856 {477}	370.152 { 91}	292.402 {115}	206.200 {163}
Units	ppm	ppm	ppm	ppm	ppm
Avg	-.00059	-.00036	.02290	.00100	.00132
Stddev	.00002	.00040	.01322	.00020	.00030
%RSD	2.9784	110.90	57.744	19.621	22.478
#1	-.00060	-.00008	.03225	.00086	.00153
#2	-.00057	-.00065	.01355	.00113	.00111
Check ?	Chk Pass	Chk Pass	Chk Pass	Chk Pass	Chk Pass
High Limit					
Low Limit					

Elem	Zr3391
Line	339.198 { 99}
Units	ppm
Avg	-.00242
Stddev	.00289
%RSD	119.80
#1	-.00037
#2	-.00446
Check ?	Chk Pass
High Limit	
Low Limit	

Int. Std.	Y_2243	Y_3600	Y_3774
Line	224.306 {450}	360.073 { 94}	377.433 { 89}
Units	Cts/S	Cts/S	Cts/S
Avg	6106.6	62134.	4937.4
Stddev	26.8	494.	13.9
%RSD	.43837	.79436	.28174
#1	6087.7	62483.	4947.2
#2	6125.6	61785.	4927.5

INORGANIC VENTURES™
300 Technology Drive
Christiansburg, VA 24073 • USA
inorganicventures.com
tel: 800.669.6799 • 540.585.3030
fax: 540.585.3012
info@inorganicventures.com

CERTIFICATE OF ANALYSIS

1.0 **INORGANIC VENTURES** is an ISO Guide 34 "General Requirements for the Competence of Reference Material Producers" and ISO 9001 registered manufacturer. Our manufacturing laboratory is accredited to ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories."

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 **DESCRIPTION OF CRM** Stock Solution

Catalog No.: CLPP-ICS-A

Lot Number: **F2-MEB414132**

Matrix: 2% HNO3(v/v)

1809609
ID: Icp stk ICSA_00007
Exp:01/01/14 Prpd:HEB Opn:12/19/12
ICP stock ICSA solution

5,000 µg/mL ea:
Al, Ca, Mg,

2,000 µg/mL ea:
Fe

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ELEMENT	CERTIFIED VALUE	ELEMENT	CERTIFIED VALUE	ELEMENT	CERTIFIED VALUE
Aluminum, Al	5,000 ± 35 µg/mL	Calcium, Ca	5,000 ± 32 µg/mL	Iron, Fe	2,000 ± 10 µg/mL
Magnesium, Mg	5,000 ± 33 µg/mL				

Certified Density: 1.085 g/mL (measured at 20 ± 1° C)

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.

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

$$\text{Uncertainty } (\pm) = 2\,[\,\Sigma(s_i)^2\,]^{1/2}$$

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements
2 = the coverage factor.
$[\,\Sigma(s_i)^2\,]^{1/2}$ = The square root of the sum of the squares of the most common errors (where 's' stands for the standard deviation) from instrumental measurement, density, NIST SRM uncertainty, weighing, dilution to volume, homogeneity, long term stability and short term stability.

4.0 TRACEBILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

· "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

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

4.1 ASSAY INFORMATION

ELEMENT	METHOD	NIST SRM#	SRM LOT#	ELEMENT	METHOD	NIST SRM#	SRM LOT#
Al	ICP Assay	3101a	060502	Al	EDTA	928	928
Ca	ICP Assay	3109a	050825	Ca	EDTA	928	928
Fe	ICP Assay	3126a	051031	Fe	EDTA	928	928
Mg	ICP Assay	3131a	050302	Mg	EDTA	928	928

4.2 BALANCE CALIBRATION - All analytical balances are calibrated yearly by an A2LA accredited calibration laboratory and are traceable to a class E 2 analytical weight set with NIST Traceability. All balances are checked daily using an in-house procedure. The weights used for testing are annually compared to master weights and are traceable to the National Institute of Standards and Technology (NIST).

4.3 THERMOMETER CALIBRATION - All thermometers are NIST traceable through thermometers that are calibrated by an A2LA accredited calibration laboratory.

4.4 GLASSWARE CALIBRATION - An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM's.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

s	Al		M	Dy	< 0.006003	O	Li	0.016000	M	Pr	< 0.000300	M	Te	< 0.030013
M	Sb	< 0.000500	M	Er	< 0.005002	M	Lu	< 0.000400	M	Re	< 0.001000	M	Tb	< 0.000300
M	As	< 0.010004	M	Eu	< 0.003001	s	Mg		M	Rh	< 0.001000	M	Tl	< 0.001000
O	Ba	< 0.000300	M	Gd	< 0.001000	O	Mn	< 0.000030	M	Rb	< 0.001000	M	Th	< 0.001000
O	Be	< 0.000600	M	Ga	< 0.001000	O	Hg	< 0.015000	M	Ru	< 0.002001	M	Tm	< 0.000400
M	Bi	0.007003	i	Ge		M	Mo	< 0.002001	M	Sm	< 0.001000	M	Sn	< 0.005002
O	B	< 0.000600	O	Au	< 0.003000	M	Nd	< 0.002001	O	Sc	< 0.000023	O	Ti	< 0.001300
M	Cd	< 0.003001	M	Hf	< 0.002001	O	Ni	< 0.002300	O	Se	< 0.050000	M	W	< 0.010004
s	Ca		M	Ho	< 0.000500	M	Nb	< 0.000500	O	Si	< 0.003400	M	U	< 0.002001
O	Ce	< 0.006000	M	In	< 0.010004	n	Os		O	Ag	< 0.006700	O	V	< 0.002700
M	Cs	< 0.000300	M	Ir	< 0.005002	M	Pd	< 0.005002	O	Na	0.020000	M	Yb	< 0.001000
O	Cr	< 0.001500	s	Fe		O	P	< 0.002500	O	Sr	0.017000	O	Y	< 0.000700
O	Co	< 0.001200	M	La	< 0.000500	M	Pt	< 0.002001	O	S	< 0.025000	M	Zn	0.090040
O	Cu	< 0.003000	M	Pb	0.012005	O	K	< 0.005000	M	Ta	< 0.007003	M	Zr	< 0.005002

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
HPLC, IC, TLC, ISE, IR, NMR, UV/VIS, MS, Capillary Electrophoresis, Potentiometry, Wet Chemistry and Voltammetry
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact Technical Staff

This CRM was manufactured using 18 megohm doubly deionized water that has been filtered through a 0.2 micron filter.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep **Tightly** sealed when not in use. Store and use at 20 ± 4ºC. **Do Not** pipette from the container. **Do Not** return portions removed from pipetting to container.

Element Specific Information - For specific information regarding any element: Contact technical staff.

Uranium Note: If uranium is present in this standard, it is natural abundance unless specified in Section 3.0.

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Safety Data sheet for information regarding this CRM.

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration
- QMI File Number 010105

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration"
- Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 "General Requirements for the Competence of Reference Material Producers"
- Reference Materials Production - Accredited A2LA Certificate Number 883.02

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission
- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission
- Reporting Defects and Non-Compliance

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies of chemically-stable solutions performed at the manufacturer's facility show a CRM shelf-life of twenty one months for solutions packaged in 125-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Manufacturer concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

11.3 Chemical Stability - Studies have been conducted on this or similar CRMs and it has been demonstrated that this CRM is chemically stable for a period of not less than two years provided the "Storage & Handling" conditions are followed that are described in section 7.0.

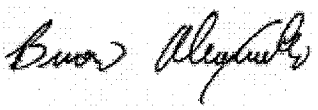
Certification Date: May 03, 2012

Expiration Date: EXPIRES 01 JAN 2014

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Stephan Blaakman
Product Documentation Technician

Certificate Approved By: Brian Alexander
PhD., Quality Control Supervisor



Certifying Officer: Paul Gaines
PhD., Senior Technical Director

Fisher Scientific
1 Reagent Lane
Fairlawn, NJ 07410
201.796.7100 tel
201.796.1329 fax

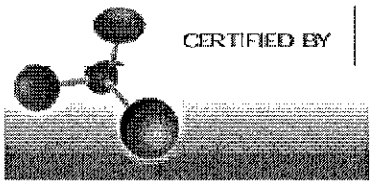
Certificate of Analysis

Fisher Scientific's Quality System has been found to conform to Quality Management System Standard ISO9001:2000 standard by DNV Certificate number CERT-08052-2006-AQ-HOU-ANAB

This is to certify that units of the above mentioned lot number were tested and found to comply with the specifications of the grade listed. Certain data have been supplied by third parties. Fisher Scientific expressly disclaims all warranties, expressed or implied, including the implied warranties of merchantability and fitness for a particular purpose. Certain products (USP/FCC/NF/EP/BP/JP grades) are sold for use in food, drug, or medical device manufacturing. Fisher does not claim regulatory coverage under 21 CFR nor maintain DMF's with the FDA. The following are the actual analytical results obtained:

Catalog Number	**L65**	**Mfg. Date**	**10/13/2008**
Lot Number	083960		
Description	**LEAD CHROMATE ACS**		
Country of Origin	**India**		

Result name	Units	Specifications	Test Value
APPEARANCE		REPORT	Orange powder
ASSAY	%	>= 98.0	98.3
CARBON COMPOUNDS	%	<= 0.01	0.006
IDENTIFICATION	PASS/FAIL	= PASS TEST	PASS TEST
SOLUBLE MATTER	%	<= 0.15	0.01



Edgar E. Hau

Lab Manager Fairlawn

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

RESTEK

110 Benner Circle
Bellefonte, PA 16823-8812
Tel: (800)356-1688
Fax: (814)353-1309

www.Restek.com

ACCREDITED
ISO Guide 34 Accredited
Reference Material Producer
Certificate #3222.01

ilac-MRA

ACCREDITED
ISO/IEC 17025 Accredited
Testing Laboratory
Certificate #3222.02

Certificate of Analysis

FOR LABORATORY USE ONLY-READ MSDS PRIOR TO USE.

This Reference Material is intended for Laboratory Use Only as a standard for the qualitative and/or quantitative determination of the analyte(s) listed.

Catalog No. : 31834 **Lot No.:** A089639

Description : Benzidine Mix

Benzidine 2000µg/mL, Methylene Chloride, 1mL/ampul

Container Size : 2 mL **Pkg Amt:** > 1 mL

Expiration Date : February 2017 **Storage:** 10°C or colder

CERTIFIED VALUES

Elution Order	Compound	Grav. Conc. (weight/volume)	Expanded Uncertainty (95% C.L.; K=2)		
1	Benzidine	2,000.0 µg/mL	+/- 11.7371	µg/mL	Gravimetric
	CAS # 92-87-5		+/- 43.8488	µg/mL	Unstressed
	Purity 99%		+/- 43.8488	µg/mL	Stressed
2	3,3'-Dichlorobenzidine	2,000.0 µg/mL	+/- 11.7371	µg/mL	Gravimetric
	CAS # 91-94-1		+/- 43.8488	µg/mL	Unstressed
	Purity 99%		+/- 43.8488	µg/mL	Stressed

Solvent: Methylene Chloride (MEOH FREE)
CAS # 75-09-2
Purity 99%

RESTEK
110 Benner Circle
Bellefonte, PA 16823-8812
Tel: (800)356-1688
Fax: (814)353-1309
www.Restek.com

ACCREDITED
ISO Guide 34 Accredited
Reference Material Producer
Certificate #3222.01

ACCREDITED
ISO/IEC 17025 Accredited
Testing Laboratory
Certificate #3222.02

Certificate of Analysis

FOR LABORATORY USE ONLY-READ MSDS PRIOR TO USE.

This Reference Material is intended for Laboratory Use Only as a standard for the qualitative and/or quantitative determination of the analyte(s) listed.

Catalog No. : 31850 **Lot No.:** A090321

Description : 8270 MegaMix

8270 Mega Mix 500-1000ug/mL, Methylene Chloride, 1mL/ampul

Container Size : 2 mL **Pkg Amt:** > 1 mL

Expiration Date : February 2014 **Storage:** 0°C or colder

Handling: Sonication required. Mix is photosensitive.

CERTIFIED VALUES

Elution Order	Compound	Grav. Conc. (weight/volume)	Expanded Uncertainty (95% C.L.; K=2)		
1	Pyridine	1,000.0 µg/mL	+/- 6.3027	µg/mL	Gravimetric
	CAS # 110-86-1		+/- 22.0446	µg/mL	Unstressed
	Purity 99%		+/- 22.0446	µg/mL	Stressed
2	N-Nitrosodimethylamine	1,000.0 µg/mL	+/- 6.3028	µg/mL	Gravimetric
	CAS # 62-75-9		+/- 22.0452	µg/mL	Unstressed
	Purity 98%		+/- 22.0452	µg/mL	Stressed
3	Aniline	1,000.0 µg/mL	+/- 6.3027	µg/mL	Gravimetric
	CAS # 62-53-3		+/- 22.0446	µg/mL	Unstressed
	Purity 99%		+/- 22.0446	µg/mL	Stressed
4	Phenol	1,000.0 µg/mL	+/- 6.3027	µg/mL	Gravimetric
	CAS # 108-95-2		+/- 22.0446	µg/mL	Unstressed
	Purity 99%		+/- 22.0446	µg/mL	Stressed
5	Bis(2-chloroethyl)ether	1,000.0 µg/mL	+/- 6.3027	µg/mL	Gravimetric
	CAS # 111-44-4		+/- 22.0446	µg/mL	Unstressed
	Purity 99%		+/- 22.0446	µg/mL	Stressed
6	2-Chlorophenol	1,000.0 µg/mL	+/- 6.3027	µg/mL	Gravimetric
	CAS # 95-57-8		+/- 22.0446	µg/mL	Unstressed
	Purity 99%		+/- 22.0446	µg/mL	Stressed
7	1,3-Dichlorobenzene	1,000.0 µg/mL	+/- 6.3027	µg/mL	Gravimetric
	CAS # 541-73-1		+/- 22.0446	µg/mL	Unstressed
	Purity 99%		+/- 22.0446	µg/mL	Stressed
8	1,4-Dichlorobenzene	1,000.0 µg/mL	+/- 6.3027	µg/mL	Gravimetric
	CAS # 106-46-7		+/- 22.0446	µg/mL	Unstressed
	Purity 99%		+/- 22.0446	µg/mL	Stressed
9	1,2-Dichlorobenzene	1,000.0 µg/mL	+/- 6.3027	µg/mL	Gravimetric
	CAS # 95-50-1		+/- 22.0446	µg/mL	Unstressed
	Purity 99%		+/- 22.0446	µg/mL	Stressed

10	Benzyl alcohol	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 100-51-6			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
11	Bis(2-chloroisopropyl)ether	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 108-60-1			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
12	2-Methylphenol (o-cresol)	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 95-48-7			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
13	Hexachloroethane	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 67-72-1			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
14	N-Nitroso-di-n-propylamine	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 621-64-7			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
15	4-Methylphenol (p-cresol)	500.0	µg/mL	+/-	3.1575	µg/mL	Gravimetric
	CAS # 106-44-5			+/-	11.0241	µg/mL	Unstressed
	Purity 99%			+/-	11.0241	µg/mL	Stressed
16	3-Methylphenol (m-cresol)	500.0	µg/mL	+/-	3.1575	µg/mL	Gravimetric
	CAS # 108-39-4			+/-	11.0241	µg/mL	Unstressed
	Purity 99%			+/-	11.0241	µg/mL	Stressed
17	Nitrobenzene	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 98-95-3			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
18	Isophorone	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 78-59-1			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
19	2-Nitrophenol	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 88-75-5			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
20	2,4-Dimethylphenol	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 105-67-9			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
21	Bis(2-chloroethoxy)methane	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 111-91-1			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
22	2,4-Dichlorophenol	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 120-83-2			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
23	1,2,4-Trichlorobenzene	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 120-82-1			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
24	Naphthalene	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 91-20-3			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
25	4-Chloroaniline	1,000.0	µg/mL	+/-	6.3028	µg/mL	Gravimetric
	CAS # 106-47-8			+/-	22.0452	µg/mL	Unstressed
	Purity 98%			+/-	22.0452	µg/mL	Stressed
26	Hexachlorobutadiene	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 87-68-3			+/-	22.0448	µg/mL	Unstressed
	Purity 97%			+/-	22.0448	µg/mL	Stressed
27	2-Methylnaphthalene	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 91-57-6			+/-	22.0448	µg/mL	Unstressed
	Purity 97%			+/-	22.0448	µg/mL	Stressed
28	4-Chloro-3-methylphenol	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 59-50-7			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed

29	1-Methylnaphthalene	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 90-12-0			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
30	Hexachlorocyclopentadiene	1,000.0	µg/mL	+/-	6.3025	µg/mL	Gravimetric
	CAS # 77-47-4			+/-	22.0439	µg/mL	Unstressed
	Purity 98%			+/-	22.0439	µg/mL	Stressed
31	2,4,6-Trichlorophenol	1,000.0	µg/mL	+/-	6.3028	µg/mL	Gravimetric
	CAS # 88-06-2			+/-	22.0452	µg/mL	Unstressed
	Purity 98%			+/-	22.0452	µg/mL	Stressed
32	2,4,5-Trichlorophenol	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 95-95-4			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
33	2-Chloronaphthalene	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 91-58-7			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
34	2-Nitroaniline	1,000.0	µg/mL	+/-	5.8141	µg/mL	Gravimetric
	CAS # 88-74-4			+/-	21.9099	µg/mL	Unstressed
	Purity 99%			+/-	21.9099	µg/mL	Stressed
35	1,4-Dinitrobenzene	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 100-25-4			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
36	Acenaphthylene	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 208-96-8			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
37	1,3-Dinitrobenzene	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 99-65-0			+/-	22.0448	µg/mL	Unstressed
	Purity 97%			+/-	22.0448	µg/mL	Stressed
38	Dimethylphthalate	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 131-11-3			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
39	2,6-Dinitrotoluene	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 606-20-2			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
40	1,2-Dinitrobenzene	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 528-29-0			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
41	Acenaphthene	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 83-32-9			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
42	3-Nitroaniline	1,000.0	µg/mL	+/-	5.8139	µg/mL	Gravimetric
	CAS # 99-09-2			+/-	21.9093	µg/mL	Unstressed
	Purity 97%			+/-	21.9093	µg/mL	Stressed
43	2,4-Dinitrophenol	1,000.0	µg/mL	+/-	6.3028	µg/mL	Gravimetric
	CAS # 51-28-5			+/-	22.0452	µg/mL	Unstressed
	Purity 98%			+/-	22.0452	µg/mL	Stressed
44	Dibenzofuran	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 132-64-9			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
45	2,4-Dinitrotoluene	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 121-14-2			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
46	4-Nitrophenol	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 100-02-7			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
47	2,3,4,6-Tetrachlorophenol	1,000.0	µg/mL	+/-	5.8141	µg/mL	Gravimetric
	CAS # 58-90-2			+/-	21.9099	µg/mL	Unstressed
	Purity 99%			+/-	21.9099	µg/mL	Stressed

48	2,3,5,6-Tetrachlorophenol	1,000.0	µg/mL	+/-	5.8141	µg/mL	Gravimetric
	CAS # 935-95-5			+/-	21.9099	µg/mL	Unstressed
	Purity 99%			+/-	21.9099	µg/mL	Stressed
49	Fluorene	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 86-73-7			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
50	4-Chlorophenyl phenyl ether	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 7005-72-3			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
51	Diethylphthalate	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 84-66-2			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
52	4-Nitroaniline	1,000.0	µg/mL	+/-	5.8141	µg/mL	Gravimetric
	CAS # 100-01-6			+/-	21.9099	µg/mL	Unstressed
	Purity 99%			+/-	21.9099	µg/mL	Stressed
53	4,6-Dinitro-2-methylphenol (Dinitro-o-cresol)	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 534-52-1			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
54	Diphenylamine	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 122-39-4			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
55	Azobenzene	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 103-33-3			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
56	4-Bromophenyl phenyl ether	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 101-55-3			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
57	Hexachlorobenzene	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 118-74-1			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
58	Pentachlorophenol	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 87-86-5			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
59	Phenanthrene	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 85-01-8			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
60	Anthracene	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 120-12-7			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
61	Carbazole	1,000.0	µg/mL	+/-	6.3028	µg/mL	Gravimetric
	CAS # 86-74-8			+/-	22.0452	µg/mL	Unstressed
	Purity 98%			+/-	22.0452	µg/mL	Stressed
62	Di-n-butylphthalate	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 84-74-2			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
63	Fluoranthene	1,000.0	µg/mL	+/-	6.3028	µg/mL	Gravimetric
	CAS # 206-44-0			+/-	22.0452	µg/mL	Unstressed
	Purity 98%			+/-	22.0452	µg/mL	Stressed
64	Pyrene	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 129-00-0			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
65	Benzyl butyl phthalate	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 85-68-7			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
66	Bis(2-ethylhexyl)adipate	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 103-23-1			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed

67	Benz(a)anthracene	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 56-55-3			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
68	Chrysene	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 218-01-9			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
69	Bis(2-ethylhexyl)phthalate	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 117-81-7			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
70	Di-n-octyl phthalate	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 117-84-0			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
71	Benzo(b)fluoranthene	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 205-99-2			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
72	Benzo(k)fluoranthene	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 207-08-9			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
73	Benzo(a)pyrene	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 50-32-8			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
74	Indeno(1,2,3-cd)pyrene	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 193-39-5			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
75	Dibenz(a,h)anthracene	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 53-70-3			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed
76	Benzo(g,h,i)perylene	1,000.0	µg/mL	+/-	6.3027	µg/mL	Gravimetric
	CAS # 191-24-2			+/-	22.0446	µg/mL	Unstressed
	Purity 99%			+/-	22.0446	µg/mL	Stressed

Solvent: Methylene Chloride (MEOH FREE)
CAS # 75-09-2
Purity 99%

Specific Reference Material Notes:

Product Notice

8270 MegaMix™, cat. #31850

The presence of benzene or other high boiling solvents can lead to low response,poor peak shape, or lack of resolution by gas chromatography of certain early
eluting semivolatile organic compounds at low concentrations. These compounds include pyridine, N-nitrosodimethylamine, 1,4-dioxane, 2-picoline, and N-nitrosomethylethylamine.
Therefore, we have discontinued the use of methylene chloride:benzene (75:25) as the solvent for this analytical reference material and replaced it with 100% methylene chloride to ensure superior performance.

If you have any questions, please do not hesitate to contact our technical service department at 800-356-1688 or 814-353-1300 ext.4.

Restek Corporation
110 Benner Circle, Bellefonte, PA16823
phone: (800) 356-1688 or (814) 353-1300
fax: (814) 353-1309; www.restekcorp.com

Tech Tips:

N-Nitrosodiphenylamine is prone to breakdown in the injection port and will be converted to diphenylamine.
N-Nitrosodiphenylamine is also a reactive species that can initiate premature decomposition of other compounds in the mix. For these reasons diphenylamine is used in the preparation of this mixture. When comparing the response of this compound to mixtures manufactured using N-nitrosodiphenylamine, a difference in response will be observed.

Column:
30m x .25mm x .25um
Rtx-5 (cat.#10223)

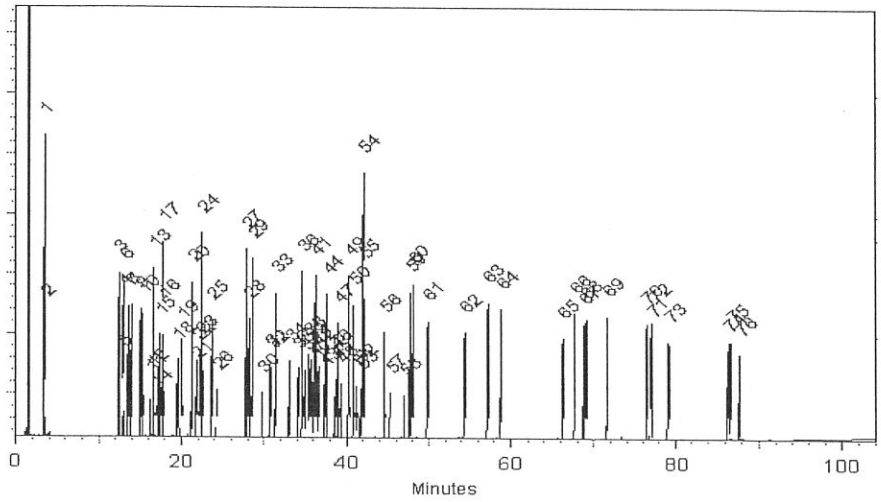
Carrier Gas:
hydrogen-constant pressure 10 psi

Temp. Program:
35°C (hold 3 min.) to 330°C
@ 3°C/min. (hold 3 min.)

Inj. Temp:
250°C

Det. Temp:
300°C

Det. Type:
FID



Jennifer L. Pollino - QC Analyst

Date Passed: 24-Aug-2012 **Balance:** 1128342313

Manufactured under Restek's ISO 9001:2008
Registered Quality System
Certificate #FM 80397

RESTEK

110 Benner Circle
Bellefonte, PA 16823-8812
Tel: (800)356-1688
Fax: (814)353-1309

www.restek.com

ACCREDITED
ISO Guide 34 Accredited
Reference Material Producer
Certificate #3222.01

ilac-MRA

ACCREDITED
ISO/IEC 17025 Accredited
Testing Laboratory
Certificate #3222.02

Certificate of Analysis

FOR LABORATORY USE ONLY-READ MSDS PRIOR TO USE.

This Reference Material is intended for Laboratory Use Only as a standard for the qualitative and/or quantitative determination of the analyte(s) listed.

Catalog No. : 31853 **Lot No.:** A090818

Description : 1,4-dioxane

1, 4-Dioxane 2000µg/mL, Methylene Chloride, 1mL/ampul

Container Size : 2 mL **Pkg Amt:** > 1 mL

Expiration Date : September 2017 **Storage:** 0°C or colder

CERTIFIED VALUES

Elution Order	Compound	Grav. Conc. (weight/volume)	Expanded Uncertainty (95% C.L.; K=2)		
1	1,4-Dioxane	2,000.0 µg/mL	+/- 11.7371	µg/mL	Gravimetric
	CAS # 123-91-1		+/- 44.2818	µg/mL	Unstressed
	Purity 99%		+/- 44.4621	µg/mL	Stressed

Solvent: Methylene Chloride (MEOH FREE)
CAS # 75-09-2
Purity 99%

RESTEK

110 Benner Circle
Bellefonte, PA 16823-8812
Tel: (800)356-1688
Fax: (814)353-1309

www.Restek.com

Certificate of Analysis

ACCREDITED
Reference Material Producer
Certificate #3222.03

ilac-MRA

ACCREDITED
Testing Laboratory
Certificate #3222.02

FOR LABORATORY USE ONLY-READ MSDS PRIOR TO USE.

This Reference Material is intended for Laboratory Use Only as a standard for the qualitative and/or quantitative determination of the analyte(s) listed.

Catalog No. : 31879 **Lot No.:** A089097

Description : Benzoic Acid Mix

Benzoic Acid 2000ug/mL, Methylene Chloride, 1mL/ampul

Container Size : 2 mL **Pkg Amt:** > 1 mL

Expiration Date : June 2016 **Storage:** 10°C or colder

CERTIFIED VALUES

Elution Order	Compound	Grav. Conc. (weight/volume)	Expanded Uncertainty (95% C.L.; K=2)		
1	Benzoic acid	2,000.0 ug/mL	+/- 11.7371	ug/mL	Gravimetric
	CAS # 65-85-0		+/- 53.2038	ug/mL	Unstressed
	Purity 99%		+/- 65.3807	ug/mL	Stressed

Solvent: Methylene Chloride
CAS # 75-09-2
Purity 99%

Certificate of Analysis

DESCRIPTION: 1-Methylnaphthalene

CATALOG NO.: 48162 MFG DATE: Oct-2010

LOT NO.: LB79536 EXPIRATION DATE: Oct-2013

SOLVENT: METHANOL

ANALYTE	CAS NUMBER	PERCENT PURITY(1)	WEIGHT(2) CONCENTRATION	ANALYTICAL(3) CONCENTRATION		STD DEV	SUPELCO LOT NO
1-METHYLNAPHTHALENE	90-12-0	99.6	2002	2000	+/-	6.5	LB65657

(1) Determined by capillary GC-FID, unless otherwise noted.

(2) NIST traceable weights are used to verify balance calibration with the preparation of each lot. Concentration of analyte in solution is ug/ml +/- 0.5%, uncertainty based upon balance and Class A volumetric glassware. Weights are corrected for analytes less than 98% pure.

(3) Determined by chromatographic analysis against an independently prepared reference lot. Mean of replicate injections.

Elwood Doughty
Quality Control Supervisor

SUPELCO Analytical
595 North Harrison Road
Bellefonte, PA 16823-0048 USA
Phone (814) 359-3441

Certificate of Analysis

DESCRIPTION: CLP Semivolatiles Calibration Mix

CATALOG NO.: 506508 MFG DATE: Feb-2012
LOT NO.: LB90140 EXPIRATION DATE: Feb-2015

SOLVENT: METHYLENE CHLORIDE:BENZENE 3:1

ANALYTE (1)	CAS NUMBER	PERCENT PURITY(2)	WEIGHT(3) CONCENTRATION	ANALYTICAL(4)	STD DEV	SUPELCO LOT NO
ACENAPHTHENE	83-32-9	99.9	1000	957	+/- 58.8	LB82590
ACENAPHTHYLENE	208-96-8	99.9	1000	966	+/- 22.3	LB84923
ANTHRACENE	120-12-7	99.5	1000	963	+/- 26.3	LB77576
AZOBENZENE	103-33-3	99.9	1000	980	+/- 159.6	LB83060
BENZO (A) ANTHRACENE	56-55-3	99.4 (a)	1000	998	+/- 48.8	LB78146
BENZO (A) PYRENE	50-32-8	99.9 (a)	1000	987	+/- 8.4	LB79478
BENZO (B) FLUORANTHENE	205-99-2	99.9	1000	1024	+/- 46.1	LB77269
BENZO (G,H,I) PERYLENE	191-24-2	99.6	1000	995	+/- 25.5	LB62550
BENZO (K) FLUORANTHENE	207-08-9	99.9	1000	984	+/- 51.0	LB84765
BENZYL BUTYL PHTHALATE	85-68-7	98.6	1000	991	+/- 107.2	LB60340
BIS (2-CHLOROETHOXY) METHANE	111-91-1	98.5	1000	964	+/- 45.5	LB71304
BIS (2-CHLOROETHYL) ETHER	111-44-4	99.9	1000	959	+/- 81.4	LB33319
BIS (2-CHLOROISOPROPYL) ETHER	108-60-1	97.4	1000	953	+/- 48.9	LB84548
BIS (2-ETHYLHEXYL) PHTHALATE	117-81-7	99.7	1000	978	+/- 122.4	LB58359
CARBAZOLE	86-74-8	99.9	1000	995	+/- 24.7	LB60643
CHRYSENE	218-01-9	98.4	1000	960	+/- 34.6	LB85109
DI-N-BUTYL PHTHALATE	84-74-2	99.5	1000	985	+/- 84.1	LB64921
DI-N-OCTYL PHTHALATE	117-84-0	99.9	1000	973	+/- 129.8	LB83131
DIBENZ (A,H) ANTHRACENE	53-70-3	99.9	1000	1025	+/- 50.8	LB87229

(1) Listed in alphabetical order.

(2) Determined by capillary GC-FID, unless otherwise noted.
a) HPLC UV-254NM

(3) NIST traceable weights are used to verify balance calibration with the preparation of each lot. Concentration of analyte in solution is ug/ml +/- 0.5%, uncertainty based upon balance and Class A volumetric glassware. Weights are corrected for analytes less than 98% pure.

(4) Determined by chromatographic analysis against an independently prepared reference lot. Mean of replicate injections.

Elwood Doughty
Quality Control Supervisor

SUPELCO Analytical
595 North Harrison Road
Bellefonte, PA 16823-0048 USA
Phone (814) 359-3441