ENVIRONMENTAL STANDARDS

Setting the Standards for Innovative Environmental Solutions

QUALITY ASSURANCE REVIEW

OF THE OU-4B AND OU-5 SOIL SAMPLES

COLLECTED ON NOVEMBER 25 AND DECEMBER 3, 2019

AT THE ANACONDA COPPER MINE SITE

IN YERINGTON, NEVADA

February 25, 2020

Prepared for:

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1.0 Introduction

This quality assurance (QA) review is based upon a rigorous examination of all data generated from the analyses of the OU-4b and OU-5 soil samples that were collected by Wood Environment & Infrastructure Solutions, Inc., on November 25 and December 3, 2019, at the Anaconda Copper Mine Site in Yerington, Nevada. These samples were analyzed by Eurofins TestAmerica, St. Louis in Missouri. The samples and analyses included in this QA review are specified on Table 1.

This review has been performed with guidance from the "National Functional Guidelines for Inorganic Data Review" (US EPA, 2/94). This document is not entirely applicable to the type of analyses and analytical protocols performed on the samples evaluated in this QA review, but it has been used with professional judgment to aid the data reviewer in the interpretation of the quality control (QC) analysis results and in the overall evaluation of the sample data deliverables. It should also be noted that results affected by blank contamination will be designated with a "UJ" qualifier (not the "U" qualifier typically used when following the National Functional Guidelines) in order to be consistent with historical project validation protocols.

The reported analytical results are presented as a summary of the data in Section 2. Data were examined to determine the usability of the analytical results and the compliance relative to the requirements specified in the published analytical methods and the Site-Wide Quality Assurance Project Plan Anaconda Copper Mine Site Yerington, Nevada, Update Version 5.1 (September 5, 2018). Qualifier codes have been placed next to results to enable the data user to quickly assess the qualitative and/or quantitative reliability of any result. This critical QA review identifies data quality issues for specific samples and specific evaluation criteria. The data qualifications allow the data's end-user to best understand the usability of the analytical results. Data not qualified in this report should be considered valid based on the QC criteria that have been reviewed. Details of this QA review are presented in Section 1 of this report. This report was prepared to provide a critical review of the laboratory analyses and reported analytical results. Rigorous QA reviews of laboratory-generated data routinely identify various problems associated with analytical measurements, even from the most experienced and capable laboratories.

TABLE 1

SAMPLES INCLUDED IN THIS QUALITY ASSURANCE REVIEW

Field Sample Identification	Laboratory Sample Identification	SDG	Matrix	Date Sample Collected	Parameter(s) Examined
STSB32_0-0.5	160-36593-1	160-36593-1	Soil	11/25/19	^{226}Ra, ^{228}Ra, Th, U
STSB32_0-0.5MS (Matrix Spike)	160-36593-1MS	160-36593-1	Soil	11/25/19	Th, U
STSB32_0-0.5MSD (Matrix Spike Duplicate)	160-36593-1MSD	160-36593-1	Soil	11/25/19	Th, U
STSB32_0-0.5DUP (Laboratory Duplicate)	160-36593-1DUP	160-36593-1	Soil	11/25/19	^{226}Ra, ^{228}Ra, Th, U
STSB32_0.5-3	160-36593-2	160-36593-1	Soil	11/25/19	^{226}Ra, ^{228}Ra, Th, U
STSB32_3-6	160-36593-3	160-36593-1	Soil	11/25/19	^{226}Ra, ^{228}Ra, Th, U
STSB32_6-15	160-36593-4	160-36593-1	Soil	11/25/19	^{226}Ra, ^{228}Ra, Th, U
STSB34_0-0.5	160-36593-5	160-36593-1	Soil	11/25/19	^{226}Ra, ^{228}Ra, Th, U
STSB34_0.5-3	160-36593-6	160-36593-1	Soil	11/25/19	^{226}Ra, ^{228}Ra, Th, U
STSB34_3-6	160-36593-7	160-36593-1	Soil	11/25/19	^{226}Ra, ^{228}Ra, Th, U
STSB34_6-15	160-36593-8	160-36593-1	Soil	11/25/19	^{226}Ra, ^{228}Ra, Th, U
STSB34-FD_3-6 (Field Duplicate of STSB34_3-6)	160-36593-9	160-36593-1	Soil	11/25/19	^{226}Ra, ^{228}Ra, Th, U
STSB33_0-0.5	160-36593-10	160-36593-1	Soil	12/3/19	^{226}Ra, ^{228}Ra, Th, U
STSB33_0.5-3	160-36593-11	160-36593-1	Soil	12/3/19	^{226}Ra, ^{228}Ra, Th, U
STSB33-FD_0.5-3 (Field Duplicate of STSB33_0.5-3)	160-36593-12	160-36593-1	Soil	12/3/19	^{226}Ra, ^{228}Ra, Th, U
STSB33_3-6	160-36593-13	160-36593-1	Soil	12/3/19	^{226}Ra, ^{228}Ra, Th, U
STSB33_6-15	160-36593-14	160-36593-1	Soil	12/3/19	^{226}Ra, ^{228}Ra, Th, U
STSB35_0.5-3	160-36593-15	160-36593-1	Soil	12/3/19	^{226}Ra, ^{228}Ra, Th, U
STSB35_0-0.5	160-36593-16	160-36593-1	Soil	12/3/19	^{226}Ra, ^{228}Ra, Th, U
STSB35_3-6	160-36593-17	160-36593-1	Soil	12/3/19	^{226}Ra, ^{228}Ra, Th, U
STSB35_6-15	160-36593-18	160-36593-1	Soil	12/3/19	^{226}Ra, ^{228}Ra, Th, U

TABLE 1 (Cont.)

NOTES:

^{226}Ra	-	Radium-226 by US EPA Method 901.1.
^{228}Ra	-	Radium-228 by US EPA Method 901.1.
Th	-	Total Thorium by SW-846 Method 6020A.
U	-	Total Uranium by SW-846 Method 6020A.

2.0 Findings

Complete support documentation for this inorganic and radiological QA review is presented in Section 8.0 of this report.

A. Inorganic Analyses

Twenty-one samples (including QC samples) were analyzed for total thorium and total uranium by SW-846 Method 6020A. The findings offered in this report for this fraction are based on the items on the following table:

Item Reviewed	Acceptable	Acceptable with Qualification	Not Acceptable
Holding Times	√		
Blank Analysis Results	√		
LCS Results	√		
MS/MSD Results	√		
Laboratory Duplicate Precision		√	
Serial Dilution Analysis	√		
Detection Limits/Sensitivity	√		
Calibrations	√		
RL Standard Recoveries	√		
Internal Standard Recoveries	√		
Field Duplicate Precision	√		
Analytical Sequence	√		
Sample Preparation	√		
Quantitation of Positive Results	√		
Evaluation of Raw Data	√		

Laboratory Duplicate Precision: Acceptable precision and sample representativeness were not observed (the relative percent difference [RPD] was > 35% when both results were > 5× the reporting limit [RL]) between the total thorium and total uranium results in the associated laboratory duplicate analysis. The positive results for total thorium and total uranium in sample STSB32_0-0.5 should be considered estimated and have been flagged “J” on the data tables.

B. Radiological Analyses

Nineteen samples (including QC samples) were analyzed for radium-226 and radium-228 by US EPA Method 901.1. The findings offered in this report for this fraction are based on the items on the following table:

Item Reviewed	Acceptable	Acceptable with Qualification	Not Acceptable
Holding Times	√		
Blank Results	√		
LCS Recoveries	√		
Laboratory Duplicate Precision	√		
Efficiency Checks	√		
Background Checks	√		
FWHM Resolution Checks	√		
Centroid Checks	√		
Field Duplicate Precision	√		
Quantitation of Results		√	
Evaluation of Raw Data	√		

Quantitation of Results: All positive results reported at concentrations greater than the method detection limit (MDL), but less than the RL, were qualified as estimated and have been flagged "J" on the data tables.

3.0 Qualifier Summary

A. Inorganic Analyses

Analyte(s)	SDG(s)	Sample(s)	Validation Qualifier(s)	Reason for Qualification(s)
total thorium and total uranium	160-36593-1	STSB32_0-0.5	J	D – Laboratory duplicate imprecision

B. Radiological Analyses

All positive results reported between the MDL and RL have been flagged "J." (Valid Reason Code: T)

4.0 Overall Assessment

Based on this QA review, the results for total thorium and total uranium in one sample were qualified as estimated due to laboratory duplicate imprecision. In addition, several radium-228 results were qualified as estimated because positive results were reported between the MDL and the RL.

5.0 Inorganic and Radiological Data Qualifiers and Valid Reason Codes

Inorganic and Radiological Data Qualifiers

U Analyte not detected at the detection limit concentration.

J Reported value is an estimated concentration.

UJ Analyte not detected at an estimated detection limit concentration.

R These data were rejected and were not used for any purposes.

UR The analyte was not detected. The detection limit is unreliable and may be representative of a false negative. These data were rejected and are not usable for any purpose.

Valid Reason Codes

1 Holding time violation
2 Method blank contamination
3 Surrogate recovery
4 Matrix spike/matrix spike duplicate recovery
5 Matrix spike/matrix spike duplicate precision outside limits
6 Laboratory control sample recovery
7 Field blank contamination
8 Field duplicate precision outside of limits
9 Other deficiencies (including cooler temperature)
A Absence of supporting QC
S ICV, CCV, or column performance check problem
Y Initial and continuing calibration blank problem
M Interference check samples problem
O Post-digestion spike outside of QC criteria
F MSA correlation coefficient < 0.995, or MSA not done
G Serial dilution problem
K DFTPP or BFB tuning problem
Q Initial calibration problem
X Internal standard recovery problem
V Second-source standard calibration verification problem
L Low bias
Z Retention time problem
N Counting time error (radionuclide chemistry)
W Detector instability (radionuclide chemistry)
C Co-elution of compounds
E Value exceeds linear calibration range
I Interferences present during analysis
T Trace-level compound, poor quantitation
P Dual-column precision outside of limits
B LCS/LCSD precision outside limits
D Lab Dup/Rep precision outside limits
H High bias

6.0 Signatures

Report Prepared by,

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Date: 2/25/20

7.0 ANALYTICAL RESULTS

Yerington
SDG: 160-36593-1

					Lab Sample	160-36593-1						160-36593-10					
					Field Sample	STSB32_0-0.5						STSB33_0-0.5					
					Collect Date	11/25/2019 1:25:00 PM						12/3/2019 12:31:00 PM					
					Type	N						N					
					Parent												
Method	**CAS Number**	**Chemical Name**	**TD**	**Test Type**	**Units**	**Result**	**Qual/ Reason**	**MDL**	**RDL**	**Uncert**	**Detect Flag**	**Result**	**Qual/ Reason**	**MDL**	**RDL**	**Uncert**	**Detect Flag**
901.1_RA	13982-63-3	Radium-226	T	INITIAL	PCI/G	3.01		0.166	1.00	0.438	Y	1.48		0.131	1.00	0.262	Y
	15262-20-1	Radium-228	T	INITIAL	PCI/G	0.910	J/T	0.185	1.00	0.250	Y	0.714	J/T	0.223	1.00	0.206	Y
SW-846 6020A	7440-29-1	Thorium	T	INITIAL	MG/KG	4.3	J/D	0.088	0.20		Y	3.4		0.084	0.19		Y
	7440-61-1	Uranium	T	INITIAL	MG/KG	1.0	J/D	0.039	0.098		Y	2.1		0.037	0.093		Y

					Lab Sample	160-36593-11						160-36593-12					
					Field Sample	STSB33_0.5-3						STSB33-FD_0.5-3					
					Collect Date	12/3/2019 12:40:00 PM						12/3/2019 12:48:00 PM					
					Type	N						N					
					Parent												
Method	**CAS Number**	**Chemical Name**	**TD**	**Test Type**	**Units**	**Result**	**Qual/ Reason**	**MDL**	**RDL**	**Uncert**	**Detect Flag**	**Result**	**Qual/ Reason**	**MDL**	**RDL**	**Uncert**	**Detect Flag**
901.1_RA	13982-63-3	Radium-226	T	INITIAL	PCI/G	1.60		0.113	1.00	0.260	Y	1.58		0.209	1.00	0.288	Y
	15262-20-1	Radium-228	T	INITIAL	PCI/G	1.05		0.169	1.00	0.222	Y	0.820	J/T	0.345	1.00	0.371	Y
SW-846 6020A	7440-29-1	Thorium	T	INITIAL	MG/KG	5.9		0.092	0.21		Y	6.4		0.086	0.19		Y
	7440-61-1	Uranium	T	INITIAL	MG/KG	1.5		0.041	0.10		Y	1.6		0.038	0.096		Y

					Lab Sample	160-36593-13						160-36593-14					
					Field Sample	STSB33_3-6						STSB33_6-15					
					Collect Date	12/3/2019 12:51:00 PM						12/3/2019 1:05:00 PM					
					Type	N						N					
					Parent												
Method	**CAS Number**	**Chemical Name**	**TD**	**Test Type**	**Units**	**Result**	**Qual/ Reason**	**MDL**	**RDL**	**Uncert**	**Detect Flag**	**Result**	**Qual/ Reason**	**MDL**	**RDL**	**Uncert**	**Detect Flag**
901.1_RA	13982-63-3	Radium-226	T	INITIAL	PCI/G	1.20		0.316	1.00	0.311	Y	1.68		0.133	1.00	0.300	Y
	15262-20-1	Radium-228	T	INITIAL	PCI/G	1.95		0.691	1.00	0.568	Y	1.40		0.130	1.00	0.288	Y
SW-846 6020A	7440-29-1	Thorium	T	INITIAL	MG/KG	9.9		0.092	0.21		Y	6.5		0.093	0.21		Y
	7440-61-1	Uranium	T	INITIAL	MG/KG	2.3		0.041	0.10		Y	1.9		0.041	0.10		Y

					Lab Sample	160-36593-15						160-36593-16					
					Field Sample	STSB35_0.5-3						STSB35_0-0.5					
					Collect Date	12/3/2019 2:41:00 PM						12/3/2019 2:35:00 PM					
					Type	N						N					
					Parent												
Method	**CAS Number**	**Chemical Name**	**TD**	**Test Type**	**Units**	**Result**	**Qual/ Reason**	**MDL**	**RDL**	**Uncert**	**Detect Flag**	**Result**	**Qual/ Reason**	**MDL**	**RDL**	**Uncert**	**Detect Flag**
901.1_RA	13982-63-3	Radium-226	T	INITIAL	PCI/G	1.71		0.133	1.00	0.270	Y	3.54		0.214	1.00	0.543	Y
	15262-20-1	Radium-228	T	INITIAL	PCI/G	0.715	J/T	0.253	1.00	0.275	Y	0.952	J/T	0.497	1.00	0.365	Y
SW-846 6020A	7440-29-1	Thorium	T	INITIAL	MG/KG	5.2		0.081	0.18		Y	6.3		0.089	0.20		Y
	7440-61-1	Uranium	T	INITIAL	MG/KG	1.2		0.036	0.090		Y	1.6		0.040	0.099		Y

					Lab Sample	160-36593-17						160-36593-18					
					Field Sample	STSB35_3-6						STSB35_6-15					
					Collect Date	12/3/2019 2:54:00 PM						12/3/2019 3:00:00 PM					
					Type	N						N					
					Parent												
Method	**CAS Number**	**Chemical Name**	**TD**	**Test Type**	**Units**	**Result**	**Qual/ Reason**	**MDL**	**RDL**	**Uncert**	**Detect Flag**	**Result**	**Qual/ Reason**	**MDL**	**RDL**	**Uncert**	**Detect Flag**
901.1_RA	13982-63-3	Radium-226	T	INITIAL	PCI/G	2.34		0.132	1.00	0.332	Y	5.62		0.214	1.00	0.714	Y
	15262-20-1	Radium-228	T	INITIAL	PCI/G	0.700	J/T	0.271	1.00	0.287	Y	1.15		0.354	1.00	0.353	Y
SW-846 6020A	7440-29-1	Thorium	T	INITIAL	MG/KG	5.0		0.082	0.18		Y	5.5		0.085	0.19		Y
	7440-61-1	Uranium	T	INITIAL	MG/KG	1.8		0.037	0.091		Y	2.2		0.038	0.095		Y

					Lab Sample	160-36593-2						160-36593-3					
					Field Sample	STSB32_0.5-3						STSB32_3-6					
					Collect Date	11/25/2019 1:40:00 PM						11/25/2019 1:49:00 PM					
					Type	N						N					
					Parent												
Method	**CAS Number**	**Chemical Name**	**TD**	**Test Type**	**Units**	**Result**	**Qual/ Reason**	**MDL**	**RDL**	**Uncert**	**Detect Flag**	**Result**	**Qual/ Reason**	**MDL**	**RDL**	**Uncert**	**Detect Flag**
901.1_RA	13982-63-3	Radium-226	T	INITIAL	PCI/G	2.49		0.127	1.00	0.343	Y	3.31		0.208	1.00	0.475	Y
	15262-20-1	Radium-228	T	INITIAL	PCI/G	0.754	J/T	0.319	1.00	0.264	Y	1.03		0.360	1.00	0.397	Y
SW-846 6020A	7440-29-1	Thorium	T	INITIAL	MG/KG	6.1		0.088	0.20		Y	4.9		0.086	0.19		Y
	7440-61-1	Uranium	T	INITIAL	MG/KG	1.4		0.039	0.098		Y	1.7		0.038	0.095		Y

					Lab Sample	160-36593-4						160-36593-5					
					Field Sample	STSB32_6-15						STSB34_0-0.5					
					Collect Date	11/25/2019 2:06:00 PM						11/25/2019 3:00:00 PM					
					Type	N						N					
					Parent												
Method	**CAS Number**	**Chemical Name**	**TD**	**Test Type**	**Units**	**Result**	**Qual/ Reason**	**MDL**	**RDL**	**Uncert**	**Detect Flag**	**Result**	**Qual/ Reason**	**MDL**	**RDL**	**Uncert**	**Detect Flag**
901.1_RA	13982-63-3	Radium-226	T	INITIAL	PCI/G	3.17		0.162	1.00	0.488	Y	1.84		0.145	1.00	0.305	Y
	15262-20-1	Radium-228	T	INITIAL	PCI/G	1.36		0.336	1.00	0.319	Y	1.07		0.170	1.00	0.271	Y
SW-846 6020A	7440-29-1	Thorium	T	INITIAL	MG/KG	7.6		0.097	0.21		Y	4.7		0.086	0.19		Y
	7440-61-1	Uranium	T	INITIAL	MG/KG	2.3		0.043	0.11		Y	1.4		0.038	0.096		Y

					Lab Sample	160-36593-6						160-36593-7					
					Field Sample	STSB34_0.5-3						STSB34_3-6					
					Collect Date	11/25/2019 3:05:00 PM						11/25/2019 3:12:00 PM					
					Type	N						N					
					Parent												
Method	**CAS Number**	**Chemical Name**	**TD**	**Test Type**	**Units**	**Result**	**Qual/ Reason**	**MDL**	**RDL**	**Uncert**	**Detect Flag**	**Result**	**Qual/ Reason**	**MDL**	**RDL**	**Uncert**	**Detect Flag**
901.1_RA	13982-63-3	Radium-226	T	INITIAL	PCI/G	2.34		0.158	1.00	0.374	Y	1.90		0.146	1.00	0.298	Y
	15262-20-1	Radium-228	T	INITIAL	PCI/G	0.930	J/T	0.289	1.00	0.243	Y	0.863	J/T	0.169	1.00	0.184	Y
SW-846 6020A	7440-29-1	Thorium	T	INITIAL	MG/KG	4.6		0.093	0.21		Y	4.7		0.089	0.20		Y
	7440-61-1	Uranium	T	INITIAL	MG/KG	1.1		0.041	0.10		Y	1.1		0.040	0.099		Y

					Lab Sample	160-36593-8						160-36593-9					
					Field Sample	STSB34_6-15						STSB34-FD_3-6					
					Collect Date	11/25/2019 3:28:00 PM						11/25/2019 3:13:00 PM					
					Type	N						N					
					Parent												
Method	**CAS Number**	**Chemical Name**	**TD**	**Test Type**	**Units**	**Result**	**Qual/ Reason**	**MDL**	**RDL**	**Uncert**	**Detect Flag**	**Result**	**Qual/ Reason**	**MDL**	**RDL**	**Uncert**	**Detect Flag**
901.1_RA	13982-63-3	Radium-226	T	INITIAL	PCI/G	2.76		0.270	1.00	0.478	Y	2.15		0.178	1.00	0.362	Y
	15262-20-1	Radium-228	T	INITIAL	PCI/G	1.56		0.330	1.00	0.452	Y	0.982	J/T	0.215	1.00	0.263	Y
SW-846 6020A	7440-29-1	Thorium	T	INITIAL	MG/KG	16		0.10	0.23		Y	5.1		0.088	0.20		Y
	7440-61-1	Uranium	T	INITIAL	MG/KG	4.3		0.046	0.12		Y	1.2		0.039	0.098		Y

8.0 SUPPORTING DOCUMENTATION

Konstadina Vlahogiani

From: Awalt, Jayna <Jayna.Awalt@testamericainc.com>
Sent: Friday, February 14, 2020 6:47 PM
To: Konstadina Vlahogiani
Cc: Lombardi, Lynda; Danielle Coles
Subject: RE: ACMS Yerington OU-4b_OU-5 Soil Sampling - requests for 160-36593-1

The metals analyst has reviewed the data and states that it looks good. She says the sample was non-homogenous but will put on for a re-run and should have something next week.

Thanks,

Jayna Awalt

Phone: 314-298-8566

E-mail: jayna.awalt@testamericainc.com

From: Konstadina Vlahogiani [mailto:dvlahogi@envstd.com]
Sent: Friday, February 14, 2020 1:07 PM
To: Awalt, Jayna
Cc: Lombardi, Lynda; Danielle Coles
Subject: ACMS Yerington OU-4b_OU-5 Soil Sampling - requests for 160-36593-1

-External Email-

Hi Jayna,

We have the following requests for job 160-36593-1.

1. For method 901.1, the monthly background provided for detector 8 is dated 11/12/2019. The samples were analyzed on 12/27/2019. Please provide the monthly background run in December 2019.
2. For method 6020A, the results reported for the lab duplicate sample 160-36593-1 DU are double than those reported for the parent sample. Could you please check the dilution factor? Also, if you still have the digest, can you please re-inject it to confirm?

Thanks

Dina

Konstadina Vlahogiani
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Konstadina Vlahogiani

From: Awalt, Jayna <Jayna.Awalt@testamericainc.com>
Sent: Tuesday, February 18, 2020 2:44 PM
To: Konstadina Vlahogiani
Cc: 'Lombardi, Lynda'; Danielle Coles
Subject: RE: ACMS Yerington OU-4b_OU-5 Soil Sampling - requests for 160-36593-1

Can you reject 36593-1 so that I can upload the level IV with the correct backgrounds for Gamma?

Thanks,

Jayna Awalt

Phone: 314-298-8566

E-mail: jayna.awalt@testamericainc.com

From: Konstadina Vlahogiani [mailto:dvlahogi@envstd.com]
Sent: Tuesday, February 18, 2020 1:38 PM
To: Awalt, Jayna
Cc: 'Lombardi, Lynda'; Danielle Coles
Subject: RE: ACMS Yerington OU-4b_OU-5 Soil Sampling - requests for 160-36593-1

EXTERNAL EMAIL*

Hi Jayna,

No re-extraction of the sample is required. Nothing further on 6020A.

Thank you for your assistance.

Dina

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610.935.5577 x 405 • www.envstd.com • kvlahogiani@envstd.com

Emergency Response Quality Assurance Hotline: 855.374.7272

ENVIRONMENTAL STANDARDS

From: Awalt, Jayna <Jayna.Awalt@testamericainc.com>
Sent: Tuesday, February 18, 2020 12:34 PM
To: Konstadina Vlahogiani <dvlahogi@envstd.com>
Cc: 'Lombardi, Lynda' <lynda.lombardi@woodplc.com>; Danielle Coles <dcoles@envstd.com>
Subject: RE: ACMS Yerington OU-4b_OU-5 Soil Sampling - requests for 160-36593-1

We do have the original sample. Let me know if you would like us to re-extract the sample and dup.

Thanks,

Jayna Awalt

Phone: 314-298-8566

E-mail: jayna.awalt@testamericainc.com

From: Awalt, Jayna
Sent: Tuesday, February 18, 2020 10:34 AM
To: 'Konstadina Vlahogiani'
Cc: Lombardi, Lynda; Danielle Coles
Subject: RE: ACMS Yerington OU-4b_OU-5 Soil Sampling - requests for 160-36593-1

We do not have digestate left to run the 6020A. Would you like us to completely re-run the sample and the duplicate? I have the lab checking for sufficient aliquot of the original.

Thanks,

Jayna Awalt

Phone: 314-298-8566

E-mail: jayna.awalt@testamericainc.com

From: Konstadina Vlahogiani [mailto:dvlahogi@envstd.com]
Sent: Friday, February 14, 2020 1:07 PM
To: Awalt, Jayna
Cc: Lombardi, Lynda; Danielle Coles
Subject: ACMS Yerington OU-4b_OU-5 Soil Sampling - requests for 160-36593-1

-External Email-

Hi Jayna,

We have the following requests for job 160-36593-1.

1. For method 901.1, the monthly background provided for detector 8 is dated 11/12/2019. The samples were analyzed on 12/27/2019. Please provide the monthly background run in December 2019.
2. For method 6020A, the results reported for the lab duplicate sample 160-36593-1 DU are double than those reported for the parent sample. Could you please check the dilution factor? Also, if you still have the digest, can you please re-inject it to confirm?

Thanks

Dina

Konstadina Vlahogiani
Senior Technical Chemist
Environmental Standards, Inc.
1140 Valley Forge Road • PO Box 810 • Valley Forge, PA 19482
610.935.5577 x 405 • www.envstd.com • kvlahogiani@envstd.com

Emergency Response Quality Assurance Hotline: 855.374.7272

ENVIRONMENTAL STANDARDS

eurofins

Environment Testing
TestAmerica

ANALYTICAL REPORT

Job Number: 160-36593-1

Job Description: ACMS - Yerington OU-4b_OU-5_SOIL

Contract Number: EPSCM 2017-009//BP01498843

For:
Wood E&I Solutions Inc
10940 White Rock Road Suite 190
Rancho Cordova, CA 95670

Attention: Kent Parrish

Approved for release
Jayna K Awalt
Project Manager II
2/18/2020 1:55 PM

Jayna K Awalt, Project Manager II
13715 Rider Trail North, Earth City, MO, 63045
(314)298-8566
jayna.awalt@testamericainc.com

02/18/2020
Revision: 1

The test results in this report meet NELAP requirements for parameters for which accreditation is required or available. Any exceptions to the NELAP requirements are noted. Results pertain only to samples listed in this report. Pursuant to NELAP, this report shall not be reproduced, except in full, without the written approval of the laboratory. This report is confidential and is intended for the sole use of TestAmerica and its client. All questions regarding this report should be directed to the TestAmerica Project Manager.

Louisiana Lab Certification ID (Non-Potable, Solid/Haz. Material): 106151
Florida Lab Certification ID (Drinking Water): E87689.

The test results in this report relate only to the samples as received by the laboratory and will meet all requirements of the methodology, with any exceptions noted. This report shall not be reproduced except in full, without the express written approval of the laboratory. All questions should be directed to the Eurofins TestAmerica Project Manager.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Eurofins TestAmerica, St. Louis
13715 Rider Trail North, Earth City, MO 63045
Tel (314) 298-8566 Fax (314) 298-8757 www.testamericainc.com

Sample Summary

Client: Wood E&I Solutions Inc
Project/Site: ACMS - Yerington OU-4b_OU-5_SOIL

Job ID: 160-36593-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
160-36593-1	STSB32_0-0.5	Solid	11/25/19 13:25	12/05/19 09:30	
160-36593-2	STSB32_0.5-3	Solid	11/25/19 13:40	12/05/19 09:30	
160-36593-3	STSB32_3-6	Solid	11/25/19 13:49	12/05/19 09:30	
160-36593-4	STSB32_6-15	Solid	11/25/19 14:06	12/05/19 09:30	
160-36593-5	STSB34_0-0.5	Solid	11/25/19 15:00	12/05/19 09:30	
160-36593-6	STSB34_0.5-3	Solid	11/25/19 15:05	12/05/19 09:30	
160-36593-7	STSB34_3-6	Solid	11/25/19 15:12	12/05/19 09:30	
160-36593-8	STSB34_6-15	Solid	11/25/19 15:28	12/05/19 09:30	
160-36593-9	STSB34-FD_3-6	Solid	11/25/19 15:13	12/05/19 09:30	
160-36593-10	STSB33_0-0.5	Solid	12/03/19 12:31	12/05/19 09:30	
160-36593-11	STSB33_0.5-3	Solid	12/03/19 12:40	12/05/19 09:30	
160-36593-12	STSB33-FD_0.5-3	Solid	12/03/19 12:48	12/05/19 09:30	
160-36593-13	STSB33_3-6	Solid	12/03/19 12:51	12/05/19 09:30	
160-36593-14	STSB33_6-15	Solid	12/03/19 13:05	12/05/19 09:30	
160-36593-15	STSB35_0.5-3	Solid	12/03/19 14:41	12/05/19 09:30	
160-36593-16	STSB35_0-0.5	Solid	12/03/19 14:35	12/05/19 09:30	
160-36593-17	STSB35_3-6	Solid	12/03/19 14:54	12/05/19 09:30	
160-36593-18	STSB35_6-15	Solid	12/03/19 15:00	12/05/19 09:30	

CASE NARRATIVE

Client: Wood E&I Solutions Inc

Project: ACMS - Yerington OU-4b_OU-5_SOIL

Report Number: 160-36593-1
Rev. 1 - The correct monthly background for 901.1 is now included.

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.

Eurofins TestAmerica, St. Louis attests to the validity of the laboratory data generated by Eurofins TestAmerica facilities reported herein. All analyses performed by Eurofins TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. Eurofins TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

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.

All solid sample results for Chemistry analyses are reported on an ""as received"" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Manual Integrations and ROIs were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

This laboratory report is confidential and is intended for the sole use of Eurofins TestAmerica and its client.

RECEIPT
The samples were received on 12/5/2019 9:30 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 2 coolers at receipt time were 2.5° C and 4.1° C.

METALS (ICPMS)
Samples STSB32_0-0.5 (160-36593-1), STSB32_0.5-3 (160-36593-2), STSB32_3-6 (160-36593-3), STSB32_6-15 (160-36593-4), STSB34_0-0.5 (160-36593-5), STSB34_0.5-3 (160-36593-6), STSB34_3-6 (160-36593-7), STSB34_6-15 (160-36593-8), STSB34-FD_3-6 (160-36593-9), STSB33_0-0.5 (160-36593-10), STSB33_0.5-3 (160-36593-11), STSB33-FD_0.5-3 (160-36593-12), STSB33_3-6 (160-36593-13), STSB33_6-15 (160-36593-14), STSB35_0.5-3 (160-36593-15), STSB35_0-0.5 (160-36593-16), STSB35_3-6 (160-36593-17) and STSB35_6-15 (160-36593-18) were analyzed for metals (ICPMS) in accordance with EPA SW-846 Methods 6020A. The samples were prepared on 12/10/2019 and analyzed on 12/27/2019.

For ICPMS Metals, a 2X dilution was performed. This is a standard dilution that is performed by TestAmerica St. Louis on all samples analyzed by method SW-846 6020A. The dilution is performed in order to have the matrix of the samples (i.e. the concentration of acids) match the matrix of the standards used for calibration and instrument quality control purposes. The MDL studies analyzed by this method undergo the same 2X dilution, and all detection limits are based on this. As such, MDL's and RL's are not affected by the dilution.

02/18/2020

The sample duplicate (DUP) precision for preparation batch 160-453801 and analytical batch 160-455416 was outside control limits for Thorium and Uranium. Sample matrix interference is suspected. STSB32_0-0.5 (160-36593-1[DU])

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

PERCENT SOLIDS

Samples STSB32_0-0.5 (160-36593-1), STSB32_0.5-3 (160-36593-2), STSB32_3-6 (160-36593-3), STSB32_6-15 (160-36593-4), STSB34_0-0.5 (160-36593-5), STSB34_0.5-3 (160-36593-6), STSB34_3-6 (160-36593-7), STSB34_6-15 (160-36593-8), STSB34-FD_3-6 (160-36593-9), STSB33_0-0.5 (160-36593-10), STSB33_0.5-3 (160-36593-11), STSB33-FD_0.5-3 (160-36593-12), STSB33_3-6 (160-36593-13), STSB33_6-15 (160-36593-14), STSB35_0.5-3 (160-36593-15), STSB35_0-0.5 (160-36593-16), STSB35_3-6 (160-36593-17) and STSB35_6-15 (160-36593-18) were analyzed for percent solids in accordance with EPA Method 160.3 MOD. The samples were analyzed on 12/05/2019.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)

Samples STSB32_0-0.5 (160-36593-1), STSB32_0.5-3 (160-36593-2), STSB32_3-6 (160-36593-3), STSB32_6-15 (160-36593-4), STSB34_0-0.5 (160-36593-5), STSB34_0.5-3 (160-36593-6), STSB34_3-6 (160-36593-7), STSB34_6-15 (160-36593-8), STSB34-FD_3-6 (160-36593-9), STSB33_0-0.5 (160-36593-10), STSB33_0.5-3 (160-36593-11), STSB33-FD_0.5-3 (160-36593-12), STSB33_3-6 (160-36593-13), STSB33_6-15 (160-36593-14), STSB35_0.5-3 (160-36593-15), STSB35_0-0.5 (160-36593-16), STSB35_3-6 (160-36593-17) and STSB35_6-15 (160-36593-18) were analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA 901.1. The samples were dried on 12/05/2019, prepared on 12/06/2019 and analyzed on 12/27/2019.

Many isotopes requested for analysis do not have any gamma emissions, or the gamma emissions they do have are very poor. Often, such analytes are reported by gamma spectrometry assuming secular equilibrium with a longer-lived parent. The client should ensure that such inference is acceptable for their sample based upon process knowledge. The following assumptions were made for this report:

Inferred from	Reported to Analyte
Th-234	Pa-234
Th-234	U-238
Pb-210	Po-210
Pb-210	Bi-210
Cs-137	Ba-137m
Pb-212	Po-216
Xe-131m	Xe-131
Sb-125	Te-125m
Ag-108m	Ag-108
Rh-106	Ru-106
Pb-212	Th-228
Pb-212	Ra-224
U-235	Th-231
Ac-228	Th-232
Ac-228	Ra-228
Th-227	Ra-223
Th-227	Ac-227
Th-227	Bi-211
Th-227	Pb-211
Bi-214	Ra-226

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Job Number: 160-36593-1

Job Description: ACMS - Yerington OU-4b_OU-5_SOIL

The results listed within this Laboratory Report pertain only to the samples tested in the laboratory. The analyses contained in this report were performed in accordance with the BPLAMP Technical Specifications, applicable federal, state, local regulations and certification requirements as well as the methodologies as described in laboratory SOPs reviewed by the BPLAMP. This Laboratory Report is confidential and is intended for the sole use of Eurofins TestAmerica and its client. This report shall not be reproduced, except in full, without written permission from TestAmerica. The signature on the cover page extends to the case narrative and all the data and forms in the package. The Chain of Custody is included and is an integral part of this report.

Jayna Awalt

Approved for release
Jayna K Awalt
Project Manager II
2/18/2020 1:55 PM

Jayna K Awalt

02/18/2020

Atlantic Richfield Company
A BP affiliated company

Laboratory Management Program LaMP Chain of Custody Record

BP/ARC Site Node Path: NV_YERINGTON
Req Due Date (mm/dd/yy): STD TAT
Rush TAT: Yes ___ No X
BP/ARC Facility Name: Anaconda Copper Mine Site
Lab Work Order Number:

Lab Name:	TestAmerica, Inc.	BP/ARC Facility Address:	1 Austin Circle	Consultant/Contractor:	Wood - E&I Solutions, Inc.
Lab Address:	13715 Rider Trail N., Earth City, MO 63045	City, State, ZIP Code:	Yerington, Nevada 89447	Consultant/Contractor Project No:	SA18170340.005.055B
Lab PM:	Jayna Awalt	Lead Regulatory Agency:	NDEP Abandoned Mine Lands Program	Address:	10940 White Rock Rd, Ste 190 Rancho Cordova, CA 95670
Lab Phone:	314-298-8566	California Global ID No.:		Consultant/Contractor PM:	Kent Parrish
Lab Shipping Accnt:	1955-3772-0 (TAL Acct #)	Enfos Proposal No: D019Q-0047	Work Release No: WR331232	Phone: 916-636-3200	Email: Kent.Parrish@woodplc.com
Lab Bottle Order No:	NA	Accounting Mode	Provision X OOC-BU ___ OOC-RM ___	Email Report/EDD To:	lynda.lombardi@woodplc.com
Other Info:	OU-4b_OU-5_Soil	Stage: Appraise	Activity: Field Work/Remedial Investigation	Invoice To:	BP/ARC X Contractor ___

BP/ARC EBM: Chuck Stilwell
EBM Phone: 713-998-2443
EBM Email: Chuck.Stilwell@bp.com

Report Type & QC Level: Standard ___ Full Data Package X

Lab No.	Sample Description	Date	Time	Soil / Solid	Water / Liquid	Air / Vapor	Total Number of Containers	Unpreserved	H_2SO_4	HNO_3	Thorium, Uranium (SW6020A)	Radium-226 (HASL 300)	Radium-228 (HASL 300)	MS/MSD or LD	Comments
	STSB32_0-0.5	11/25/19	1325	X			4	4			X	X	X	X	Report soil on dry weight basis.
	STSB32_0.5-3	11/25/19	1340	X			2	2			X	X	X		
	STSB32_3-6	11/25/19	1349	X			2	2			X	X	X		
	STSB32_6-15	11/25/19	1406	X			2	2			X	X	X		
	STSB34_0-0.5	11/25/19	1500	X			2	2			X	X	X		
	STSB34_0.5-3	11/25/19	1505	X			2	2			X	X	X		
	STSB34_3-6	11/25/19	1512	X			2	2			X	X	X		
	STSB34_6-15	11/25/19	1528	X			2	2			X	X	X		
	STSB34-FD_3-6	11/25/19	1513	X			2	2			X	X	X		
	STSB33_0-0.5	12/03/19	1231	X			2	2			X	X	X		

160-36593 Chain of Custody

Sampler's Name: Bryce Johnson
Sampler's Company: Wood
Shipment Method: Fed Ex Ship Date: 12/4/19
Shipment Tracking No: 7771 5034 9430/7771 5039 2441

Relinquished By / Affiliation	Date	Time	Accepted By / Affiliation	Date	Time
[illegible] / Wood	12/4/19	1200	[illegible] / TASL	12/5/19	0930

Special Instructions:

THIS LINE - LAB USE ONLY: Custody Seals In Place: Yes / No | Temp Blank: Yes / No | Cooler Temp on Receipt: _____ °F/C | Trip Blank: Yes / No | MS/MSD Sample Submitted: Yes / No

BP/ARC LaMP COC Rev. 7, Jul 29, 2010

Atlantic Richfield Company
A BP affiliated company

Laboratory Management Program LaMP Chain of Custody Record

BP/ARC Site Node Path: NV_YERINGTON
Req Due Date (mm/dd/yy): STD TAT
Rush TAT: Yes ___ No X
BP/ARC Facility Name: Anaconda Copper Mine Site
Lab Work Order Number:

Lab Name:	TestAmerica, Inc.	BP/ARC Facility Address:	1 Austin Circle	Consultant/Contractor	Wood - E&I Solutions, Inc.
Lab Address:	13715 Rider Trail N., Earth City, MO 63045	City, State, ZIP Code:	Yerington, Nevada 89447	Consultant/Contractor Project No:	SA18170340.005.055B
Lab PM:	Jayna Awalt	Lead Regulatory Agency:	NDEP Abandoned Mine Lands Program	Address:	10940 White Rock Rd, Ste 190 Rancho Cordova, CA 95670
Lab Phone:	314-298-8566	California Global ID No.:		Consultant/Contractor PM:	Kent Parrish
Lab Shipping Acct:	1955-3772-0 (TAL Acct #)	Enfos Proposal No: D019Q-0047	Work Release No: WR331232	Phone: 916-636-3200	Email: Kent.Parrish@woodplc.com
Lab Bottle Order No:	NA	Accounting Mode:	Provision X OOC-BU ___ OOC-RM ___	Email Report/EDD To:	lynda.lombardi@woodplc.com
Other Info:	OU-4b_OU-5_Soil	Stage: Appraise	Activity: Field Work/Remedial Investigation	Invoice To:	BP/ARC X Contractor ___

BP/ARC EBM: Chuck Stilwell
EBM Phone: 713-998-2443
EBM Email: Chuck.Stilwell@bp.com

Report Type & QC Level: Standard ___ Full Data Package X

Lab No.	Sample Description	Date	Time	Soil / Solid	Water / Liquid	Air / Vapor	Total Number of Containers	Unpreserved	H_2SO_4	HNO_3	Thorium, Uranium (SW6020A)	Radium-226 (HASL 300)	Radium-228 (HASL 300)	MS/MSD or LD	Comments (Note: If sample not collected, indicate "No Sample" in comments and single-strike out and initial any preprinted sample description)
	STSB33_0.5-3	12/03/19	1240	X			2	2			X	X	X		Report soil on dry weight basis.
	STSB33-FD_0.5-3	12/03/19	1248	X			2	2			X	X	X		
	STSB33_3-6	12/03/19	1251	X			2	2			X	X	X		
	STSB33_6-15	12/03/19	1305	X			2	2			X	X	X		
	STSB35_0.5-3	12/03/19	1441	X			2	2			X	X	X		
	STSB35_0-0.5	12/03/19	1435	X			2	2			X	X	X		
	STSB35_3-6	12/03/19	1454	X			2	2			X	X	X		
	STSB35_6-15	12/03/19	1500	X			2	2			X	X	X		

Sampler's Name: Bryce Johnson
Sampler's Company: Wood
Shipment Method: Fed Ex Ship Date: 12/4/19
Shipment Tracking No: 7771 5034 9430/7771 5039 2441

Relinquished By / Affiliation	Date	Time	Accepted By / Affiliation	Date	Time
[illegible] / Wood	12/4/19	1200	[illegible] / TASL	12-5-19	0930

Special Instructions:

THIS LINE - LAB USE ONLY: Custody Seals In Place: Yes / No | Temp Blank: Yes / No | Cooler Temp on Receipt ___ °F/C | Trip Blank: Yes / No | MS/MSD Sample Submitted: Yes / No

Login Sample Receipt Checklist

Client: Wood E&I Solutions Inc

Job Number: 160-36593-1

Login Number: 36593
List Number: 1
Creator: Press, Nicholas B

List Source: Eurofins TestAmerica, St. Louis

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Internal Chain of Custody Tracking

Login	Smp	Customer Sample ID	Matrix	Container ID	Lab Sample ID	Container Type	Location	Custody User	I/O	ICOC ID	ICOC Date
160-36593	1	STSB32_0-0.5	Solid	160-1846499	160-36593-A-1	Plastic Bag - 500g	Pre-Prep	Oetter, David R	I	160-187430	12/05/19 14:09
160-36593	1	STSB32_0-0.5	Solid	160-1846499	160-36593-A-1	Plastic Bag - 500g	DRY AND GRIND	Oetter, David R	I	160-187437	12/05/19 15:08
160-36593	1	STSB32_0-0.5	Solid	160-1846535	160-36593-A-1	Plastic Bag - 500g	Pre-Prep	Oetter, David R	I	160-187430	12/05/19 14:09
160-36593	1	STSB32_0-0.5	Solid	160-1846535	160-36593-A-1	Plastic Bag - 500g	DRY AND GRIND	Oetter, David R	I	160-187437	12/05/19 15:08
160-36593	1	STSB32_0-0.5	Solid	160-1846536	160-36593-A-1	Clear Glass 4oz Wide -	1-46	Mazariegos, Leonel	I	160-187802	12/11/19 09:24
160-36593	1	STSB32_0-0.5	Solid	160-1846536	160-36593-A-1	Clear Glass 4oz Wide -	METALS	Mazariegos, Leonel	I	160-187729	12/10/19 12:46
160-36593	1	STSB32_0-0.5	Solid	160-1846537	160-36593-A-1	No Container	1-46	Mazariegos, Leonel	I	160-187802	12/11/19 09:24
160-36593	1	STSB32_0-0.5	Solid	160-1846537	160-36593-A-1	No Container	METALS	Mazariegos, Leonel	I	160-187729	12/10/19 12:46
160-36593	1	STSB32_0-0.5	Solid	160-1846500	160-36593-B-1	Clear Glass 4oz Wide -	1-46	Mazariegos, Leonel	I	160-187802	12/11/19 09:24
160-36593	1	STSB32_0-0.5	Solid	160-1846500	160-36593-B-1	Clear Glass 4oz Wide -	METALS	Mazariegos, Leonel	I	160-187729	12/10/19 12:46
160-36593	2	STSB32_0.5-3	Solid	160-1846501	160-36593-A-2	Plastic Bag - 500g	Pre-Prep	Oetter, David R	I	160-187430	12/05/19 14:09
160-36593	2	STSB32_0.5-3	Solid	160-1846501	160-36593-A-2	Plastic Bag - 500g	DRY AND GRIND	Oetter, David R	I	160-187437	12/05/19 15:08
160-36593	2	STSB32_0.5-3	Solid	160-1846502	160-36593-B-2	Clear Glass 4oz Wide -	1-46	Mazariegos, Leonel	I	160-187802	12/11/19 09:24
160-36593	2	STSB32_0.5-3	Solid	160-1846502	160-36593-B-2	Clear Glass 4oz Wide -	METALS	Mazariegos, Leonel	I	160-187729	12/10/19 12:46
160-36593	3	STSB32_3-6	Solid	160-1846503	160-36593-A-3	Plastic Bag - 500g	Pre-Prep	Oetter, David R	I	160-187430	12/05/19 14:09
160-36593	3	STSB32_3-6	Solid	160-1846503	160-36593-A-3	Plastic Bag - 500g	DRY AND GRIND	Oetter, David R	I	160-187437	12/05/19 15:08
160-36593	3	STSB32_3-6	Solid	160-1846504	160-36593-B-3	Clear Glass 4oz Wide -	1-46	Mazariegos, Leonel	I	160-187802	12/11/19 09:24
160-36593	3	STSB32_3-6	Solid	160-1846504	160-36593-B-3	Clear Glass 4oz Wide -	METALS	Mazariegos, Leonel	I	160-187729	12/10/19 12:46
160-36593	4	STSB32_6-15	Solid	160-1846505	160-36593-A-4	Plastic Bag - 500g	Pre-Prep	Oetter, David R	I	160-187430	12/05/19 14:09
160-36593	4	STSB32_6-15	Solid	160-1846505	160-36593-A-4	Plastic Bag - 500g	DRY AND GRIND	Oetter, David R	I	160-187437	12/05/19 15:08
160-36593	4	STSB32_6-15	Solid	160-1846506	160-36593-B-4	Clear Glass 4oz Wide -	1-46	Mazariegos, Leonel	I	160-187802	12/11/19 09:24
160-36593	4	STSB32_6-15	Solid	160-1846506	160-36593-B-4	Clear Glass 4oz Wide -	METALS	Mazariegos, Leonel	I	160-187729	12/10/19 12:46
160-36593	5	STSB34_0-0.5	Solid	160-1846507	160-36593-A-5	Plastic Bag - 500g	Pre-Prep	Oetter, David R	I	160-187430	12/05/19 14:09
160-36593	5	STSB34_0-0.5	Solid	160-1846507	160-36593-A-5	Plastic Bag - 500g	DRY AND GRIND	Oetter, David R	I	160-187437	12/05/19 15:08
160-36593	5	STSB34_0-0.5	Solid	160-1846508	160-36593-B-5	Clear Glass 4oz Wide -	1-46	Mazariegos, Leonel	I	160-187802	12/11/19 09:24
160-36593	5	STSB34_0-0.5	Solid	160-1846508	160-36593-B-5	Clear Glass 4oz Wide -	METALS	Mazariegos, Leonel	I	160-187729	12/10/19 12:46
160-36593	6	STSB34_0.5-3	Solid	160-1846509	160-36593-A-6	Plastic Bag - 500g	Pre-Prep	Oetter, David R	I	160-187430	12/05/19 14:09
160-36593	6	STSB34_0.5-3	Solid	160-1846509	160-36593-A-6	Plastic Bag - 500g	DRY AND GRIND	Oetter, David R	I	160-187437	12/05/19 15:08
160-36593	6	STSB34_0.5-3	Solid	160-1846510	160-36593-B-6	Clear Glass 4oz Wide -	1-46	Mazariegos, Leonel	I	160-187802	12/11/19 09:24
160-36593	6	STSB34_0.5-3	Solid	160-1846510	160-36593-B-6	Clear Glass 4oz Wide -	METALS	Mazariegos, Leonel	I	160-187729	12/10/19 12:46
160-36593	7	STSB34_3-6	Solid	160-1846511	160-36593-A-7	Plastic Bag - 500g	Pre-Prep	Oetter, David R	I	160-187430	12/05/19 14:09
160-36593	7	STSB34_3-6	Solid	160-1846511	160-36593-A-7	Plastic Bag - 500g	DRY AND GRIND	Oetter, David R	I	160-187437	12/05/19 15:08
160-36593	7	STSB34_3-6	Solid	160-1846512	160-36593-B-7	Clear Glass 4oz Wide -	1-46	Mazariegos, Leonel	I	160-187802	12/11/19 09:24
160-36593	7	STSB34_3-6	Solid	160-1846512	160-36593-B-7	Clear Glass 4oz Wide -	METALS	Mazariegos, Leonel	I	160-187729	12/10/19 12:46
160-36593	8	STSB34_6-15	Solid	160-1846513	160-36593-A-8	Plastic Bag - 500g	Pre-Prep	Oetter, David R	I	160-187430	12/05/19 14:09
160-36593	8	STSB34_6-15	Solid	160-1846513	160-36593-A-8	Plastic Bag - 500g	DRY AND GRIND	Oetter, David R	I	160-187437	12/05/19 15:08
160-36593	8	STSB34_6-15	Solid	160-1846514	160-36593-B-8	Clear Glass 4oz Wide -	1-46	Mazariegos, Leonel	I	160-187802	12/11/19 09:24
160-36593	8	STSB34_6-15	Solid	160-1846514	160-36593-B-8	Clear Glass 4oz Wide -	METALS	Mazariegos, Leonel	I	160-187729	12/10/19 12:46
160-36593	9	STSB34-FD_3-6	Solid	160-1846515	160-36593-A-9	Plastic Bag - 500g	Pre-Prep	Oetter, David R	I	160-187430	12/05/19 14:09
160-36593	9	STSB34-FD_3-6	Solid	160-1846515	160-36593-A-9	Plastic Bag - 500g	DRY AND GRIND	Oetter, David R	I	160-187437	12/05/19 15:08

Internal Chain of Custody Tracking

Login	Smp	Customer Sample ID	Matrix	Container ID	Lab Sample ID	Container Type	Location	Custody User	I/O	ICOC ID	ICOC Date
160-36593	9	STSB34-FD_3-6	Solid	160-1846516	160-36593-B-9	Clear Glass 4oz Wide -	1-46	Mazariegos, Leonel	I	160-187802	12/11/19 09:24
160-36593	9	STSB34-FD_3-6	Solid	160-1846516	160-36593-B-9	Clear Glass 4oz Wide -	METALS	Mazariegos, Leonel	I	160-187729	12/10/19 12:46
160-36593	10	STSB33_0-0.5	Solid	160-1846517	160-36593-A-10	Plastic Bag - 500g	Pre-Prep	Oetter, David R	I	160-187430	12/05/19 14:09
160-36593	10	STSB33_0-0.5	Solid	160-1846517	160-36593-A-10	Plastic Bag - 500g	DRY AND GRIND	Oetter, David R	I	160-187437	12/05/19 15:08
160-36593	10	STSB33_0-0.5	Solid	160-1846518	160-36593-B-10	Clear Glass 4oz Wide -	1-46	Mazariegos, Leonel	I	160-187802	12/11/19 09:24
160-36593	10	STSB33_0-0.5	Solid	160-1846518	160-36593-B-10	Clear Glass 4oz Wide -	METALS	Mazariegos, Leonel	I	160-187729	12/10/19 12:46
160-36593	11	STSB33_0.5-3	Solid	160-1846519	160-36593-A-11	Plastic Bag - 500g	Pre-Prep	Oetter, David R	I	160-187430	12/05/19 14:09
160-36593	11	STSB33_0.5-3	Solid	160-1846519	160-36593-A-11	Plastic Bag - 500g	DRY AND GRIND	Oetter, David R	I	160-187437	12/05/19 15:08
160-36593	11	STSB33_0.5-3	Solid	160-1846520	160-36593-B-11	Clear Glass 4oz Wide -	1-46	Mazariegos, Leonel	I	160-187802	12/11/19 09:24
160-36593	11	STSB33_0.5-3	Solid	160-1846520	160-36593-B-11	Clear Glass 4oz Wide -	METALS	Mazariegos, Leonel	I	160-187729	12/10/19 12:46
160-36593	12	STSB33-FD_0.5-3	Solid	160-1846521	160-36593-A-12	Plastic Bag - 500g	Pre-Prep	Oetter, David R	I	160-187430	12/05/19 14:09
160-36593	12	STSB33-FD_0.5-3	Solid	160-1846521	160-36593-A-12	Plastic Bag - 500g	DRY AND GRIND	Oetter, David R	I	160-187437	12/05/19 15:08
160-36593	12	STSB33-FD_0.5-3	Solid	160-1846522	160-36593-B-12	Clear Glass 4oz Wide -	1-46	Mazariegos, Leonel	I	160-187802	12/11/19 09:24
160-36593	12	STSB33-FD_0.5-3	Solid	160-1846522	160-36593-B-12	Clear Glass 4oz Wide -	METALS	Mazariegos, Leonel	I	160-187729	12/10/19 12:46
160-36593	13	STSB33_3-6	Solid	160-1846523	160-36593-A-13	Plastic Bag - 500g	Pre-Prep	Oetter, David R	I	160-187430	12/05/19 14:09
160-36593	13	STSB33_3-6	Solid	160-1846523	160-36593-A-13	Plastic Bag - 500g	DRY AND GRIND	Oetter, David R	I	160-187437	12/05/19 15:08
160-36593	13	STSB33_3-6	Solid	160-1846524	160-36593-B-13	Clear Glass 4oz Wide -	1-46	Mazariegos, Leonel	I	160-187802	12/11/19 09:24
160-36593	13	STSB33_3-6	Solid	160-1846524	160-36593-B-13	Clear Glass 4oz Wide -	METALS	Mazariegos, Leonel	I	160-187729	12/10/19 12:46
160-36593	14	STSB33_6-15	Solid	160-1846525	160-36593-A-14	Plastic Bag - 500g	Pre-Prep	Oetter, David R	I	160-187430	12/05/19 14:09
160-36593	14	STSB33_6-15	Solid	160-1846525	160-36593-A-14	Plastic Bag - 500g	DRY AND GRIND	Oetter, David R	I	160-187437	12/05/19 15:08
160-36593	14	STSB33_6-15	Solid	160-1846526	160-36593-B-14	Clear Glass 4oz Wide -	1-46	Mazariegos, Leonel	I	160-187802	12/11/19 09:24
160-36593	14	STSB33_6-15	Solid	160-1846526	160-36593-B-14	Clear Glass 4oz Wide -	METALS	Mazariegos, Leonel	I	160-187729	12/10/19 12:46
160-36593	15	STSB35_0.5-3	Solid	160-1846527	160-36593-A-15	Plastic Bag - 500g	Pre-Prep	Oetter, David R	I	160-187430	12/05/19 14:09
160-36593	15	STSB35_0.5-3	Solid	160-1846527	160-36593-A-15	Plastic Bag - 500g	DRY AND GRIND	Oetter, David R	I	160-187437	12/05/19 15:08
160-36593	15	STSB35_0.5-3	Solid	160-1846528	160-36593-B-15	Clear Glass 4oz Wide -	1-46	Mazariegos, Leonel	I	160-187802	12/11/19 09:24
160-36593	15	STSB35_0.5-3	Solid	160-1846528	160-36593-B-15	Clear Glass 4oz Wide -	METALS	Mazariegos, Leonel	I	160-187729	12/10/19 12:46
160-36593	16	STSB35_0-0.5	Solid	160-1846529	160-36593-A-16	Plastic Bag - 500g	Pre-Prep	Oetter, David R	I	160-187430	12/05/19 14:09
160-36593	16	STSB35_0-0.5	Solid	160-1846529	160-36593-A-16	Plastic Bag - 500g	DRY AND GRIND	Oetter, David R	I	160-187437	12/05/19 15:08
160-36593	16	STSB35_0-0.5	Solid	160-1846530	160-36593-B-16	Clear Glass 4oz Wide -	1-46	Mazariegos, Leonel	I	160-187802	12/11/19 09:24
160-36593	16	STSB35_0-0.5	Solid	160-1846530	160-36593-B-16	Clear Glass 4oz Wide -	METALS	Mazariegos, Leonel	I	160-187729	12/10/19 12:46
160-36593	17	STSB35_3-6	Solid	160-1846531	160-36593-A-17	Plastic Bag - 500g	Pre-Prep	Oetter, David R	I	160-187430	12/05/19 14:09
160-36593	17	STSB35_3-6	Solid	160-1846531	160-36593-A-17	Plastic Bag - 500g	DRY AND GRIND	Oetter, David R	I	160-187437	12/05/19 15:08
160-36593	17	STSB35_3-6	Solid	160-1846532	160-36593-B-17	Clear Glass 4oz Wide -	1-46	Mazariegos, Leonel	I	160-187802	12/11/19 09:24
160-36593	17	STSB35_3-6	Solid	160-1846532	160-36593-B-17	Clear Glass 4oz Wide -	METALS	Mazariegos, Leonel	I	160-187729	12/10/19 12:46
160-36593	18	STSB35_6-15	Solid	160-1846533	160-36593-A-18	Plastic Bag - 500g	Pre-Prep	Oetter, David R	I	160-187430	12/05/19 14:09
160-36593	18	STSB35_6-15	Solid	160-1846533	160-36593-A-18	Plastic Bag - 500g	DRY AND GRIND	Oetter, David R	I	160-187437	12/05/19 15:08
160-36593	18	STSB35_6-15	Solid	160-1846534	160-36593-B-18	Clear Glass 4oz Wide -	1-46	Mazariegos, Leonel	I	160-187802	12/11/19 09:24
160-36593	18	STSB35_6-15	Solid	160-1846534	160-36593-B-18	Clear Glass 4oz Wide -	METALS	Mazariegos, Leonel	I	160-187729	12/10/19 12:46

Method Summary

Client: Wood E&I Solutions Inc
Project/Site: ACMS - Yerington OU-4b_OU-5_SOIL

Job ID: 160-36593-1

Method	Method Description	Protocol	Laboratory
6020A	Metals (ICP/MS)	SW846	TAL SL
Moisture	Percent Moisture	EPA	TAL SL
901.1	Radium-226 & Other Gamma Emitters (GS)	EPA	TAL SL
3050B	Preparation, Metals	SW846	TAL SL
Dry and Grind	Preparation, Dry and Grind	None	TAL SL
Fill_Geo-21	Fill Geometry, 21-Day In-Growth	None	TAL SL

Protocol References:

EPA = US Environmental Protection Agency

None = None

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

Laboratory References:

TAL SL = Eurofins TestAmerica, St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Accreditation/Certification Summary

Client: Wood E&I Solutions Inc
Project/Site: ACMS - Yerington OU-4b_OU-5_SOIL

Job ID: 160-36593-1

Laboratory: Eurofins TestAmerica, St. Louis

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	Identification Number	Expiration Date
Louisiana	NELAP	04080	06-30-20

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
901.1	Fill_Geo-21	Solid	Radium-226
901.1	Fill_Geo-21	Solid	Radium-228
Moisture		Solid	Percent Moisture
Moisture		Solid	Percent Solids

Nevada	State Program	MO000542018-1	07-31-20

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
6020A	3050B	Solid	Thorium
901.1	Fill_Geo-21	Solid	Radium-226
901.1	Fill_Geo-21	Solid	Radium-228
Moisture		Solid	Percent Moisture
Moisture		Solid	Percent Solids

ENVIRONMENTAL STANDARDS

INORGANIC ANALYSIS SUPPORT DOCUMENTATION

ESI project name:	ARCO Yerington	Reviewed by:	DC
Sample Collection Dates:	11/25/19, 12/3/19	Approved by:	Dina V
Job Number:	20115675.GW20	Completion Date:	2/21/2020
Project Manager:	KV		
Laboratory:	TestAmerica- St. Louis		

Applicable Sample No's ( ) Refer to Table 1 in the Quality Assurance Review

Deliverable:			Sample No.	Lab Control No.
	CLP (Full)	( )		
	Level IV (Full)	(X)	160-36593-1	
	Limited	( )		
	Other:			

The following table indicates criteria that were examined, the identified problems, and support documentation attachments

	Criteria Examined in Detail Check (√) if Yes or Footnote Letter for Comments Below					Problems Identified Check (√) if Yes or Footnote Letter for Comments Below					Support Documentation Attachments Check (√) if Yes or Footnote Letter for Comments Below				
	6020A					6020A					6020A				
Holding Times	X										X				
Blank Analysis Results	X										X				
Matrix Spike (Predigestion) Results	X										X				
Duplicate Analysis: (x) Field (x) Lab	X					X					X				
Quantitation of Results	X										X				
Detection Limit/Sensitivity															
Initial Calibrations	X										X				
Continuing Calibrations	X										X				
Laboratory Control Standard (LCS)	X										X				
ICP Linear Range Analysis	X										X				
ICP Interference Checks	X										X				
ICP Serial Dilutions	X										X				
ICP Post-Digestion Spike	X										X				
GFAA Post Digestion Spikes															
GFAA Duplicate Injections															
ICP Multiple Exposures	X										X				
GFAA Standard Additions															
CRDL Standards	X										X				
Condition on Receipt	X										X				
Percent Solids															
Others: ICPMS internal standards	X										X				

Comments:

ENVIRONMENTAL STANDARDS

RADIOLOGICAL ANALYSIS SUPPORT DOCUMENTATION

ESI project name:	ARCO Yerington	Reviewed by:	DC
Sample Collection Dates:	11/25/19, 12/3/19	Approved by:	Dina V
Job Number:	20115675.GW20	Completion Date:	2/21/2020
Project Manager:	KV		
Laboratory:	TestAmerica- St. Louis		

Applicable Sample No's (X) — Refer to Table 1 in the Quality Assurance Review

Deliverable:			Sample No.	Lab Control No.
	Level IV (Full)	(X)	160-36593-1	
	Limited	( )		
	Other:			

The following table indicates criteria that were examined, the identified problems, and support documentation attachments

	Criteria Examined in Detail Check (√) if Yes or Footnote Letter for Comments Below					Problems Identified Check (√) if Yes or Footnote Letter for Comments Below					Support Documentation Attachments Check (√) if Yes or Footnote Letter for Comments Below				
	901.1					901.1					901.1				
Holding Times	X										X				
Blank Analysis Results	X										X				
Laboratory Control Standard (LCS)	X										X				
Tracer/Chemical Yield															
Duplicate Analysis: (X) Field (X) Lab	X										X				
Matrix Spike Results															
Quantitation of Results	X					X					X				
Detection Limit															
Efficiency/Energy Calibrations	X										X				
Initial Calibration Verifications	X										X				
Annual Calibration Verifications															
Continuing Calibration Checks	X										X				
Continuing Calibration Backgrounds	X										X				
Sample Preservation	X										X				
Condition on Receipt	X										X				
Others: Headspace	X										X				

Comments:

RADIOLOGICAL FIELD DUPLICATE EVALUATION

DUPLICATE ERROR RATIO (DER 2-s) LIMIT < 2

DER = ABS (SAMPLE ACT - DUPLICATE ACT) / SQRT [(TPU 2-s SAMPLE)2 + (TPU 2-s DUPLICATE)2]

160-36593-1

Samples: STSB34_3-6 and STSB34-FD_3-6

Analyte	Sample Act	Sample TPU	Duplicate Act	Duplicate TPU	DER 2-s
Ra-226	1.9	0.298	2.15	0.362	1.07
Ra-228	0.863	0.184	0.982	0.263	0.74

Samples: STSB33_0.5-3 and STSB33-FD_0.5-3

Analyte	Sample Act	Sample TPU	Duplicate Act	Duplicate TPU	DER 2-s
Ra-226	1.6	0.26	1.58	0.288	0.10
Ra-228	1.05	0.222	0.82	0.371	1.06

EVALUATION OF INORGANIC FIELD DUPLICATE SAMPLE ANALYSIS PRECISION

Units see below	PRECISION OBJECTIVES*	
	Analyte > or = 5 X RL	RPD < or = 40
	Analyte < 5 X RL	Difference ≤ RL × 2

* Enter the project-specific or default acceptance criteria

ANALYTE	Units	STSB34_3-6 Analyte Concentration	Qual	RL	STSB34-FD_3-6 Analyte Concentration	Qual	RL	Difference	RPD	Notes
Thorium	mg/Kg	4.7		0.2	5.1		0.2	NA	8.2%	IN
Uranium	mg/Kg	1.1		0.099	1.2		0.1	NA	8.7%	IN
% solids	%	94.7		0.1	94.7		0.1	NA	0.0%	IN
								NA	#DIV/0!	#DIV/0!
								NA	#DIV/0!	#DIV/0!
								NA	#DIV/0!	#DIV/0!
								NA	#DIV/0!	#DIV/0!
								NA	#DIV/0!	#DIV/0!
								NA	#DIV/0!	#DIV/0!
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								NA	#DIV/0!	#DIV/0!
								NA	#DIV/0!	#DIV/0!
								NA	#DIV/0!	#DIV/0!

NOTES:

Qual) Column to enter J, U, U*, or B

RPD) Relative Percent Difference

RL) Reporting Limit

J) The analyte concentration should be considered estimated.

U) The analyte was not-detected in the sample. The numerical value of the EDL will be used for comparison purposes.

U* or B) The result was blank qualified. The numerical value will be used for comparison purposes.

NA) The RPD or Difference is not applicable.

1) Both results are > or = 5 X RL and RPD over acceptance limit, flag positive results "J".

2) At least one of the results is < 5 X RL and difference is over acceptance limit, flag positive results "J" and "not-detected" res

Comments:

EVALUATION OF INORGANIC FIELD DUPLICATE SAMPLE ANALYSIS PRECISION

Units see below	PRECISION OBJECTIVES*	
	Analyte > or = 5 X RL	RPD < or = 40
	Analyte < 5 X RL	Difference ≤ RL × 2

* Enter the project-specific or default acceptance criteria

ANALYTE	Units	STSB33_0.5-3 Analyte Concentration	Qual	RL	STSB33-FD_0.5-3 Analyte Concentration	Qual	RL	Difference	RPD	Notes
Thorium	mg/Kg	5.9		0.21	6.4		0.19	NA	8.1%	IN
Uranium	mg/Kg	1.5		0.1	1.6		0.096	NA	6.5%	IN
% solids	%	94		0.1	94.5		0.1	NA	0.5%	IN
								NA	#DIV/0!	#DIV/0!
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								NA	#DIV/0!	#DIV/0!
								NA	#DIV/0!	#DIV/0!
								NA	#DIV/0!	#DIV/0!
								NA	#DIV/0!	#DIV/0!

NOTES:

Qual) Column to enter J, U, U*, or B

RPD) Relative Percent Difference

RL) Reporting Limit

J) The analyte concentration should be considered estimated.

U) The analyte was not-detected in the sample. The numerical value of the EDL will be used for comparison purposes.

U* or B) The result was blank qualified. The numerical value will be used for comparison purposes.

NA) The RPD or Difference is not applicable.

1) Both results are > or = 5 X RL and RPD over acceptance limit, flag positive results "J".

2) At least one of the results is < 5 X RL and difference is over acceptance limit, flag positive results "J" and "not-detected" res

Comments:

Definitions/Glossary

Client: Wood E&I Solutions Inc
Project/Site: ACMS - Yerington OU-4b_OU-5_SOIL

Job ID: 160-36593-1

Qualifiers

Metals

Qualifier	Qualifier Description
F3	Duplicate RPD exceeds the control limit

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Client Sample Results

Client: Wood E&I Solutions Inc
Project/Site: ACMS - Yerington OU-4b_OU-5_SOIL

Job ID: 160-36593-1

Client Sample ID: STSB32_0-0.5

Lab Sample ID: 160-36593-1
Date Collected: 11/25/19 13:25
Matrix: Solid
Date Received: 12/05/19 09:30

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	3.01		0.306	0.438	1.00	0.166	pCi/g	12/06/19 13:38	12/27/19 07:44	1
Radium-228	0.910	J,T	0.232	0.250	1.00	0.185	pCi/g	12/06/19 13:38	12/27/19 07:44	1

Client Sample ID: STSB32_0-0.5

Lab Sample ID: 160-36593-1
Date Collected: 11/25/19 13:25
Matrix: Solid
Date Received: 12/05/19 09:30
Percent Solids: 93.3

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Thorium J,D	4.3		0.20	0.088	mg/Kg	☼	12/10/19 13:15	12/27/19 01:59	2
Uranium J,D	1.0		0.098	0.039	mg/Kg	☼	12/10/19 13:15	12/27/19 01:59	2

Client Sample ID: STSB32_0.5-3

Lab Sample ID: 160-36593-2
Date Collected: 11/25/19 13:40
Matrix: Solid
Date Received: 12/05/19 09:30

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	2.49		0.225	0.343	1.00	0.127	pCi/g	12/06/19 13:38	12/27/19 08:16	1
Radium-228	0.754	J,T	0.253	0.264	1.00	0.319	pCi/g	12/06/19 13:38	12/27/19 08:16	1

Client Sample ID: STSB32_0.5-3

Lab Sample ID: 160-36593-2
Date Collected: 11/25/19 13:40
Matrix: Solid
Date Received: 12/05/19 09:30
Percent Solids: 95.4

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Thorium J,D	6.1		0.20	0.088	mg/Kg	☼	12/10/19 13:15	12/27/19 02:33	2
Uranium J,D	1.4		0.098	0.039	mg/Kg	☼	12/10/19 13:15	12/27/19 02:33	2

Client Sample ID: STSB32_3-6

Lab Sample ID: 160-36593-3
Date Collected: 11/25/19 13:49
Matrix: Solid
Date Received: 12/05/19 09:30

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	3.31		0.335	0.475	1.00	0.208	pCi/g	12/06/19 13:38	12/27/19 08:17	1
Radium-228	1.03		0.383	0.397	1.00	0.360	pCi/g	12/06/19 13:38	12/27/19 08:17	1

Client Sample ID: STSB32_3-6

Lab Sample ID: 160-36593-3
Date Collected: 11/25/19 13:49
Matrix: Solid
Date Received: 12/05/19 09:30
Percent Solids: 93.3

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Thorium J,D	4.9		0.19	0.086	mg/Kg	☼	12/10/19 13:15	12/27/19 02:40	2

Client Sample ID: STSB32_3-6

Lab Sample ID: 160-36593-3
Date Collected: 11/25/19 13:49
Matrix: Solid
Date Received: 12/05/19 09:30
Percent Solids: 93.3

Method: 6020A - Metals (ICP/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Uranium J,D	1.7		0.095	0.038	mg/Kg	☼	12/10/19 13:15	12/27/19 02:40	2

Client Sample ID: STSB32_6-15

Lab Sample ID: 160-36593-4
Date Collected: 11/25/19 14:06
Matrix: Solid
Date Received: 12/05/19 09:30

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	3.17		0.360	0.488	1.00	0.162	pCi/g	12/06/19 13:38	12/27/19 08:19	1
Radium-228	1.36		0.287	0.319	1.00	0.336	pCi/g	12/06/19 13:38	12/27/19 08:19	1

Client Sample ID: STSB32_6-15

Lab Sample ID: 160-36593-4
Date Collected: 11/25/19 14:06
Matrix: Solid
Date Received: 12/05/19 09:30
Percent Solids: 91.0

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Thorium J,D	7.6		0.21	0.097	mg/Kg	☼	12/10/19 13:15	12/27/19 03:07	2
Uranium J,D	2.3		0.11	0.043	mg/Kg	☼	12/10/19 13:15	12/27/19 03:07	2

Client Sample ID: STSB34_0-0.5

Lab Sample ID: 160-36593-5
Date Collected: 11/25/19 15:00
Matrix: Solid
Date Received: 12/05/19 09:30

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	1.84		0.237	0.305	1.00	0.145	pCi/g	12/06/19 13:38	12/27/19 08:58	1
Radium-228	1.07		0.248	0.271	1.00	0.170	pCi/g	12/06/19 13:38	12/27/19 08:58	1

Client Sample ID: STSB34_0-0.5

Lab Sample ID: 160-36593-5
Date Collected: 11/25/19 15:00
Matrix: Solid
Date Received: 12/05/19 09:30
Percent Solids: 94.9

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Thorium J,D	4.7		0.19	0.086	mg/Kg	☼	12/10/19 13:15	12/27/19 03:13	2
Uranium J,D	1.4		0.096	0.038	mg/Kg	☼	12/10/19 13:15	12/27/19 03:13	2

Client Sample ID: STSB34_0.5-3

Lab Sample ID: 160-36593-6
Date Collected: 11/25/19 15:05
Matrix: Solid
Date Received: 12/05/19 09:30

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	2.34		0.284	0.374	1.00	0.158	pCi/g	12/06/19 13:38	12/27/19 09:03	1
Radium-228	0.930	J|T	0.224	0.243	1.00	0.289	pCi/g	12/06/19 13:38	12/27/19 09:03	1

Client Sample Results

Client: Wood E&I Solutions Inc
Project/Site: ACMS - Yerington OU-4b_OU-5_SOIL

Job ID: 160-36593-1

Client Sample ID: STSB34_0.5-3

Lab Sample ID: 160-36593-6
Date Collected: 11/25/19 15:05
Matrix: Solid
Date Received: 12/05/19 09:30
Percent Solids: 94.3

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Thorium J,D	4.6		0.21	0.093	mg/Kg	☼	12/10/19 13:15	12/27/19 03:20	2
Uranium J,D	1.1		0.10	0.041	mg/Kg	☼	12/10/19 13:15	12/27/19 03:20	2

Client Sample ID: STSB34_3-6

Lab Sample ID: 160-36593-7
Date Collected: 11/25/19 15:12
Matrix: Solid
Date Received: 12/05/19 09:30

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	1.90		0.223	0.298	1.00	0.146	pCi/g	12/06/19 13:38	12/27/19 09:30	1
Radium-228	0.863 J/T		0.161	0.184	1.00	0.169	pCi/g	12/06/19 13:38	12/27/19 09:30	1

Client Sample ID: STSB34_3-6

Lab Sample ID: 160-36593-7
Date Collected: 11/25/19 15:12
Matrix: Solid
Date Received: 12/05/19 09:30
Percent Solids: 94.7

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Thorium J,D	4.7		0.20	0.069	mg/Kg	☼	12/10/19 13:15	12/27/19 03:27	2
Uranium J,D	1.1		0.099	0.040	mg/Kg	☼	12/10/19 13:15	12/27/19 03:27	2

Client Sample ID: STSB34_6-15

Lab Sample ID: 160-36593-8
Date Collected: 11/25/19 15:28
Matrix: Solid
Date Received: 12/05/19 09:30

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	2.76		0.387	0.478	1.00	0.270	pCi/g	12/06/19 13:36	12/27/19 09:31	1
Radium-228	1.56		0.424	0.452	1.00	0.330	pCi/g	12/06/19 13:36	12/27/19 09:31	1

Client Sample ID: STSB34_6-15

Lab Sample ID: 160-36593-8
Date Collected: 11/25/19 15:28
Matrix: Solid
Date Received: 12/05/19 09:30
Percent Solids: 77.9

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Thorium J,D	16		0.23	0.10	mg/Kg	☼	12/10/19 13:15	12/27/19 03:33	2
Uranium J,D	4.3		0.12	0.046	mg/Kg	☼	12/10/19 13:15	12/27/19 03:33	2

Client Sample ID: STSB34-FD_3-6

Lab Sample ID: 160-36593-9
Date Collected: 11/25/19 15:13
Matrix: Solid
Date Received: 12/05/19 09:30

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	2.15		0.285	0.362	1.00	0.178	pCi/g	12/06/19 13:38	12/27/19 09:35	1

Client Sample ID: STSB34-FD_3-6

Lab Sample ID: 160-36593-9
Date Collected: 11/25/19 15:13
Matrix: Solid
Date Received: 12/05/19 09:30

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.982	J/T	0.244	0.263	1.00	0.215	pCi/g	12/06/19 13:38	12/27/19 09:35	1

Client Sample ID: STSB34-FD_3-6

Lab Sample ID: 160-36593-9
Date Collected: 11/25/19 15:13
Matrix: Solid
Date Received: 12/05/19 09:30
Percent Solids: 94.7

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Thorium J,D	5.1		0.20	0.088	mg/Kg	☼	12/10/19 13:15	12/27/19 03:40	2
Uranium J,D	1.2		0.098	0.039	mg/Kg	☼	12/10/19 13:15	12/27/19 03:40	2

Client Sample ID: STSB33_0-0.5

Lab Sample ID: 160-36593-10
Date Collected: 12/03/19 12:31
Matrix: Solid
Date Received: 12/05/19 09:30

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	1.48		0.212	0.262	1.00	0.131	pCi/g	12/06/19 13:38	12/27/19 09:34	1
Radium-228	0.714	J/T	0.192	0.206	1.00	0.223	pCi/g	12/06/19 13:38	12/27/19 09:34	1

Client Sample ID: STSB33_0-0.5

Lab Sample ID: 160-36593-10
Date Collected: 12/03/19 12:31
Matrix: Solid
Date Received: 12/05/19 09:30
Percent Solids: 94.9

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Thorium J,D	3.4		0.19	0.084	mg/Kg	☼	12/10/19 13:15	12/27/19 03:47	2
Uranium J,D	2.1		0.093	0.037	mg/Kg	☼	12/10/19 13:15	12/27/19 03:47	2

Client Sample ID: STSB33_0.5-3

Lab Sample ID: 160-36593-11
Date Collected: 12/03/19 12:40
Matrix: Solid
Date Received: 12/05/19 09:30

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	1.60		0.199	0.260	1.00	0.113	pCi/g	12/06/19 13:38	12/27/19 10:11	1
Radium-228	1.05		0.194	0.222	1.00	0.169	pCi/g	12/06/19 13:38	12/27/19 10:11	1

Client Sample ID: STSB33_0.5-3

Lab Sample ID: 160-36593-11
Date Collected: 12/03/19 12:40
Matrix: Solid
Date Received: 12/05/19 09:30
Percent Solids: 94.0

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Thorium J,D	5.9		0.21	0.092	mg/Kg	☼	12/10/19 13:15	12/27/19 03:54	2
Uranium J,D	1.5		0.10	0.041	mg/Kg	☼	12/10/19 13:15	12/27/19 03:54	2

Client Sample Results

Client: Wood E&I Solutions Inc
Project/Site: ACMS - Yerington OU-4b_OU-5_SOIL

Job ID: 160-36593-1

Client Sample ID: STSB33-FD_0.5-3

Lab Sample ID: 160-36593-12
Date Collected: 12/03/19 12:48
Matrix: Solid
Date Received: 12/05/19 09:30

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	1.58		0.239	0.288	1.00	0.209	pCi/g	12/06/19 13:38	12/27/19 10:12	1
Radium-228	0.820	J/T	0.362	0.371	1.00	0.345	pCi/g	12/06/19 13:38	12/27/19 10:12	1

Client Sample ID: STSB33-FD_0.5-3

Lab Sample ID: 160-36593-12
Date Collected: 12/03/19 12:48
Matrix: Solid
Date Received: 12/05/19 09:30
Percent Solids: 94.5

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Thorium J,D	6.4		0.19	0.086	mg/Kg	☼	12/10/19 13:15	12/27/19 04:00	2
Uranium J,D	1.6		0.096	0.038	mg/Kg	☼	12/10/19 13:15	12/27/19 04:00	2

Client Sample ID: STSB33_3-6

Lab Sample ID: 160-36593-13
Date Collected: 12/03/19 12:51
Matrix: Solid
Date Received: 12/05/19 09:30

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	1.20		0.285	0.311	1.00	0.316	pCi/g	12/06/19 13:38	12/27/19 10:14	1
Radium-228	1.95		0.532	0.568	1.00	0.691	pCi/g	12/06/19 13:38	12/27/19 10:14	1

Client Sample ID: STSB33_3-6

Lab Sample ID: 160-36593-13
Date Collected: 12/03/19 12:51
Matrix: Solid
Date Received: 12/05/19 09:30
Percent Solids: 93.3

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Thorium J,D	9.9		0.21	0.092	mg/Kg	☼	12/10/19 13:15	12/27/19 04:07	2
Uranium J,D	2.3		0.10	0.041	mg/Kg	☼	12/10/19 13:15	12/27/19 04:07	2

Client Sample ID: STSB33_6-15

Lab Sample ID: 160-36593-14
Date Collected: 12/03/19 13:05
Matrix: Solid
Date Received: 12/05/19 09:30

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	1.68		0.244	0.300	1.00	0.133	pCi/g	12/06/19 13:38	12/27/19 10:15	1
Radium-228	1.40		0.249	0.288	1.00	0.130	pCi/g	12/06/19 13:38	12/27/19 10:15	1

Client Sample ID: STSB33_6-15

Lab Sample ID: 160-36593-14
Date Collected: 12/03/19 13:05
Matrix: Solid
Date Received: 12/05/19 09:30
Percent Solids: 93.5

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Thorium J,D	6.5		0.21	0.093	mg/Kg	☼	12/10/19 13:15	12/27/19 04:34	2

Client Sample ID: STSB33_6-15

Lab Sample ID: 160-36593-14
Date Collected: 12/03/19 13:05
Matrix: Solid
Date Received: 12/05/19 09:30
Percent Solids: 93.5

Method: 6020A - Metals (ICP/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Uranium J,D	1.9		0.10	0.041	mg/Kg	☼	12/10/19 13:15	12/27/19 04:34	2

Client Sample ID: STSB35_0.5-3

Lab Sample ID: 160-36593-15
Date Collected: 12/03/19 14:41
Matrix: Solid
Date Received: 12/05/19 09:30

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	1.71		0.203	0.270	1.00	0.133	pCi/g	12/06/19 13:38	12/27/19 10:53	1
Radium-228	0.715	J|T	0.265	0.275	1.00	0.253	pCi/g	12/06/19 13:38	12/27/19 10:53	1

Client Sample ID: STSB35_0.5-3

Lab Sample ID: 160-36593-15
Date Collected: 12/03/19 14:41
Matrix: Solid
Date Received: 12/05/19 09:30
Percent Solids: 95.5

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Thorium J,D	5.2		0.18	0.081	mg/Kg	☼	12/10/19 13:15	12/27/19 04:41	2
Uranium J,D	1.2		0.090	0.036	mg/Kg	☼	12/10/19 13:15	12/27/19 04:41	2

Client Sample ID: STSB35_0-0.5

Lab Sample ID: 160-36593-16
Date Collected: 12/03/19 14:35
Matrix: Solid
Date Received: 12/05/19 09:30

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	3.54		0.400	0.543	1.00	0.214	pCi/g	12/06/19 13:38	12/27/19 10:54	1
Radium-228	0.952	J|T	0.352	0.365	1.00	0.497	pCi/g	12/06/19 13:38	12/27/19 10:54	1

Client Sample ID: STSB35_0-0.5

Lab Sample ID: 160-36593-16
Date Collected: 12/03/19 14:35
Matrix: Solid
Date Received: 12/05/19 09:30
Percent Solids: 92.4

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Thorium J,D	6.3		0.20	0.089	mg/Kg	☼	12/10/19 13:15	12/27/19 04:47	2
Uranium J,D	1.6		0.099	0.040	mg/Kg	☼	12/10/19 13:15	12/27/19 04:47	2

Client Sample ID: STSB35_3-6

Lab Sample ID: 160-36593-17
Date Collected: 12/03/19 14:54
Matrix: Solid
Date Received: 12/05/19 09:30

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	2.34		0.225	0.332	1.00	0.132	pCi/g	12/06/19 13:38	12/27/19 11:37	1
Radium-228	0.700	J|T	0.278	0.287	1.00	0.271	pCi/g	12/06/19 13:38	12/27/19 11:37	1

Client Sample Results

Client: Wood E&I Solutions Inc
Project/Site: ACMS - Yerington OU-4b_OU-5_SOIL

Job ID: 160-36593-1

Client Sample ID: STSB35_3-6

Lab Sample ID: 160-36593-17
Date Collected: 12/03/19 14:54
Matrix: Solid
Date Received: 12/05/19 09:30
Percent Solids: 94.3

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Thorium J,D	5.0		0.18	0.082	mg/Kg	☼	12/10/19 13:15	12/27/19 04:54	2
Uranium J,D	1.8		0.091	0.037	mg/Kg	☼	12/10/19 13:15	12/27/19 04:54	2

Client Sample ID: STSB35_6-15

Lab Sample ID: 160-36593-18
Date Collected: 12/03/19 15:00
Matrix: Solid
Date Received: 12/05/19 09:30

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	5.62		0.426	0.714	1.00	0.214	pCi/g	12/06/19 13:38	12/27/19 11:37	1
Radium-228	1.15		0.333	0.353	1.00	0.354	pCi/g	12/06/19 13:38	12/27/19 11:37	1

Client Sample ID: STSB35_6-15

Lab Sample ID: 160-36593-18
Date Collected: 12/03/19 15:00
Matrix: Solid
Date Received: 12/05/19 09:30
Percent Solids: 92.6

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Thorium J,D	5.5		0.19	0.085	mg/Kg	☼	12/10/19 13:49	12/27/19 05:01	2
Uranium J,D	2.2		0.095	0.038	mg/Kg	☼	12/10/19 13:49	12/27/19 05:01	2

QC Sample Results

Client: Wood E&I Solutions Inc
Project/Site: ACMS - Yerington OU-4b_OU-5_SOIL

Job ID: 160-36593-1

Method: 6020A - Metals (ICP/MS)

Lab Sample ID: MB 160-453801/1-A
Matrix: Solid
Analysis Batch: 455416

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 453801

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Thorium	ND		0.19	0.087	mg/Kg		12/10/19 13:15	12/27/19 01:39	2
Uranium	ND		0.097	0.039	mg/Kg		12/10/19 13:15	12/27/19 01:39	2

clear

Lab Sample ID: LCS 160-453801/2-A
Matrix: Solid
Analysis Batch: 455416

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 453801

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Thorium	90.2	90.2		mg/Kg		100	80 - 120

75-125%

Lab Sample ID: LCSSRM 160-453801/3-A
Matrix: Solid
Analysis Batch: 455416

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 453801

Analyte	Spike Added	LCSSRM Result	LCSSRM Qualifier	Unit	D	%Rec	%Rec. Limits
Uranium	98.1	102		mg/Kg		104.3	74.0 - 126.4

75-125%

Lab Sample ID: 160-36593-1 MS
Matrix: Solid
Analysis Batch: 455416

Client Sample ID: STSB32_0-0.5
Prep Type: Total/NA
Prep Batch: 453801

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Thorium	4.3		101	105		mg/Kg	☼	99	75 - 125
Uranium	1.0		101	102		mg/Kg	☼	99	75 - 125

Lab Sample ID: 160-36593-1 MSD
Matrix: Solid
Analysis Batch: 455416

Client Sample ID: STSB32_0-0.5
Prep Type: Total/NA
Prep Batch: 453801

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Thorium	4.3		104	110		mg/Kg	☼	102	75 - 125	5	30
Uranium	1.0		104	107		mg/Kg	☼	101	75 - 125	5	30

Lab Sample ID: 160-36593-1 DU
Matrix: Solid
Analysis Batch: 455416

Client Sample ID: STSB32_0-0.5
Prep Type: Total/NA
Prep Batch: 453801

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Thorium	4.3		8.07	F3	mg/Kg	☼	62	30
Uranium	1.0		2.12	F3	mg/Kg	☼	69	30

35

sample -1 qualified (see lab's email) J, D: all results

Field duplicates passed QC criteria

Serial dilution passed QC criteria

QC Sample Results

Client: Wood E&I Solutions Inc
Project/Site: ACMS - Yerington OU-4b_OU-5_SOIL

Job ID: 160-36593-1

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-453329/1-A
Matrix: Solid
Analysis Batch: 455404

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 453329

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.001468	U	0.147	0.147	1.00	0.256	pCi/g	12/06/19 13:38	12/27/19 07:39	1
Radium-228 Clear	0.006121	U	0.0488	0.0488	1.00	0.188	pCi/g	12/06/19 13:38	12/27/19 07:39	1

Lab Sample ID: LCS 160-453329/2-A
Matrix: Solid
Analysis Batch: 455401

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 453329

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Americium-241	96.6	99.53		11.7		1.14	pCi/g	103 ✓	75 - 125
Cesium-137	27.3	30.32		3.19		0.310	pCi/g	111 ✓	75 - 125
Cobalt-60	10.7	11.88		1.25		0.161	pCi/g	111 ✓	75 - 125

Lab Sample ID: 160-36593-1 DU
Matrix: Solid
Analysis Batch: 455402

Client Sample ID: STSB32_0-0.5
Prep Type: Total/NA
Prep Batch: 453329

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	DER	DER Limit
Radium-226	3.01		3.248		0.479	1.00	0.181	pCi/g	0.72	2
Radium-228	0.910		1.268		0.378	1.00	0.238	pCi/g	1.58 ✓	2

QC Association Summary

Client: Wood E&I Solutions Inc
Project/Site: ACMS - Yerington OU-4b_OU-5_SOIL

Job ID: 160-36593-1

Metals

Prep Batch: 453801

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-36593-1	STSB32_0-0.5	Total/NA	Solid	3050B	
160-36593-2	STSB32_0.5-3	Total/NA	Solid	3050B	
160-36593-3	STSB32_3-6	Total/NA	Solid	3050B	
160-36593-4	STSB32_6-15	Total/NA	Solid	3050B	
160-36593-5	STSB34_0-0.5	Total/NA	Solid	3050B	
160-36593-6	STSB34_0.5-3	Total/NA	Solid	3050B	
160-36593-7	STSB34_3-6	Total/NA	Solid	3050B	
160-36593-8	STSB34_6-15	Total/NA	Solid	3050B	
160-36593-9	STSB34-FD_3-6	Total/NA	Solid	3050B	
160-36593-10	STSB33_0-0.5	Total/NA	Solid	3050B	
160-36593-11	STSB33_0.5-3	Total/NA	Solid	3050B	
160-36593-12	STSB33-FD_0.5-3	Total/NA	Solid	3050B	
160-36593-13	STSB33_3-6	Total/NA	Solid	3050B	
160-36593-14	STSB33_6-15	Total/NA	Solid	3050B	
160-36593-15	STSB35_0.5-3	Total/NA	Solid	3050B	
160-36593-16	STSB35_0-0.5	Total/NA	Solid	3050B	
160-36593-17	STSB35_3-6	Total/NA	Solid	3050B	
160-36593-18	STSB35_6-15	Total/NA	Solid	3050B	
MB 160-453801/1-A	Method Blank	Total/NA	Solid	3050B	
LCS 160-453801/2-A	Lab Control Sample	Total/NA	Solid	3050B	
LCSSRM 160-453801/3-A	Lab Control Sample	Total/NA	Solid	3050B	
160-36593-1 MS	STSB32_0-0.5	Total/NA	Solid	3050B	
160-36593-1 MSD	STSB32_0-0.5	Total/NA	Solid	3050B	
160-36593-1 DU	STSB32_0-0.5	Total/NA	Solid	3050B	

Analysis Batch: 455416

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-36593-1	STSB32_0-0.5	Total/NA	Solid	6020A	453801
160-36593-2	STSB32_0.5-3	Total/NA	Solid	6020A	453801
160-36593-3	STSB32_3-6	Total/NA	Solid	6020A	453801
160-36593-4	STSB32_6-15	Total/NA	Solid	6020A	453801
160-36593-5	STSB34_0-0.5	Total/NA	Solid	6020A	453801
160-36593-6	STSB34_0.5-3	Total/NA	Solid	6020A	453801
160-36593-7	STSB34_3-6	Total/NA	Solid	6020A	453801
160-36593-8	STSB34_6-15	Total/NA	Solid	6020A	453801
160-36593-9	STSB34-FD_3-6	Total/NA	Solid	6020A	453801
160-36593-10	STSB33_0-0.5	Total/NA	Solid	6020A	453801
160-36593-11	STSB33_0.5-3	Total/NA	Solid	6020A	453801
160-36593-12	STSB33-FD_0.5-3	Total/NA	Solid	6020A	453801
160-36593-13	STSB33_3-6	Total/NA	Solid	6020A	453801
160-36593-14	STSB33_6-15	Total/NA	Solid	6020A	453801
160-36593-15	STSB35_0.5-3	Total/NA	Solid	6020A	453801
160-36593-16	STSB35_0-0.5	Total/NA	Solid	6020A	453801
160-36593-17	STSB35_3-6	Total/NA	Solid	6020A	453801
160-36593-18	STSB35_6-15	Total/NA	Solid	6020A	453801
MB 160-453801/1-A	Method Blank	Total/NA	Solid	6020A	453801
LCS 160-453801/2-A	Lab Control Sample	Total/NA	Solid	6020A	453801
LCSSRM 160-453801/3-A	Lab Control Sample	Total/NA	Solid	6020A	453801
160-36593-1 MS	STSB32_0-0.5	Total/NA	Solid	6020A	453801
160-36593-1 MSD	STSB32_0-0.5	Total/NA	Solid	6020A	453801
160-36593-1 DU	STSB32_0-0.5	Total/NA	Solid	6020A	453801

QC Association Summary

Client: Wood E&I Solutions Inc
Project/Site: ACMS - Yerington OU-4b_OU-5_SOIL

Job ID: 160-36593-1

General Chemistry

Analysis Batch: 453177

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-36593-1	STSB32_0-0.5	Total/NA	Solid	Moisture	
160-36593-2	STSB32_0.5-3	Total/NA	Solid	Moisture	
160-36593-3	STSB32_3-6	Total/NA	Solid	Moisture	
160-36593-4	STSB32_6-15	Total/NA	Solid	Moisture	
160-36593-5	STSB34_0-0.5	Total/NA	Solid	Moisture	
160-36593-6	STSB34_0.5-3	Total/NA	Solid	Moisture	
160-36593-7	STSB34_3-6	Total/NA	Solid	Moisture	
160-36593-8	STSB34_6-15	Total/NA	Solid	Moisture	
160-36593-9	STSB34-FD_3-6	Total/NA	Solid	Moisture	
160-36593-10	STSB33_0-0.5	Total/NA	Solid	Moisture	
160-36593-11	STSB33_0.5-3	Total/NA	Solid	Moisture	
160-36593-12	STSB33-FD_0.5-3	Total/NA	Solid	Moisture	
160-36593-13	STSB33_3-6	Total/NA	Solid	Moisture	
160-36593-14	STSB33_6-15	Total/NA	Solid	Moisture	
160-36593-15	STSB35_0.5-3	Total/NA	Solid	Moisture	
160-36593-16	STSB35_0-0.5	Total/NA	Solid	Moisture	
160-36593-17	STSB35_3-6	Total/NA	Solid	Moisture	
160-36593-18	STSB35_6-15	Total/NA	Solid	Moisture	
160-36593-1 DU	STSB32_0-0.5	Total/NA	Solid	Moisture	

Rad

Leach Batch: 453184

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-36593-1	STSB32_0-0.5	Total/NA	Solid	Dry and Grind	
160-36593-2	STSB32_0.5-3	Total/NA	Solid	Dry and Grind	
160-36593-3	STSB32_3-6	Total/NA	Solid	Dry and Grind	
160-36593-4	STSB32_6-15	Total/NA	Solid	Dry and Grind	
160-36593-5	STSB34_0-0.5	Total/NA	Solid	Dry and Grind	
160-36593-6	STSB34_0.5-3	Total/NA	Solid	Dry and Grind	
160-36593-7	STSB34_3-6	Total/NA	Solid	Dry and Grind	
160-36593-8	STSB34_6-15	Total/NA	Solid	Dry and Grind	
160-36593-9	STSB34-FD_3-6	Total/NA	Solid	Dry and Grind	
160-36593-10	STSB33_0-0.5	Total/NA	Solid	Dry and Grind	
160-36593-11	STSB33_0.5-3	Total/NA	Solid	Dry and Grind	
160-36593-12	STSB33-FD_0.5-3	Total/NA	Solid	Dry and Grind	
160-36593-13	STSB33_3-6	Total/NA	Solid	Dry and Grind	
160-36593-14	STSB33_6-15	Total/NA	Solid	Dry and Grind	
160-36593-15	STSB35_0.5-3	Total/NA	Solid	Dry and Grind	
160-36593-16	STSB35_0-0.5	Total/NA	Solid	Dry and Grind	
160-36593-17	STSB35_3-6	Total/NA	Solid	Dry and Grind	
160-36593-18	STSB35_6-15	Total/NA	Solid	Dry and Grind	
160-36593-1 DU	STSB32_0-0.5	Total/NA	Solid	Dry and Grind	

Prep Batch: 453329

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-36593-1	STSB32_0-0.5	Total/NA	Solid	Fill_Geo-21	453184
160-36593-2	STSB32_0.5-3	Total/NA	Solid	Fill_Geo-21	453184
160-36593-3	STSB32_3-6	Total/NA	Solid	Fill_Geo-21	453184
160-36593-4	STSB32_6-15	Total/NA	Solid	Fill_Geo-21	453184
160-36593-5	STSB34_0-0.5	Total/NA	Solid	Fill_Geo-21	453184

Rad (Continued)

Prep Batch: 453329 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-36593-6	STSB34_0.5-3	Total/NA	Solid	Fill_Geo-21	453184
160-36593-7	STSB34_3-6	Total/NA	Solid	Fill_Geo-21	453184
160-36593-8	STSB34_6-15	Total/NA	Solid	Fill_Geo-21	453184
160-36593-9	STSB34-FD_3-6	Total/NA	Solid	Fill_Geo-21	453184
160-36593-10	STSB33_0-0.5	Total/NA	Solid	Fill_Geo-21	453184
160-36593-11	STSB33_0.5-3	Total/NA	Solid	Fill_Geo-21	453184
160-36593-12	STSB33-FD_0.5-3	Total/NA	Solid	Fill_Geo-21	453184
160-36593-13	STSB33_3-6	Total/NA	Solid	Fill_Geo-21	453184
160-36593-14	STSB33_6-15	Total/NA	Solid	Fill_Geo-21	453184
160-36593-15	STSB35_0.5-3	Total/NA	Solid	Fill_Geo-21	453184
160-36593-16	STSB35_0-0.5	Total/NA	Solid	Fill_Geo-21	453184
160-36593-17	STSB35_3-6	Total/NA	Solid	Fill_Geo-21	453184
160-36593-18	STSB35_6-15	Total/NA	Solid	Fill_Geo-21	453184
MB 160-453329/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-453329/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
160-36593-1 DU	STSB32_0-0.5	Total/NA	Solid	Fill_Geo-21	453184

Lab Chronicle

Client: Wood E&I Solutions Inc
Project/Site: ACMS - Yerington OU-4b_OU-5_SOIL

Job ID: 160-36593-1

Client Sample ID: STSB32_0-0.5

Lab Sample ID: 160-36593-1
Date Collected: 11/25/19 13:25
Matrix: Solid
Date Received: 12/05/19 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1	453177	12/05/19 14:09	DRO	TAL SL
Total/NA	Leach	Dry and Grind			453184	12/05/19 15:08	DRO	TAL SL
Total/NA	Prep	Fill_Geo-21			453329	12/06/19 13:38	KRS	TAL SL
Total/NA	Analysis	901.1		1	455403	12/27/19 07:44	KLS	TAL SL

Client Sample ID: STSB32_0-0.5

Lab Sample ID: 160-36593-1
Date Collected: 11/25/19 13:25
Matrix: Solid
Date Received: 12/05/19 09:30
Percent Solids: 93.3

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			453801	12/10/19 13:15	LAM	TAL SL
Total/NA	Analysis	6020A		2	455416	12/27/19 01:59	FLC	TAL SL

Client Sample ID: STSB32_0.5-3

Lab Sample ID: 160-36593-2
Date Collected: 11/25/19 13:40
Matrix: Solid
Date Received: 12/05/19 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1	453177	12/05/19 14:09	DRO	TAL SL
Total/NA	Leach	Dry and Grind			453184	12/05/19 15:08	DRO	TAL SL
Total/NA	Prep	Fill_Geo-21			453329	12/06/19 13:38	KRS	TAL SL
Total/NA	Analysis	901.1		1	455404	12/27/19 08:16	KLS	TAL SL

Client Sample ID: STSB32_0.5-3

Lab Sample ID: 160-36593-2
Date Collected: 11/25/19 13:40
Matrix: Solid
Date Received: 12/05/19 09:30
Percent Solids: 95.4

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			453801	12/10/19 13:15	LAM	TAL SL
Total/NA	Analysis	6020A		2	455416	12/27/19 02:33	FLC	TAL SL

Client Sample ID: STSB32_3-6

Lab Sample ID: 160-36593-3
Date Collected: 11/25/19 13:49
Matrix: Solid
Date Received: 12/05/19 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1	453177	12/05/19 14:09	DRO	TAL SL
Total/NA	Leach	Dry and Grind			453184	12/05/19 15:08	DRO	TAL SL
Total/NA	Prep	Fill_Geo-21			453329	12/06/19 13:38	KRS	TAL SL
Total/NA	Analysis	901.1		1	455401	12/27/19 08:17	KLS	TAL SL

Lab Chronicle

Client: Wood E&I Solutions Inc
Project/Site: ACMS - Yerington OU-4b_OU-5_SOIL

Job ID: 160-36593-1

Client Sample ID: STSB32_3-6 — Lab Sample ID: 160-36593-3

Date Collected: 11/25/19 13:49 — **Matrix: Solid**
Date Received: 12/05/19 09:30 — **Percent Solids: 93.3**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			453801	12/10/19 13:15	LAM	TAL SL
Total/NA	Analysis	6020A		2	455416	12/27/19 02:40	FLC	TAL SL

Client Sample ID: STSB32_6-15 — Lab Sample ID: 160-36593-4

Date Collected: 11/25/19 14:06 — **Matrix: Solid**
Date Received: 12/05/19 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1	453177	12/05/19 14:09	DRO	TAL SL
Total/NA	Leach	Dry and Grind			453184	12/05/19 15:08	DRO	TAL SL
Total/NA	Prep	Fill_Geo-21			453329	12/06/19 13:38	KRS	TAL SL
Total/NA	Analysis	901.1		1	455403	12/27/19 08:19	KLS	TAL SL

Client Sample ID: STSB32_6-15 — Lab Sample ID: 160-36593-4

Date Collected: 11/25/19 14:06 — **Matrix: Solid**
Date Received: 12/05/19 09:30 — **Percent Solids: 91.0**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			453801	12/10/19 13:15	LAM	TAL SL
Total/NA	Analysis	6020A		2	455416	12/27/19 03:07	FLC	TAL SL

Client Sample ID: STSB34_0-0.5 — Lab Sample ID: 160-36593-5

Date Collected: 11/25/19 15:00 — **Matrix: Solid**
Date Received: 12/05/19 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1	453177	12/05/19 14:09	DRO	TAL SL
Total/NA	Leach	Dry and Grind			453184	12/05/19 15:08	DRO	TAL SL
Total/NA	Prep	Fill_Geo-21			453329	12/06/19 13:38	KRS	TAL SL
Total/NA	Analysis	901.1		1	455403	12/27/19 08:58	KLS	TAL SL

Client Sample ID: STSB34_0-0.5 — Lab Sample ID: 160-36593-5

Date Collected: 11/25/19 15:00 — **Matrix: Solid**
Date Received: 12/05/19 09:30 — **Percent Solids: 94.9**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			453801	12/10/19 13:15	LAM	TAL SL
Total/NA	Analysis	6020A		2	455416	12/27/19 03:13	FLC	TAL SL

Client Sample ID: STSB34_0.5-3 — Lab Sample ID: 160-36593-6

Date Collected: 11/25/19 15:05 — **Matrix: Solid**
Date Received: 12/05/19 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1	453177	12/05/19 14:09	DRO	TAL SL

Lab Chronicle

Client: Wood E&I Solutions Inc
Project/Site: ACMS - Yerington OU-4b_OU-5_SOIL

Job ID: 160-36593-1

Client Sample ID: STSB34_0.5-3
Date Collected: 11/25/19 15:05
Date Received: 12/05/19 09:30

Lab Sample ID: 160-36593-6
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Leach	Dry and Grind			453184	12/05/19 15:08	DRO	TAL SL
Total/NA	Prep	Fill_Geo-21			453329	12/06/19 13:38	KRS	TAL SL
Total/NA	Analysis	901.1		1	455402	12/27/19 09:03	KLS	TAL SL

Client Sample ID: STSB34_0.5-3
Date Collected: 11/25/19 15:05
Date Received: 12/05/19 09:30

Lab Sample ID: 160-36593-6
Matrix: Solid
Percent Solids: 94.3

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			453801	12/10/19 13:15	LAM	TAL SL
Total/NA	Analysis	6020A		2	455416	12/27/19 03:20	FLC	TAL SL

Client Sample ID: STSB34_3-6
Date Collected: 11/25/19 15:12
Date Received: 12/05/19 09:30

Lab Sample ID: 160-36593-7
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1	453177	12/05/19 14:09	DRO	TAL SL
Total/NA	Leach	Dry and Grind			453184	12/05/19 15:08	DRO	TAL SL
Total/NA	Prep	Fill_Geo-21			453329	12/06/19 13:38	KRS	TAL SL
Total/NA	Analysis	901.1		1	455404	12/27/19 09:30	KLS	TAL SL

Client Sample ID: STSB34_3-6
Date Collected: 11/25/19 15:12
Date Received: 12/05/19 09:30

Lab Sample ID: 160-36593-7
Matrix: Solid
Percent Solids: 94.7

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			453801	12/10/19 13:15	LAM	TAL SL
Total/NA	Analysis	6020A		2	455416	12/27/19 03:27	FLC	TAL SL

Client Sample ID: STSB34_6-15
Date Collected: 11/25/19 15:28
Date Received: 12/05/19 09:30

Lab Sample ID: 160-36593-8
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1	453177	12/05/19 14:09	DRO	TAL SL
Total/NA	Leach	Dry and Grind			453184	12/05/19 15:08	DRO	TAL SL
Total/NA	Prep	Fill_Geo-21			453329	12/06/19 13:38	KRS	TAL SL
Total/NA	Analysis	901.1		1	455401	12/27/19 09:31	KLS	TAL SL

Lab Chronicle

Client: Wood E&I Solutions Inc
Project/Site: ACMS - Yerington OU-4b_OU-5_SOIL

Job ID: 160-36593-1

Client Sample ID: STSB34_6-15
Lab Sample ID: 160-36593-8
Date Collected: 11/25/19 15:28
Matrix: Solid
Date Received: 12/05/19 09:30
Percent Solids: 77.9

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			453801	12/10/19 13:15	LAM	TAL SL
Total/NA	Analysis	6020A		2	455416	12/27/19 03:33	FLC	TAL SL

Client Sample ID: STSB34-FD_3-6
Lab Sample ID: 160-36593-9
Date Collected: 11/25/19 15:13
Matrix: Solid
Date Received: 12/05/19 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1	453177	12/05/19 14:09	DRO	TAL SL
Total/NA	Leach	Dry and Grind			453184	12/05/19 15:08	DRO	TAL SL
Total/NA	Prep	Fill_Geo-21			453329	12/06/19 13:38	KRS	TAL SL
Total/NA	Analysis	901.1		1	455402	12/27/19 09:35	KLS	TAL SL

Client Sample ID: STSB34-FD_3-6
Lab Sample ID: 160-36593-9
Date Collected: 11/25/19 15:13
Matrix: Solid
Date Received: 12/05/19 09:30
Percent Solids: 94.7

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			453801	12/10/19 13:15	LAM	TAL SL
Total/NA	Analysis	6020A		2	455416	12/27/19 03:40	FLC	TAL SL

Client Sample ID: STSB33_0-0.5
Lab Sample ID: 160-36593-10
Date Collected: 12/03/19 12:31
Matrix: Solid
Date Received: 12/05/19 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1	453177	12/05/19 14:09	DRO	TAL SL
Total/NA	Leach	Dry and Grind			453184	12/05/19 15:08	DRO	TAL SL
Total/NA	Prep	Fill_Geo-21			453329	12/06/19 13:38	KRS	TAL SL
Total/NA	Analysis	901.1		1	455403	12/27/19 09:34	KLS	TAL SL

Client Sample ID: STSB33_0-0.5
Lab Sample ID: 160-36593-10
Date Collected: 12/03/19 12:31
Matrix: Solid
Date Received: 12/05/19 09:30
Percent Solids: 94.9

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			453801	12/10/19 13:15	LAM	TAL SL
Total/NA	Analysis	6020A		2	455416	12/27/19 03:47	FLC	TAL SL

Client Sample ID: STSB33_0.5-3
Lab Sample ID: 160-36593-11
Date Collected: 12/03/19 12:40
Matrix: Solid
Date Received: 12/05/19 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1	453177	12/05/19 14:09	DRO	TAL SL

Lab Chronicle

Client: Wood E&I Solutions Inc
Project/Site: ACMS - Yerington OU-4b_OU-5_SOIL

Job ID: 160-36593-1

Client Sample ID: STSB33_0.5-3
Date Collected: 12/03/19 12:40
Date Received: 12/05/19 09:30

Lab Sample ID: 160-36593-11
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Leach	Dry and Grind			453184	12/05/19 15:08	DRO	TAL SL
Total/NA	Prep	Fill_Geo-21			453329	12/06/19 13:38	KRS	TAL SL
Total/NA	Analysis	901.1		1	455404	12/27/19 10:11	KLS	TAL SL

Client Sample ID: STSB33_0.5-3
Date Collected: 12/03/19 12:40
Date Received: 12/05/19 09:30

Lab Sample ID: 160-36593-11
Matrix: Solid
Percent Solids: 94.0

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			453801	12/10/19 13:15	LAM	TAL SL
Total/NA	Analysis	6020A		2	455416	12/27/19 03:54	FLC	TAL SL

Client Sample ID: STSB33-FD_0.5-3
Date Collected: 12/03/19 12:48
Date Received: 12/05/19 09:30

Lab Sample ID: 160-36593-12
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1	453177	12/05/19 14:09	DRO	TAL SL
Total/NA	Leach	Dry and Grind			453184	12/05/19 15:08	DRO	TAL SL
Total/NA	Prep	Fill_Geo-21			453329	12/06/19 13:38	KRS	TAL SL
Total/NA	Analysis	901.1		1	455401	12/27/19 10:12	KLS	TAL SL

Client Sample ID: STSB33-FD_0.5-3
Date Collected: 12/03/19 12:48
Date Received: 12/05/19 09:30

Lab Sample ID: 160-36593-12
Matrix: Solid
Percent Solids: 94.5

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			453801	12/10/19 13:15	LAM	TAL SL
Total/NA	Analysis	6020A		2	455416	12/27/19 04:00	FLC	TAL SL

Client Sample ID: STSB33_3-6
Date Collected: 12/03/19 12:51
Date Received: 12/05/19 09:30

Lab Sample ID: 160-36593-13
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1	453177	12/05/19 14:09	DRO	TAL SL
Total/NA	Leach	Dry and Grind			453184	12/05/19 15:08	DRO	TAL SL
Total/NA	Prep	Fill_Geo-21			453329	12/06/19 13:38	KRS	TAL SL
Total/NA	Analysis	901.1		1	455402	12/27/19 10:14	KLS	TAL SL

Lab Chronicle

Client: Wood E&I Solutions Inc
Project/Site: ACMS - Yerington OU-4b_OU-5_SOIL

Job ID: 160-36593-1

Client Sample ID: STSB33_3-6
Lab Sample ID: 160-36593-13
Date Collected: 12/03/19 12:51
Matrix: Solid
Date Received: 12/05/19 09:30
Percent Solids: 93.3

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			453801	12/10/19 13:15	LAM	TAL SL
Total/NA	Analysis	6020A		2	455416	12/27/19 04:07	FLC	TAL SL

Client Sample ID: STSB33_6-15
Lab Sample ID: 160-36593-14
Date Collected: 12/03/19 13:05
Matrix: Solid
Date Received: 12/05/19 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1	453177	12/05/19 14:09	DRO	TAL SL
Total/NA	Leach	Dry and Grind			453184	12/05/19 15:08	DRO	TAL SL
Total/NA	Prep	Fill_Geo-21			453329	12/06/19 13:38	KRS	TAL SL
Total/NA	Analysis	901.1		1	455403	12/27/19 10:15	KLS	TAL SL

Client Sample ID: STSB33_6-15
Lab Sample ID: 160-36593-14
Date Collected: 12/03/19 13:05
Matrix: Solid
Date Received: 12/05/19 09:30
Percent Solids: 93.5

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			453801	12/10/19 13:15	LAM	TAL SL
Total/NA	Analysis	6020A		2	455416	12/27/19 04:34	FLC	TAL SL

Client Sample ID: STSB35_0.5-3
Lab Sample ID: 160-36593-15
Date Collected: 12/03/19 14:41
Matrix: Solid
Date Received: 12/05/19 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1	453177	12/05/19 14:09	DRO	TAL SL
Total/NA	Leach	Dry and Grind			453184	12/05/19 15:08	DRO	TAL SL
Total/NA	Prep	Fill_Geo-21			453329	12/06/19 13:38	KRS	TAL SL
Total/NA	Analysis	901.1		1	455404	12/27/19 10:53	KLS	TAL SL

Client Sample ID: STSB35_0.5-3
Lab Sample ID: 160-36593-15
Date Collected: 12/03/19 14:41
Matrix: Solid
Date Received: 12/05/19 09:30
Percent Solids: 95.5

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			453801	12/10/19 13:15	LAM	TAL SL
Total/NA	Analysis	6020A		2	455416	12/27/19 04:41	FLC	TAL SL

Client Sample ID: STSB35_0-0.5
Lab Sample ID: 160-36593-16
Date Collected: 12/03/19 14:35
Matrix: Solid
Date Received: 12/05/19 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1	453177	12/05/19 14:09	DRO	TAL SL

Lab Chronicle

Client: Wood E&I Solutions Inc
Project/Site: ACMS - Yerington OU-4b_OU-5_SOIL

Job ID: 160-36593-1

Client Sample ID: STSB35_0-0.5
Lab Sample ID: 160-36593-16
Date Collected: 12/03/19 14:35
Matrix: Solid
Date Received: 12/05/19 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Leach	Dry and Grind			453184	12/05/19 15:08	DRO	TAL SL
Total/NA	Prep	Fill_Geo-21			453329	12/06/19 13:38	KRS	TAL SL
Total/NA	Analysis	901.1		1	455403	12/27/19 10:54	KLS	TAL SL

Client Sample ID: STSB35_0-0.5
Lab Sample ID: 160-36593-16
Date Collected: 12/03/19 14:35
Matrix: Solid
Date Received: 12/05/19 09:30
Percent Solids: 92.4

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			453801	12/10/19 13:15	LAM	TAL SL
Total/NA	Analysis	6020A		2	455416	12/27/19 04:47	FLC	TAL SL

Client Sample ID: STSB35_3-6
Lab Sample ID: 160-36593-17
Date Collected: 12/03/19 14:54
Matrix: Solid
Date Received: 12/05/19 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1	453177	12/05/19 14:09	DRO	TAL SL
Total/NA	Leach	Dry and Grind			453184	12/05/19 15:08	DRO	TAL SL
Total/NA	Prep	Fill_Geo-21			453329	12/06/19 13:38	KRS	TAL SL
Total/NA	Analysis	901.1		1	455404	12/27/19 11:37	KLS	TAL SL

Client Sample ID: STSB35_3-6
Lab Sample ID: 160-36593-17
Date Collected: 12/03/19 14:54
Matrix: Solid
Date Received: 12/05/19 09:30
Percent Solids: 94.3

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			453801	12/10/19 13:15	LAM	TAL SL
Total/NA	Analysis	6020A		2	455416	12/27/19 04:54	FLC	TAL SL

Client Sample ID: STSB35_6-15
Lab Sample ID: 160-36593-18
Date Collected: 12/03/19 15:00
Matrix: Solid
Date Received: 12/05/19 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1	453177	12/05/19 14:09	DRO	TAL SL
Total/NA	Leach	Dry and Grind			453184	12/05/19 15:08	DRO	TAL SL
Total/NA	Prep	Fill_Geo-21			453329	12/06/19 13:38	KRS	TAL SL
Total/NA	Analysis	901.1		1	455401	12/27/19 11:37	KLS	TAL SL

Lab Chronicle

Client: Wood E&I Solutions Inc
Project/Site: ACMS - Yerington OU-4b_OU-5_SOIL

Job ID: 160-36593-1

Client Sample ID: STSB35_6-15

Date Collected: 12/03/19 15:00
Date Received: 12/05/19 09:30

Lab Sample ID: 160-36593-18

Matrix: Solid
Percent Solids: 92.6

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			453801	12/10/19 13:49	LAM	TAL SL
Total/NA	Analysis	6020A		2	455416	12/27/19 05:01	FLC	TAL SL

Laboratory References:

TAL SL = Eurofins TestAmerica, St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

METALS

COVER PAGE
METALS

Lab Name: Eurofins TestAmerica, St. Louis Job Number: 160-36593-1

SDG No.:

Project: ACMS - Yerington OU-4b_OU-5_SOIL

Client Sample ID	Lab Sample ID
STSB32_0-0.5	160-36593-1
STSB32_0.5-3	160-36593-2
STSB32_3-6	160-36593-3
STSB32_6-15	160-36593-4
STSB34_0-0.5	160-36593-5
STSB34_0.5-3	160-36593-6
STSB34_3-6	160-36593-7
STSB34_6-15	160-36593-8
STSB34-FD_3-6	160-36593-9
STSB33_0-0.5	160-36593-10
STSB33_0.5-3	160-36593-11
STSB33-FD_0.5-3	160-36593-12
STSB33_3-6	160-36593-13
STSB33_6-15	160-36593-14
STSB35_0.5-3	160-36593-15
STSB35_0-0.5	160-36593-16
STSB35_3-6	160-36593-17
STSB35_6-15	160-36593-18

Comments:

2A-IN
CALIBRATION VERIFICATIONS
METALS

Lab Name: Eurofins TestAmerica, St. Louis Job No.: 160-36593-1

SDG No.:

ICV Source: MS A ICV_01081 Concentration Units: ug/L

CCV Source: MS A CAL1 LLC_00421

90-110% 50-150%

	ICV 160-455416/7 12/27/2019 00:51				CCVL 160-455416/24 12/27/2019 02:46				CCVL 160-455416/37 12/27/2019 04:14			
Analyte	Found	C	True	%R	Found	C	True	%R	Found	C	True	%R
Thorium	99.3		100	99	1.85	J	2.00	93	1.80	J	2.00	90
Uranium	101		100	101	0.908	J	1.00	91	0.890	J	1.00	89

Note! Calculations are performed before rounding to avoid round-off errors in calculated results.
Italicized analytes were not requested for this sequence.

2A-IN
CALIBRATION VERIFICATIONS
METALS

Lab Name: Eurofins TestAmerica, St. Louis Job No.: 160-36593-1

SDG No.:

ICV Source: MS A ICV_01081 Concentration Units: ug/L

CCV Source: MS A CAL1 LLC_00421

50-150%

	CCVL 160-455416/50 12/27/2019 05:41											
Analyte	Found	C	True	%R	Found	C	True	%R	Found	C	True	%R
Thorium	1.80	J	2.00	90								
Uranium	0.901	J	1.00	90								

Note! Calculations are performed before rounding to avoid round-off errors in calculated results.
Italicized analytes were not requested for this sequence.

2A-IN
CALIBRATION VERIFICATIONS
METALS

Lab Name: Eurofins TestAmerica, St. Louis Job No.: 160-36593-1

SDG No.:

ICV Source: MS A ICV_01081 Concentration Units: ug/L

CCV Source: MS A CAL2 CCV_00378

90-110%

	ICV 160-455416/7 12/27/2019 00:51				CCV 160-455416/12 12/27/2019 01:25				CCV 160-455416/25 12/27/2019 02:53			
Analyte	Found	C	True	%R	Found	C	True	%R	Found	C	True	%R
Thorium	99.3		100	99	101		100	101	97.9		100	98
Uranium	101		100	101	101		100	101	98.5		100	98

Note! Calculations are performed before rounding to avoid round-off errors in calculated results.
Italicized analytes were not requested for this sequence.

2A-IN
CALIBRATION VERIFICATIONS
METALS

Lab Name: Eurofins TestAmerica, St. Louis Job No.: 160-36593-1

SDG No.:

ICV Source: MS A ICV_01081 Concentration Units: ug/L

CCV Source: MS A CAL2 CCV_00378

90-110%

	CCV 160-455416/38 12/27/2019 04:20				CCV 160-455416/51 12/27/2019 05:48							
Analyte	Found	C	True	%R	Found	C	True	%R	Found	C	True	%R
Thorium	98.5		100	99	101		100	101				
Uranium	99.1		100	99	102		100	102				

Note! Calculations are performed before rounding to avoid round-off errors in calculated results.
Italicized analytes were not requested for this sequence.

2B-IN
CRQL CHECK STANDARD
METALS

Lab Name: Eurofins TestAmerica, St. Louis Job No.: 160-36593-1

SDG No.:

Method: 6020A Instrument ID: ICPMS7700

Lab Sample ID: CRI 160-455416/9 Concentration Units: ug/L

CRQL Check Standard Source: MS A CAL1 LLC 00421

50-150%

	CRQL Check Standard				
Analyte	True	Found	Qualifiers	%R(1)	Limits
Thorium	2.00	1.90	J	95	70-130
Uranium	1.00	0.921	J	92	70-130

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

FORM IIB-IN

3-IN
INSTRUMENT BLANKS
METALS

Lab Name: Eurofins TestAmerica, St. Louis Job No.: 160-36593-1

SDG No.:

Concentration Units: ug/L

		ICB 160-455416/8 12/27/2019 00:58		CCB 160-455416/13 12/27/2019 01:32		CCB 160-455416/26 12/27/2019 03:00		CCB 160-455416/39 12/27/2019 04:27	
Analyte	RL	Found	C	Found	C	Found	C	Found	C
Thorium	2.0	ND		ND		ND		ND	
Uranium	1.0	ND		ND		ND		ND	
		clear		clear		clear		clear	

Italicized analytes were not requested for this sequence.

3-IN
INSTRUMENT BLANKS
METALS

Lab Name: Eurofins TestAmerica, St. Louis Job No.: 160-36593-1

SDG No.:

Concentration Units: ug/L

		CCB 160-455416/52 12/27/2019 05:55							
Analyte	RL	Found	C	Found	C	Found	C	Found	C
Thorium	2.0	ND							
Uranium	1.0	ND							

Clear

Italicized analytes were not requested for this sequence.

3-IN
METHOD BLANK
METALS

Lab Name: Eurofins TestAmerica, St. Louis Job No.: 160-36593-1

SDG No.:

Concentration Units: mg/Kg Lab Sample ID: MB 160-453801/1-A

Instrument Code: ICPMS7700 Batch No.: 455416

CAS No.	Analyte	Concentration	C	Q	Method
7440-29-1	Thorium	ND			6020A
7440-61-1	Uranium	ND			6020A

Clear

FORM III-IN

4A-IN
INTERFERENCE CHECK STANDARD
METALS

Lab Name: Eurofins TestAmerica, St. Louis Job No.: 160-36593-1

SDG No.:

Lab Sample ID: ICSA 160-455416/10 Instrument ID: ICPMS7700

Lab File ID: 082ICSA.D ICS Source: MS A ICSA 00329

Concentration Units: ug/L

Analyte	True Solution A	Found Solution A	Percent Recovery (80-120%)
Thorium		0.0570	
Uranium		0.0000	-0.00029
Titanium	*2000*	*2165*	*108*

* results for all samples < ½ spike amount for all spiked analytes, no qual/cual

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

FORM IVA-IN

4A-IN
INTERFERENCE CHECK STANDARD
METALS

Lab Name: Eurofins TestAmerica, St. Louis Job No.: 160-36593-1

SDG No.:

Lab Sample ID: ICSAB 160-455416/11 Instrument ID: ICPMS7700

Lab File ID: 083ICSB.D ICS Source: MS A ICSAB_00341

Concentration Units: ug/L

80-120%

Analyte	True Solution AB	Found Solution AB	Percent Recovery
Thorium	50.0	50.9	102
Uranium	50.0	50.6	101

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

FORM IVA-IN

5A-IN
MATRIX SPIKE SAMPLE RECOVERY
METALS

Client ID: STSB32_0-0.5 MS

Lab ID: 160-36593-1 MS

Lab Name: Eurofins TestAmerica, St. Louis

Job No.: 160-36593-1

SDG No.:

Matrix: Solid

Concentration Units: mg/Kg

% Solids: 93.3

Analyte	SSR C	Sample Result (SR) C	Spike Added (SA)	%R	Control Limit %R	Q	Method
Thorium	105	4.3	101	99	75-125		6020A
Uranium	102	1.0	101	99	75-125		6020A

SSR = Spiked Sample Result

Calculations are performed before rounding to avoid round-off errors in calculated results.
Note - Results and Reporting Limits have been adjusted for dry weight.

FORM VA - IN

5A-IN
MATRIX SPIKE DUPLICATE SAMPLE RECOVERY
METALS

Client ID: STSB32_0-0.5 MSD

Lab ID: 160-36593-1 MSD

Lab Name: Eurofins TestAmerica, St. Louis

Job No.: 160-36593-1

SDG No.:

Matrix: Solid

Concentration Units: mg/Kg

% Solids: 93.3

35%

Analyte	(SDR) C	Spike Added (SA)	%R	Control Limit %R	RPD	RPD Limit	Q	Method
Thorium	110	104	102	75-125	5	30		6020A
Uranium	107	104	101	75-125	5	30		6020A

SDR = Sample Duplicate Result

Calculations are performed before rounding to avoid round-off errors in calculated results.
Note - Results and Reporting Limits have been adjusted for dry weight.

FORM VD - IN

6-IN
DUPLICATES
METALS

Client ID: STSB32_0-0.5 DU

Lab ID: 160-36593-1 DU

Lab Name: Eurofins TestAmerica, St. Louis

Job No.: 160-36593-1

SDG No.:

% Solids for Sample: 93.3

% Solids for Duplicate: 93.8

Matrix: Solid

Concentration Units: mg/Kg

Analyte	Control Limit	Sample (S) C	Duplicate (D) C	RPD	Q	Method
Thorium	0.20	4.3 ✓	8.07 ✓	62	F3	6020A
Uranium	0.10	1.0 ✓	2.12 ✓	69	F3	6020A

J,D: ~~#~~ samples -01

See email to Lab.

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

FORM VI-IN

LINEAR RANGE CHECK STANDARD
METALS -

Lab ID: LRC 160-455416/2

Lab Name: Eurofins TestAmerica, St. Louis Job No.: 160-36593-1

Sample Matrix: Solid LCS Source: MS LDR 2_00188

Solid(ug/L)

Analyte	True	Found	C	%R	Limits		Q	Method
Thorium	2000	2090		104	90	110		6020A
Uranium	2000	2030		101	90	110		6020A

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

7A-IN
LAB CONTROL SAMPLE
METALS

Lab ID: LCS 160-453801/2-A

Lab Name: Eurofins TestAmerica, St. Louis Job No.: 160-36593-1

Sample Matrix: Solid LCS Source: MPREP1-A_00004

75-125%

Solid(mg/Kg)

Analyte	True	Found	C	%R	Limits		Q	Method
Thorium	90.2	90.2 ✓		100 ✓	80	120		6020A

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

FORM VIIA - IN

Sample Report

Sample Name	LCS 160-453801/2-A
Data File Name	087SMPL.D
DataPath	C:\ICPMH\1\DATA\122619B1.B
Acq Date Time	2019-12-27T01:45:52-06:00
Type	Sample
VialNumber	3102
Dilution	2
Comment	
Operator	LP 7700
ISTDRefDataFileName	075CALB.D

QC Analyte Table

Element	m/z	ISTD	Tune Step	Meas Value	FinalConcentration	Units	High Value	Analyte	QC Flag
Li	7	6	3	50.40129	100.80258	ug/l	1000	Li	
Be	9	6	3	49.49548	98.99096	ug/l	1000	Be	
B	11	6	3	89.95237	179.90473	ug/l	2000	B	
Na	23	45	2	5062.28082	10124.56163	ug/l	50000	Na	
Mg	24	45	2	5096.26211	10192.52421	ug/l	50000	Mg	
Al	27	45	2	5035.26191	10070.52382	ug/l	100000	Al	
P	31	45	2	521.29278	1042.58556	ug/l	100000	P	
K	39	45	2	5050.44532	10100.89064	ug/l	100000	K	
Ca	44	45	3	5125.19445	10250.38890	ug/l	100000	Ca	
Ti	47	45	3	505.05047	1010.10095	ug/l	2000	Ti	
V	51	45	2	489.26460	978.52919	ug/l	2000	V	
Cr	52	45	2	496.85639	993.71277	ug/l	2000	Cr	
Mn	55	72	2	523.63389	1047.26779	ug/l	5000	Mn	
Fe	57	72	2	5417.32916	10834.65833	ug/l	100000	Fe	
Co	59	72	2	521.18692	1042.37383	ug/l	2000	Co	
Ni	60	72	2	538.98436	1077.96873	ug/l	2000	Ni	
Cu	63	72	2	523.32011	1046.64022	ug/l	2000	Cu	
Zn	66	72	2	506.77114	1013.54229	ug/l	5000	Zn	
As	75	72	2	509.82407	1019.64813	ug/l	2000	As	
Se	78	72	2	256.63593	513.27185	ug/l	1000	Se	
Sr	88	72	3	511.94111	1023.88222	ug/l	2000	Sr	
Y	89	72	2	0.00597	0.01194	ug/l	200	Y	
Zr	90	72	2	514.92477	1029.84953	ug/l	2000	Zr	
Nb	93	72	2	0.69656	1.39312	ug/l	100	Nb	
Mo	95	72	3	253.30458	506.60916	ug/l	1000	Mo	
Ru	101	72	2	-0.00595	-0.01189	ug/l	200	Ru	
Rh	103	72	2	0.01386	0.02772	ug/l	200	Rh	
Pd	105	72	2	0.03131	0.06262	ug/l	20	Pd	
Ag	107	115	3	98.74063	197.48125	ug/l	400	Ag	
Cd	111	115	3	503.27128	1006.54255	ug/l	2000	Cd	
Sn	118	115	3	510.68437	1021.36873	ug/l	2000	Sn	
Sb	121	115	3	250.11734	500.23467	ug/l	1000	Sb	
Te	125	165	2	0.02664	0.05327	ug/l	200	Te	
Cs	133	165	2	-0.00064	-0.00129	ug/l	2000	Cs	
Ba	137	165	3	497.02053	994.04106	ug/l	5000	Ba	
La	139	165	2	0.81709	1.63419	ug/l	200	La	
Ce	140	165	2	0.05579	0.11158	ug/l	200	Ce	
Pr	141	165	2	0.00446	0.00892	ug/l	200	Pr	
Nd	146	165	2	0.01890	0.03779	ug/l	200	Nd	
Sm	147	165	3	508.36434	1016.72867	ug/l	2000	Sm	
Hf	178	165	2	0.69631	1.39262	ug/l	200	Hf	
Ta	181	165	2	0.51068	1.02137	ug/l	200	Ta	
W	182	165	2	486.79038	973.58076	ug/l	2000	W	
Re	185	193	3	0.00517	0.01034	ug/l	200	Re	
Pt	195	193	2	0.00768	0.01536	ug/l	200	Pt	
Au	197	193	3	0.03147	0.06294	ug/l	2000	Au	
Tl	205	193	3	100.46179	200.92358	ug/l	400	Tl	
Pb	208	193	3	507.59925	1015.19850	ug/l	5000	Pb	
Bi	209	193	2	523.99826	1047.99651	ug/l	2000	Bi	
Th	232	193	3	500.14199	1000.28399	ug/l	2000	Th	
U	238	193	3	508.44312	1016.88623	ug/l	2000	U	

QC ISTD Table

Element	m/z	Tune Step	CPS	%RSD	Reference CPS	%Recovery	Lower Limit	Upper Limit	Analyte	QC Flag
Li (IS)	6	3	4922972	0.61	4941712	99.6	80	120	Li (IS)	
Sc (IS)	45	2	200279	1.18	186699	107.3	80	120	Sc (IS)	
Sc (IS)	45	3	3412992	0.29	3281398	104.0	80	120	Sc (IS)	
Ge (IS)	72	2	442228	1.11	410530	107.7	80	120	Ge (IS)	
Ge (IS)	72	3	2652705	0.53	2540877	104.4	80	120	Ge (IS)	
In (IS)	115	3	19410545	1.02	19102387	101.6	80	120	In (IS)	
Ho (IS)	165	2	14664642	0.89	14511718	101.1	80	120	Ho (IS)	
Ho (IS)	165	3	24077364	0.86	23609138	102.0	80	120	Ho (IS)	
Ir (IS)	193	2	9410142	0.59	9828030	95.7	80	120	Ir (IS)	
Ir (IS)	193	3	11637895	0.24	11858846	98.1	80	120	Ir (IS)	

TuneStep	TuneFile
2	he.u
3	nogas.u

Sample Report

Sample Name	LCSSRM 160-453801/3-A
Data File Name	088SMPL.D
DataPath	C:\ICPMH\1\DATA\122619B1.B
Acq Date Time	2019-12-27T01:52:33-06:00
Type	Sample
VialNumber	3103
Dilution	10
Comment	
Operator	LP 7700
ISTDRefDataFileName	075CALB.D

QC Analyte Table

Element	m/z	ISTD	Tune Step	Meas Value	FinalConcentration	Units	High Value	Analyte	QC Flag
Li	7	6	3	8.22910	82.29096	ug/l	1000	Li	
Be	9	6	3	119.43221	1194.32210	ug/l	1000	Be	
B	11	6	3	89.80222	898.02217	ug/l	2000	B	
Na	23	45	2	254.15638	2541.56377	ug/l	50000	Na	
Mg	24	45	2	2732.69300	27326.92999	ug/l	50000	Mg	
Al	27	45	2	9231.59316	92315.93156	ug/l	100000	Al	
P	31	45	2	702.08046	7020.80457	ug/l	100000	P	
K	39	45	2	2293.33826	22933.38262	ug/l	100000	K	
Ca	44	45	3	5469.10284	54691.02836	ug/l	100000	Ca	
Ti	47	45	3	451.28532	4512.85320	ug/l	2000	Ti	
V	51	45	2	67.78217	677.82170	ug/l	2000	V	
Cr	52	45	2	163.20189	1632.01890	ug/l	2000	Cr	
Mn	55	72	2	289.25702	2892.57019	ug/l	5000	Mn	
Fe	57	72	2	20166.39229	201663.92291	ug/l	100000	Fe	
Co	59	72	2	58.86408	588.64078	ug/l	2000	Co	
Ni	60	72	2	116.91001	1169.10013	ug/l	2000	Ni	
Cu	63	72	2	214.37617	2143.76173	ug/l	2000	Cu	
Zn	66	72	2	246.69392	2466.93923	ug/l	5000	Zn	
As	75	72	2	202.05372	2020.53723	ug/l	2000	As	
Se	78	72	2	244.47587	2444.75873	ug/l	1000	Se	
Sr	88	72	3	131.05314	1310.53141	ug/l	2000	Sr	
Y	89	72	2	10.97326	109.73259	ug/l	200	Y	
Zr	90	72	2	7.22933	72.29328	ug/l	2000	Zr	
Nb	93	72	2	0.77072	7.70724	ug/l	100	Nb	
Mo	95	72	3	139.14108	1391.41080	ug/l	1000	Mo	
Ru	101	72	2	-0.00557	-0.05568	ug/l	200	Ru	
Rh	103	72	2	-0.00243	-0.02431	ug/l	200	Rh	
Pd	105	72	2	0.02013	0.20134	ug/l	20	Pd	
Ag	107	115	3	54.13815	541.38147	ug/l	400	Ag	
Cd	111	115	3	257.78752	2577.87523	ug/l	2000	Cd	
Sn	118	115	3	126.01924	1260.19238	ug/l	2000	Sn	
Sb	121	115	3	59.05844	590.58439	ug/l	1000	Sb	
Te	125	165	2	0.03616	0.36162	ug/l	200	Te	
Cs	133	165	2	1.31467	13.14668	ug/l	2000	Cs	
Ba	137	165	3	307.54886	3075.48856	ug/l	5000	Ba	
La	139	165	2	36.83028	368.30276	ug/l	200	La	
Ce	140	165	2	80.53441	805.34412	ug/l	200	Ce	
Pr	141	165	2	9.08456	90.84563	ug/l	200	Pr	
Nd	146	165	2	34.09792	340.97915	ug/l	200	Nd	
Sm	147	165	3	5.76422	57.64223	ug/l	2000	Sm	
Hf	178	165	2	0.15275	1.52752	ug/l	200	Hf	
Ta	181	165	2	0.01625	0.16249	ug/l	200	Ta	
W	182	165	2	1.34547	13.45473	ug/l	2000	W	
Re	185	193	3	-0.00349	-0.03489	ug/l	200	Re	
Pt	195	193	2	0.00101	0.01010	ug/l	200	Pt	
Au	197	193	3	0.01146	0.11457	ug/l	2000	Au	
Tl	205	193	3	192.73971	1927.39709	ug/l	400	Tl	
Pb	208	193	3	137.07455	1370.74545	ug/l	5000	Pb	
Bi	209	193	2	0.58260	5.82600	ug/l	2000	Bi	
Th	232	193	3	18.16713	181.67128	ug/l	2000	Th	
U	238	193	3	116.81818	1168.18177	ug/l	2000	U	

QC ISTD Table

Element	m/z	Tune Step	CPS	%RSD	Reference CPS	%Recovery	Lower Limit	Upper Limit	Analyte	QC Flag
Li (IS)	6	3	4977943	2.29	4941712	100.7	80	120	Li (IS)	
Sc (IS)	45	2	208017	0.96	186699	111.4	80	120	Sc (IS)	
Sc (IS)	45	3	3623816	2.73	3281398	110.4	80	120	Sc (IS)	
Ge (IS)	72	2	447736	0.28	410530	109.1	80	120	Ge (IS)	
Ge (IS)	72	3	2665888	2.21	2540877	104.9	80	120	Ge (IS)	
In (IS)	115	3	19224586	2.88	19102387	100.6	80	120	In (IS)	
Ho (IS)	165	2	14759623	0.70	14511718	101.7	80	120	Ho (IS)	
Ho (IS)	165	3	24101798	3.75	23609138	102.1	80	120	Ho (IS)	
Ir (IS)	193	2	9736573	0.60	9828030	99.1	80	120	Ir (IS)	
Ir (IS)	193	3	11775200	2.95	11858846	99.3	80	120	Ir (IS)	

TuneStep	TuneFile
2	he.u
3	nogas.u

7A-IN
LCS-CERTIFIED REFERENCE MATERIAL
METALS

Lab ID: LCSSRM 160-453801/3-A

Lab Name: Eurofins TestAmerica, St. Louis Job No.: 160-36593-1

Sample Matrix: Solid LCS Source: PR_LCSSRM U_00001

75-125%

Solid(mg/Kg)

Analyte	True	Found	C	%R	Limits		Q	Method
Uranium	98.1	102		104.3	74.0	126.4		6020A

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

FORM VIIA - IN

8-IN
ICP-AES AND ICP-MS SERIAL DILUTIONS
METALS

Lab ID: 160-36593-1

SDG No:

Lab Name: Eurofins TestAmerica, St. Louis Job No: 160-36593-1

Matrix: Solid Concentration Units: mg/Kg

Analyte	Initial Sample Result (I)	C	Serial Dilution Result (S)	C	% Difference	Q	Method
Thorium	4.3		3.82		NC		6020A
Uranium	1.0		1.04		NC		6020A

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

FORM VIII-IN

9-IN
DETECTION LIMITS
METALS

Lab Name: Eurofins TestAmerica, St. Louis Job Number: 160-36593-1

SDG Number:

Matrix: Solid Instrument ID: ICPMS7700

Method: 6020A MDL Date: 05/14/2018 10:39

Prep Method: 3050B

Analyte	Wavelength/ Mass	RL (mg/Kg)	MDL (mg/Kg)
Thorium	232	0.2	0.09
Uranium	238	0.1	0.04

9-IN
CALIBRATION BLANK DETECTION LIMITS
METALS

Lab Name: Eurofins TestAmerica, St. Louis Job Number: 160-36593-1

SDG Number:

Matrix: Solid Instrument ID: ICPMS7700

Method: 6020A XMDL Date: 06/27/2019 14:00

Analyte	Wavelength/ Mass	XRL (ug/L)	XMDL (ug/L)
Thorium	232	2	0.9
Uranium	238	1	0.4

✓

FORM IX - IN

11-IN
LINEAR RANGES
METALS

Lab Name: Eurofins TestAmerica, St. Loui Job No: 160-36593-1

SDG No.:

Instrument ID: ICPMS7700 Date: 08/05/2019 16:42

Analyte	Integ. Time (Sec.)	Concentration (ug/L)	Method
Thorium		2000	6020A
Uranium		2000	6020A

FORM XI - IN

12-IN
PREPARATION LOG
METALS

Lab Name: Eurofins TestAmerica, St. Louis Job No.: 160-36593-1

SDG No.:

Prep Method: 3050B

Lab Sample ID	Preparation Date	Prep Batch	Initial Weight (g)	Initial Volume	Final Volume (mL)
MB 160-453801/1-A	12/10/2019 13:15	453801	0.5153		50
LCS 160-453801/2-A	12/10/2019 13:15	453801	0.5542		50
LCSSRM 160-453801/3-A	12/10/2019 13:15	453801	0.5708		50
160-36593-1	12/10/2019 13:15	453801	0.5479		50
160-36593-1 DU	12/10/2019 13:15	453801	0.5295		50
160-36593-1 MS	12/10/2019 13:15	453801	0.5289		50
160-36593-1 MSD	12/10/2019 13:15	453801	0.5132		50
160-36593-2	12/10/2019 13:15	453801	0.5375		50
160-36593-3	12/10/2019 13:15	453801	0.5635		50
160-36593-4	12/10/2019 13:15	453801	0.5122		50
160-36593-5	12/10/2019 13:15	453801	0.5511		50
160-36593-6	12/10/2019 13:15	453801	0.5151		50
160-36593-7	12/10/2019 13:15	453801	0.5310		50
160-36593-8	12/10/2019 13:15	453801	0.5567		50
160-36593-9	12/10/2019 13:15	453801	0.5410		50
160-36593-10	12/10/2019 13:15	453801	0.5644		50
160-36593-11	12/10/2019 13:15	453801	0.5175		50
160-36593-12	12/10/2019 13:15	453801	0.5527		50
160-36593-13	12/10/2019 13:15	453801	0.5224		50
160-36593-14	12/10/2019 13:15	453801	0.5166		50
160-36593-15	12/10/2019 13:15	453801	0.5816		50
160-36593-16	12/10/2019 13:15	453801	0.5462		50
160-36593-17	12/10/2019 13:15	453801	0.5803		50
160-36593-18	12/10/2019 13:49	453801	0.5713		50

FORM XII-IN

13-IN
ANALYSIS RUN LOG
METALS

Lab Name: Eurofins TestAmerica, St. Louis Job No.: 160-36593-1

SDG No.:

Instrument ID: ICPMS7700 Analysis Method: 6020A

Start Date: 12/26/2019 17:19 End Date: 12/27/2019 07:50

Lab Sample Id	D/F	Type	Time	Analytes	
				Th	U
LRC 160-455416/1			17:19		
LRC 160-455416/2	1		17:26	X	X
ICIS 160-455416/3			00:24	X	X
IC 160-455416/4	1		00:31	X	X
IC 160-455416/5	1		00:38	X	X
IC 160-455416/6	1		00:45	X	X
ICV 160-455416/7	1		00:51	X	X
ICB 160-455416/8	1		00:58	X	X
CRI 160-455416/9	1		01:05	X	X
ICSA 160-455416/10	1		01:12	X	X
ICSAB 160-455416/11	1		01:18	X	X
CCV 160-455416/12	1		01:25	X	X
CCB 160-455416/13	1		01:32	X	X
MB 160-453801/1-A	2	T	01:39	X	X
LCS 160-453801/2-A	2	T	01:45	X	
LCSSRM 160-453801/3-A	10	T	01:52		X
160-36593-1	2	T	01:59	X	X
160-36593-1 SD	10	T	02:06	X	X
160-36593-1 DU	2	T	02:12	X	X
160-36593-1 MS	2	T	02:19	X	X
160-36593-1 MSD	2	T	02:26	X	X
160-36593-2	2	T	02:33	X	X
160-36593-3	2	T	02:40	X	X
CCVL 160-455416/24	1		02:46	X	X
CCV 160-455416/25	1		02:53	X	X
CCB 160-455416/26	1		03:00	X	X
160-36593-4	2	T	03:07	X	X
160-36593-5	2	T	03:13	X	X
160-36593-6	2	T	03:20	X	X
160-36593-7	2	T	03:27	X	X
160-36593-8	2	T	03:33	X	X
160-36593-9	2	T	03:40	X	X
160-36593-10	2	T	03:47	X	X
160-36593-11	2	T	03:54	X	X
160-36593-12	2	T	04:00	X	X
160-36593-13	2	T	04:07	X	X
CCVL 160-455416/37	1		04:14	X	X
CCV 160-455416/38	1		04:20	X	X
CCB 160-455416/39	1		04:27	X	X
160-36593-14	2	T	04:34	X	X
160-36593-15	2	T	04:41	X	X
160-36593-16	2	T	04:47	X	X

FORM XIII-IN

13-IN
ANALYSIS RUN LOG
METALS

Lab Name: Eurofins TestAmerica, St. Louis Job No.: 160-36593-1

SDG No.:

Instrument ID: ICPMS7700 Analysis Method: 6020A

Start Date: 12/26/2019 17:19 End Date: 12/27/2019 07:50

Lab Sample Id	D/F	Type	Time	Th	U	Analytes
160-36593-17	2	T	04:54	X	X	
160-36593-18	2	T	05:01	X	X	
ZZZZZZ			05:08			
ZZZZZZ			05:15			
ZZZZZZ			05:21			
ZZZZZZ			05:28			
ZZZZZZ			05:35			
CCVL 160-455416/50	1		05:41	X	X	
CCV 160-455416/51	1		05:48	X	X	
CCB 160-455416/52	1		05:55	X	X	
ZZZZZZ			06:02			
ZZZZZZ			06:08			
ZZZZZZ			06:15			
ZZZZZZ			06:22			
ZZZZZZ			06:29			
ZZZZZZ			06:35			
ZZZZZZ			06:42			
ZZZZZZ			06:49			
ZZZZZZ			06:56			
ZZZZZZ			07:02			
CCVL 160-455416/63			07:09			
CCV 160-455416/64			07:16			
CCB 160-455416/65			07:23			
ZZZZZZ			07:29			
CCVL 160-455416/67			07:36			
CCV 160-455416/68			07:43			
CCB 160-455416/69			07:50			

Prep Types:
T = Total/NA

FORM XIII-IN

* ISTD Ir/3 associated w/ reported results ONLY, all other ISTD not evaluated

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

METALS

Lab Name: Eurofins TestAmerica, St. Louis Job No.: 160-36593-1

SDG No.:

ICP-MS Instrument ID: ICPMS7700 Start Date: 12/26/2019 End Date: 12/27/2019

Internal Standards %RI For:

Lab Sample ID	Time	Element Li-6	Q	Element Sc/2	Q	Element Sc/3	Q	Element Ge/2	Q	Element Ge/3	Q
LRC 160-455416/3	11:26	94		124		108		118		106	
IC 160-455416/4	00:31	102		101		103		102		103	
IC 160-455416/5	00:38	99		102		103		107		104	
IC 160-455416/6	00:45	100		103		104		110		106	
ICV 160-455416/7	00:51	103		101		104		107		105	
ICB 160-455416/8	00:58	101		104		103		103		102	
CRI 160-455416/9	01:05	102		104		103		106		104	
ICSA 160-455416/10	01:12	112		110		110		107		105	
ICSAB 160-455416/11	01:18	114		118		115		114		108	
CCV 160-455416/12	01:25	108		114		112		119		112	
CCB 160-455416/13	01:32	105		110		109		109		106	
MB 160-453801/1-A	01:39	106		110		108		113		110	
LCS 160-453801/2-A	01:45	100		107		104		108		104	
LCSSRM 160-453801/3-A	01:52	101		111		110		109		105	
160-36593-1	01:59	110		122		126		114		113	
160-36593-1 SD	02:06	111		118		114		118		114	
160-36593-1 DU	02:12	112		133		132		120		114	
160-36593-1 MS	02:19	107		133		130		114		110	
160-36593-1 MSD	02:26	105		130		127		114		109	
160-36593-2	02:33	108		123		125		115		112	
160-36593-3	02:40	107		128		127		117		111	
CCVL 160-455416/24	02:46	106		112		110		113		108	
CCV 160-455416/25	02:53	103		112		109		118		110	
CCB 160-455416/26	03:00	101		108		105		106		104	
160-36593-4	03:07	108		129		126		120		114	
160-36593-5	03:13	109		133		133		119		114	
160-36593-6	03:20	109		130		131		118		114	
160-36593-7	03:27	109		132		129		118		113	
160-36593-8	03:33	109		126		126		119		114	
160-36593-9	03:40	108		130		130		117		113	
160-36593-10	03:47	107		127		128		117		113	
160-36593-11	03:54	104		124		124		116		111	
160-36593-12	04:00	105		125		126		116		112	
160-36593-13	04:07	103		122		123		116		112	
CCVL 160-455416/37	04:14	107		116		114		116		112	
CCV 160-455416/38	04:20	102		115		110		120		111	
CCB 160-455416/39	04:27	101		109		108		108		106	
160-36593-14	04:34	102		122		121		115		111	
160-36593-15	04:41	107		131		133		118		114	
160-36593-16	04:47	104		129		128		116		112	
160-36593-17	04:54	104		132		131		115		112	

FORM XV - IN

15-IN
ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY
METALS

Lab Name: Eurofins TestAmerica, St. Louis Job No.: 160-36593-1

SDG No.:

ICP-MS Instrument ID: ICPMS7700 Start Date: 12/26/2019 End Date: 12/27/2019

		Internal Standards %RI For:									
Lab Sample ID	Time	Element Li-6	Q	Element Sc/2	Q	Element Sc/3	Q	Element Ge/2	Q	Element Ge/3	Q
160-36593-18	05:01	101		125		124		116		110	
CCVL 160-455416/50	05:41	93		104		100		105		101	
CCV 160-455416/51	05:48	89		99		98		106		99	
CCB 160-455416/52	05:55	90		100		97		100		97	

FORM XV - IN

* only Ir/3 evaluated

15-IN
ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY
METALS

Lab Name: Eurofins TestAmerica, St. Louis Job No.: 160-36593-1

SDG No.:

ICP-MS Instrument ID: ICPMS7700 Start Date: 12/26/2019 End Date: 12/27/2019

Internal Standards %RI For: 60-125%

Lab Sample ID	Time	Element In	Q	Element Ho/2	Q	Element Ho/3	Q	Element Ir/2	Q	Element Ir/3	Q
LRC 160-455416/2	17:26	93		100		95		89		87	
IC 160-455416/4	00:31	103		99		103		100		103	
IC 160-455416/5	00:38	102		101		103		100		101	
IC 160-455416/6	00:45	102		101		104		100		102	
ICV 160-455416/7	00:51	104		99		103		100		104	
ICB 160-455416/8	00:58	102		102		103		102		102	
CRI 160-455416/9	01:05	103		102		102		102		102	
ICSA 160-455416/10	01:12	95		97		96		89		88	
ICSAB 160-455416/11	01:18	98		99		98		89		90	
CCV 160-455416/12	01:25	106		106		103		101		99	
CCB 160-455416/13	01:32	106		102		103		100		101	
MB 160-453801/1-A	01:39	106		104		103		104		102	
LCS 160-453801/2-A	01:45	102		101		102		96		98	
LCSSRM 160-453801/3-A	01:52	101		102		102		99		99	
160-36593-1	01:59	104		104		104		99		99	
160-36593-1 SD	02:06	105		106		103		101		99	
160-36593-1 DU	02:12	105		106		103		99		97	
160-36593-1 MS	02:19	102		103		101		95		96	
160-36593-1 MSD	02:26	101		102		101		95		95	
160-36593-2	02:33	103		104		102		97		96	
160-36593-3	02:40	101		104		100		96		94	
CCVL 160-455416/24	02:46	105		103		101		100		99	
CCV 160-455416/25	02:53	103		103		101		100		98	
CCB 160-455416/26	03:00	102		100		100		98		99	
160-36593-4	03:07	104		107		103		99		97	
160-36593-5	03:13	104		104		103		97		97	
160-36593-6	03:20	104		104		102		96		97	
160-36593-7	03:27	104		103		101		95		96	
160-36593-8	03:33	105		103		102		96		96	
160-36593-9	03:40	103		102		101		94		95	
160-36593-10	03:47	103		102		102		95		95	
160-36593-11	03:54	102		101		100		95		94	
160-36593-12	04:00	103		102		100		95		95	
160-36593-13	04:07	103		102		101		95		95	
CCVL 160-455416/37	04:14	109		103		103		101		100	
CCV 160-455416/38	04:20	105		104		101		101		99	
CCB 160-455416/39	04:27	103		100		100		97		98	
160-36593-14	04:34	102		103		100		96		95	
160-36593-15	04:41	105		102		101		94		95	
160-36593-16	04:47	102		101		100		93		93	
160-36593-17	04:54	102		101		100		94		93	

FORM XV - IN

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

METALS

* Ir/3 only

Lab Name: Eurofins TestAmerica, St. Louis Job No.: 160-36593-1

SDG No.:

ICP-MS Instrument ID: ICPMS7700 Start Date: 12/26/2019 End Date: 12/27/2019

Internal Standards %RI For: 60-125%

Lab Sample ID	Time	Element In	Q	Element Ho/2	Q	Element Ho/3	Q	Element Ir/2	Q	Element Ir/3	Q
160-36593-18	05:01	100		101		98		93		91	
CCVL 160-455416/50	05:41	99		98		96		96		95	
CCV 160-455416/51	05:48	96		96		95		93		93	
CCB 160-455416/52	05:55	97		96		95		94		94	

FORM XV - IN

METALS BATCH WORKSHEET

Lab Name: Eurofins TestAmerica, St. Loui Job No.: 160-36593-1

SDG No.:

Batch Number: 453801 Batch Start Date: 12/10/19 13:15 Batch Analyst: Mazariegos, Leonel A

Batch Method: 3050B Batch End Date: 12/11/19 13:45

Lab Sample ID	Client Sample ID	Method Chain	Basis	InitialAmount	FinalAmount	MPREP1-A 00004	MPREP1-B 00004	MPREP2 00022	PR_LCSSRM U 00001
MB 160-453801/1		3050B, 6020A		0.5153 g	50 mL				
LCS 160-453801/2		3050B, 6020A		0.5542 g	50 mL	0.25 mL	0.25 mL	0.25 mL	
LCSSRM 160-453801/3		3050B, 6020A		0.5708 g	50 mL				0.5708 g
93.3 160-36593-B-1	STSB32_0-0.5	3050B, 6020A	T	0.5479 g	50 mL				
93.8 160-36593-B-1 DU	STSB32_0-0.5	3050B, 6020A	T	0.5295 g	50 mL				
160-36593-A-1 MS	STSB32_0-0.5	3050B, 6020A	T	0.5289 g	50 mL	0.25 mL	0.25 mL	0.25 mL	
160-36593-A-1 MSD	STSB32_0-0.5	3050B, 6020A	T	0.5132 g	50 mL	0.25 mL	0.25 mL	0.25 mL	
160-36593-B-2	STSB32_0.5-3	3050B, 6020A	T	0.5375 g	50 mL				
160-36593-B-3	STSB32_3-6	3050B, 6020A	T	0.5635 g	50 mL				
160-36593-B-4	STSB32_6-15	3050B, 6020A	T	0.5122 g	50 mL				
160-36593-B-5	STSB34_0-0.5	3050B, 6020A	T	0.5511 g	50 mL				
160-36593-B-6	STSB34_0.5-3	3050B, 6020A	T	0.5151 g	50 mL				
160-36593-B-7	STSB34_3-6	3050B, 6020A	T	0.5310 g	50 mL				
160-36593-B-8	STSB34_6-15	3050B, 6020A	T	0.5567 g	50 mL				
160-36593-B-9	STSB34-FD_3-6	3050B, 6020A	T	0.5410 g	50 mL				
160-36593-B-10	STSB33_0-0.5	3050B, 6020A	T	0.5644 g	50 mL				
160-36593-B-11	STSB33_0.5-3	3050B, 6020A	T	0.5175 g	50 mL				
160-36593-B-12	STSB33-FD_0.5-3	3050B, 6020A	T	0.5527 g	50 mL				
160-36593-B-13	STSB33_3-6	3050B, 6020A	T	0.5224 g	50 mL				
160-36593-B-14	STSB33_6-15	3050B, 6020A	T	0.5166 g	50 mL				
160-36593-B-15	STSB35_0.5-3	3050B, 6020A	T	0.5816 g	50 mL				
160-36593-B-16	STSB35_0-0.5	3050B, 6020A	T	0.5462 g	50 mL				
160-36593-B-17	STSB35_3-6	3050B, 6020A	T	0.5803 g	50 mL				
160-36593-B-18	STSB35_6-15	3050B, 6020A	T	0.5713 g	50 mL				

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

METALS BATCH WORKSHEET

Lab Name: Eurofins TestAmerica, St. Loui Job No.: 160-36593-1

SDG No.:

Batch Number: 453801 Batch Start Date: 12/10/19 13:15 Batch Analyst: Mazariegos, Leonel A

Batch Method: 3050B Batch End Date: 12/11/19 13:45

Batch Notes	
Balance ID	27150420
Blank Soil Lot Number	25438819
Temperature - Corrected - End	E5: 91.7 Degrees C
Temperature - Corrected - Start	B1: 92.5 Degrees C
Digestion End Time	12/11/2019 13:15
Digestion Start Time	12/11/2019 10:34
Digestion Unit ID	HOTBLOCK 2
Digestion Tube/Cup ID	344749-4653
Hydrogen Peroxide ID	1819373
Hydrochloric Acid ID	1843669
Nitric Acid ID	1843691, 1847195
Pipette/Syringe/Dispenser ID	MET-12
Analyst ID - Spike Analyst	LAM
Sufficient Volume for Batch QC	YES
Thermometer ID	160322347

Basis	Basis Description
T	Total/NA

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

Tune Report

Tune File : autotune.u
Comment :

Integration Time:	0.1000 sec	
Sampling Period:	0.3100 sec	
n:	200	
Oxide:	156/140	1.045%
Doubly Charged:	70/140	1.126%

<5

m/z	Range	Count	Mean	RSD%	Background
7	50,000	39532.0	39641.2	1.80	1.00
89	200,000	141511.0	139424.7	4.68	2.60
205	100,000	96857.0	95317.5	2.15	5.20

m/z:	7	89	205
Height:	39,705	97,240	95,532
Axis:	7.05	89.05	204.95
W-50%:	0.65	0.55	0.60
W-10%:	0.700	0.6500	0.7500

Integration Time: 0.1000 sec
Acquisition Time: 22.7600 sec

Y axis : Linear

Page: 1

Generated : Dec 26, 2019 14:32:51
Printed : Dec 26, 2019 14:32:53

Tune Report

Tune File : autotune.u
Comment :

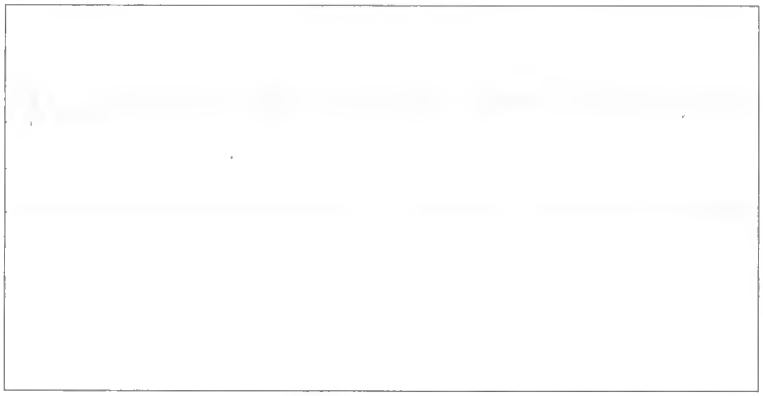
Tuning Parameters

===Plasma Condition===			===Ion Lenses===			===Q-Pole Parameters===		
RF Power	:	1550 W	Extract 1	:	0 V	AMU Gain	:	118
RF Matching	:	1.5 V	Extract 2	:	-120 V	AMU Offset	:	128
Smpl Depth	:	8 mm	Omega Bias	:	-90 V	Axis Gain	:	0.998
Torch-H	:	0.1 mm	Omega Lens	:	8 V	Axis Offset	:	0.11
Torch-V	:	0 mm	Cell Entrance	:	-30 V	QP Bias	:	-3 V
Carrier Gas	:	0.55 L/min	Cell Exit	:	-50 V			
Dilution Mode	:	ON	Deflect	:	12.2 V	===Detector Parameters===		
Dilution Gas	:	0.5 L/min	Plate Bias	:	-40 V	Discriminator	:	4.5 mV
Optional Gas	:	0 %	===Octopole Parameters===			Analog HV	:	1931 V
Nebulizer Pump	:	0.1 rps	OctP RF	:	190 V	Pulse HV	:	1184 V
Sample Pump	:	--- rps	OctP Bias	:	-8 V			
S/C Temp	:	2 degC						

===Reaction Cell===								
Reaction Mode	:	OFF						
H2 Gas	:	0 mL/min	He Gas	:	0 mL/min	Optional Gas	:	--- %

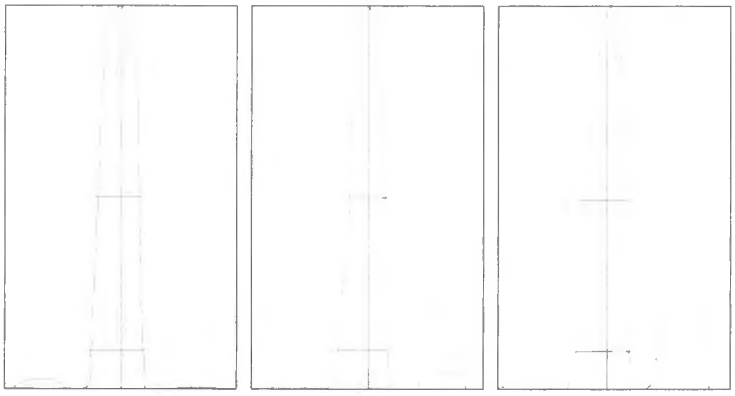
Tune Report

Tune File : he.u
Comment :



Integration Time:	0.1000 sec	
Sampling Period:	0.6200 sec	
n:	200	
Oxide:	156/140	0.365%
Doubly Charged:	70/140	0.987%

m/z	Range	Count	Mean	RSD%	Background
59	50,000	23625.0	23479.8	2.04	0.10
89	50,000	28607.0	29513.4	2.13	0.10
140	100,000	78001.0	79484.4	2.16	0.50
205	100,000	73851.0	73411.4	2.50	0.50
156/140	1	0.299%	0.328%	7.99	
70/140	2	0.910%	0.977%	5.26	



m/z:	59	89	205
Height:	23,681	29,911	73,743
Axis:	59.05	89.05	204.95
W-50%:	0.60	0.50	0.60
W-10%:	0.700	0.6500	0.700

Integration Time: 0.1000 sec
Acquisition Time: 22.5600 sec

Y axis : Linear

Generated : Dec 26, 2019 14:53:47
Printed : Dec 26, 2019 14:53:49

Tune Report

Tune File : he.u
Comment :

Tuning Parameters

===Plasma Condition===			===Ion Lenses===			===Q-Pole Parameters===		
RF Power	:	1550 W	Extract 1	:	0 V	AMU Gain	:	118
RF Matching	:	1.5 V	Extract 2	:	-120 V	AMU Offset	:	128
Smpl Depth	:	8 mm	Omega Bias	:	-80 V	Axis Gain	:	0.998
Torch-H	:	0.1 mm	Omega Lens	:	8.5 V	Axis Offset	:	0.11
Torch-V	:	0 mm	Cell Entrance	:	-40 V	QP Bias	:	-15 V
Carrier Gas	:	0.55 L/min	Cell Exit	:	-60 V			
Dilution Mode	:	ON	Deflect	:	-0.4 V	===Detector Parameters===		
Dilution Gas	:	0.5 L/min	Plate Bias	:	-60 V	Discriminator	:	4.5 mV
Optional Gas	:	0 %	===Octopole Parameters===			Analog HV	:	1931 V
Nebulizer Pump	:	0.1 rps	OctP RF	:	190 V	Pulse HV	:	1184 V
Sample Pump	:	--- rps	OctP Bias	:	-18 V			
S/C Temp	:	2 degC						

===Reaction Cell===								
Reaction Mode	:	ON						
H2 Gas	:	0 mL/min	He Gas	:	4.3 mL/min	Optional Gas	:	--- %

QC Tune Report

Data File: C:\ICPMH\1\7500\QCTUNE.D
Date Acquired: 26 Dec 2019 04:03:31 pm
Operator: LP 7700
Misc Info:
Vial Number: 1307
Current Method: C:\ICPMH\1\METHODS\TN_6020.m

Minimum Response(CPS)

Element	Actual	Required	Flag

RSD (%)

<5

Element	Actual	Required	Flag
6 Li	0.49	5.00	
59 Co	1.08	5.00	
115 In	1.03	5.00	
205 Tl	1.41 ✓	5.00	

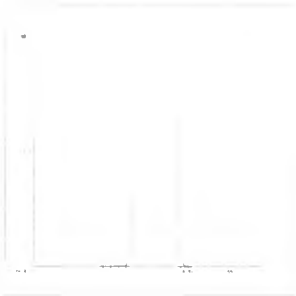
Ion Ratio

Element	Actual	Required	Flag

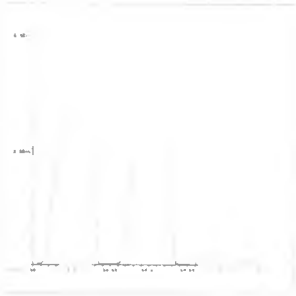
Maximum Bkg. Count(CPS)

Element	Actual	Required	Flag

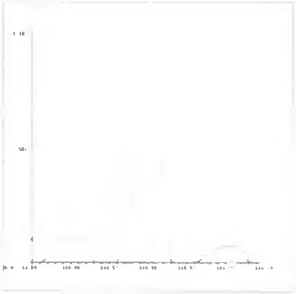
C:\ICPMH\1\DATA\122619B1.B\QCTUNE00.D



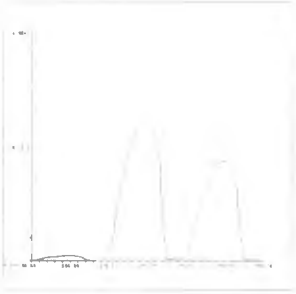
6 Li
Mass Calib.
Actual: 6.05
Required: 5.90-6.10
Flag:
Peak Width
Actual: 0.65
Required: 0.90
Flag:



59 Co
Mass Calib.
Actual: 59.05
Required: 58.90-59.10
Flag:
Peak Width
Actual: 0.60
Required: 0.90
Flag:



115 In
Mass Calib.
Actual: 115.05
Required: 114.90-115.10
Flag:
Peak Width
Actual: 0.60
Required: 0.90
Flag:



205 Tl
Mass Calib.
Actual: 204.95
Required: 204.90-205.10
Flag:
Peak Width
Actual: 0.65
Required: 0.90
Flag:

QC Tune Result:Pass

C:\ICPMH\1\DATA\122619B1.B\QCTUNE00.D

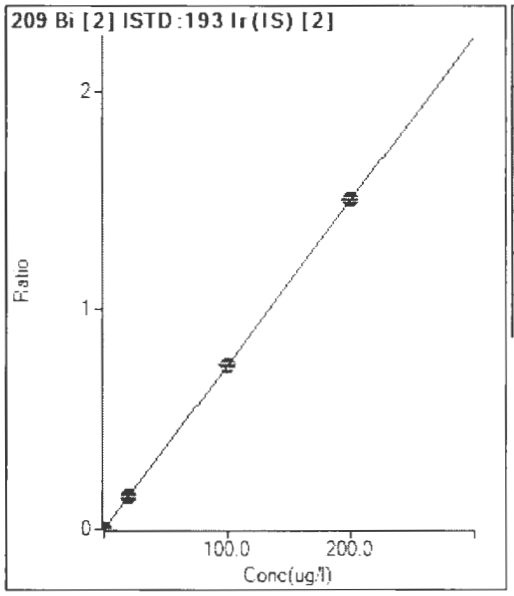
Replicated Data: Tune #1

Mass	Count(CPS)				
6	2283606.00	2262525.00	2261298.00	2265936.00	2268574.00
7	129469.60	128890.10	129287.10	128711.50	129095.40
8	27.50	22.00	18.50	21.50	28.50
58	1601094.00	1603206.00	1613231.00	1614190.00	1606794.00
59	1488278.00	1508473.00	1500156.00	1506911.00	1509109.00
60	611248.00	619122.31	621654.13	625654.19	625113.13
95	893246.50	906927.63	916263.31	912930.81	906383.19
111	1082867.00	1087430.00	1095493.00	1097177.00	1086668.00
114	2569336.00	2571551.00	2592238.00	2593701.00	2583909.00
115	11069500.00	10972350.00	11040990.00	10990880.00	11225750.00
116	1607604.00	1605007.00	1620643.00	1635359.00	1622187.00
118	1519578.00	1521277.00	1537396.00	1538859.00	1540469.00
204	117522.30	121152.00	125969.20	128844.10	128699.60
205	2997790.00	3064880.00	3075998.00	3101899.00	3128373.00
206	2132391.00	2165216.00	2170110.00	2202991.00	2199913.00
207	1913012.00	1922433.00	1967207.00	1966196.00	1967767.00
208	4520813.00	4616707.00	4639973.00	4658486.00	4670178.00

Calibration for 004CALS.D

Batch Folder:	C:¥ICPMH¥1¥DATA¥122619B1.B¥
Analysis File:	122619B1.batch.xml
DA Date-Time:	12/26/2019 4:41:09 PM
Calibration Title:	
Calibration Method:	External Calibration
VIS Interpolation Fit:	
Tune Step:	#1 he.u
	#2 nogas.u

Level	Standard Data File	Sample Name	Acq. Date-Time
1	003CALB.D	ICIS 1854886	12/26/2019 4:18:31 PM
2	004CALS.D	IC 1856860	12/26/2019 4:25:15 PM
3	005CALS.D	IC 1856861	12/26/2019 4:31:58 PM
4	006CALS.D	IC 1856862	12/26/2019 4:38:41 PM
5			
6			
7			



	Rjct	Conc.	Calc Conc.	CPS	Ratio	Det.	RSD
1	☐	0.000	0.000	9355.37	0.0009	P	1.7
2	☐	20.000	20.321	1678732.27	0.1530	A	0.2
3	☐	100.000	99.292	8243418.84	0.7441	A	3.1
4	☐	200.000	200.322	16157749.06	1.5004	A	0.9
5	☐						
6	☐						
7	☐						

y = 0.0075 * x + 8.5058E-004

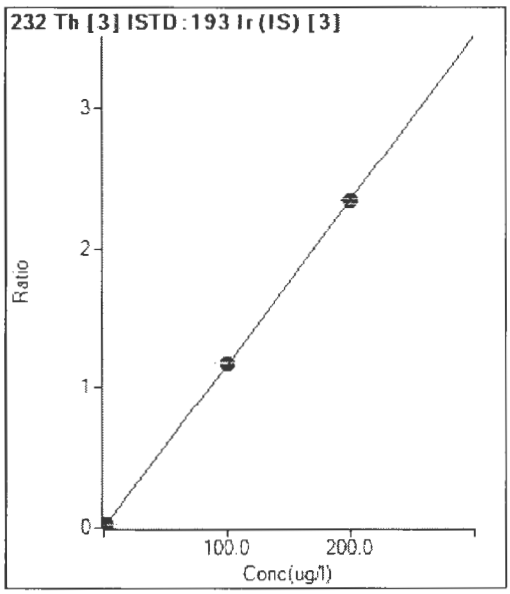
R = 1.0000

DL = 0.005772

BEC = 0.1136

Weight: None

Min Conc: <None>



	Rjct	Conc.	Calc Conc.	CPS	Ratio	Det.	RSD
1	☐	0.000	0.000	8383.75	0.0006	P	2.2
2	☐	2.000	1.756	289165.23	0.0212	P	0.3
3	☐	100.000	100.801	16020525.87	1.1833	A	0.8
4	☐	200.000	199.602	31816598.69	2.3426	A	1.4
5	☐						
6	☐						
7	☐						

y = 0.0117 * x + 6.1686E-004 ✓

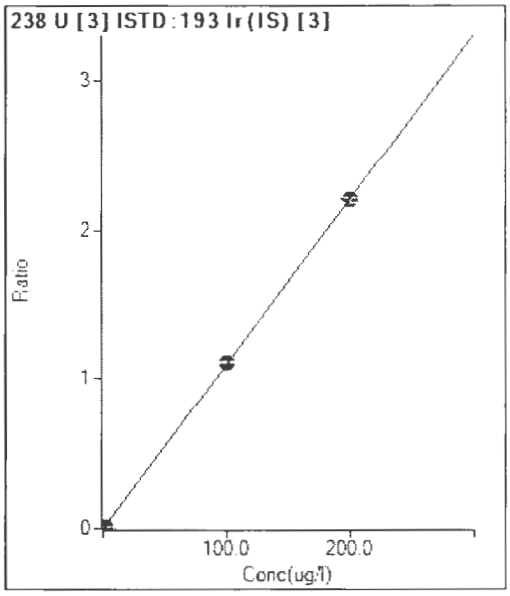
R = 1.0000 ✓

DL = 0.003498

BEC = 0.05257

Weight: None

Min Conc: <None>



	Rjct	Conc.	Calc Conc.	CPS	Ratio	Det.	RSD
1	☐	0.000	0.000	743.39	0.0001	P	6.7
2	☐	1.000	0.897	135872.63	0.0100	P	0.2
3	☐	100.000	100.878	15099523.11	1.1153	A	0.8
4	☐	200.000	199.562	29966125.67	2.2063	A	1.3
5	☐						
6	☐						
7	☐						

y = 0.0111 * x + 5.4711E-005

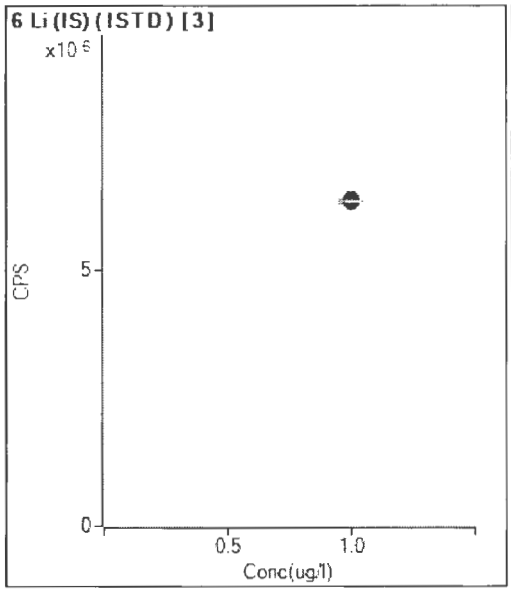
R = 1.0000

DL = 0.0009953

BEC = 0.004949

Weight: None

Min Conc: <None>

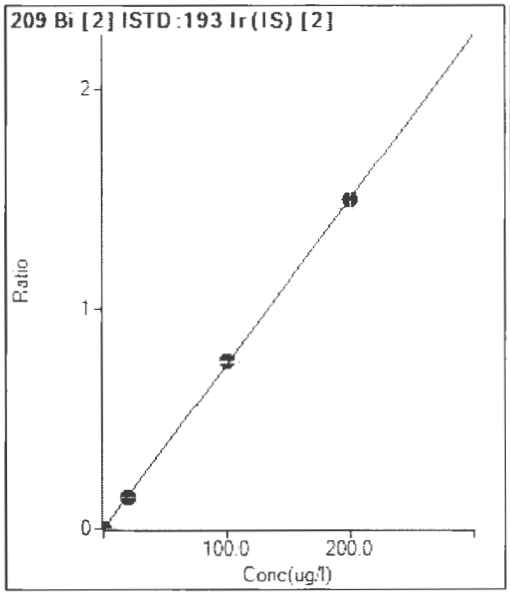


	Rjct	Conc.	Calc Conc.	CPS	Ratio	Det.	RSD
1	☐	1.000		6327919.89		A	0.2
2	☐	1.000		6381641.00		A	0.1
3	☐	1.000		6310620.16		A	0.3
4	☐	1.000		6344334.47		A	0.2
5	☐	1.000					
6	☐	1.000					
7	☐	1.000					

Calibration for 076CALS.D

Batch Folder:	C:¥ICPMH¥1¥DATA¥122619B1.B¥
Analysis File:	122619B1.batch.xml
DA Date-Time:	12/27/2019 12:47:39 AM
Calibration Title:	
Calibration Method:	External Calibration
VIS Interpolation Fit:	
Tune Step:	#1 he.u
	#2 nogas.u

Level	Standard Data File	Sample Name	Acq. Date-Time
1	075CALB.D	ICIS 1854886	12/27/2019 12:24:53 AM
2	076CALS.D	IC 1856860	12/27/2019 12:31:37 AM
3	077CALS.D	IC 1856861	12/27/2019 12:38:21 AM
4	078CALS.D	IC 1856862	12/27/2019 12:45:03 AM
5			
6			
7			



	Rjct	Conc.	Calc Conc.	CPS	Ratio	Det.	RSD
1	☐	0.000	0.000	6159.28	0.0006	P	1.2
2	☐	20.000	18.764	1386710.83	0.1414	P	2.1
3	☐	100.000	101.042	7463190.79	0.7589	A	0.9
4	☐	200.000	199.603	14701699.50	1.4986	A	4.5
5	☐						
6	☐						
7	☐						

y = 0.0075 * x + 6.2665E-004

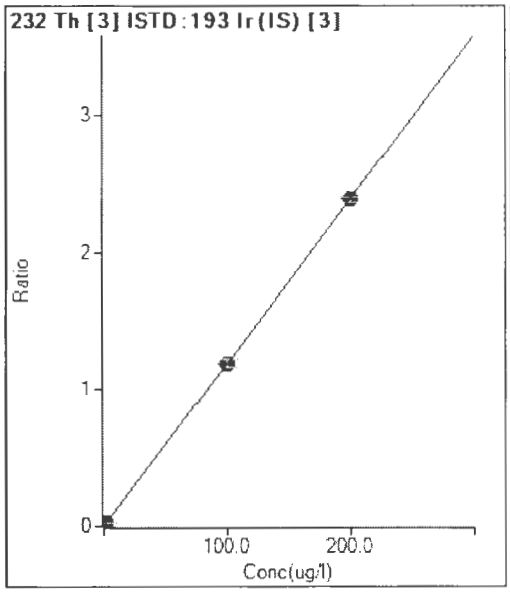
R = 0.9999

DL = 0.002984

BEC = 0.0835

Weight: None

Min Conc: <None>



	Rjct	Conc.	Calc Conc.	CPS	Ratio	Det.	RSD
1	☐	0.000	0.000	5232.24	0.0004	P	3.1
2	☐	2.000	1.736	259225.46	0.0212	P	3.2
3	☐	100.000	100.113	14276153.95	1.1985	A	5.7
4	☐	200.000	199.946	28836035.40	2.3932	A	1.6
5	☐						
6	☐						
7	☐						

y = 0.0120 * x + 4.4125E-004 ✓

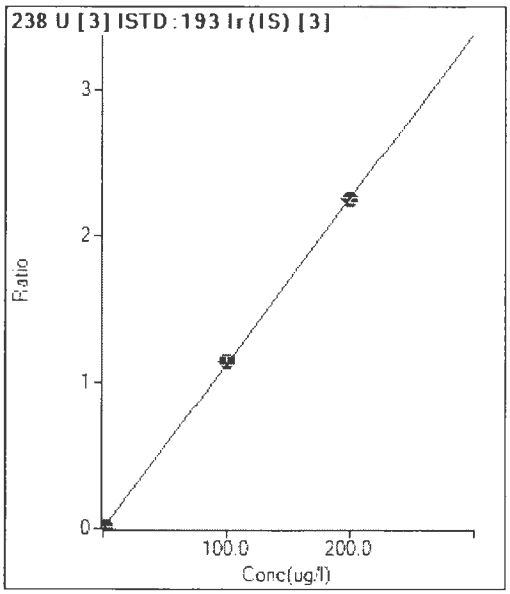
R = 1.0000 ✓

DL = 0.003391

BEC = 0.03687

Weight: None

Min Conc: <None>



	Rjct	Conc.	Calc Conc.	CPS	Ratio	Det.	RSD
1	☐	0.000	0.000	938.97	0.0001	P	9.9
2	☐	1.000	0.896	124346.26	0.0102	P	3.7
3	☐	100.000	101.762	13660324.10	1.1468	A	5.8
4	☐	200.000	199.119	27038049.04	2.2439	A	1.5
5	☐						
6	☐						
7	☐						

y = 0.0113 * x + 7.9194E-005

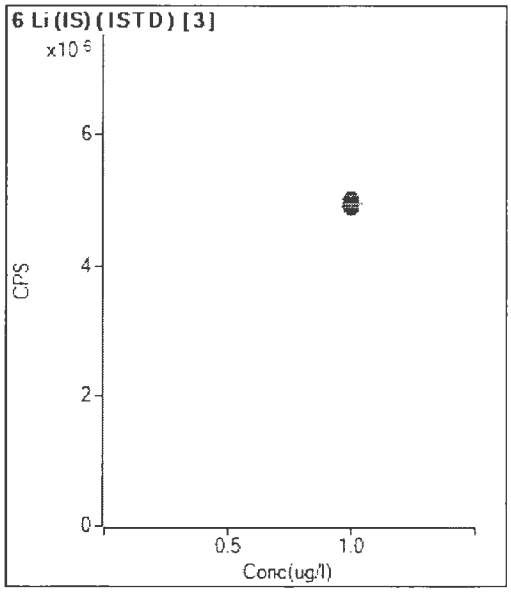
R = 0.9999

DL = 0.002095

BEC = 0.007028

Weight: None

Min Conc: <None>



	Rjct	Conc.	Calc Conc.	CPS	Ratio	Det.	RSD
1	☐	1.000		4941711.79		A	0.2
2	☐	1.000		5019571.57		A	2.4
3	☐	1.000		4900801.11		A	3.6
4	☐	1.000		4925733.37		A	0.9
5	☐	1.000					
6	☐	1.000					
7	☐	1.000					

122619B1-1

une Ste	Mass	Name	R	a	b (blank)	DL	BEC	Units
3	7	Li	0.999999	0.005579	0.055406	0.257972	9.930944	ug/l
3	9	Be	0.99999	0.001631	2.6E-05	0.009684	0.015929	ug/l
3	11	B	0.999876	0.001244	0.00114	0.063462	0.916382	ug/l
2	23	Na	0.999996	0.007265	0.07528	0.638675	10.36175	ug/l
2	24	Mg	0.999994	0.003691	0.002087	0.101254	0.565429	ug/l
2	27	Al	0.999259	0.001555	0.001594	0.625798	1.024839	ug/l
2	31	P	0.999999	0.000111	0.000838	5.853239	7.546952	ug/l
2	39	K	0.99997	0.004036	0.145763	1.067652	36.11391	ug/l
3	44	Ca	0.999929	0.000432	0.017794	0.38909	41.15053	ug/l
3	47	Ti	0.999997	0.001249	0.000195	0.040424	0.156164	ug/l
2	51	V	0.999841	0.048219	0.020231	0.057985	0.419567	ug/l
2	52	Cr	0.999996	0.059235	0.00834	0.021638	0.140802	ug/l
2	55	Mn	0.999951	0.016611	0.000764	0.016927	0.045971	ug/l
2	57	Fe	0.999938	0.000585	0.001059	0.585802	1.812491	ug/l
2	59	Co	0.999792	0.041485	0.00126	0.002009	0.030372	ug/l
2	60	Ni	0.999742	0.010291	0.000346	0.018134	0.033636	ug/l
2	63	Cu	0.99976	0.028995	0.022791	0.007122	0.786021	ug/l
2	66	Zn	0.999856	0.005555	0.00254	0.089652	0.457149	ug/l
2	75	As	0.999896	0.003843	0.000632	0.055805	0.164507	ug/l
2	78	Se	0.999994	0.000294	0.000189	0.195539	0.642334	ug/l
3	88	Sr	0.999973	0.03475	0.000416	0.003386	0.01198	ug/l
2	89	Y	0.999895	0.051196	0.00041	0.002032	0.008	ug/l
2	90	Zr	0.999919	0.039361	0.001666	0.012707	0.042328	ug/l
2	93	Nb	0.998692	0.078127	0.00481	0.008993	0.061565	ug/l
3	95	Mo	0.999574	0.006561	0.001233	0.01711	0.187916	ug/l
2	101	Ru	0.999934	0.022718	0.000267	0.008078	0.011736	ug/l
2	103	Rh	0.999866	0.131764	0.001878	0.001211	0.014252	ug/l
2	105	Pd	0.999759	0.025705	0.000218	0.005195	0.008489	ug/l
3	107	Ag	0.999788	0.002455	8.35E-05	0.002706	0.034025	ug/l
3	111	Cd	0.999681	0.000531	8.72E-06	0.004712	0.016433	ug/l
3	118	Sn	0.999988	0.001534	0.000476	0.024485	0.3102	ug/l
3	121	Sb	0.999995	0.002	5.98E-05	0.008452	0.029887	ug/l
2	125	Te	0.999953	2.31E-05	1.37E-07	0.015421	0.005936	ug/l
2	133	Cs	1	0.001858	7.32E-06	0.001319	0.003938	ug/l
3	137	Ba	0.999992	0.000652	2.6E-05	0.006799	0.039884	ug/l
2	139	La	1	0.004037	1.54E-05	0.000681	0.003812	ug/l
2	140	Ce	0.999996	0.004664	2.3E-05	0.000648	0.004928	ug/l
2	141	Pr	1	0.004845	2.02E-05	0.000678	0.004164	ug/l
2	146	Nd	0.999999	0.000911	4.31E-06	0.000787	0.004734	ug/l
3	147	Sm	0.99998	0.001003	4.08E-06	0.002248	0.004067	ug/l
2	178	Hf	0.999924	0.002027	4.79E-05	0.004904	0.023611	ug/l
2	181	Ta	0.999769	0.008616	0.001482	0.010389	0.171962	ug/l
2	182	W	0.999995	0.002067	0.000794	0.032729	0.384411	ug/l
3	185	Re	0.999982	0.004402	1.5E-05	0.002757	0.003417	ug/l
2	195	Pt	0.999953	0.001957	3.82E-05	0.007158	0.019508	ug/l
3	197	Au	0.999997	0.00332	5.24E-05	0.002995	0.015789	ug/l
3	205	Tl	0.999951	0.007391	0.000325	0.01433	0.044019	ug/l
3	206	(Pb)	0.999917	0.002536	0.00043	0.017564	0.169466	ug/l
3	207	(Pb)	0.999905	0.002211	0.000428	0.014934	0.193484	ug/l
3	208	Pb	0.999926	0.010091	0.00168	0.006284	0.16646	ug/l
2	209	Bi	0.999986	0.007486	0.000851	0.005772	0.113624	ug/l
3	232	Th	0.999984	0.011733	0.000617	0.003498	0.052574	ug/l
3	238	U	0.999983	0.011056	5.47E-05	0.000995	0.004949	ug/l
3	6	Li (IS)						ug/l
2	45	Sc (IS)						ug/l
3	45	Sc (IS)						ug/l
2	72	Ge (IS)						ug/l
3	72	Ge (IS)						ug/l
3	115	In (IS)						ug/l
2	165	Ho (IS)						ug/l
3	165	Ho (IS)						ug/l
2	193	Ir (IS)						ug/l
3	193	Ir (IS)						ug/l

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Metals Y Intercept

Analyst: LKP
Instrument: 7700
Calibration File: 122619B1
Matrix: Water
Units:

Date: 12/27/2019

Element	MDL	3XMDL	Y-Intercept	Pass/Fail
LI	2.00	6.00	0.055406	PASS
BE	0.20	0.60	2.6E-05	PASS
B	45.00	135.00	0.00114	PASS
NA	20.00	60.00	0.07528	PASS
MG	20.00	60.00	0.002087	PASS
AL	20.00	60.00	0.001594	PASS
P	45.00	135.00	0.000838	PASS
K	45.00	135.00	0.145763	PASS
CA	45.00	135.00	0.017794	PASS
TI	2.00	6.00	0.000195	PASS
V	4.00	12.00	0.020231	PASS
CR	4.00	12.00	0.00834	PASS
MN	0.90	2.70	0.000764	PASS
FE	20.00	60.00	0.001059	PASS
CO	0.90	2.70	0.00126	PASS
NI	2.00	6.00	0.000346	PASS
CU	0.40	1.20	0.022791	PASS
ZN	7.50	22.50	0.00254	PASS
AS	4.00	12.00	0.000632	PASS
SE	2.00	6.00	0.000189	PASS
SR	2.00	6.00	0.000416	PASS
Y	2.00	6.00	0.00041	PASS
ZR	2.00	6.00	0.001666	PASS
NB	10.00	30.00	0.00481	PASS
MO	2.00	6.00	0.001233	PASS
RU	4.00	12.00	0.000267	PASS
RH	4.00	12.00	0.001878	PASS
PD	0.20	0.60	0.000218	PASS
AG	0.90	2.70	8.35E-05	PASS
CD	0.20	0.60	8.72E-06	PASS
SN	1.20	3.60	0.000476	PASS
SB	2.00	6.00	5.98E-05	PASS
TE	7.50	22.50	1.37E-07	PASS
CS	0.20	0.60	7.32E-06	PASS
BA	0.90	2.70	2.6E-05	PASS
LA	0.90	2.70	1.54E-05	PASS
CE	4.00	12.00	2.3E-05	PASS
PR	0.90	2.70	2.02E-05	PASS
ND	0.90	2.70	4.31E-06	PASS
SM	4.00	12.00	4.08E-06	PASS
HF	4.00	12.00	4.79E-05	PASS
TA	4.00	12.00	0.001482	PASS
W	2.00	6.00	0.000794	PASS
RE	0.40	1.20	1.5E-05	PASS
PT	0.40	1.20	3.82E-05	PASS
AU	5.00	15.00	5.24E-05	PASS
TL	0.90	2.70	0.000325	PASS
(PB 206)	1.00	3.00	0.00043	PASS
(PB 207)	1.00	3.00	0.000428	PASS
PB	1.00	3.00	0.00168	PASS
BI	7.50	22.50	0.000851	PASS
TH	0.90	2.70	0.000617	PASS
U	0.40	1.20	5.47E-05	PASS

Analyst:
Instrument: 7700
Calibration File: 122619B1
Matrix: Soil
Units: PPB

Element	MDL	3XMDL	Y-Intercept	Pass/Fail
LI	4.00	12.00	0.055406	PASS
BE	0.40	1.20	0.000026	PASS
B	45.00	135.00	0.001140	PASS
NA	75.00	225.00	0.075280	PASS
MG	25.00	75.00	0.002087	PASS
AL	20.00	60.00	0.001594	PASS
P	200.00	600.00	0.000838	PASS
K	40.00	120.00	0.145763	PASS
CA	100.00	300.00	0.017794	PASS
TI	2.40	7.20	0.000195	PASS
V	4.00	12.00	0.020231	PASS
CR	4.50	13.50	0.008340	PASS
MN	2.00	6.00	0.000764	PASS
FE	20.00	60.00	0.001059	PASS
CO	0.75	2.25	0.001260	PASS
NI	2.00	6.00	0.000346	PASS
CU	4.00	12.00	0.022791	PASS
ZN	20.00	60.00	0.002540	PASS
AS	4.00	12.00	0.000632	PASS
SE	3.20	9.60	0.000189	PASS
SR	2.40	7.20	0.000416	PASS
Y	4.00	12.00	0.000410	PASS
ZR	4.00	12.00	0.001666	PASS
NB	12.00	36.00	0.004810	PASS
MO	2.00	6.00	0.001233	PASS
RU	4.00	12.00	0.000267	PASS
RH	4.00	12.00	0.001878	PASS
PD	0.40	1.20	0.000218	PASS
AG	0.75	2.25	0.000084	PASS
CD	0.24	0.72	0.000009	PASS
SN	0.90	2.70	0.000476	PASS
SB	2.00	6.00	0.000060	PASS
TE	4.00	12.00	0.000000	PASS
CS	2.00	6.00	0.000007	PASS
BA	5.00	15.00	0.000026	PASS
LA	0.75	2.25	0.000015	PASS
CE	4.00	12.00	0.000023	PASS
PR	0.75	2.25	0.000020	PASS
ND	0.75	2.25	0.000004	PASS
SM	4.00	12.00	0.000004	PASS
HF	4.00	12.00	0.000048	PASS
TA	4.00	12.00	0.001482	PASS
W	10.00	30.00	0.000794	PASS
RE	4.00	12.00	0.000015	PASS
PT	0.40	1.20	0.000038	PASS
AU	2.00	6.00	0.000052	PASS
TL	2.00	6.00	0.000325	PASS
(PB 206)	1.25	3.75	0.000430	PASS
(PB 207)	1.25	3.75	0.000428	PASS
PB	1.25	3.75	0.001680	PASS
BI	7.50	22.50	0.000851	PASS
TH	0.90	2.70	0.000617	PASS
U	0.40	1.20	0.000055	PASS

122619B1-2

une Ste	Mass	Name	R	a	b (blank)	DL	BEC	Units
3	7	Li	0.999983	0.00557	0.056241	0.171945	10.09723	ug/l
3	9	Be	1	0.001618	2.14E-05	0.013889	0.013205	ug/l
3	11	B	0.999809	0.001225	0.009654	0.141283	7.882622	ug/l
2	23	Na	0.999997	0.007066	0.090066	1.237115	12.74614	ug/l
2	24	Mg	0.999999	0.003637	0.002392	0.04877	0.657772	ug/l
2	27	Al	0.999054	0.001549	0.001541	0.219353	0.995016	ug/l
2	31	P	0.999999	0.000108	0.000601	2.806163	5.585696	ug/l
2	39	K	0.999997	0.004012	0.150213	0.924596	37.43951	ug/l
3	44	Ca	0.999954	0.00043	0.007617	0.761542	17.70576	ug/l
3	47	Ti	0.999994	0.001239	0.000149	0.023488	0.120541	ug/l
2	51	V	0.999875	0.048166	0.024261	0.015606	0.503699	ug/l
2	52	Cr	0.999994	0.058438	0.008132	0.021877	0.139149	ug/l
2	55	Mn	0.999991	0.016261	0.000995	0.048378	0.06119	ug/l
2	57	Fe	0.999863	0.00055	0.000924	0.773232	1.680396	ug/l
2	59	Co	0.999895	0.040054	0.001407	0.008679	0.035128	ug/l
2	60	Ni	0.999894	0.010079	0.000317	0.010452	0.031404	ug/l
2	63	Cu	0.999997	0.027761	0.010852	0.063649	0.39092	ug/l
2	66	Zn	0.99987	0.00545	0.001462	0.017745	0.268218	ug/l
2	75	As	0.999899	0.003719	0.000517	0.051713	0.139044	ug/l
2	78	Se	0.999949	0.000283	0.000206	0.705903	0.727633	ug/l
3	88	Sr	0.999924	0.034755	0.000551	0.004076	0.015854	ug/l
2	89	Y	0.999991	0.051661	0.000539	0.003929	0.010429	ug/l
2	90	Zr	0.99996	0.03941	0.001324	0.014768	0.033596	ug/l
2	93	Nb	0.998209	0.077529	0.01488	0.041744	0.191929	ug/l
3	95	Mo	0.999822	0.006513	0.000394	0.009942	0.060562	ug/l
2	101	Ru	0.999971	0.022793	0.000239	0.009758	0.010465	ug/l
2	103	Rh	0.999823	0.131228	0.002515	0.008339	0.019169	ug/l
2	105	Pd	0.999923	0.025885	9.2E-05	0.001034	0.003554	ug/l
3	107	Ag	0.999953	0.002405	5.67E-05	0.000434	0.023586	ug/l
3	111	Cd	0.999841	0.000521	7.72E-06	0.008119	0.014813	ug/l
3	118	Sn	0.999999	0.001514	0.000424	0.01602	0.279968	ug/l
3	121	Sb	0.999995	0.001961	6.89E-05	0.001974	0.035129	ug/l
2	125	Te	0.99988	2.26E-05	8.41E-07	0.063222	0.037298	ug/l
2	133	Cs	0.999989	0.001821	1.86E-05	0.005497	0.010217	ug/l
3	137	Ba	0.999956	0.000641	2.94E-05	0.009825	0.045804	ug/l
2	139	La	0.999994	0.003979	2.53E-05	9.46E-05	0.006369	ug/l
2	140	Ce	0.999991	0.004612	3.3E-05	0.000943	0.007157	ug/l
2	141	Pr	0.999993	0.004788	3.02E-05	0.00155	0.0063	ug/l
2	146	Nd	0.999535	0.000897	7.27E-06	0.006588	0.008108	ug/l
3	147	Sm	0.999956	0.000986	7.49E-06	0.002454	0.007593	ug/l
2	178	Hf	0.999995	0.002031	5.21E-05	0.00298	0.025641	ug/l
2	181	Ta	0.999888	0.008555	0.001517	0.011209	0.177288	ug/l
2	182	W	0.999994	0.002073	0.000695	0.01539	0.335332	ug/l
3	185	Re	0.99997	0.004343	2.59E-05	0.001278	0.005956	ug/l
2	195	Pt	1	0.001966	3.53E-05	0.009191	0.017968	ug/l
3	197	Au	0.999991	0.003251	0.000122	0.002501	0.037467	ug/l
3	205	Tl	0.999955	0.007412	0.000109	0.001708	0.014655	ug/l
3	206	(Pb)	0.99994	0.002539	0.000279	0.015135	0.109971	ug/l
3	207	(Pb)	0.999904	0.002218	0.000298	0.021805	0.13431	ug/l
3	208	Pb	0.999948	0.010148	0.001129	0.008008	0.111262	ug/l
2	209	Bi	0.999948	0.007505	0.000627	0.002984	0.083498	ug/l
3	232	Th	0.999999	0.011967	0.000441	0.003391	0.036873	ug/l
3	238	U	0.999934	0.011269	7.92E-05	0.002095	0.007028	ug/l
3	6	Li (IS)						ug/l
2	45	Sc (IS)						ug/l
3	45	Sc (IS)						ug/l
2	72	Ge (IS)						ug/l
3	72	Ge (IS)						ug/l
3	115	In (IS)						ug/l
2	165	Ho (IS)						ug/l
3	165	Ho (IS)						ug/l
2	193	Ir (IS)						ug/l
3	193	Ir (IS)						ug/l

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Metals Y Intercept

Analyst: LKP
Instrument: 7700
Calibration File: 122619B1
Matrix: Water
Units: PPB

Date: 12/27/2019

Element	MDL	3XMDL	Y-Intercept	Pass/Fail
LI	2.00	6.00	0.056241	PASS
BE	0.20	0.60	2.14E-05	PASS
B	45.00	135.00	0.009654	PASS
NA	20.00	60.00	0.090066	PASS
MG	20.00	60.00	0.002392	PASS
AL	20.00	60.00	0.001541	PASS
P	45.00	135.00	0.000601	PASS
K	45.00	135.00	0.150213	PASS
CA	45.00	135.00	0.007617	PASS
TI	2.00	6.00	0.000149	PASS
V	4.00	12.00	0.024261	PASS
CR	4.00	12.00	0.008132	PASS
MN	0.90	2.70	0.000995	PASS
FE	20.00	60.00	0.000924	PASS
CO	0.90	2.70	0.001407	PASS
NI	2.00	6.00	0.000317	PASS
CU	0.40	1.20	0.010852	PASS
ZN	7.50	22.50	0.001462	PASS
AS	4.00	12.00	0.000517	PASS
SE	2.00	6.00	0.000206	PASS
SR	2.00	6.00	0.000551	PASS
Y	2.00	6.00	0.000539	PASS
ZR	2.00	6.00	0.001324	PASS
NB	10.00	30.00	0.01488	PASS
MO	2.00	6.00	0.000394	PASS
RU	4.00	12.00	0.000239	PASS
RH	4.00	12.00	0.002515	PASS
PD	0.20	0.60	9.2E-05	PASS
AG	0.90	2.70	5.67E-05	PASS
CD	0.20	0.60	7.72E-06	PASS
SN	1.20	3.60	0.000424	PASS
SB	2.00	6.00	6.89E-05	PASS
TE	7.50	22.50	8.41E-07	PASS
CS	0.20	0.60	1.86E-05	PASS
BA	0.90	2.70	2.94E-05	PASS
LA	0.90	2.70	2.53E-05	PASS
CE	4.00	12.00	3.3E-05	PASS
PR	0.90	2.70	3.02E-05	PASS
ND	0.90	2.70	7.27E-06	PASS
SM	4.00	12.00	7.49E-06	PASS
HF	4.00	12.00	5.21E-05	PASS
TA	4.00	12.00	0.001517	PASS
W	2.00	6.00	0.000695	PASS
RE	0.40	1.20	2.59E-05	PASS
PT	0.40	1.20	3.53E-05	PASS
AU	5.00	15.00	0.000122	PASS
TL	0.90	2.70	0.000109	PASS
(PB 206)	1.00	3.00	0.000279	PASS
(PB 207)	1.00	3.00	0.000298	PASS
PB	1.00	3.00	0.001129	PASS
BI	7.50	22.50	0.000627	PASS
TH	0.90	2.70	0.000441	PASS
U	0.40	1.20	7.92E-05	PASS

Analyst:
Instrument: 7700
Calibration File: 122619B1
Matrix: Soil
Units: PPB

Element	MDL	3XMDL	Y-Intercept	Pass/Fail
LI	4.00	12.00	0.056241	PASS
BE	0.40	1.20	0.000021	PASS
B	45.00	135.00	0.009654	PASS
NA	75.00	225.00	0.090066	PASS
MG	25.00	75.00	0.002392	PASS
AL	20.00	60.00	0.001541	PASS
P	200.00	600.00	0.000601	PASS
K	40.00	120.00	0.150213	PASS
CA	100.00	300.00	0.007617	PASS
TI	2.40	7.20	0.000149	PASS
V	4.00	12.00	0.024261	PASS
CR	4.50	13.50	0.008132	PASS
MN	2.00	6.00	0.000995	PASS
FE	20.00	60.00	0.000924	PASS
CO	0.75	2.25	0.001407	PASS
NI	2.00	6.00	0.000317	PASS
CU	4.00	12.00	0.010852	PASS
ZN	20.00	60.00	0.001462	PASS
AS	4.00	12.00	0.000517	PASS
SE	3.20	9.60	0.000206	PASS
SR	2.40	7.20	0.000551	PASS
Y	4.00	12.00	0.000539	PASS
ZR	4.00	12.00	0.001324	PASS
NB	12.00	36.00	0.014880	PASS
MO	2.00	6.00	0.000394	PASS
RU	4.00	12.00	0.000239	PASS
RH	4.00	12.00	0.002515	PASS
PD	0.40	1.20	0.000092	PASS
AG	0.75	2.25	0.000057	PASS
CD	0.24	0.72	0.000008	PASS
SN	0.90	2.70	0.000424	PASS
SB	2.00	6.00	0.000069	PASS
TE	4.00	12.00	0.000001	PASS
CS	2.00	6.00	0.000019	PASS
BA	5.00	15.00	0.000029	PASS
LA	0.75	2.25	0.000025	PASS
CE	4.00	12.00	0.000033	PASS
PR	0.75	2.25	0.000030	PASS
ND	0.75	2.25	0.000007	PASS
SM	4.00	12.00	0.000007	PASS
HF	4.00	12.00	0.000052	PASS
TA	4.00	12.00	0.001517	PASS
W	10.00	30.00	0.000695	PASS
RE	4.00	12.00	0.000026	PASS
PT	0.40	1.20	0.000035	PASS
AU	2.00	6.00	0.000122	PASS
TL	2.00	6.00	0.000109	PASS
(PB 206)	1.25	3.75	0.000279	PASS
(PB 207)	1.25	3.75	0.000298	PASS
PB	1.25	3.75	0.001129	PASS
BI	7.50	22.50	0.000627	PASS
TH	0.90	2.70	0.000441	PASS
U	0.40	1.20	0.000079	PASS

File: 122619B1 P/A: 1844732
Tune: 1848646 IS: 1848675 1st reviewed on 12/27/19 by FLC:
Rinse: 1843378

	Method	Type	Vial	Sample	Comment	Dil/Lvl	ISTD Conc
1		Keyword		Start of TUNE			
2		Keyword		TN_6020.U			
3		Keyword		1307			
4		Keyword		End of TUNE			
5		Keyword		Start of SMPL			
6	C:\ICPMH\1\METHODS\MET_2014.m	6-Blank	1	RINSE		1.000	Level 1
7	C:\ICPMH\1\METHODS\MET_2014.m	CalBlk	4	ICIS 1854886		Level 1	Level 1
8	C:\ICPMH\1\METHODS\MET_2014.m	CalStd	1101	IC 1856860		Level 2	Level 1
9	C:\ICPMH\1\METHODS\MET_2014.m	CalStd	1102	IC 1856861		Level 3	Level 1
10	C:\ICPMH\1\METHODS\MET_2014.m	CalStd	1103	IC 1856862		Level 4	Level 1
11	C:\ICPMH\1\METHODS\MET_2014.m	ICV	1104	ICV 1856859		1.000	Level 1
12	C:\ICPMH\1\METHODS\MET_2014.m	ICB	4	ICB 1854886		1.000	Level 1
13	C:\ICPMH\1\METHODS\MET_2014.m	CRI	1101	CRI 1856860		1.000	Level 1
14	C:\ICPMH\1\METHODS\MET_2014.m	ICSA	1105	ICSA 1856863		1.000	Level 1
15	C:\ICPMH\1\METHODS\MET_2014.m	ICSAB	1106	ICSAB 1856864		1.000	Level 1
16	C:\ICPMH\1\METHODS\MET_2014.m	Sample	1301	LRC 1856174		1.000	Level 1
17	C:\ICPMH\1\METHODS\MET_2014.m	Sample	1302	LRC 1856175		1.000	Level 1
18	C:\ICPMH\1\METHODS\MET_2014.m	CCV	1102	CCV 1856861	(455415)	1.000	Level 1
19	C:\ICPMH\1\METHODS\MET_2014.m	CCB	4	CCB 1854886		1.000	Level 1
20	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2101	MB 160-454797/1-A	454797	2.000	Level 1
21	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2102	160-36005-A-17-E MDLV		2.000	Level 1
22	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2103	160-36007-A-16-A LOQV		2.000	Level 1
23	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2104	MB 160-454924/1-A	454924	2.000	Level 1
24	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2105	LCS 160-454924/2-A		2.000	Level 1
25	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2106	280-131107-E-1-B		2.000	Level 1
26	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2107	280-131107-E-2-D		2.000	Level 1
27	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2108	280-131107-E-2-D SD	All	10.00	Level 1
28	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2109	280-131107-E-2-E MS		2.000	Level 1
29	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2110	280-131107-E-2-F MSD		2.000	Level 1
30	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2111	280-131107-E-3-B		2.000	Level 1
31	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2112	280-131107-E-4-B		2.000	Level 1
32	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2201	280-131107-E-6-B		2.000	Level 1
33	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2202	MB 160-454230/1-A Ag	454230	2.000	Level 1

	Method	Type	Vial	Sample	Comment	Dil/Lvl	ISTD Conc
34	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2203	LCS 160-454230/2-A		2.000	Level 1
35	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2204	280-131840-I-1-A		2.000	Level 1
36	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2205	280-131840-I-2-A		2.000	Level 1
37	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2206	280-131840-I-2-A SD		10.00	Level 1
38	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2207	280-131840-I-2-B MS		2.000	Level 1
39	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2208	280-131840-I-2-C MSD		2.000	Level 1
40	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2209	280-131840-I-2-A PDS		2.000	Level 1
41	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2210	160-36457-A-149-B	453793	10.00	Level 1
42	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2211	160-36457-A-155-A		10.00	Level 1
43	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2212	160-36457-A-157-A		10.00	Level 1
44	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2301	160-36457-A-159-A	453794	10.00	Level 1
45	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2302	160-36457-A-160-A		10.00	Level 1
46	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2303	160-36457-A-162-A		10.00	Level 1
47	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2304	160-36457-A-163-A		10.00	Level 1
48	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2305	160-36457-A-164-A		10.00	Level 1
49	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2306	160-36457-A-165-A		10.00	Level 1
50	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2307	MB 160-454546/1-A	454546	2.000	Level 1
51	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2308	LCS 160-454546/2-A		2.000	Level 1
52	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2309	280-131980-A-1-B		20.00	Level 1
53	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2310	280-131980-A-1-B SD		100.0	Level 1
54	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2311	280-131980-A-1-C MS		20.00	Level 1
55	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2312	280-131980-A-1-D MSD		20.00	Level 1
56	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2401	280-131980-A-1-B PDS		20.00	Level 1
57	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2402	280-131980-A-2-B		2.000	Level 1
58	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2403	280-131980-A-3-B		20.00	Level 1
59	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2404	280-131980-A-4-B		20.00	Level 1
60	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2405	280-131980-A-5-B		2.000	Level 1
61	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2406	280-131980-A-6-B		2.000	Level 1
62	C:\ICPMH\1\METHODS\MET_2014.m	Sample	2407	280-131980-A-7-D		2.000	Level 1
63	C:\ICPMH\1\METHODS\MET_2014.m	CRI	1101	CCVL 1856860		1.000	Level 1
64	C:\ICPMH\1\METHODS\MET_2014.m	CCV	1102	CCV 1856861		1.000	Level 1
65	C:\ICPMH\1\METHODS\MET_2014.m	CCB	4	CCB 1854886		1.000	Level 1
66	C:\ICPMH\1\METHODS\MET_2014.m	6-Blank	1	RINSE		1.000	Level 1

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Ag

	Method	Type	Vial	Sample	Comment	Dil/Lvl	ISTD Conc
67	C:\ICPMH\1\METHODS\MET_2014.m	CalBlk	4	ICIS 1854886		Level 1	Level 1
68	C:\ICPMH\1\METHODS\MET_2014.m	CalStd	1101	IC 1856860		Level 2	Level 1
69	C:\ICPMH\1\METHODS\MET_2014.m	CalStd	1102	IC 1856861		Level 3	Level 1
70	C:\ICPMH\1\METHODS\MET_2014.m	CalStd	1103	IC 1856862		Level 4	Level 1
71	C:\ICPMH\1\METHODS\MET_2014.m	ICV	1104	ICV 1856859		1.000	Level 1
72	C:\ICPMH\1\METHODS\MET_2014.m	ICB	4	ICB 1854886		1.000	Level 1
73	C:\ICPMH\1\METHODS\MET_2014.m	CRI	1101	CRI 1856860		1.000	Level 1
74	C:\ICPMH\1\METHODS\MET_2014.m	ICSA	1105	ICSA 1856863		1.000	Level 1
75	C:\ICPMH\1\METHODS\MET_2014.m	ICSAB	1106	ICSAB 1856864		1.000	Level 1
76	C:\ICPMH\1\METHODS\MET_2014.m	CCV	1102	CCV 1856861	(455416)	1.000	Level 1
77	C:\ICPMH\1\METHODS\MET_2014.m	CCB	4	CCB 1854886		1.000	Level 1
78	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3101	MB 160-453801/1-A	453801	2.000	Level 1
79	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3102	LCS 160-453801/2-A		2.000	Level 1
80	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3103	LCSSRM 160-453801/3-A		10.00	Level 1
81	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3104	160-36593-B-1-A		2.000	Level 1
82	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3105	160-36593-B-1-A SD		10.00	Level 1
83	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3106	160-36593-B-1-B DU		2.000	Level 1
84	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3107	160-36593-A-1-E MS		2.000	Level 1
85	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3108	160-36593-A-1-F MSD		2.000	Level 1
86	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3109	160-36593-B-2-A		2.000	Level 1
87	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3110	160-36593-B-3-A		2.000	Level 1
88	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3111	160-36593-B-4-A	All	2.000	Level 1
89	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3112	160-36593-B-5-A		2.000	Level 1
90	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3201	160-36593-B-6-A		2.000	Level 1
91	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3202	160-36593-B-7-A		2.000	Level 1
92	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3203	160-36593-B-8-A		2.000	Level 1
93	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3204	160-36593-B-9-A		2.000	Level 1
94	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3205	160-36593-B-10-A		2.000	Level 1
95	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3206	160-36593-B-11-A		2.000	Level 1
96	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3207	160-36593-B-12-A		2.000	Level 1
97	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3208	160-36593-B-13-A		2.000	Level 1
98	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3209	160-36593-B-14-A		2.000	Level 1
99	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3210	160-36593-B-15-A		2.000	Level 1

	Method	Type	Vial	Sample	Comment	Dil/Lvl	ISTD Conc
100	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3211	160-36593-B-16-A		2.000	Level 1
101	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3212	160-36593-B-17-A		2.000	Level 1
102	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3301	160-36593-B-18-B		2.000	Level 1
103	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3302	MB 160-453196/1-A	453196	2.000	Level 1
104	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3303	LCS 160-453196/2-A		2.000	Level 1
105	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3304	180-99027-C-2-A		2.000	Level 1
106	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3305	180-99027-C-4-A		2.000	Level 1
107	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3306	180-99027-C-6-A		2.000	Level 1
108	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3307	180-99027-C-8-A		2.000	Level 1
109	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3308	180-99027-C-10-A		2.000	Level 1
110	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3309	180-99027-C-12-A		2.000	Level 1
111	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3310	180-99027-C-14-A		2.000	Level 1
112	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3311	180-99027-C-16-A		2.000	Level 1
113	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3312	180-99027-C-18-A		2.000	Level 1
114	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3401	180-99027-C-18-A SD		10.00	Level 1
115	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3402	180-99027-C-18-B MS		2.000	Level 1
116	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3403	180-99027-C-18-C MSD		2.000	Level 1
117	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3404	180-99027-C-18-A PDS		2.000	Level 1
118	C:\ICPMH\1\METHODS\MET_2014.m	Sample	3405	180-99027-C-20-A		2.000	Level 1
119		Keyword		End of SMPL			
120		Keyword		Start of CCV			
121	C:\ICPMH\1\METHODS\MET_2014.m	CRI	1101	CCVL 1856860		1.000	Level 1
122	C:\ICPMH\1\METHODS\MET_2014.m	CCV	1102	CCV 1856861		1.000	Level 1
123	C:\ICPMH\1\METHODS\MET_2014.m	CCB	4	CCB 1854886		1.000	Level 1
124		Keyword		End of CCV			
125		Keyword		Start of TERM			
126		Keyword					
127		Keyword		End of TERM			
128		Keyword		End of Sequence			
129		Keyword		Start of CALIB			
130		Keyword		End of CALIB			
131		Keyword		Start of BLANK			
132		Keyword		End of BLANK			

All

	Method	Type	Vial	Sample	Comment	Dil/Lvl	ISTD Conc
133		Keyword		Start of ERRTERM			
134		Keyword		End of ERRTERM			

GENERAL CHEMISTRY

COVER PAGE
GENERAL CHEMISTRY

Lab Name: Eurofins TestAmerica, St. Louis Job Number: 160-36593-1

SDG No.:

Project: ACMS - Yerington OU-4b_OU-5_SOIL

Client Sample ID	Lab Sample ID
STSB32_0-0.5	160-36593-1
STSB32_0.5-3	160-36593-2
STSB32_3-6	160-36593-3
STSB32_6-15	160-36593-4
STSB34_0-0.5	160-36593-5
STSB34_0.5-3	160-36593-6
STSB34_3-6	160-36593-7
STSB34_6-15	160-36593-8
STSB34-FD_3-6	160-36593-9
STSB33_0-0.5	160-36593-10
STSB33_0.5-3	160-36593-11
STSB33-FD_0.5-3	160-36593-12
STSB33_3-6	160-36593-13
STSB33_6-15	160-36593-14
STSB35_0.5-3	160-36593-15
STSB35_0-0.5	160-36593-16
STSB35_3-6	160-36593-17
STSB35_6-15	160-36593-18

Comments:

9-IN
DETECTION LIMITS
GENERAL CHEMISTRY

Lab Name: Eurofins TestAmerica, St. Louis Job Number: 160-36593-1

SDG Number:

Matrix: Solid Instrument ID: NOEQUIP

Method: Moisture RL Date: 01/28/2011 14:43

Analyte	Wavelength/ Mass	RL (%)
Percent Moisture		0.1
Percent Solids		0.1

9-IN
CALIBRATION BLANK DETECTION LIMITS
GENERAL CHEMISTRY

Lab Name: Eurofins TestAmerica, St. Louis Job Number: 160-36593-1

SDG Number:

Matrix: Solid Instrument ID: NOEQUIP

Method: Moisture XRL Date: 01/28/2011 14:42

Analyte	Wavelength/ Mass	XRL (%)
Percent Moisture		0.1
Percent Solids		0.1

FORM IX - IN

13-IN
ANALYSIS RUN LOG
GENERAL CHEMISTRY

Lab Name: Eurofins TestAmerica, St. Louis Job No.: 160-36593-1

SDG No.:

Instrument ID: NOEQUIP Analysis Method: Moisture

Start Date: 12/05/2019 14:09 End Date: 12/05/2019 14:09

Lab Sample Id	D/F	Type	Time	% Sol	Moist	Analytes
160-36593-1	1	T	14:09	X	X	
160-36593-1 DU	1	T	14:09	X	X	
160-36593-2	1	T	14:09	X	X	
160-36593-3	1	T	14:09	X	X	
160-36593-4	1	T	14:09	X	X	
160-36593-5	1	T	14:09	X	X	
160-36593-6	1	T	14:09	X	X	
160-36593-7	1	T	14:09	X	X	
160-36593-8	1	T	14:09	X	X	
160-36593-9	1	T	14:09	X	X	
160-36593-10	1	T	14:09	X	X	
160-36593-11	1	T	14:09	X	X	
160-36593-12	1	T	14:09	X	X	
160-36593-13	1	T	14:09	X	X	
160-36593-14	1	T	14:09	X	X	
160-36593-15	1	T	14:09	X	X	
160-36593-16	1	T	14:09	X	X	
160-36593-17	1	T	14:09	X	X	
160-36593-18	1	T	14:09	X	X	

Prep Types:
T = Total/NA

FORM XIII-IN

$\left(\frac{\text{Mass Dry} - \text{dish}}{\text{Mass wet} - \text{dish}}\right) \times 100 = \%$ solid

GENERAL CHEMISTRY BATCH WORKSHEET

Lab Name: Eurofins TestAmerica, St. Loui Job No.: 160-36593-1

SDG No.:

Batch Number: 453177 Batch Start Date: 12/05/19 14:09 Batch Analyst: Oetter, David R

Batch Method: Moisture Batch End Date: 12/06/19 09:30

Lab Sample ID	Client Sample ID	Method Chain	Basis	DISH#	DishWeight	SampleMassWet	SampleMassDry	
160-36593-A-1	STSB32_0-0.5	Moisture	T	1	1.0071 g	12.8186 g	12.0268 g	93.3
160-36593-A-1 DU	STSB32_0-0.5	Moisture	T	2	1.0143 g	12.1906 g	11.4978 g	93.8
160-36593-A-2	STSB32_0.5-3	Moisture	T	3	0.9889 g	12.2573 g	11.7398 g	
160-36593-A-3	STSB32_3-6	Moisture	T	4	1.0148 g	11.6789 g	10.9635 g	
160-36593-A-4	STSB32_6-15	Moisture	T	5	1.0062 g	11.6574 g	10.6941 g	
160-36593-A-5	STSB34_0-0.5	Moisture	T	6	0.9864 g	10.6616 g	10.1638 g	94.9
160-36593-A-6	STSB34_0.5-3	Moisture	T	7	0.9911 g	10.9556 g	10.3880 g	
160-36593-A-7	STSB34_3-6	Moisture	T	8	0.9929 g	12.1310 g	11.5443 g	
160-36593-A-8	STSB34_6-15	Moisture	T	9	1.0000 g	13.7308 g	10.9189 g	
160-36593-A-9	STSB34-FD_3-6	Moisture	T	10	1.0025 g	14.0592 g	13.3721 g	
160-36593-A-10	STSB33_0-0.5	Moisture	T	11	0.9900 g	11.6395 g	11.0934 g	94.9
160-36593-A-11	STSB33_0.5-3	Moisture	T	12	1.0116 g	12.0866 g	11.4244 g	
160-36593-A-12	STSB33-FD_0.5-3	Moisture	T	13	1.0066 g	10.8363 g	10.2964 g	
160-36593-A-13	STSB33_3-6	Moisture	T	14	1.0121 g	11.7635 g	11.0384 g	
160-36593-A-14	STSB33_6-15	Moisture	T	15	1.0204 g	10.9941 g	10.3460 g	
160-36593-A-15	STSB35_0.5-3	Moisture	T	16	0.9931 g	12.5509 g	12.0321 g	
160-36593-A-16	STSB35_0-0.5	Moisture	T	17	1.0088 g	12.4609 g	11.5885 g	
160-36593-A-17	STSB35_3-6	Moisture	T	18	1.0052 g	11.7988 g	11.1845 g	
160-36593-A-18	STSB35_6-15	Moisture	T	19	0.9985 g	12.7845 g	11.9105 g	92.6

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

GENERAL CHEMISTRY BATCH WORKSHEET

Lab Name: Eurofins TestAmerica, St. Loui Job No.: 160-36593-1

SDG No.:

Batch Number: 453177 Batch Start Date: 12/05/19 14:09 Batch Analyst: Oetter, David R

Batch Method: Moisture Batch End Date: 12/06/19 09:30

Batch Notes	
Balance ID	0034150065
Batch Comment	TRAY B-2
Date samples were placed in the oven	12/05/2019
Oven Temp In	104.1 Degrees C
Time samples were place in the oven	14:52
Date samples were removed from oven	12/06/2019
Oven Temp Out	104 Degrees C
Time Samples were removed from oven	09:30
Oven ID	OC
Thermometer ID	A142186

Basis	Basis Description
T	Total/NA

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

GAMMA SPECTROSCOPY

Method 901.1
Ra-226

Radium-226 & Other Gamma Emitters (GS) by Method 901.1

Prep Batch: 453329

Fill Geometry, 21-Day In-Growth

Gamma Spectroscopy Analysis Detail Report
Prep Batch: 453329

Lab Id: MB 160-453329/1-A | Analyzed: 12/27/19 07:39 | Ts: 30 | Sigma: 2
Client ID: | Detector: GV9 | Decay Corrected: No | Ingrowth:

Analyte	MB Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Anly Batch
Radium-226	-0.001468	0.147	0.147	U	pCi/g	1.00	0.256	455404
Radium-228	0.006121	0.0488	0.0488	U	pCi/g	1.00	0.188	455404

Lab Id: LCS 160-453329/2-A | Analyzed: 12/27/19 07:38 | Ts: 30 | Sigma: 2
Client ID: | Detector: GV12 | Decay Corrected: No | Ingrowth:

Analyte	LCS Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Anly Batch
Americium-241	99.53	1.48	11.7		pCi/g		1.14	455401
Cesium-137	30.32	0.768	3.19		pCi/g		0.310	455401
Cobalt-60	11.88	0.389	1.25		pCi/g		0.161	455401

Lab Id: 160-36593-1 | Analyzed: 12/27/19 07:44 | Ts: 30 | Sigma: 2
Client ID: STSB32_0-0.5 | Detector: GV8 | Decay Corrected: No | Ingrowth:

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Anly Batch
Radium-226	3.01	0.306	0.438		pCi/g	1.00	0.166	455403
Radium-228	0.910	0.232	0.250		pCi/g	1.00	0.185	455403

Lab Id: 160-36593-1 DU | Analyzed: 12/27/19 08:18 | Ts: 30 | Sigma: 2
Client ID: STSB32_0-0.5 | Detector: GV5 | Decay Corrected: No | Ingrowth:

Analyte	DU Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Anly Batch
Radium-226	3.248	0.340	0.479		pCi/g	1.00	0.181	455402
Radium-228	1.268	0.355	0.378		pCi/g	1.00	0.238	455402

Lab Id: 160-36593-2 | Analyzed: 12/27/19 08:16 | Ts: 30 | Sigma: 2
Client ID: STSB32_0.5-3 | Detector: GV9 | Decay Corrected: No | Ingrowth:

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Anly Batch
Radium-226	2.49	0.225	0.343		pCi/g	1.00	0.127	455404
Radium-228	0.754	0.253	0.264		pCi/g	1.00	0.319	455404

Lab Id: 160-36593-3 | Analyzed: 12/27/19 08:17 | Ts: 30 | Sigma: 2
Client ID: STSB32_3-6 | Detector: GV12 | Decay Corrected: No | Ingrowth:

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Anly Batch
Radium-226	3.31	0.335	0.475		pCi/g	1.00	0.208	455401
Radium-228	1.03	0.383	0.397		pCi/g	1.00	0.360	455401

Gamma Spectroscopy Analysis Detail Report
Prep Batch: 453329

Lab Id: 160-36593-4 Analyzed: 12/27/19 08:19 Ts: 30 Sigma: 2
Client ID: STSB32_6-15 Detector: GV8 Decay Corrected: No Ingrowth:

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Anly Batch
Radium-226	3.17	0.360	0.488		pCi/g	1.00	0.162	455403
Radium-228	1.36	0.287	0.319		pCi/g	1.00	0.336	455403

Lab Id: 160-36593-5 Analyzed: 12/27/19 08:58 Ts: 30 Sigma: 2
Client ID: STSB34_0-0.5 Detector: GV8 Decay Corrected: No Ingrowth:

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Anly Batch
Radium-226	1.84	0.237	0.305		pCi/g	1.00	0.145	455403
Radium-228	1.07	0.248	0.271		pCi/g	1.00	0.170	455403

Lab Id: 160-36593-6 Analyzed: 12/27/19 09:03 Ts: 30 Sigma: 2
Client ID: STSB34_0.5-3 Detector: GV5 Decay Corrected: No Ingrowth:

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Anly Batch
Radium-226	2.34	0.284	0.374		pCi/g	1.00	0.158	455402
Radium-228	0.930	0.224	0.243		pCi/g	1.00	0.289	455402

Lab Id: 160-36593-7 Analyzed: 12/27/19 09:30 Ts: 30 Sigma: 2
Client ID: STSB34_3-6 Detector: GV9 Decay Corrected: No Ingrowth:

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Anly Batch
Radium-226	1.90	0.223	0.298		pCi/g	1.00	0.146	455404
Radium-228	0.863	0.161	0.184		pCi/g	1.00	0.169	455404

Lab Id: 160-36593-8 Analyzed: 12/27/19 09:31 Ts: 30 Sigma: 2
Client ID: STSB34_6-15 Detector: GV12 Decay Corrected: No Ingrowth:

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Anly Batch
Radium-226	2.76	0.387	0.478		pCi/g	1.00	0.270	455401
Radium-228	1.56	0.424	0.452		pCi/g	1.00	0.330	455401

Lab Id: 160-36593-9 Analyzed: 12/27/19 09:35 Ts: 30 Sigma: 2
Client ID: STSB34-FD_3-6 Detector: GV5 Decay Corrected: No Ingrowth:

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Anly Batch
Radium-226	2.15	0.285	0.362		pCi/g	1.00	0.178	455402
Radium-228	0.982	0.244	0.263		pCi/g	1.00	0.215	455402

Gamma Spectroscopy Analysis Detail Report
Prep Batch: 453329

Lab Id: 160-36593-10 Analyzed: 12/27/19 09:34 Ts: 30 Sigma: 2
Client ID: STSB33_0-0.5 Detector: GV8 Decay Corrected: No Ingrowth:

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Anly Batch
Radium-226	1.48	0.212	0.262		pCi/g	1.00	0.131	455403
Radium-228	0.714	0.192	0.206		pCi/g	1.00	0.223	455403

Lab Id: 160-36593-11 Analyzed: 12/27/19 10:11 Ts: 30 Sigma: 2
Client ID: STSB33_0.5-3 Detector: GV9 Decay Corrected: No Ingrowth:

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Anly Batch
Radium-226	1.60	0.199	0.260		pCi/g	1.00	0.113	455404
Radium-228	1.05	0.194	0.222		pCi/g	1.00	0.169	455404

Lab Id: 160-36593-12 Analyzed: 12/27/19 10:12 Ts: 30 Sigma: 2
Client ID: STSB33-FD_0.5-3 Detector: GV12 Decay Corrected: No Ingrowth:

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Anly Batch
Radium-226	1.58	0.239	0.288		pCi/g	1.00	0.209	455401
Radium-228	0.820	0.362	0.371		pCi/g	1.00	0.345	455401

Lab Id: 160-36593-13 Analyzed: 12/27/19 10:14 Ts: 30 Sigma: 2
Client ID: STSB33_3-6 Detector: GV5 Decay Corrected: No Ingrowth:

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Anly Batch
Radium-226	1.20	0.285	0.311		pCi/g	1.00	0.316	455402
Radium-228	1.95	0.532	0.568		pCi/g	1.00	0.691	455402

Lab Id: 160-36593-14 Analyzed: 12/27/19 10:15 Ts: 30 Sigma: 2
Client ID: STSB33_6-15 Detector: GV8 Decay Corrected: No Ingrowth:

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Anly Batch
Radium-226	1.68	0.244	0.300		pCi/g	1.00	0.133	455403
Radium-228	1.40	0.249	0.288		pCi/g	1.00	0.130	455403

Lab Id: 160-36593-15 Analyzed: 12/27/19 10:53 Ts: 30 Sigma: 2
Client ID: STSB35_0.5-3 Detector: GV9 Decay Corrected: No Ingrowth:

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Anly Batch
Radium-226	1.71	0.203	0.270		pCi/g	1.00	0.133	455404
Radium-228	0.715	0.265	0.275		pCi/g	1.00	0.253	455404

Gamma Spectroscopy Analysis Detail Report
Prep Batch: 453329

Lab Id: 160-36593-16 | Analyzed: 12/27/19 10:54 | Ts: 30 | Sigma: 2
Client ID: STSB35_0-0.5 | Detector: GV8 | Decay Corrected: No | Ingrowth:

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Anly Batch
Radium-226	3.54	0.400	0.543		pCi/g	1.00	0.214	455403
Radium-228	0.952	0.352	0.365		pCi/g	1.00	0.497	455403

Lab Id: 160-36593-17 | Analyzed: 12/27/19 11:37 | Ts: 30 | Sigma: 2
Client ID: STSB35_3-6 | Detector: GV9 | Decay Corrected: No | Ingrowth:

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Anly Batch
Radium-226	2.34	0.225	0.332		pCi/g	1.00	0.132	455404
Radium-228	0.700	0.278	0.287		pCi/g	1.00	0.271	455404

Lab Id: 160-36593-18 | Analyzed: 12/27/19 11:37 | Ts: 30 | Sigma: 2
Client ID: STSB35_6-15 | Detector: GV12 | Decay Corrected: No | Ingrowth:

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Anly Batch
Radium-226	5.62	0.426	0.714		pCi/g	1.00	0.214	455401
Radium-228	1.15	0.333	0.353		pCi/g	1.00	0.354	455401

Quality Control Summary

Method Blank ID:	Analyte	Parent Result	Spike Added	MB Result	Qualifier	Unit	% Rec	% Rec Limits	RPD	RER	DER	DER Limit	Z Factor
MB 160-453329/1-A	Radium-226			-0.001468	U	pCi/g							-.02
MB 160-453329/1-A	Radium-228		clear	0.006121	U	pCi/g							.2508
Lab Control Sample ID:	**Analyte**	**Parent Result**	**Spike Added**	**LCS Result**	**Qualifier**	**Unit**	**% Rec**	**% Rec Limits**	**RPD**	**RER**	**DER**	**DER Limit**	**Z Factor**
LCS 160-453329/2-A	Americium-241		96.6	99.53		pCi/g	103	75 - 125					.4843
LCS 160-453329/2-A	Cesium-137		27.3	30.32		pCi/g	111	75 - 125					1.7994
LCS 160-453329/2-A	Cobalt-60		10.7	11.88		pCi/g	111	75 - 125					1.7409
Duplicate ID:	**Analyte**	**Parent Result**	**Spike Added**	**DU Result**	**Qualifier**	**Unit**	**% Rec**	**% Rec Limits**	**RPD**	**RER**	**DER**	**DER Limit**	**Z Factor**
160-36593-1	Radium-226	3.01		3.248		pCi/g			7	0.25	0.72	2	.7191
160-36593-1	Radium-228	0.910		1.268		pCi/g			33	0.57	1.58	2	1.5797

Glossary:

Ts = Count Duration, Sample

GAMMA SPECTROSCOPY BATCH WORKSHEET

Lab Name: Eurofins TestAmerica, St. Loui Job No.: 160-36593-1

SDG No.:

Batch Number: 453329 Batch Start Date: 12/06/19 13:38 Batch Analyst: Slama, Kurt R

Batch Method: Fill_Geo-21 Batch End Date: 12/06/19 14:24

Lab Sample ID	Client Sample ID	Method Chain	Basis	TareWeight	GrossWeight	InitialAmount	IngDecDate1	IngDecDate3	Geometry
MB 160-453329/1		Fill_Geo-21, 901.1				291.18 g	12/06/2019 14:24	12/27/2019 14:24	tuna can
LCS 160-453329/2		Fill_Geo-21, 901.1				341.9 g	12/06/2019 14:24	12/27/2019 14:24	tuna can
160-36593-A-1-A	STSB32_0-0.5	Fill_Geo-21, 901.1	T	46.3 g	454.6 g	408.3 g	12/06/2019 14:24	12/27/2019 14:24	tuna can
160-36593-A-1-B DU	STSB32_0-0.5	Fill_Geo-21, 901.1	T	46.3 g	454.6 g	408.3 g	12/06/2019 14:24	12/27/2019 14:24	tuna can
160-36593-A-2-A	STSB32_0.5-3	Fill_Geo-21, 901.1	T	45.9 g	479.9 g	434 g	12/06/2019 14:24	12/27/2019 14:24	tuna can
160-36593-A-3-A	STSB32_3-6	Fill_Geo-21, 901.1	T	46.2 g	446.7 g	400.5 g	12/06/2019 14:24	12/27/2019 14:24	tuna can
160-36593-A-4-A	STSB32_6-15	Fill_Geo-21, 901.1	T	46.2 g	324.1 g	277.9 g	12/06/2019 14:24	12/27/2019 14:24	tuna can
160-36593-A-5-A	STSB34_0-0.5	Fill_Geo-21, 901.1	T	46.6 g	478.6 g	432 g	12/06/2019 14:24	12/27/2019 14:24	tuna can
160-36593-A-6-A	STSB34_0.5-3	Fill_Geo-21, 901.1	T	46.4 g	457.5 g	411.1 g	12/06/2019 14:24	12/27/2019 14:24	tuna can
160-36593-A-7-A	STSB34_3-6	Fill_Geo-21, 901.1	T	45.7 g	471.4 g	425.7 g	12/06/2019 14:24	12/27/2019 14:24	tuna can
160-36593-A-8-A	STSB34_6-15	Fill_Geo-21, 901.1	T	46.1 g	304.4 g	258.3 g	12/06/2019 14:24	12/27/2019 14:24	tuna can
160-36593-A-9-A	STSB34-FD_3-6	Fill_Geo-21, 901.1	T	46.7 g	438.5 g	391.8 g	12/06/2019 14:24	12/27/2019 14:24	tuna can
160-36593-A-10-A	STSB33_0-0.5	Fill_Geo-21, 901.1	T	47.0 g	472.5 g	425.5 g	12/06/2019 14:24	12/27/2019 14:24	tuna can
160-36593-A-11-A	STSB33_0.5-3	Fill_Geo-21, 901.1	T	46.6 g	370.6 g	324 g	12/06/2019 14:24	12/27/2019 14:24	tuna can
160-36593-A-12-A	STSB33-FD_0.5-3	Fill_Geo-21, 901.1	T	46.8 g	395.2 g	348.4 g	12/06/2019 14:24	12/27/2019 14:24	tuna can
160-36593-A-13-A	STSB33_3-6	Fill_Geo-21, 901.1	T	46.7 g	339.0 g	292.3 g	12/06/2019 14:24	12/27/2019 14:24	tuna can
160-36593-A-14-A	STSB33_6-15	Fill_Geo-21, 901.1	T	46.7 g	363.9 g	317.2 g	12/06/2019 14:24	12/27/2019 14:24	tuna can
160-36593-A-15-A	STSB35_0.5-3	Fill_Geo-21, 901.1	T	46.5 g	465.7 g	419.2 g	12/06/2019 14:24	12/27/2019 14:24	tuna can
160-36593-A-16-A	STSB35_0-0.5	Fill_Geo-21, 901.1	T	46.6 g	330.6 g	284 g	12/06/2019 14:24	12/27/2019 14:24	tuna can
160-36593-A-17-A	STSB35_3-6	Fill_Geo-21, 901.1	T	46.7 g	464.4 g	417.7 g	12/06/2019 14:24	12/27/2019 14:24	tuna can
160-36593-A-18-A	STSB35_6-15	Fill_Geo-21, 901.1	T	46.6 g	428.3 g	381.7 g	12/06/2019 14:24	12/27/2019 14:24	tuna can

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

GAMMA SPECTROSCOPY BATCH WORKSHEET

Lab Name: Eurofins TestAmerica, St. Loui Job No.: 160-36593-1

SDG No.:

Batch Number: 453329 Batch Start Date: 12/06/19 13:38 Batch Analyst: Slama, Kurt R

Batch Method: Fill_Geo-21 Batch End Date: 12/06/19 14:24

Lab Sample ID	Client Sample ID	Method Chain	Basis	Tuna Can LCS 00009
MB 160-453329/1		Fill_Geo-21, 901.1		
LCS 160-453329/2		Fill_Geo-21, 901.1		# g
160-36593-A-1-A	STSB32_0-0.5	Fill_Geo-21, 901.1	T	
160-36593-A-1-B DU	STSB32_0-0.5	Fill_Geo-21, 901.1	T	
160-36593-A-2-A	STSB32_0.5-3	Fill_Geo-21, 901.1	T	
160-36593-A-3-A	STSB32_3-6	Fill_Geo-21, 901.1	T	
160-36593-A-4-A	STSB32_6-15	Fill_Geo-21, 901.1	T	
160-36593-A-5-A	STSB34_0-0.5	Fill_Geo-21, 901.1	T	
160-36593-A-6-A	STSB34_0.5-3	Fill_Geo-21, 901.1	T	
160-36593-A-7-A	STSB34_3-6	Fill_Geo-21, 901.1	T	
160-36593-A-8-A	STSB34_6-15	Fill_Geo-21, 901.1	T	
160-36593-A-9-A	STSB34-FD_3-6	Fill_Geo-21, 901.1	T	
160-36593-A-10-A	STSB33_0-0.5	Fill_Geo-21, 901.1	T	
160-36593-A-11-A	STSB33_0.5-3	Fill_Geo-21, 901.1	T	
160-36593-A-12-A	STSB33-FD_0.5-3	Fill_Geo-21, 901.1	T	
160-36593-A-13-A	STSB33_3-6	Fill_Geo-21, 901.1	T	
160-36593-A-14-A	STSB33_6-15	Fill_Geo-21, 901.1	T	
160-36593-A-15-A	STSB35_0.5-3	Fill_Geo-21, 901.1	T	
160-36593-A-16-A	STSB35_0-0.5	Fill_Geo-21, 901.1	T	
160-36593-A-17-A	STSB35_3-6	Fill_Geo-21, 901.1	T	
160-36593-A-18-A	STSB35_6-15	Fill_Geo-21, 901.1	T	

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

GAMMA SPECTROSCOPY BATCH WORKSHEET

Lab Name: Eurofins TestAmerica, St. Loui Job No.: 160-36593-1

SDG No.:

Batch Number: 453329 Batch Start Date: 12/06/19 13:38 Batch Analyst: Slama, Kurt R

Batch Method: Fill_Geo-21 Batch End Date: 12/06/19 14:24

Batch Notes	
Balance ID	1121432711
SOP Number	ST-RC-0003, ST-RC-0025

Basis	Basis Description
T	Total/NA

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

Daily Checks

12/27/19

tumcan: GV 5,8,9,12

Test America
St. Louis
Quality Control Check

Spectrum: 5_20191227001_QCAsLeft
Description: Quality control Check (QC Source 'A') Post Stabilization
Acquired: 12/27/2019 5:36:33 AM
Detector: Detector # 5
Quality Control Evaluation Criteria:
1) Notify Supervisor if 'AS FOUND' parameters exceed Tolerance or Control Limits.
2) Place out of service if 'AS LEFT' parameters exceed Tolerance or Control Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
QA-60							
Channel	238.00	236.00	237.00	237.90	239.00	240.00	PASS
Energy	59.54	59.04	59.29	59.59	59.79	60.04	PASS
FWHM	0.74	0.00	0.00	0.72	1.84	1.94	PASS
ActivityDiff	636.60	-5.00	-4.00	0.32	4.00	5.00	PASS
QA-662							
FWHM	1.36	0.00	0.00	1.37	3.06	3.16	PASS
ActivityDiff	596.80	-5.00	-4.00	-0.05	4.00	5.00	PASS
QA-1332							
Channel	5330.00	5327.00	5328.00	5329.00	5332.00	5333.00	PASS
Energy	1332.51	1331.76	1332.01	1332.30	1333.01	1333.26	PASS
FWHM	1.90	0.00	0.00	1.98	4.10	4.20	PASS
ActivityDiff	1164.20	-5.00	-4.00	-1.56	4.00	5.00	PASS

Analyst: kody Saulters Reviewer: kody Saulters

Test America
St. Louis
Background Check

Spectrum: 5_20191227002_BG
Description: Background Contamination Check
Acquired: 12/27/2019 5:59:00 AM
Detector: Detector # 5

Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	1.45	1.30	1.35	1.46	1.55	1.60	PASS

Analyst: Caleb Quinn Reviewer: kody Saulters

Test America
St. Louis
Quality Control Check

Spectrum: 8_20191227001_QCAsLeft
Description: Quality control Check (QC Source 'D') Post Stabilization
Acquired: 12/27/2019 5:37:51 AM
Detector: Detector # 8
Quality Control Evaluation Criteria:
1) Notify Supervisor if 'AS FOUND' parameters exceed Tolerance or Control Limits.
2) Place out of service if 'AS LEFT' parameters exceed Tolerance or Control Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
QA-60							
Channel	238.00	236.00	237.00	238.00	239.00	240.00	PASS
Energy	59.54	59.04	59.29	59.56	59.79	60.04	PASS
FWHM	1.10	0.00	0.00	1.29	2.20	2.30	PASS
ActivityDiff	650.60	-5.00	-4.00	0.35	4.00	5.00	PASS
QA-662							
FWHM	1.53	0.00	0.00	1.67	3.23	3.33	PASS
ActivityDiff	609.90	-5.00	-4.00	3.44	4.00	5.00	PASS
QA-1332							
Channel	5330.00	5327.00	5328.00	5330.50	5332.00	5333.00	PASS
Energy	1332.51	1331.76	1332.01	1332.64	1333.01	1333.26	PASS
FWHM	1.90	0.00	0.00	1.84	4.10	4.20	PASS
ActivityDiff	1189.70	-5.00	-4.00	2.65	4.00	5.00	PASS

Analyst: kody Saulters Reviewer: kody Saulters

Test America
St. Louis
Background Check

Spectrum: 8_20191227002_BG
Description: Background Contamination Check
Acquired: 12/27/2019 5:56:22 AM
Detector: Detector # 8

Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	1.56	1.39	1.45	1.57	1.68	1.74	PASS

Analyst: Caleb Quinn Reviewer: kody Saulters

Test America
St. Louis
Quality Control Check

Spectrum: 9_20191227002_QCAsLeft
Description: Quality control Check (QC Source 'E') Post Stabilization
Acquired: 12/27/2019 6:10:52 AM
Detector: Detector # 9
Quality Control Evaluation Criteria:
1) Notify Supervisor if 'AS FOUND' parameters exceed Tolerance or Control Limits.
2) Place out of service if 'AS LEFT' parameters exceed Tolerance or Control Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
QA-60							
Channel	238.00	236.00	237.00	237.80	239.00	240.00	PASS
Energy	59.54	59.04	59.29	59.56	59.79	60.04	PASS
FWHM	1.08	0.00	0.00	0.93	2.18	2.28	PASS
ActivityDiff	649.44	-5.00	-4.00	0.05	4.00	5.00	PASS
QA-662							
FWHM	1.62	0.00	0.00	1.49	3.32	3.42	PASS
ActivityDiff	607.56	-5.00	-4.00	-0.82	4.00	5.00	PASS
QA-1332							
Channel	5330.00	5327.00	5328.00	5329.60	5332.00	5333.00	PASS
Energy	1332.51	1331.76	1332.01	1332.31	1333.01	1333.26	PASS
FWHM	2.12	0.00	0.00	1.95	4.32	4.42	PASS
ActivityDiff	1191.31	-5.00	-4.00	-2.09	4.00	5.00	PASS

Analyst: Caleb Quinn Reviewer: kody Saulters

Test America
St. Louis
Background Check

Spectrum: 9_20191227001_BG
Description: Background Contamination Check
Acquired: 12/27/2019 5:04:11 AM
Detector: Detector # 9
Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	1.89	1.53	1.65	1.82	2.14	2.26	PASS

Analyst: kody Saulters Reviewer: kody Saulters

Test America
St. Louis
Quality Control Check

Spectrum: 12_20191227002_QCAsLeft
Description: Quality control Check (QC Source 'H') Post Stabilization
Acquired: 12/27/2019 6:48:07 AM
Detector: Detector #12
Quality Control Evaluation Criteria:
1) Notify Supervisor if 'AS FOUND' parameters exceed Tolerance or Control Limits.
2) Place out of service if 'AS LEFT' parameters exceed Tolerance or Control Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
QA-60							
Channel	238.00	236.00	237.00	237.90	239.00	240.00	PASS
Energy	59.54	59.04	59.29	59.58	59.79	60.04	PASS
FWHM	0.90	0.00	0.00	0.84	2.00	2.10	PASS
ActivityDiff	691.00	-5.00	-4.00	-1.16	4.00	5.00	PASS
QA-662							
FWHM	1.48	0.00	0.00	1.46	3.18	3.28	PASS
ActivityDiff	659.00	-5.00	-4.00	0.36	4.00	5.00	PASS
QA-1332							
Channel	5330.00	5327.00	5328.00	5329.50	5332.00	5333.00	PASS
Energy	1332.51	1331.76	1332.01	1332.37	1333.01	1333.26	PASS
FWHM	2.00	0.00	0.00	1.97	4.20	4.30	PASS
ActivityDiff	1274.00	-5.00	-4.00	-0.51	4.00	5.00	PASS

Analyst: Caleb Quinn Reviewer: kody Saulters

Test America
St. Louis
Background Check

Spectrum: 12_20191227001_BG
Description: Background Contamination Check
Acquired: 12/27/2019 5:05:29 AM
Detector: Detector #12

Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	2.00	1.89	1.93	2.00	2.07	2.10	PASS

Analyst: kody Saulters Reviewer: kody Saulters

Initial Calibrations

tuna can

GV 5,8,9,12

Gamma Verification per Geometry

Detector: Ge5

Geometry: Tunacan

Reference date 1/1/2012

Calibration Standard: 90099

Standard volume g / vial 1550

Standard volume transferred in g / geometry 317.8

lab ID# of cal standard Rad12-0007

Isotope	Certified Activity gammas/sec	Geometry Activity gammas/sec	γ abundance	Bq/sample	Count Results	%recovery
Pb-210	3094	634	0.0425	14926	14353	96.2
Am-241	2037	418	0.3590	1163	1230.2	105.7
Cd-109	2881	591	0.0361	16363	16101	98.4
Co-57	1511	310	0.8560	362	347.72	96.1
Ce-139	2139	439	0.7990	549	538.4	98.1
Hg-203	4651	954	0.8146	1171	1208.4	103.2
Sn-113	3015	618	0.6400	966	972.07	100.6
Cs-137	1938	397	0.8510	467	462.35	99.0
Y-88	7264	1489	0.9370	1589	1559.3	98.1
Co-60	3580	734	0.9997	734	722.51	98.4
Co-60	3581	734	0.9999	734	739.67	100.7
Y-88	7690	1577	0.9920	1589	1613.8	101.5

Reviewed By: Jody Watson

Date: 3/27/2012

Gamma Verification per Geometry

Detector: Ge8

Geometry: Tunacan

Reference date 1/1/2012

Calibration Standard: 90099

Standard volume g / vial 1550

Standard volume transferred in g / geometry 317.8

lab ID# of cal standard 6699

Isotope	Certified Activity gammas/sec	Geometry Activity gammas/sec	γ abundance	Bq/sample	Count Results	%recovery
Pb-210	3094	634	0.0425	14926	14960	100.2
Am-241	2037	418	0.3590	1163	1240.5	106.6
Cd-109	2881	591	0.0361	16363	16066	98.2
Co-57	1511	310	0.8560	362	345.12	95.4
Ce-139	2139	439	0.7990	549	536.34	97.7
Hg-203	4651	954	0.8146	1171	1218.2	104.1
Sn-113	3015	618	0.6400	966	967.15	100.1
Cs-137	1938	397	0.8510	467	465.86	99.8
Y-88	7264	1489	0.9370	1589	1552.1	97.6
Co-60	3580	734	0.9997	734	724.48	98.7
Co-60	3581	734	0.9999	734	729.98	99.4
Y-88	7690	1577	0.9920	1589	1627.2	102.4

Reviewed By: Jody Watson

Date: 3/28/2012

Gamma Verification per Geometry

Detector: Ge9

Geometry: Tunacan

Reference date 1/1/2012

Calibration Standard: 90099

Standard volume g / vial 1550

Standard volume transferred in g / geometry 317.8

lab ID# of cal standard 6699

Isotope	Certified Activity gammas/sec	Geometry Activity gammas/sec	γ abundance	Bq/sample	Count Results	%recovery
Pb-210	3094	634	0.0425	14926	14240	95.4
Am-241	2037	418	0.3590	1163	1244.5	107.0
Cd-109	2881	591	0.0361	16363	15902	97.2
Co-57	1511	310	0.8560	362	347.48	96.0
Ce-139	2139	439	0.7990	549	535.87	97.6
Hg-203	4651	954	0.8146	1171	1216.7	103.9
Sn-113	3015	618	0.6400	966	970.65	100.5
Cs-137	1938	397	0.8510	467	466.58	99.9
Y-88	7264	1489	0.9370	1589	1552.5	97.7
Co-60	3580	734	0.9997	734	727.12	99.0
Co-60	3581	734	0.9999	734	719.75	98.0
Y-88	7690	1577	0.9920	1589	1638.8	103.1

Reviewed By: Jody Watson

Date: 6/14/2012

Gamma Verification per Geometry

Detector: Ge12
Geometry: Tuna Can
Reference date: 1/1/2018
Calibration Standard: 108513
Standard volume g / vial: 1550
Standard volume transferred in g / geometry: 342.2
lab ID# of cal standard: #1402359 / Tuna Can_2018_00001

Isotope	Certified Activity - Bq	Geometry Activity - Bq	Count Results	%recovery
Pb-210	72410	15986	16000	100.1
Am-241	5770	1274	1261	99.0
Cd-109	79700	17596	18250	103.7
Co-57	1809	399	393.1	98.4
Ce-139	2723	601	585.9	97.5
Hg-203	5868	1296	1312	101.3
Sn-113	4658	1028	1059	103.0
Cs-137	2283	504	509.8	101.1
Y-88	7810	1724	1705	98.9
Co-60	3574	789	776.5	98.4
Co-60	3574	789	765.4	97.0
Y-88	7810	1724	1769	102.5

Reviewed By: Jody Watson

Date: 4/23/2018

Initial Calibration Verifications

tunacan

GV 5, 8, 9, 12

2nd Source Verification

Detector: Ge5 ✓

Geometry: Tunacan ✓

Reference date 1/1/2010

Source: 81427-334

Standard volume g / vial 1550

Standard volume transferred in g / geometry 318.5

lab ID# of cal standard 6665

Isotope	Certified Activity gammas/sec	Geometry Activity	γ abundance	Bq/sample	Count Results	%recovery
Am-241	2034	418	0.359	1164	1160.9 ✓	99.7
Cs-137	1926	396	0.851	465	442.36	95.1 ✓
Co-60	3611	742	0.99974	742	700.21 ✓	94.3 ✓
Co-60	3612	742	0.999856	742	701.86	94.6 ✓

Reviewed By: Jody Watson

Date: 3/27/2012

2nd Source Verification

Detector: Ge8

Geometry: Tunacan

Reference date 1/1/2010

Source: 81427-334

Standard volume g / vial 1550

Standard volume transferred in g / geometry 318.5

lab ID# of cal standard 6665

Isotope	Certified Activity gammas/sec	Geometry Activity	γ abundance	Bq/sample	Count Results	%recovery
Am-241	2034	418	0.359	1164	1175.4	101.0
Cs-137	1926	396	0.851	465	446.61	96.0
Co-60	3611	742	0.99974	742	697.22	93.9
Co-60	3612	742	0.999856	742	691.92	93.2

Reviewed By: Jody Watson

Date: 3/29/2012

2nd Source Verification

Detector:	Ge9
Geometry:	Tunacan
Reference date	1/1/2010
Source:	81427-334
Standard volume g / vial	1550
Standard volume transferred in g / geometry	318.5
lab ID# of cal standard	6665

Isotope	Certified Activity gammas/sec	Geometry Activity	γ abundance	Bq/sample	Count Results	%recovery
Am-241	2034	418	0.359	1164	1169.4	100.4
Cs-137	1926	396	0.851	465	444.52	95.6
Co-60	3611	742	0.99974	742	687.72	92.7
Co-60	3612	742	0.999856	742	692.56	93.3

Reviewed By: Jody Watson

Date: 6/14/2012

2nd Source Verification

Detector: Ge12
Geometry: Tunacan
Reference date: 10/1/2006
Calibration Standard: 74139-334
Standard volume g / vial: 1550
Standard volume transferred in g / geometry: 341.9
lab ID# of cal standard: 1282974

Isotope	Certified Activity gammas/sec	Geometry Activity	γ abundance	Bq/sample	Count Results	%recovery
Am-241	2034	449	0.359	1250	1288	103.1
Cs-137	1926	425	0.851	499	509.9	102.1
Co-60	3612	797	0.999856	797	833.8	104.6

Reviewed By: Jody Watson

Date: 4/24/2018

Monthly Backgrounds

December bkgs

turn can: GV 5,8,9,12

Test America
St. Louis
Background Check

Spectrum: 5_20191206006_BGLong
Description: Background Long PBC Count
Acquired: 12/6/2019 6:41:26 PM
Detector: Detector # 5
Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	1.45	1.30	1.35	1.48	1.55	1.60	PASS

Analyst: Shiloh Smith Reviewer: Shiloh Smith

(Page 1 of 8)

Test America
St. Louis
Background Check

Spectrum: 8_20191206007_BGLong
Description: Background Long PBC Count
Acquired: 12/6/2019 6:49:15 PM ✓
Detector: Detector # 8 ✓
Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	1.56	1.39	1.45	1.57	1.68	1.74	PASS ✓

Analyst: Shiloh Smith Reviewer: kody Saulters

(Page 1 of 7)

Revision

02/18/2020

Test America
St. Louis
Background Check

Spectrum: 9_20191206007_BGLong
Description: Background Long PBC Count
Acquired: 12/6/2019 6:43:28 PM
Detector: Detector # 9
Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	1.89	1.53	1.65	1.77	2.14	2.26	PASS

Analyst: Shiloh Smith Reviewer: Shiloh Smith

(Page 1 of 7)

Test America
St. Louis
Background Check

Spectrum: 12_20191206008_BGLong
Description: Background Long PBC Count
Acquired: 12/6/2019 6:42:59 PM
Detector: Detector #12
Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	2.00	1.89	1.93	1.94	2.07	2.10	PASS

Analyst: Shiloh Smith Reviewer: Shiloh Smith

(Page 1 of 5)

Run Logs

Gamma Spectroscopy Run Log

Detector: GV5

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
03/26/12 15:05		IC 160-12297/1		12297			JLW
03/27/12 10:12		ICV 160-12297/2		12297			JLW
12/06/19 18:41		ICB 160-453835/1		453835			JLW
12/27/19 05:15		CCV 160-455402/1		455402			
12/27/19 05:36		CCV 160-455402/2		455402			KLS
12/27/19 05:59		CCB 160-455402/3		455402			KLS
12/27/19 06:33	60	ZZZZZ		455402			
12/27/19 07:41	30	ZZZZZ		455402			
12/27/19 08:18	30	160-36593-1 DU	STSB32_0-0.5 DU	455402	453329	901.1	KLS
12/27/19 09:03	30	160-36593-6	STSB34_0.5-3	455402	453329	901.1	KLS
12/27/19 09:35	30	160-36593-9	STSB34-FD_3-6	455402	453329	901.1	KLS
12/27/19 10:14	30	160-36593-13	STSB33_3-6	455402	453329	901.1	KLS
12/27/19 10:51	30	ZZZZZ		455402			

Detector: GV8

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
03/27/12 10:58		IC 160-12311/1		12311			JLW
03/29/12 01:58		ICV 160-12311/2		12311			JLW
11/12/19 13:01		ICB 160-450430/1		450430			JLW
12/27/19 05:16		CCV 160-455403/1		455403			
12/27/19 05:37		CCV 160-455403/2		455403			KLS
12/27/19 05:56		CCB 160-455403/3		455403			KLS
12/27/19 06:30	30	ZZZZZ		455403			
12/27/19 07:09	30	ZZZZZ		455403			
12/27/19 07:44	30	160-36593-1	STSB32_0-0.5	455403	453329	901.1	KLS
12/27/19 08:19	30	160-36593-4	STSB32_6-15	455403	453329	901.1	KLS
12/27/19 08:58	30	160-36593-5	STSB34_0-0.5	455403	453329	901.1	KLS
12/27/19 09:34	30	160-36593-10	STSB33_0-0.5	455403	453329	901.1	KLS
12/27/19 10:15	30	160-36593-14	STSB33_6-15	455403	453329	901.1	KLS
12/27/19 10:54	30	160-36593-16	STSB35_0-0.5	455403	453329	901.1	KLS

Detector: GV9

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
05/03/12 13:37		IC 160-12326/1		12326			JLW
06/14/12 10:54		ICV 160-12326/2		12326			JLW
12/06/19 18:43		ICB 160-453837/1		453837			JLW
12/27/19 05:04		CCB 160-455404/1		455404			KLS
12/27/19 05:50		CCV 160-455404/2		455404			
12/27/19 06:10		CCV 160-455404/3		455404			KLS
12/27/19 06:31	30	ZZZZZ		455404			
12/27/19 07:06	30	ZZZZZ		455404			
12/27/19 07:39	30	MB 160-453329/1-A		455404	453329	901.1	KLS
12/27/19 08:16	30	160-36593-2	STSB32_0.5-3	455404	453329	901.1	KLS
12/27/19 08:53	30	ZZZZZ		455404			
12/27/19 09:30	30	160-36593-7	STSB34_3-6	455404	453329	901.1	KLS
12/27/19 10:11	30	160-36593-11	STSB33_0.5-3	455404	453329	901.1	KLS
12/27/19 10:53	30	160-36593-15	STSB35_0.5-3	455404	453329	901.1	KLS
12/27/19 11:37	30	160-36593-17	STSB35_3-6	455404	453329	901.1	KLS

Gamma Spectroscopy Run Log

Detector: GV12

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
04/18/18 13:54		IC 160-364854/1		364854			JLW
04/24/18 09:26		ICV 160-364854/2		364854			JLW
12/06/19 18:42		ICB 160-453836/1		453836			JLW
12/27/19 05:05		CCB 160-455401/1		455401			KLS
12/27/19 06:27		CCV 160-455401/2		455401			
12/27/19 06:48		CCV 160-455401/3		455401			KLS
12/27/19 07:07	30	ZZZZZ		455401			
12/27/19 07:38	30	LCS 160-453329/2-A		455401	453329	901.1	KLS
12/27/19 08:17	30	160-36593-3	STSB32_3-6	455401	453329	901.1	KLS
12/27/19 08:54	30	ZZZZZ		455401			
12/27/19 09:31	30	160-36593-8	STSB34_6-15	455401	453329	901.1	KLS
12/27/19 10:12	30	160-36593-12	STSB33-FD_0.5-3	455401	453329	901.1	KLS
12/27/19 10:50	30	ZZZZZ		455401			
12/27/19 11:37	30	160-36593-18	STSB35_6-15	455401	453329	901.1	KLS

REAGENT TRACEABILITY SUMMARY

Lab Name: Eurofins TestAmerica, St. Louis Job No.: 160-36593-1

SDG No.:

Reagent ID	Exp Date	Prep Date	Dilutant Used	Reagent Final Volume	Parent Reagent		Analyte	Concentration
					Reagent ID	Volume Added		
MPREP1-A_00004	11/26/20	CPI International, Lot 10094019-9			(Purchased Reagent)		Ag	40 mg/L
							Al	2000 mg/L
							As	200 mg/L
							B	40 mg/L
							Ba	200 mg/L
							Be	20 mg/L
							Bi	200 mg/L
							Ca	2000 mg/L
							Cd	200 mg/L
							Co	200 mg/L
							Cr	200 mg/L
							Cu	200 mg/L
							Fe	2000 mg/L
							K	2000 mg/L
							Li	20 mg/L
							Mg	2000 mg/L
							Mn	200 mg/L
							Na	2000 mg/L
							Ni	200 mg/L
							P	200 mg/L
							Pb	200 mg/L
							Se	100 mg/L
							Sm	200 mg/L
							Sr	200 mg/L
							Thorium	200 mg/L
							Tl	40 mg/L
							Uranium	200 mg/L
							V	200 mg/L
							Zn	200 mg/L
MPREP1-B_00004	11/26/20	CPI International, Lot 10094019-8			(Purchased Reagent)		Sulfur	2000 mg/L
MPREP2_00022	11/26/20	CPI International, Lot 10094019-7			(Purchased Reagent)		Mo	100 mg/L
							Sb	99.99 mg/L
							Si	1000 mg/L
							Sn	200 mg/L
							Ti	200 mg/L
							W	200 mg/L
							Zr	200 mg/L
MS A CAL1 LLC_00421	01/22/20	12/26/19	2% HCL 2% HN03, Lot 1854886	500 mL	MS CAL 1 A_00006	0.5 mL	Thorium	2 ug/L
							Uranium	1 ug/L
.MS CAL 1 A_00006	09/18/20	CPI, Lot 10103046-1			(Purchased Reagent)		Thorium	2 ug/mL
							Uranium	1 ug/mL
MS A CAL2 CCV_00378	01/22/20	12/26/19	2% HCL 2% HN03, Lot 1854886	500 mL	MS CAL3 A_00011	0.5 mL	Thorium	100 ug/L
							Uranium	100 ug/L
.MS CAL3 A_00011	05/31/20	CPI, Lot 10097743-1			(Purchased Reagent)		Thorium	100 ug/mL

REAGENT TRACEABILITY SUMMARY

Lab Name: Eurofins TestAmerica, St. Louis Job No.: 160-36593-1

SDG No.:

Reagent ID	Exp Date	Prep Date	Dilutant Used	Reagent Final Volume	Parent Reagent		Analyte	Concentration
					Reagent ID	Volume Added		
							Uranium	100 ug/mL
MS A CAL3_00337	01/22/20	12/26/19	2% HCL 2% HN03, Lot 1854886	200 mL	MS CAL3 A_00011	0.4 mL	Thorium	200 ug/L
							Uranium	200 ug/L
.MS CAL3 A_00011	05/31/20	CPI, Lot 10097743-1			(Purchased Reagent)		Thorium	100 ug/mL
							Uranium	100 ug/mL
MS A ICSA_00329	01/01/20	12/26/19	2% HCL 2% HN03, Lot 1854886	100 mL	STD TI_00010	0.2 mL	Ti	2 mg/L
.STD TI_00010	08/19/20	CPI, Lot 987438-5			(Purchased Reagent)		Ti	1000 ug/mL
MS A ICSAB_00341	01/01/20	12/26/19	2% HCL 2% HN03, Lot 1854886	100 mL	MS CAL3 A_00012	0.05 mL	Thorium	50 ug/L
							Uranium	50 ug/L
.MS CAL3 A_00012	11/20/20	CPI, Lot 10097743-1			(Purchased Reagent)		Thorium	100 ug/mL
							Uranium	100 ug/mL
MS A ICV_01081	12/27/19	12/26/19	2% Nitric Acid, Lot 1854886	100 mL	MS ICV 2_00009	0.05 mL	Thorium	100 ug/L
							Uranium	100 ug/L
.MS ICV 2_00009	05/31/20	CPI, Lot 10097743-4			(Purchased Reagent)		Thorium	200 ug/mL
							Uranium	200 ug/mL
MS LDR 2_00188	01/24/20	12/24/19	2% HCL 2% HNO3, Lot 1854886	100 mL	MS CAL3 A_00011	2 mL	Thorium	2 ug/mL
							Uranium	2 ug/mL
.MS CAL3 A_00011	05/31/20	CPI, Lot 10097743-1			(Purchased Reagent)		Thorium	100 ug/mL
							Uranium	100 ug/mL
PR_LCSSRM U_00001	03/31/20	ERA, Lot D099-540			(Purchased Reagent)		Ag	43.3 mg/Kg
							Al	8360 mg/Kg
							As	161 mg/Kg
							B	81.6 mg/Kg
							Ba	260 mg/Kg
							Be	97.6 mg/Kg
							Ca	4760 mg/Kg
							Cd	211 mg/Kg
							Co	48.2 mg/Kg
							Cr	136 mg/Kg
							Cu	166 mg/Kg
							Fe	14100 mg/Kg
							Hg	11.5 mg/Kg
							K	2020 mg/Kg
							Mg	2340 mg/Kg
							Mn	228 mg/Kg
							Mo	110 mg/Kg
							Na	218 mg/Kg
							Ni	91.9 mg/Kg
							Pb	111 mg/Kg
							Sb	75.5 mg/Kg
							Se	191 mg/Kg

REAGENT TRACEABILITY SUMMARY

Lab Name: Eurofins TestAmerica, St. Louis Job No.: 160-36593-1

SDG No.:

Reagent ID	Exp Date	Prep Date	Dilutant Used	Reagent Final Volume	Parent Reagent		Analyte	Concentration
					Reagent ID	Volume Added		
							Sn	99.9 mg/Kg
							Sr	107 mg/Kg
							Ti	376 mg/Kg
							Tl	156 mg/Kg
							Uranium	98.1 mg/Kg
							V	56.7 mg/Kg
							Zn	199 mg/Kg
Source A_00001	04/01/59	02/23/11	water, Lot 79670-334	0.9986 Source	Gamma Ampuole_00001	0.9986 g	Americium-241	9.4429 Bq
							Cd-109	132.909 Bq
							Ce-139	4.4538 Bq
							Cesium-137	3.7296 Bq
							Co-57	2.9513 Bq
							Cobalt-60	6.2002 Bq
							Hg-203	9.6996 Bq
							Sn-113	7.6266 Bq
							Y-88	12.712 Bq
.Gamma Ampuole_00001	04/07/59		Analytics, Lot 79670-334		(Purchased Reagent)		Americium-241	9442.9 Bq
							Cd-109	132909 Bq
							Ce-139	4453.8 Bq
							Cesium-137	3729.6 Bq
							Co-57	2951.3 Bq
							Cobalt-60	6200.2 Bq
							Hg-203	9699.6 Bq
							Sn-113	7626.6 Bq
							Y-88	12712 Bq
Source D_00001	04/01/59	02/23/11	water, Lot 79670-334	0.9781 g	Gamma Ampuole_00001	0.9781 g	Americium-241	9442.9 Bq
							Cd-109	132909 Bq
							Ce-139	4453.8 Bq
							Cesium-137	3729.6 Bq
							Co-57	2951.3 Bq
							Cobalt-60	6200.2 Bq
							Hg-203	9699.6 Bq
							Sn-113	7626.6 Bq
							Y-88	12712 Bq
.Gamma Ampuole_00001	04/07/59		Analytics, Lot 79670-334		(Purchased Reagent)		Americium-241	9442.9 Bq
							Cd-109	132909 Bq
							Ce-139	4453.8 Bq
							Cesium-137	3729.6 Bq
							Co-57	2951.3 Bq
							Cobalt-60	6200.2 Bq
							Hg-203	9699.6 Bq
							Sn-113	7626.6 Bq
							Y-88	12712 Bq
Source E_00001	04/01/59	02/23/11	water, Lot 79670-334	1.0205 g	Gamma Ampuole_00001	1.0205 g	Americium-241	9442.9 Bq
							Cd-109	132909 Bq
							Ce-139	4453.8 Bq

REAGENT TRACEABILITY SUMMARY

Lab Name: Eurofins TestAmerica, St. Louis Job No.: 160-36593-1

SDG No.:

Reagent ID	Exp Date	Prep Date	Dilutant Used	Reagent Final Volume	Parent Reagent		Analyte	Concentration
					Reagent ID	Volume Added		
							Cesium-137	3729.6 Bq
							Co-57	2951.3 Bq
							Cobalt-60	6200.2 Bq
							Hg-203	9699.6 Bq
							Sn-113	7626.6 Bq
							Y-88	12712 Bq
.Gamma Ampuole_00001	04/07/59		Analytics, Lot 79670-334		(Purchased Reagent)		Americium-241	9442.9 Bq
							Cd-109	132909 Bq
							Ce-139	4453.8 Bq
							Cesium-137	3729.6 Bq
							Co-57	2951.3 Bq
							Cobalt-60	6200.2 Bq
							Hg-203	9699.6 Bq
							Sn-113	7626.6 Bq
							Y-88	12712 Bq
Source H_00002	01/01/51	01/01/12	wataer, Lot 83725-334	10 mL	Gamma Ampuole_00003	2.1184 g	Americium-241	1924.27 Bq
							Cd-109	27950 Bq
							Ce-139	927.965 Bq
							Cesium-137	774.911 Bq
							Co-57	605.079 Bq
							Cobalt-60	1273.92 Bq
							Hg-203	2007.23 Bq
							Sn-113	1643.41 Bq
							Y-88	2681.34 Bq
.Gamma Ampuole_00003	01/19/61		Analytics, Lot 83725-334		(Purchased Reagent)		Americium-241	9083.6 Bq
							Cd-109	131939 Bq
							Ce-139	4380.5 Bq
							Cesium-137	3658 Bq
							Co-57	2856.3 Bq
							Cobalt-60	6013.6 Bq
							Hg-203	9475.2 Bq
							Sn-113	7757.8 Bq
							Y-88	12657.4 Bq
Tuna Can LCS_00009	09/13/20		Analytics, Lot 74139-334		(Purchased Reagent)		Americium-241	219 dpm/g
							Cesium-137	82.3 dpm/g
							Cobalt-60	136 dpm/g
Tuna Can_00003	02/09/17		Eckert & Ziegler, Lot 90099		(Purchased Reagent)		Americium-241	1164 Bq
							Cd-109	16373 Bq
							Ce-139	549 Bq
							Cesium-137	467 Bq
							Co-57	362 Bq
							Cobalt-60	735 Bq
							Hg-203	1171 Bq
							Pb-210	14936 Bq
							Sn-113	967 Bq
							Y-88	1590 Bq

REAGENT TRACEABILITY SUMMARY

Lab Name: Eurofins TestAmerica, St. Louis Job No.: 160-36593-1

SDG No.:

Reagent ID	Exp Date	Prep Date	Dilutant Used	Reagent Final Volume	Parent Reagent		Analyte	Concentration
					Reagent ID	Volume Added		
Tuna Can_00006	03/01/16	Eckert & Ziegler, Lot 83814-334			(Purchased Reagent)		Americium-241	1195 Bq
							Cd-109	16353 Bq
							Ce-139	543 Bq
							Cesium-137	453 Bq
							Co-57	354 Bq
							Cobalt-60	745 Bq
							Hg-203	1175 Bq
							Pb-210	14606 Bq
							Sn-113	961 Bq
							Y-88	1568 Bq

Reagent

Gamma Ampuole_00001

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404·352·8677
Fax 404·352·2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

79670-334

5 mL Liquid in Flame Sealed Vial

Customer: TestAmerica St. Louis
P.O. No.: 2303925, Item 1
Calibration Date: 01-Apr-2009 12:00 EST **Grams of Master Source:** 0.028371

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Analytics maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Nuclide	Gamma-Ray Energy (keV)	Half-Life, Days	Master Source* γps/gram	This Source γps	Uncertainty, % Type u_A	u_B	U	Calibration Method
Am-241	59.5	157860	———	3.390E+03	0.1	0.9	1.8	4π LS
Cd-109	88.0	462.60	1.691E+05	4.798E+03	0.4	1.7	3.5	HPGe
Co-57	122.1	271.79	8.904E+04	2.526E+03	0.5	1.3	2.8	HPGe
Ce-139	165.9	137.6	1.256E+05	3.563E+03	0.4	1.1	2.3	HPGe
Hg-203	279.2	46.61	2.788E+05	7.910E+03	0.3	1.1	2.3	HPGe
Sn-113	391.7	115.1	1.725E+05	4.894E+03	0.5	1.1	2.4	HPGe
Cs-137	661.7	10983	1.120E+05	3.178E+03	0.7	1.2	2.8	HPGe
Y-88	898.0	106.6	4.205E+05	1.193E+04	0.8	1.1	2.7	HPGe
Co-60	1173.2	1925.4	2.184E+05	6.196E+03	0.7	1.1	2.6	HPGe
Co-60	1332.5	1925.4	2.185E+05	6.199E+03	0.7	1.1	2.6	HPGe
Y-88	1836.1	106.6	4.444E+05	1.261E+04	0.7	1.1	2.6	HPGe

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

Calibration Methods: 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:
5.31740 grams 4M HCl solution with approximately 30 microg/g each of Cd, Co, Ce, Hg, Sn, Cs, and Y carriers.

This standard will expire one year after the calibration date.

Source Prepared by: W. Mao for
W. Mao, Radiochemist

QA Approved: D. M. Montgomery
D. M. Montgomery, QA Manager

Date: 5-13-09

End of Certificate

Corporate Office
24937 Avenue Tibbitts Valencia, California 91355

Laboratory
1380 Seaboard Industrial Blvd. Atlanta, Georgia, 30318

Reagent

Gamma Ampuole_00003

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

83725-334

5 mL Liquid in Flame Sealed Vial

Customer: Test America St. Louis/Earth City, MO
P.O. No.: 2397508, Item 1
Reference Date: 01-Jan-2011 12:00 PM EST **Grams of Master Source:** 0.028066

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Nuclide	Gamma-Ray Energy (keV)	Half-Life, Days	Master Source* γps/gram	This Source γps	Uncertainty, % Type u_A	u_B	U	Calibration Method
Am-241	59.5	1.580E+05	———	3.261E+03	0.1	0.9	1.8	4π LS
Cd-109	88.0	4.626E+02	1.697E+05	4.763E+03	0.8	1.7	3.8	HPGe
Co-57	122.1	2.718E+02	8.711E+04	2.445E+03	0.5	1.3	2.8	HPGe
Ce-139	165.9	1.376E+02	1.247E+05	3.500E+03	0.5	1.1	2.4	HPGe
Hg-203	279.2	4.661E+01	2.753E+05	7.727E+03	0.4	1.1	2.3	HPGe
Sn-113	391.7	1.151E+02	1.769E+05	4.965E+03	0.5	1.1	2.4	HPGe
Cs-137	661.7	1.098E+04	1.109E+05	3.113E+03	0.7	1.2	2.8	HPGe
Y-88	898.0	1.066E+02	4.224E+05	1.186E+04	0.5	1.1	2.4	HPGe
Co-60	1173.2	1.925E+03	2.142E+05	6.012E+03	0.6	1.1	2.5	HPGe
Co-60	1332.5	1.925E+03	2.143E+05	6.015E+03	0.6	1.1	2.5	HPGe
Y-88	1836.1	1.066E+02	4.472E+05	1.255E+04	0.5	1.1	2.4	HPGe

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

Calibration Methods: 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

(Certificate continued on reverse side)

ACCREDITED SOURCE CALIBRATION LABORATORY HEALTH PHYSICS SOCIETY FOUNDED 1956

Comments:
5.30203 grams 4M HCl solution with approximately 30 μg/g each of Cd, Co, Ce, Hg, Sn, Cs, and Y carriers.

This standard will expire one year after the reference date.

Source Prepared by: MITaskaeva
M. I. Taskaeva, Radiochemist

QA Approved: _____ Date: 13/JAN/11
J. D. McCorvey, QA Manager Alternate

Reagent

MPREP1-A_00004

CPI INTERNATIONAL

1642488
ID MPREP1-A 00004
Exp 11/26/20 Prpd AM Opn 11/26/19
Metals Prep 1 Spike A

CERTIFICATE OF ANALYSIS

Multi-Element Aqueous CRM

Product #: TA-CM-FEB19-STL1-A

Custom ISO G34 Metals Prep 1 Spike A

Lot #: 10094019-9

Matrix: 5% HNO_3

Element	Certified Concentration & Uncertainty	Element	Certified Concentration & Uncertainty	Element	Certified Concentration & Uncertainty
Ag	40.00 ± 0.40 µg/mL	Cr	200.0 ± 2.0 µg/mL	Pb	200.0 ± 2.0 µg/mL
Al	2000 ± 10 µg/mL	Cu	200.0 ± 2.0 µg/mL	Se	100.0 ± 1.0 µg/mL
As	200.0 ± 2.0 µg/mL	Fe	2000 ± 10 µg/mL	Sm	200.0 ± 2.0 µg/mL
B	40.00 ± 0.20 µg/mL	K	2000 ± 10 µg/mL	Sr	200.0 ± 2.0 µg/mL
Ba	200.0 ± 2.0 µg/mL	Li	20.00 ± 0.20 µg/mL	Th	200.0 ± 2.0 µg/mL
Be	20.00 ± 0.20 µg/mL	Mg	2000 ± 10 µg/mL	Tl	40.00 ± 0.40 µg/mL
Bi	200.0 ± 2.0 µg/mL	Mn	200.0 ± 2.0 µg/mL	U	200.0 ± 2.0 µg/mL
Ca	2000 ± 10 µg/mL	Na	2000 ± 10 µg/mL	V	200.0 ± 2.0 µg/mL
Cd	200.0 ± 2.0 µg/mL	Ni	200.0 ± 2.0 µg/mL	Zn	200.0 ± 2.0 µg/mL
Co	200.0 ± 2.0 µg/mL	P	200.0 ± 2.0 µg/mL		

Source Material Lot# Chart

Element	Source Material Lot#	Element	Source Material Lot#	Element	Source Material Lot#
Ag	975475	Cr	880115	Pb	168223
Al	992545	Cu	148793	Se	929078
As	166531	Fe	1004971	Sm	120677R
B	982524	K	983959	Sr	976606
Ba	150283R	Li	156949	Th	122067
Be	998969	Mg	738337	Tl	991734
Bi	753003	Mn	985851	U	AM17-111UX
Ca	150704	Na	994710	V	983037
Cd	173171	Ni	752769	Zn	979871
Co	979870	P	122196R		

Intended Use: This solution is intended for use as a certified reference material (CRM) or calibration standard for inductively coupled plasma optical emission spectroscopy (ICP-OES), inductively coupled plasma mass spectrometry (ICP-MS), flame or furnace atomic absorption spectroscopy (AA or GFAA), and other techniques for elemental analysis.

Certification & Traceability: This CRM was manufactured, processed, and certified under a quality management system that is registered/accredited to **ISO 9001**, **ISO 17034**, and **ISO/IEC 17025**. This CRM was prepared to the certified concentrations shown above by gravimetric methods, using single-element concentrates that were certified using the "High Performance ICP-OES" protocol developed by NIST and are directly traceable to **NIST SRMs (see reverse side)**. The solution was stabilized using high purity nitric acid (HNO_3) and diluted with filtered (0.22 µm), 18 M-ohm deionized water. The balances used in the preparation of this CRM are calibrated regularly with traceability to NIST, using a calibration provider that is accredited to ISO/IEC 17025 by a mutually recognized accreditation body. All volumetric dilutions are performed in Class A calibrated glassware. The certified concentrations were determined based upon gravimetric procedures. Secondary verification of the certified concentrations was performed using ICP-OES that was calibrated and/or referenced against **NIST SRMs (see reverse side)**. The uncertainty associated with each certified concentration represents the expanded uncertainty at the 95% confidence level using a coverage factor of k=2.

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The Netherlands

12/31/2019

Instructions for Use: We recommend that the solution be thoroughly mixed by repeated shaking or swirling of the bottle immediately prior to use. To achieve the highest accuracy, the analyst should: (1) use only pre-cleaned containers and transferware, (2) not pipette directly from the CRM's original container, (3) never pour used product back into the original container, (4) make dilutions using calibrated balances or certified class A volumetric flasks and pipettes, (5) use a minimum sub-sample size of 500 µL, and (6) dilute with the same matrix as the original CRM or other chemically suitable matrix. The solution should be kept tightly capped and stored under normal laboratory conditions. Do not freeze, heat, or immerse the bottle or its contents, and avoid exposure to direct sunlight or moisture.

Period of Validity: CPI International ensures the accuracy of this solution for **18 months** from the certification date shown below, provided the instructions for use are followed. During the period of validity, the purchaser will be notified if this product is recalled due to any significant changes in the stability of the solution.

Chuck Goudreau

Chuck Goudreau, Certifying Officer

November 8, 2019

Certification Date

CPI International waives all responsibility for any damages resulting from the usage and/or implementation of the products/data described herein.

Health and Safety Information: Refer to the Safety Data Sheet (SDS).

Homogeneity: This solution was determined to be homogeneous by procedures consistent with the requirements of ISO Guide 34 and ISO Guide 35. Replicate samples of the finished solution were analyzed to confirm its homogeneity, in accordance with QSP 6-13 Assessment of Homogeneity and Stability. To ensure homogeneity, users should not take a smaller sub-sample than specified in the Instructions for Use, as doing so will invalidate the certified values and uncertainties.

Quality Manual Rev: No. 5, 03/01/2013

Further Information: Please contact CPI International for further information about this CRM.

Quality Certifications: This CRM was prepared under a quality management system that is registered/accredited to the following:

- ISO 9001 – Quality Management Systems – Requirements (TUV NORD Cert. No. 44 100 16560231)
- ISO/IEC 17025 – General Requirements for the Competence of Testing and Calibration Laboratories (A2LA Cert. No. 2848.01)
- ISO Guide 34 – General Requirements for the Competence of Reference Material Producers (A2LA Cert. No. 2848.02)
    - ISO Guide 34 references additional requirements specified in ISO Guide 31 and ISO Guide 35.

This CRM is traceable to the following NIST SRMs:

Analyte	Aq. SRM	MO SRM		Analyte	Aq. SRM	MO SRM		Analyte	Aq. SRM	MO SRM
Ag	3151	1077a		Hf	3122	—		S	3154	2770
Al	3101a	1075a		Hg	3133	3133		Sb	3102a	3102a
As	3103a	3103a		Ho	3123a	—		Sc	3148a	3148a
Au	3121	—		In	3124a	3124a		Se	3149	3149
B	3107	3107		K	3141a	3141a		Si	3150	1066a
Ba	3104a	1051b		La	3127a	3127a		Sm	3147a	—
Be	3105a	3105a		Li	3129a	3129a		Sn	3161a	1057b
Bi	3106	3106		Lu	3130a	—		SO_4^{-2}	3181	—
Br^-	3184	—		Mg	3131a	3131a		Sr	3153a	3153a
Ca	3109a	3109a		Mn	3132	3132		Ta	3155	—
Cd	3108	1053a		Mo	3134	3134		Tb	3157a	—
Ce	3110	3110		Na	3152a	3152a		Te	3156	—
Cl^-	3182	1818a		Nb	3137	—		Th	3159	—
Co	3113	3113		Nd	3135a	—		Ti	3162a	3162a
Cr	3112a	1078b		Ni	3136	1065b		Tl	3158	3158
Cs	3111a	—		NO_3^-	3185	—		Tm	3160a	—
Cu	3114	1080a		P	3139a	3139a		U	3164	—
Dy	3115a	—		Pb	3128	3128		V	3165	1052b
Er	3116a	—		Pd	3138	—		W	3163	3163
Eu	3117a	—		PO_4^{-3}	3186	—		Y	3167a	3167a
F^-	3183	—		Pr	3142a	—		Yb	3166a	—
Fe	3126a	1079b		Pt	3140	3140		Zn	3168a	3168a
Ga	3119a	—		Rb	3145a	—		Zr	3169	3169
Gd	3118a	—		Re	3143	—				
Ge	3120a	—		Rh	3144	3144				

Reagent

MPREP1-B_00004

1842490
ID: MPREP1 B_00004
Exp 11/26/20 Prpd LAM Opn 11/26/19
Metals Prep 1 Spike B

CERTIFICATE OF ANALYSIS

Single-Element Aqueous CRM

Product #: TA-CM-FEB19-STL1-B

Custom ISO G34 Metals Prep 1 Spike Std. Solution B

Product Lot #: 10094019-8

Matrix: H_2O

Source Material Lot #: 983063

Element	Certified Concentration & Uncertainty
S	**2000 ± 10 µg/mL**

Intended Use: This solution is intended for use as a certified reference material (CRM) or calibration standard for inductively coupled plasma optical emission spectroscopy (ICP-OES), inductively coupled plasma mass spectrometry (ICP-MS), flame or furnace atomic absorption spectroscopy (AA or GFAA), and other techniques for elemental analysis.

Certification & Traceability: This CRM was manufactured, processed, and certified under a quality management system that is registered/accredited to **ISO 9001**, **ISO 17034**, and **ISO/IEC 17025**. This CRM was prepared to a nominal concentration of 2000 µg/mL by gravimetric methods using a single-element concentrate dissolved in high purity nitric acid (HNO_3) and diluted with filtered (0.22 µm), 18 M-ohm deionized water. The balances used in the preparation of this CRM are calibrated regularly with traceability to NIST, using a calibration provider that is accredited to ISO/IEC 17025 by a mutually recognized accreditation body. All volumetric dilutions are performed in Class A calibrated glassware. The certified concentration and uncertainty were determined using the "High Performance ICP-OES" protocol developed by NIST, and both the certified concentration and uncertainty values are traceable to **NIST SRM 3154**. The uncertainty associated with the certified concentration represents the expanded uncertainty at the 95% confidence level using a coverage factor of k=2.

Instructions for Use: We recommend that the solution be thoroughly mixed by repeated shaking or swirling of the bottle immediately prior to use. To achieve the highest accuracy, the analyst should: (1) use only pre-cleaned containers and transferware, (2) not pipette directly from the CRM's original container, (3) never pour used product back into the original container, (4) make dilutions using calibrated balances or certified class A volumetric flasks and pipettes, (5) use a minimum sub-sample size of 500 µL, and (6) dilute with the same matrix as the original CRM or other chemically suitable matrix. The solution should be kept tightly capped and stored under normal laboratory conditions. Do not freeze, heat, or immerse the bottle or its contents, and avoid exposure to direct sunlight or moisture.

Period of Validity: CPI International ensures the accuracy of this solution for **18 months** from the certification date shown below, provided the instructions for use are followed. During the period of validity, the purchaser will be notified if this product is recalled due to any significant changes in the stability of the solution.

Chuck Goudreau

Chuck Goudreau, Certifying Officer

November 8, 2019
Certification Date

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The Netherlands

Health and Safety Information: Refer to the Safety Data Sheet (SDS)

Homogeneity: This solution was determined to be homogeneous by procedures consistent with the requirements of ISO Guide 34 and ISO Guide 35. Replicate samples of the finished solution were analyzed to confirm its homogeneity, in accordance with QSP 6-13 Assessment of Homogeneity and Stability. To ensure homogeneity, users should not take a smaller sub-sample than specified in the Instructions for Use, as doing so will invalidate the certified values and uncertainties.

Quality Manual Rev: No. 5, 03/01/2013

Further Information: Please contact CPI International for further information about this CRM.

Quality Certifications: This CRM was prepared under a quality management system that is registered/accredited to the following:

- ISO 9001 – Quality Management Systems – Requirements (TUV NORD Cert. No. 44 100 16560231)
- ISO/IEC 17025 – General Requirements for the Competence of Testing and Calibration Laboratories (A2LA Cert No. 2848.01)
- ISO Guide 34 – General Requirements for the Competence of Reference Material Producers (A2LA Cert. No. 2848.02)
    - ISO Guide 34 references additional requirements specified in ISO Guide 31 and ISO Guide 35.

Reagent

MPREP2_00022

1842492
ID MPREP2_00022
Exp 11/26/20 Prpd LAM Opn 11/26/19
Metals Prep 2 Spike

CERTIFICATE OF ANALYSIS

Multi-Element Aqueous CRM

Product #: TA-CM-FEB19-STL2-500

Custom ISO G34 Metals Prep 2 Spike Standard

Lot #: 10094019-7

Matrix: 5% HNO_3/tr. HF

Element	Certified Concentration & Uncertainty	Element	Certified Concentration & Uncertainty	Element	Certified Concentration & Uncertainty
Mo	100.0 ± 1.0 µg/mL	Sn	200.0 ± 2.0 µg/mL	Zr	200.0 ± 2.0 µg/mL
Sb	99.99 ± 0.50 µg/mL	Ti	200.0 ± 2.0 µg/mL		
Si	1000 ± 10 µg/mL	W	200.0 ± 2.0 µg/mL		

Source Material Lot# Chart

Element	Source Material Lot#	Element	Source Material Lot#	Element	Source Material Lot#
Mo	175215	Sn	171360	Zr	172925
Sb	978317	Ti	161694		
Si	977647	W	997482		

Intended Use: This solution is intended for use as a certified reference material (CRM) or calibration standard for inductively coupled plasma optical emission spectroscopy (ICP-OES), inductively coupled plasma mass spectrometry (ICP-MS), flame or furnace atomic absorption spectroscopy (AA or GFAA), and other techniques for elemental analysis.

Certification & Traceability: This CRM was manufactured, processed, and certified under a quality management system that is registered/accredited to **ISO 9001**, **ISO 17034**, and **ISO/IEC 17025**. This CRM was prepared to the certified concentrations shown above by gravimetric methods, using single-element concentrates that were certified using the "High Performance ICP-OES" protocol developed by NIST and are directly traceable to **NIST SRMs (see reverse side)**. The solution was stabilized using high purity nitric acid (HNO_3), trace hydrofluoric acid (HF) and diluted with filtered (0.22 µm), 18 M-ohm deionized water. The balances used in the preparation of this CRM are calibrated regularly with traceability to NIST, using a calibration provider that is accredited to ISO/IEC 17025 by a mutually recognized accreditation body. All volumetric dilutions are performed in Class A calibrated glassware. The certified concentrations were determined based upon gravimetric procedures. Secondary verification of the certified concentrations was performed using ICP-OES that was calibrated and/or referenced against **NIST SRMs (see reverse side)**. The uncertainty associated with each certified concentration represents the expanded uncertainty at the 95% confidence level using a coverage factor of k=2.

Instructions for Use: We recommend that the solution be thoroughly mixed by repeated shaking or swirling of the bottle immediately prior to use. To achieve the highest accuracy, the analyst should: (1) use only pre-cleaned containers and transferware, (2) not pipette directly from the CRM's original container, (3) never pour used product back into the original container, (4) make dilutions using calibrated balances or certified class A volumetric flasks and pipettes, (5) use a minimum sub-sample size of 500 µL, and (6) dilute with the same matrix as the original CRM or other chemically suitable matrix. The solution should be kept tightly capped and stored under normal laboratory conditions. Do not freeze, heat, or immerse the bottle or its contents, and avoid exposure to direct sunlight or moisture.

Period of Validity: CPI International ensures the accuracy of this solution for **18 months** from the certification date shown below, provided the instructions for use are followed. During the period of validity, the purchaser will be notified if this product is recalled due to any significant changes in the stability of the solution.

Chuck Goudreau, Certifying Officer

November 8, 2019
Certification Date

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The Netherlands

www.cpiinternational.com

Health and Safety Information: Refer to the Safety Data Sheet (SDS).

Homogeneity: This solution was determined to be homogeneous by procedures consistent with the requirements of ISO Guide 34 and ISO Guide 35. Replicate samples of the finished solution were analyzed to confirm its homogeneity, in accordance with QSP 6-13 Assessment of Homogeneity and Stability. To ensure homogeneity, users should not take a smaller sub-sample than specified in the Instructions for Use, as doing so will invalidate the certified values and uncertainties.

Quality Manual Rev: No. 5, 03/01/2013

Further Information: Please contact CPI International for further information about this CRM.

Quality Certifications: This CRM was prepared under a quality management system that is registered/accredited to the following:

- ISO 9001 – Quality Management Systems – Requirements (TUV NORD Cert. No. 44 100 16560231)
- ISO/IEC 17025 – General Requirements for the Competence of Testing and Calibration Laboratories (A2LA Cert. No. 2848.01)
- ISO Guide 34 – General Requirements for the Competence of Reference Material Producers (A2LA Cert. No. 2848.02)
    - ISO Guide 34 references additional requirements specified in ISO Guide 31 and ISO Guide 35.

This CRM is traceable to the following NIST SRMs:

Analyte	Aq. SRM	MO SRM		Analyte	Aq. SRM	MO SRM		Analyte	Aq. SRM	MO SRM
Ag	3151	1077a		Hf	3122	—		S	3154	2770
Al	3101a	1075a		Hg	3133	3133		Sb	3102a	3102a
As	3103a	3103a		Ho	3123a	—		Sc	3148a	3148a
Au	3121	—		In	3124a	3124a		Se	3149	3149
B	3107	3107		K	3141a	3141a		Si	3150	1066a
Ba	3104a	1051b		La	3127a	3127a		Sm	3147a	—
Be	3105a	3105a		Li	3129a	3129a		Sn	3161a	1057b
Bi	3106	3106		Lu	3130a	—		SO_4^{2-}	3181	—
Br^-	3184	—		Mg	3131a	3131a		Sr	3153a	3153a
Ca	3109a	3109a		Mn	3132	3132		Ta	3155	—
Cd	3108	1053a		Mo	3134	3134		Tb	3157a	—
Ce	3110	3110		Na	3152a	3152a		Te	3156	—
Cl^-	3182	1818a		Nb	3137	—		Th	3159	—
Co	3113	3113		Nd	3135a	—		Ti	3162a	3162a
Cr	3112a	1078b		Ni	3136	1065b		Tl	3158	3158
Cs	3111a	—		NO_3^-	3185	—		Tm	3160a	—
Cu	3114	1080a		P	3139a	3139a		U	3164	—
Dy	3115a	—		Pb	3128	3128		V	3165	1052b
Er	3116a	—		Pd	3138	—		W	3163	3163
Eu	3117a	—		PO_4^{3-}	3186	—		Y	3167a	3167a
F^-	3183	—		Pr	3142a	—		Yb	3166a	—
Fe	3126a	1079b		Pt	3140	3140		Zn	3168a	3168a
Ga	3119a	—		Rb	3145a	—		Zr	3169	3169
Gd	3118a	—		Re	3143	—				
Ge	3120a	—		Rh	3144	3144				

Reagent

MS CAL 1 A_00006

1799532
ID MS CAL 1 A 00006
Exp 09/18/20 Prpd cb Opn 09/18/19
MS CAL 1 A

CPI INTERNATIONAL

CERTIFICATE OF ANALYSIS

Multi-Element Aqueous CRM

Product #: TA-CM-AUG19-STL4

Custom Standard

Lot #: 10103046-1

Matrix: 5% HNO_3

Element	Certified Concentration	Element	Certified Concentration	Element	Certified Concentration
Ag	2.0 µg/mL	Cr	10.0 µg/mL	Sm	10.0 µg/mL
As	10.0 µg/mL	Cu	3.0 µg/mL	Sr	5.0 µg/mL
B	100 µg/mL	Li	5.0 µg/mL	Th	2.0 µg/mL
Ba	2.0 µg/mL	Mn	4.0 µg/mL	Tl	2.0 µg/mL
Be	0.5 µg/mL	Ni	5.0 µg/mL	U	1.0 µg/mL
Cd	0.5 µg/mL	Pb	3.0 µg/mL	V	10.0 µg/mL
Co	2.0 µg/mL	Se	5.0 µg/mL	Zn	20.0 µg/mL

Source Material Lot # Chart

Element	Source Material Lot#	Element	Source Material Lot#	Element	Source Material Lot#
Ag	975475	Cr	975466	Sm	148251
As	175385	Cu	982446	Sr	998106
B	982186	Li	751942	Th	987024
Ba	994634	Mn	997487	Tl	991734
Be	998969	Ni	984273	U	992180
Cd	996631	Pb	981329	V	990117
Co	979906	Se	982461	Zn	984272

Intended Use: This solution is intended for use as a reference material (RM) or calibration standard for inductively coupled plasma optical emission spectroscopy (ICP-OES), inductively coupled plasma mass spectrometry (ICP-MS), flame or furnace atomic absorption spectroscopy (AA or GFAA), and other techniques for elemental analysis.

Certification & Traceability: This RM was manufactured, processed, and/or certified under a quality management system that is registered/accredited to **ISO 9001**, **ISO 17034**, and **ISO/IEC 17025**. This RM was prepared to the certified concentrations shown above by gravimetric methods using single-element concentrates, and was stabilized using high purity nitric acid (HNO_3), and diluted with filtered (0.22 µm), 18 M-ohm deionized water. The balances used in the preparation of this RM are calibrated regularly with traceability to NIST, using a calibration provider that is accredited to ISO/IEC 17025 by a mutually recognized accreditation body. All volumetric dilutions are performed in Class A calibrated glassware. The certified concentrations were determined based upon gravimetric procedures. Secondary verification of the certified concentrations was performed using ICP-OES that was calibrated and/or referenced against **NIST SRMs (see reverse side)**. The uncertainty associated with the certified concentration is ±0.5% relative, which is the sum of the estimated errors due to the purity of the raw materials, the gravimetric preparation of the solution, and transpiration through the container. This represents the expanded uncertainty at the 95% confidence level using a coverage factor of k=2.

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1013BG Amsterdam F: +31 20 420 28 36
The Netherlands

12/31/2019

Instructions for Use: We recommend that the solution be thoroughly mixed by repeated shaking or swirling of the bottle immediately prior to use. To achieve the highest accuracy, the analyst should: (1) use only pre-cleaned containers and transferware, (2) not pipette directly from the RM's original container, (3) never pour used product back into the original container, (4) make dilutions using calibrated balances or certified class A volumetric flasks and pipettes, (5) use a minimum sub-sample size of 500 µL, and (6) dilute with the same matrix as the original RM or other chemically suitable matrix. The solution should be kept tightly capped and stored under normal laboratory conditions. Do not freeze, heat, or immerse the bottle or its contents, and avoid exposure to direct sunlight or moisture.

Period of Validity: CPI International ensures the accuracy of this solution for **18 months** from the certification date shown below, provided the instructions for use are followed. During the period of validity, the purchaser will be notified if this product is recalled due to any significant changes in the stability of the solution.

Chuck Goudreau

Chuck Goudreau, Certifying Officer

September 12, 2019

Certification Date

CPI International waives all responsibility for any damages resulting from the usage and/or implementation of the products/data described herein.

This RM is traceable to the following NIST SRMs:

Analyte	Aq. SRM	MO SRM		Analyte	Aq. SRM	MO SRM		Analyte	Aq. SRM	MO SRM
Ag	3151	1077a		[illegible]	[illegible]	—		S	3154	2770
Al	3101a	1075a		[illegible]	[illegible]	[illegible]		Sb	3102a	3102a
As	3103a	3103a		[illegible]	[illegible]	—		Sc	3148a	3148a
Au	3121	—		[illegible]	[illegible]	[illegible]124a		Se	3149	3149
B	3107	3107		[illegible]	[illegible]	[illegible]		Si	3150	1066a
Ba	3104a	1051b		[illegible]	[illegible]	[illegible]		Sm	3147a	—
Be	3105a	3105a		[illegible]	[illegible]	[illegible]129a		Sn	3161a	1057b
Bi	3106	3106		[illegible]	[illegible]	—		SO_4^{2-}	3181	—
Br	3184	—		[illegible]	[illegible]	[illegible]		Sr	3153a	3153a
Ca	3109a	3109a		[illegible]	[illegible]	[illegible]		Ta	3155	—
Cd	3108	1053a		[illegible]	[illegible]	[illegible]		Tb	3157a	—
Ce	3110	3110		[illegible]	[illegible]	[illegible]152a		Te	3156	—
Cl	3182	1818a		[illegible]	[illegible]			Th	3159	—
Co	3113	3113		[illegible]	[illegible]	—		Ti	3162a	3162a
Cr	3112a	1078b		[illegible]	[illegible]	[illegible]065b		Tl	3158	3158
Cs	3111a	—		[illegible]	[illegible]	—		Tm	3160a	—
Cu	3114	1080a		[illegible]	[illegible]	[illegible]139a		U	3164	—
Dy	3115a	—		[illegible]	[illegible]	[illegible]128		V	3165	1052b
Er	3116a	—		[illegible]	[illegible]	[illegible]		W	3163	3163
Eu	3117a	—		[illegible]	[illegible]	—		Y	3167a	3167a
F	3183	—		[illegible]	[illegible]	—		Yb	3166a	—
Fe	3126a	1079b		[illegible]	[illegible]	[illegible]		Zn	3168a	3168a
Ga	3119a	—		[illegible]	[illegible]	—		Zr	3169	3169
Gd	3118a	—		[illegible]	[illegible]	—				
Ge	3120a	—		[illegible]	[illegible]	[illegible]144				

Reagent

MS CAL3 A_00011

1738191
D MS CAL3 A_00011
Exp 05/31/20 Prpd cb Opn 05/31/19
MS CAL 3 A

CPI INTERNATIONAL

CERTIFICATE OF ANALYSIS

Multi-Element Aqueous CRM

Product #: TA-CM-APR19-STL5

Mix Name: TA-CAL-3

Lot #: 10097743-1

Matrix: 2% HNO_3

Element	Certified Concentration & Uncertainty	Element	Certified Concentration & Uncertainty	Element	Certified Concentration & Uncertainty
Ag	20.02 ± 0.10 µg/mL	Cr	100.1 ± 0.5 µg/mL	Sm	100.1 ± 0.5 µg/mL
As	100.0 ± 0.5 µg/mL	Cu	100.0 ± 0.5 µg/mL	Sr	100.1 ± 0.5 µg/mL
B	200.0 ± 1.0 µg/mL	Li	100.1 ± 0.5 µg/mL	Th	100.1 ± 0.5 µg/mL
Ba	100.1 ± 0.5 µg/mL	Mn	100.1 ± 0.5 µg/mL	Tl	20.02 ± 0.10 µg/mL
Be	100.0 ± 0.5 µg/mL	Ni	100.0 ± 0.5 µg/mL	U	100.1 ± 0.5 µg/mL
Cd	100.0 ± 0.5 µg/mL	Pb	100.1 ± 0.5 µg/mL	V	100.0 ± 0.5 µg/mL
Co	100.0 ± 0.5 µg/mL	Se	50.01 ± 0.25 µg/mL	Zn	100.0 ± 0.5 µg/mL

Intended Use: This solution is intended for use as a certified reference material (CRM) or calibration standard for inductively coupled plasma optical emission spectroscopy (ICP-OES), inductively coupled plasma mass spectrometry (ICP-MS), flame or furnace atomic absorption spectroscopy (AA or GFAA), and other techniques for elemental analysis.

Certification & Traceability: This CRM was manufactured, processed, and certified under a quality management system that is registered/accredited to **ISO 9001**, **ISO 17034**, and **ISO/IEC 17025**. This CRM was prepared to the certified concentrations shown above by gravimetric methods, using single-element concentrates that were certified using the "High Performance ICP-OES" protocol developed by NIST and are directly traceable to **NIST SRMs (see reverse side)**. The solution was stabilized using high purity nitric acid (HNO_3) and diluted with filtered (0.22 µm), 18 M-ohm deionized water. The balances used in the preparation of this CRM are calibrated regularly with traceability to NIST, using a calibration provider that is accredited to ISO/IEC 17025 by a mutually recognized accreditation body. All volumetric dilutions are performed in Class A calibrated glassware. The certified concentrations were determined based upon gravimetric procedures. Secondary verification of the certified concentrations was performed using ICP-OES that was calibrated and/or referenced against **NIST SRMs (see reverse side)**. The uncertainty associated with each certified concentration represents the expanded uncertainty at the 95% confidence level using a coverage factor of k=2.

Instructions for Use: We recommend that the solution be thoroughly mixed by repeated shaking or swirling of the bottle immediately prior to use. To achieve the highest accuracy, the analyst should: (1) use only pre-cleaned containers and transferware, (2) not pipette directly from the CRM's original container, (3) never pour used product back into the original container, (4) make dilutions using calibrated balances or certified class A volumetric flasks and pipettes, (5) use a minimum sub-sample size of 500 µL, and (6) dilute with the same matrix as the original CRM or other chemically suitable matrix. The solution should be kept tightly capped and stored under normal laboratory conditions. Do not freeze, heat, or immerse the bottle or its contents, and avoid exposure to direct sunlight or moisture.

Period of Validity: CPI International ensures the accuracy of this solution for **18 months** from the certification date shown below, provided the instructions for use are followed. During the period of validity, the purchaser will be notified if this product is recalled due to any significant changes in the stability of the solution.

Chuck Goudreau

Chuck Goudreau, Certifying Officer

May 23, 2019
Certification Date

CPI International waives all responsibility for any damages resulting from the usage and/or implementation of the products/data described herein.

USA
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Nieuwe Hemweg 7P P: +31 20 638 05 97
1013BG Amsterdam F: +31 20 420 28 36
The Netherlands

www.cpiinternational.com

Health and Safety Information: Refer to the Safety Data Sheet (SDS).

Homogeneity: This solution was determined to be homogeneous by procedures consistent with the requirements of ISO Guide 34 and ISO Guide 35. Replicate samples of the finished solution were analyzed to confirm its homogeneity, in accordance with QSP 6-13 Assessment of Homogeneity and Stability. To ensure homogeneity, users should not take a smaller sub-sample than specified in the Instructions for Use, as doing so will invalidate the certified values and uncertainties.

Quality Manual Rev: No. 5, 03/01/2013

Further Information: Please contact CPI International for further information about this CRM.

Quality Certifications: This CRM was prepared under a quality management system that is registered/accredited to the following:

- ISO 9001 – Quality Management Systems – Requirements (TUV NORD Cert. No. 44 100 16560231)
- ISO/IEC 17025 – General Requirements for the Competence of Testing and Calibration Laboratories (A2LA Cert. No. 2848.01)
- ISO Guide 34 – General Requirements for the Competence of Reference Material Producers (A2LA Cert. No. 2848.02)
    - ISO Guide 34 references additional requirements specified in ISO Guide 31 and ISO Guide 35.

This CRM is traceable to the following NIST SRMs:

Analyte	Aq. SRM	MO SRM		Analyte	Aq. SRM	MO SRM		Analyte	Aq. SRM	MO SRM
Ag	3151	1077a		Hf	3122	—		S	3154	2770
Al	3101a	1075a		Hg	3133	3133		Sb	3102a	3102a
As	3103a	3103a		Ho	3123a	—		Sc	3148a	3148a
Au	3121	—		In	3124a	3124a		Se	3149	3149
B	3107	3107		K	3141a	3141a		Si	3150	1066a
Ba	3104a	1051b		La	3127a	3127a		Sm	3147a	—
Be	3105a	3105a		Li	3129a	3129a		Sn	3161a	1057b
Bi	3106	3106		Lu	3130a	—		SO_4^{-2}	3181	—
Br^-	3184	—		Mg	3131a	3131a		Sr	3153a	3153a
Ca	3109a	3109a		Mn	3132	3132		Ta	3155	—
Cd	3108	1053a		Mo	3134	3134		Tb	3157a	—
Ce	3110	3110		Na	3152a	3152a		Te	3156	—
Cl^-	3182	1818a		Nb	3137	—		Th	3159	—
Co	3113	3113		Nd	3135a	—		Ti	3162a	3162a
Cr	3112a	1078b		Ni	3136	1065b		Tl	3158	3158
Cs	3111a	—		NO_3	3185	—		Tm	3160a	—
Cu	3114	1080a		P	3139a	3139a		U	3164	—
Dy	3115a	—		Pb	3128	3128		V	3165	1052b
Er	3116a	—		Pd	3138	—		W	3163	3163
Eu	3117a	—		PO_4^{-3}	3186	—		Y	3167a	3167a
F^-	3183	—		Pr	3142a	—		Yb	3166a	—
Fe	3126a	1079b		Pt	3140	3140		Zn	3168a	3168a
Ga	3119a	—		Rb	3145a	—		Zr	3169	3169
Gd	3118a	—		Re	3143	—				
Ge	3120a	—		Rh	3144	3144				

Reagent

MS CAL3 A_00012

183/637
ID MS CAL 3 A 00012
Exp 11/20/20 Prpd LKP Opn 11/20/19
MS CAL 3 A

CERTIFICATE OF ANALYSIS

Multi-Element Aqueous CRM

Product #: TA-CM-APR19-STL5

Mix Name: TA-CAL-3

Lot #: 10097743-1

Matrix: 2% HNO_3

Element	Certified Concentration & Uncertainty	Element	Certified Concentration & Uncertainty	Element	Certified Concentration & Uncertainty
Ag	20.02 ± 0.10 µg/mL	Cr	100.1 ± 0.5 µg/mL	Sm	100.1 ± 0.5 µg/mL
As	100.0 ± 0.5 µg/mL	Cu	100.0 ± 0.5 µg/mL	Sr	100.1 ± 0.5 µg/mL
B	200.0 ± 1.0 µg/mL	Li	100.1 ± 0.5 µg/mL	Th	100.1 ± 0.5 µg/mL
Ba	100.1 ± 0.5 µg/mL	Mn	100.1 ± 0.5 µg/mL	Tl	20.02 ± 0.10 µg/mL
Be	100.0 ± 0.5 µg/mL	Ni	100.0 ± 0.5 µg/mL	U	100.1 ± 0.5 µg/mL
Cd	100.0 ± 0.5 µg/mL	Pb	100.1 ± 0.5 µg/mL	V	100.0 ± 0.5 µg/mL
Co	100.0 ± 0.5 µg/mL	Se	50.01 ± 0.25 µg/mL	Zn	100.0 ± 0.5 µg/mL

Intended Use: This solution is intended for use as a certified reference material (CRM) or calibration standard for inductively coupled plasma optical emission spectroscopy (ICP-OES), inductively coupled plasma mass spectrometry (ICP-MS), flame or furnace atomic absorption spectroscopy (AA or GFAA), and other techniques for elemental analysis.

Certification & Traceability: This CRM was manufactured, processed, and certified under a quality management system that is registered/accredited to **ISO 9001**, **ISO 17034**, and **ISO/IEC 17025**. This CRM was prepared to the certified concentrations shown above by gravimetric methods, using single-element concentrates that were certified using the "High Performance ICP-OES" protocol developed by NIST and are directly traceable to **NIST SRMs (see reverse side)**. The solution was stabilized using high purity nitric acid (HNO_3) and diluted with filtered (0.22 µm), 18 M-ohm deionized water. The balances used in the preparation of this CRM are calibrated regularly with traceability to NIST, using a calibration provider that is accredited to ISO/IEC 17025 by a mutually recognized accreditation body. All volumetric dilutions are performed in Class A calibrated glassware. The certified concentrations were determined based upon gravimetric procedures. Secondary verification of the certified concentrations was performed using ICP-OES that was calibrated and/or referenced against **NIST SRMs (see reverse side)**. The uncertainty associated with each certified concentration represents the expanded uncertainty at the 95% confidence level using a coverage factor of k=2.

Instructions for Use: We recommend that the solution be thoroughly mixed by repeated shaking or swirling of the bottle immediately prior to use. To achieve the highest accuracy, the analyst should: (1) use only pre-cleaned containers and transferware, (2) not pipette directly from the CRM's original container, (3) never pour used product back into the original container, (4) make dilutions using calibrated balances or certified class A volumetric flasks and pipettes, (5) use a minimum sub-sample size of 500 µL, and (6) dilute with the same matrix as the original CRM or other chemically suitable matrix. The solution should be kept tightly capped and stored under normal laboratory conditions. Do not freeze, heat, or immerse the bottle or its contents, and avoid exposure to direct sunlight or moisture.

Period of Validity: CPI International ensures the accuracy of this solution for **18 months** from the certification date shown below, provided the instructions for use are followed. During the period of validity, the purchaser will be notified if this product is recalled due to any significant changes in the stability of the solution.

Chuck Goudreau

Chuck Goudreau, Certifying Officer

November 12, 2019
Certification Date

CPI International waives all responsibility for any damages resulting from the usage and/or implementation of the products/data described herein.

Health and Safety Information: Refer to the Safety Data Sheet (SDS).

Homogeneity: This solution was determined to be homogeneous by procedures consistent with the requirements of ISO Guide 34 and ISO Guide 35. Replicate samples of the finished solution were analyzed to confirm its homogeneity, in accordance with QSP 6-13 Assessment of Homogeneity and Stability. To ensure homogeneity, users should not take a smaller sub-sample than specified in the Instructions for Use, as doing so will invalidate the certified values and uncertainties.

Quality Manual Rev: No. 5. 03/01/2013

Further Information: Please contact CPI International for further information about this CRM.

Quality Certifications: This CRM was prepared under a quality management system that is registered/accredited to the following:

- ISO 9001 – Quality Management Systems – Requirements (TUV NORD Cert. No. 44 100 16560231)
- ISO/IEC 17025 – General Requirements for the Competence of Testing and Calibration Laboratories (A2LA Cert. No. 2848.01)
- ISO Guide 34 – General Requirements for the Competence of Reference Material Producers (A2LA Cert. No. 2848.02)
    - ISO Guide 34 references additional requirements specified in ISO Guide 31 and ISO Guide 35.

This CRM is traceable to the following NIST SRMs:

Analyte	Aq. SRM	MO SRM	Analyte	Aq. SRM	MO SRM	Analyte	Aq. SRM	MO SRM
Ag	3151	1077a	Hf	3122	—	S	3154	2770
Al	3101a	1075a	Hg	3133	3133	Sb	3102a	3102a
As	3103a	3103a	Ho	3123a	—	Sc	3148a	3148a
Au	3121	—	In	3124a	3124a	Se	3149	3149
B	3107	3107	K	3141a	3141a	Si	3150	1066a
Ba	3104a	1051b	La	3127a	3127a	Sm	3147a	—
Be	3105a	3105a	Li	3129a	3129a	Sn	3161a	1057b
Bi	3106	3106	Lu	3130a	—	SO_4^{-2}	3181	—
Br	3184	—	Mg	3131a	3131a	Sr	3153a	3153a
Ca	3109a	3109a	Mn	3132	3132	Ta	3155	—
Cd	3108	1053a	Mo	3134	3134	Tb	3157a	—
Ce	3110	3110	Na	3152a	3152a	Te	3156	—
Cl	3182	1818a	Nb	3137	—	Th	3159	—
Co	3113	3113	Nd	3135a	—	Ti	3162a	3162a
Cr	3112a	1078b	Ni	3136	1065b	Tl	3158	3158
Cs	3111a	—	NO_3^-	3185	—	Tm	3160a	—
Cu	3114	1080a	P	3139a	3139a	U	3164	—
Dy	3115a	—	Pb	3128	3128	V	3165	1052b
Er	3116a	—	Pd	3138	—	W	3163	3163
Eu	3117a	—	PO_4^{-3}	3186	—	Y	3167a	3167a
F	3183	—	Pr	3142a	—	Yb	3166a	—
Fe	3126a	1079b	Pt	3140	3140	Zn	3168a	3168a
Ga	3119a	—	Rb	3145a	—	Zr	3169	3169
Gd	3118a	—	Re	3143	—			
Ge	3120a	—	Rh	3144	3144			

Reagent

MS ICV 2_00009

1 38 64
D MS ICV 2_00009
Exp 05/31/20 Prpd cb Opn 05/31/19
CV 2 - new

CPI INTERNATIONAL

CERTIFICATE OF ANALYSIS

Multi-Element Aqueous CRM

Product #: G34-TA-CM-APR19-STL8

Mix Name: G34 MC ICV 2

Lot #: 10097743-4

Matrix: 2% HNO_3

Element	Certified Concentration & Uncertainty	Element	Certified Concentration & Uncertainty	Element	Certified Concentration & Uncertainty
Ag	39.98 ± 0.20 µg/mL	Li	200.1 ± 1.0 µg/mL	Tl	40.17 ± 0.20 µg/mL
Ba	200.0 ± 1.0 µg/mL	Mn	200.4 ± 1.0 µg/mL	U	200.4 ± 1.0 µg/mL
Be	200.4 ± 1.0 µg/mL	Ni	200.1 ± 1.0 µg/mL	V	200.1 ± 1.0 µg/mL
Cd	200.3 ± 1.0 µg/mL	Pb	200.1 ± 1.0 µg/mL	Zn	200.1 ± 1.0 µg/mL
Co	200.1 ± 1.0 µg/mL	Sm	200.2 ± 1.0 µg/mL	Zr	200.5 ± 1.0 µg/mL
Cr	200.2 ± 1.0 µg/mL	Sr	200.5 ± 1.0 µg/mL		
Cu	200.2 ± 1.0 µg/mL	Th	200.0 ± 1.0 µg/mL		

Intended Use: This solution is intended for use as a second source certified reference material (CRM) or calibration standard for inductively coupled plasma optical emission spectroscopy (ICP-OES), inductively coupled plasma mass spectrometry (ICP-MS), flame or furnace atomic absorption spectroscopy (AA or GFAA), and other techniques for elemental analysis.

Certification & Traceability: This CRM was manufactured, processed, and certified under a quality management system that is registered/accredited to **ISO 9001**, **ISO 17034**, and **ISO/IEC 17025**. This CRM was prepared to the certified concentrations shown above by gravimetric methods, using single-element concentrates that were certified using the "High Performance ICP-OES" protocol developed by NIST and are directly traceable to **NIST SRMs (see reverse side)**. The solution was stabilized using high purity nitric acid (HNO_3) and diluted with filtered (0.22 µm), 18 M-ohm deionized water. The balances used in the preparation of this CRM are calibrated regularly with traceability to NIST, using a calibration provider that is accredited to ISO/IEC 17025 by a mutually recognized accreditation body. All volumetric dilutions are performed in Class A calibrated glassware. The certified concentrations were determined based upon gravimetric procedures. Secondary verification of the certified concentrations was performed using ICP-OES that was calibrated and/or referenced against **NIST SRMs (see reverse side)**. The uncertainty associated with each certified concentration represents the expanded uncertainty at the 95% confidence level using a coverage factor of k=2.

Instructions for Use: We recommend that the solution be thoroughly mixed by repeated shaking or swirling of the bottle immediately prior to use. To achieve the highest accuracy, the analyst should: (1) use only pre-cleaned containers and transferware, (2) not pipette directly from the CRM's original container, (3) never pour used product back into the original container, (4) make dilutions using calibrated balances or certified class A volumetric flasks and pipettes, (5) use a minimum sub-sample size of 500 µL, and (6) dilute with the same matrix as the original CRM or other chemically suitable matrix. The solution should be kept tightly capped and stored under normal laboratory conditions. Do not freeze, heat, or immerse the bottle or its contents, and avoid exposure to direct sunlight or moisture.

Period of Validity: CPI International ensures the accuracy of this solution for **18 months** from the certification date shown below, provided the instructions for use are followed. During the period of validity, the purchaser will be notified if this product is recalled due to any significant changes in the stability of the solution.

Chuck Goudreau

Chuck Goudreau, Certifying Officer

May 23, 2019
Certification Date

CPI International waives all responsibility for any damages resulting from the usage and/or implementation of the products/data described herein.

Health and Safety Information: Refer to the Safety Data Sheet (SDS).

Homogeneity: This solution was determined to be homogeneous by procedures consistent with the requirements of ISO Guide 34 and ISO Guide 35. Replicate samples of the finished solution were analyzed to confirm its homogeneity, in accordance with QSP 6-13 Assessment of Homogeneity and Stability. To ensure homogeneity, users should not take a smaller sub-sample than specified in the Instructions for Use, as doing so will invalidate the certified values and uncertainties.

Quality Manual Rev: No. 5, 03/01/2013

Further Information: Please contact CPI International for further information about this CRM.

Quality Certifications: This CRM was prepared under a quality management system that is registered/accredited to the following:

- ISO 9001 – Quality Management Systems – Requirements (TUV NORD Cert. No. 44 100 16560231)
- ISO/IEC 17025 – General Requirements for the Competence of Testing and Calibration Laboratories (A2LA Cert. No. 2848.01)
- ISO Guide 34 – General Requirements for the Competence of Reference Material Producers (A2LA Cert. No. 2848.02)
    - ISO Guide 34 references additional requirements specified in ISO Guide 31 and ISO Guide 35.

This CRM is traceable to the following NIST SRMs:

Analyte	Aq. SRM	MO SRM		Analyte	Aq. SRM	MO SRM		Analyte	Aq. SRM	MO SRM
Ag	3151	1077a		Hf	3122	—		S	3154	2770
Al	3101a	1075a		Hg	3133	3133		Sb	3102a	3102a
As	3103a	3103a		Ho	3123a	—		Sc	3148a	3148a
Au	3121	—		In	3124a	3124a		Se	3149	3149
B	3107	3107		K	3141a	3141a		Si	3150	1066a
Ba	3104a	1051b		La	3127a	3127a		Sm	3147a	—
Be	3105a	3105a		Li	3129a	3129a		Sn	3161a	1057b
Bi	3106	3106		Lu	3130a	—		SO_4^{-2}	3181	—
Br^-	3184	—		Mg	3131a	3131a		Sr	3153a	3153a
Ca	3109a	3109a		Mn	3132	3132		Ta	3155	—
Cd	3108	1053a		Mo	3134	3134		Tb	3157a	—
Ce	3110	3110		Na	3152a	3152a		Te	3156	—
Cl^-	3182	1818a		Nb	3137	—		Th	3159	—
Co	3113	3113		Nd	3135a	—		Ti	3162a	3162a
Cr	3112a	1078b		Ni	3136	1065b		Tl	3158	3158
Cs	3111a	—		NO_3	3185	—		Tm	3160a	—
Cu	3114	1080a		P	3139a	3139a		U	3164	—
Dy	3115a	—		Pb	3128	3128		V	3165	1052b
Er	3116a	—		Pd	3138	—		W	3163	3163
Eu	3117a	—		PO_4^{-3}	3186	—		Y	3167a	3167a
F^-	3183	—		Pr	3142a	—		Yb	3166a	—
Fe	3126a	1079b		Pt	3140	3140		Zn	3168a	3168a
Ga	3119a	—		Rb	3145a	—		Zr	3169	3169
Gd	3118a	—		Re	3143	—				
Ge	3120a	—		Rh	3144	3144				

Reagent

PR_LCSSRM U_00001

Reference Materials

▪ Certificate of Analysis ▪

Product:	Metals in Soil
Catalog Number:	540
Lot No.	D099-540
Certificate Issue Date:	September 25, 2017
Expiration Date:	May 31, 2020
Revision Number:	Original

1598412

ID: PR_LCSSRM_0021

File 03/20 Prep KP Den 365 pH Soil ERA

Product use instructions are included as part of the certification packet and are paginated separately from this Certificate of Analysis. Please reference the product use instructions for catalog #540 revision 030512.

CERTIFICATION

Parameter	Certified Value[1]	Reference Value	Uncertainty[2]	QC Performance Acceptance Limits[3]	PT Performance Acceptance Limits[4]
	mg/kg	mg/kg	%	mg/kg	mg/kg
Aluminum	10100	8360	6.40	4150 - 12600	4200 - 12500
Antimony	145	75.5	4.11	2.85 - 148	14.5 - 199
Arsenic	171	161	5.55	134 - 188	113 - 209
Barium	272	260	1.63	215 - 305	195 - 325
Beryllium	102	97.6	6.04	81.4 - 114	73.2 - 122
Boron	102	81.6	5.55	59.2 - 104	49.0 - 114
Cadmium	225	211	4.08	176 - 246	158 - 264
Calcium	5190	4760	5.49	3890 - 5640	3460 - 6070
Chromium	144	136	5.99	112 - 160	95.2 - 177
Cobalt	48.8	48.2	5.95	40.6 - 55.7	36.1 - 60.2
Copper	174	166	6.60	139 - 192	124 - 207
Iron	15000	14100	7.12	8470 - 19700	4930 - 23200
Lead	111	111	5.58	92.1 - 130	78.8 - 143
Magnesium	2570	2340	5.51	1780 - 2900	1450 - 3220
Manganese	232	228	3.96	188 - 268	165 - 291
Mercury	12.0	11.5	1.02	8.23 - 14.7	6.87 - 16.0
Molybdenum	123	110	2.96	88.2 - 132	77.5 - 142
Nickel	98.3	91.9	5.89	76.2 - 108	64.3 - 119
Potassium	2420	2020	6.79	1410 - 2630	1190 - 2850
Selenium	206	191	6.44	152 - 231	131 - 252
Silver	45.5	43.3	6.26	34.6 - 51.9	30.1 - 56.5
Sodium	252	218	6.53	159 - 278	105 - 332
Strontium	111	107	5.08	87.0 - 127	77.2 - 137
Thallium	167	156	6.28	127 - 186	110 - 202

16341 Table Mountain Pkwy ▪ Golden, CO 80403 ▪ T: 800.372.0122 ▪ 303.431.8454 ▪ www.eraqc.com

▪ Certificate of Analysis ▪

Parameter	Certified Value[1]	Reference Value	Uncertainty[2]	QC Performance Acceptance Limits[3]	PT Performance Acceptance Limits[4]
	mg/kg	mg/kg	%	mg/kg	mg/kg
Tin	111	99.9	6.00	78.1 - 122	56.7 - 143
Titanium	512	376	5.98	68.8 - 683	51.2 - 803
Uranium	97.6	98.1	6.22	74.9 - 121	72.6 - 124
Vanadium	61.8	56.7	9.53	44.8 - 68.7	32.2 - 81.3
Zinc	207	199	7.09	162 - 237	139 - 259

ANALYTICAL VERIFICATION

Parameter	Certified Value[1]	Proficiency Testing Study			NIST Traceability	
		Mean	Recovery[5]	n	SRM Number	Recovery
	mg/kg	mg/kg	%			%
Aluminum	10100	8360	82.8	157	-	-
Antimony	145	75.5	52.0	160	-	-
Arsenic	171	161	94.2	200	-	-
Barium	272	260	95.6	182	-	-
Beryllium	102	97.6	95.6	167	-	-
Boron	102	81.6	80.0	115	-	-
Cadmium	225	211	93.7	200	-	-
Calcium	5190	4760	91.8	140	-	-
Chromium	144	136	94.5	191	-	-
Cobalt	48.8	48.2	98.7	168	-	-
Copper	174	166	95.2	202	-	-
Iron	15000	14100	93.6	153	-	-
Lead	111	111	99.9	208	-	-
Magnesium	2570	2340	90.9	143	-	-
Manganese	232	228	98.4	170	-	-
Mercury	12.0	11.5	95.5	133	-	-
Molybdenum	123	110	89.4	168	-	-
Nickel	98.3	91.9	93.5	197	-	-
Potassium	2420	2020	83.6	142	-	-
Selenium	208	191	92.9	184	-	-

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▪ Certificate of Analysis ▪

Parameter	Certified Value[1]	Proficiency Testing Study			NIST Traceability	
		Mean	Recovery[5]	n	SRM Number	Recovery
	mg/kg	mg/kg	%			%
Silver	45.5	43.3	95.1	165	-	-
Sodium	252	218	86.6	138	-	-
Strontium	111	107	96.5	118	-	-
Thallium	167	156	93.6	163	-	-
Tin	111	99.9	90.0	126	-	-
Titanium	512	376	73.4	122	-	-
Uranium	97.6	98.1	100	36	-	-
Vanadium	61.8	56.7	91.8	163	-	-
Zinc	207	199	96.2	200	-	-

1. The **Certified Values** are the actual "made-to" concentrations confirmed by ERA analytical verification. 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.

2. The **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. The uncertainty applies to the product as supplied and does not take into account any required or optional dilution and/or preparations the laboratory may perform while using this product.

3. The **QC Performance Acceptance Limits (QC PALs™)** are based on actual historical data collected in ERA's Proficiency Testing program. The QC PALs™ reflect any inherent biases in the methods used to establish the limits and closely approximate a 95% confidence interval of the performance that experienced laboratories should achieve using accepted environmental methods. Use the QC PALs™ to realistically evaluate your performance against your peers.

4. The **PT Performance Acceptance Limits (PT PALs™)** are calculated using the regression equations and fixed acceptance criteria specified in the NELAC proficiency testing requirements. Use the PT PALs™ when analyzing this QC standard alongside USEPA and NELAC compliant PT standards. Please note that many PT study acceptance limits are concentration dependent (some non-linearly) and, therefore, the acceptance limits of this QC standard and any PT standard may differ relative to their difference in concentrations.

5. The **PT Data/Traceability** data include the mean value, percent recovery and number of data points reported by the laboratories in our Proficiency Testing study compared to the Certified Values. In addition, where NIST Standard Reference Materials (SRMs) are available, each analyte has been analytically traced to the NIST SRM listed. This product is traceable to the lot numbers of its starting materials. All gravimetric and volumetric measurements related to its manufacture are traceable to NIST through an unbroken chain of comparisons.
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.

6. For additional information on this product such as intended use, instructions for use, level of homogeneity, and safety information, please refer to the provided Instruction Sheet

If you have any questions or need technical assistance, please call ERA technical assistance at 1-800-372-0122 or send an email to info@eraqc.com.

Certifying Officer
Brian Miller

Quality Officer
Patrick Larson

16341 Table Mountain Pkwy • Golden, CO 80403 • T: 800.372.0122 • 303.431.8454 • www.eraqc.com

Reagent

Source A_00001

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

79670-334

5 mL Liquid in Flame Sealed Vial

Customer: TestAmerica St. Louis
P.O. No.: 2303925, Item 1
Calibration Date: 01-Apr-2009 12:00 EST **Grams of Master Source:** 0.028371

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Analytics maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Nuclide	Gamma-Ray Energy (keV)	Half-Life, Days	Master Source* γps/gram	This Source γps	Uncertainty, % Type u_A	u_B	U	Calibration Method
Am-241	59.5	157860	———	3.390E+03	0.1	0.9	1.8	4π LS
Cd-109	88.0	462.60	1.691E+05	4.798E+03	0.4	1.7	3.5	HPGe
Co-57	122.1	271.79	8.904E+04	2.526E+03	0.5	1.3	2.8	HPGe
Ce-139	165.9	137.6	1.256E+05	3.563E+03	0.4	1.1	2.3	HPGe
Hg-203	279.2	46.61	2.788E+05	7.910E+03	0.3	1.1	2.3	HPGe
Sn-113	391.7	115.1	1.725E+05	4.894E+03	0.5	1.1	2.4	HPGe
Cs-137	661.7	10983	1.120E+05	3.178E+03	0.7	1.2	2.8	HPGe
Y-88	898.0	106.6	4.205E+05	1.193E+04	0.8	1.1	2.7	HPGe
Co-60	1173.2	1925.4	2.184E+05	6.196E+03	0.7	1.1	2.6	HPGe
Co-60	1332.5	1925.4	2.185E+05	6.199E+03	0.7	1.1	2.6	HPGe
Y-88	1836.1	106.6	4.444E+05	1.261E+04	0.7	1.1	2.6	HPGe

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

Calibration Methods: 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:
5.31740 grams 4M HCl solution with approximately 30 microg/g each of Cd, Co, Ce, Hg, Sn, Cs, and Y carriers.

This standard will expire one year after the calibration date.

Source Prepared by: [signature] for
W. Mao, Radiochemist

QA Approved: [signature] Date: 5-13-09
D. M. Montgomery, QA Manager

End of Certificate

Corporate Office
24937 Avenue Tibbitts Valencia, California 91355

Laboratory
1380 Seaboard Industrial Blvd. Atlanta, Georgia, 30318

Reagent

Source D_00001

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404·352·8677
Fax 404·352·2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

79670-334

5 mL Liquid in Flame Sealed Vial

Customer: TestAmerica St. Louis
P.O. No.: 2303925, Item 1
Calibration Date: 01-Apr-2009 12:00 EST **Grams of Master Source:** 0.028371

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Analytics maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Nuclide	Gamma-Ray Energy (keV)	Half-Life, Days	Master Source* γps/gram	This Source γps	Uncertainty, % Type u_A	u_B	U	Calibration Method
Am-241	59.5	157860	———	3.390E+03	0.1	0.9	1.8	4π LS
Cd-109	88.0	462.60	1.691E+05	4.798E+03	0.4	1.7	3.5	HPGe
Co-57	122.1	271.79	8.904E+04	2.526E+03	0.5	1.3	2.8	HPGe
Ce-139	165.9	137.6	1.256E+05	3.563E+03	0.4	1.1	2.3	HPGe
Hg-203	279.2	46.61	2.788E+05	7.910E+03	0.3	1.1	2.3	HPGe
Sn-113	391.7	115.1	1.725E+05	4.894E+03	0.5	1.1	2.4	HPGe
Cs-137	661.7	10983	1.120E+05	3.178E+03	0.7	1.2	2.8	HPGe
Y-88	898.0	106.6	4.205E+05	1.193E+04	0.8	1.1	2.7	HPGe
Co-60	1173.2	1925.4	2.184E+05	6.196E+03	0.7	1.1	2.6	HPGe
Co-60	1332.5	1925.4	2.185E+05	6.199E+03	0.7	1.1	2.6	HPGe
Y-88	1836.1	106.6	4.444E+05	1.261E+04	0.7	1.1	2.6	HPGe

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

Calibration Methods: 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:
5.31740 grams 4M HCl solution with approximately 30 microg/g each of Cd, Co, Ce, Hg, Sn, Cs, and Y carriers.

This standard will expire one year after the calibration date.

Source Prepared by: [signature] for
W. Mao, Radiochemist

QA Approved: [signature] Date: 5-13-09
D. M. Montgomery, QA Manager

End of Certificate

Corporate Office
24937 Avenue Tibbitts Valencia, California 91355
Laboratory
1380 Seaboard Industrial Blvd. Atlanta, Georgia, 30318

Reagent

Source E_00001

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404·352·8677
Fax 404·352·2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

79670-334

5 mL Liquid in Flame Sealed Vial

Customer: TestAmerica St. Louis
P.O. No.: 2303925, Item 1
Calibration Date: 01-Apr-2009 12:00 EST **Grams of Master Source:** 0.028371

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Analytics maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Nuclide	Gamma-Ray Energy (keV)	Half-Life, Days	Master Source* γps/gram	This Source γps	Uncertainty, % Type u_A	u_B	U	Calibration Method
Am-241	59.5	157860	———	3.390E+03	0.1	0.9	1.8	4π LS
Cd-109	88.0	462.60	1.691E+05	4.798E+03	0.4	1.7	3.5	HPGe
Co-57	122.1	271.79	8.904E+04	2.526E+03	0.5	1.3	2.8	HPGe
Ce-139	165.9	137.6	1.256E+05	3.563E+03	0.4	1.1	2.3	HPGe
Hg-203	279.2	46.61	2.788E+05	7.910E+03	0.3	1.1	2.3	HPGe
Sn-113	391.7	115.1	1.725E+05	4.894E+03	0.5	1.1	2.4	HPGe
Cs-137	661.7	10983	1.120E+05	3.178E+03	0.7	1.2	2.8	HPGe
Y-88	898.0	106.6	4.205E+05	1.193E+04	0.8	1.1	2.7	HPGe
Co-60	1173.2	1925.4	2.184E+05	6.196E+03	0.7	1.1	2.6	HPGe
Co-60	1332.5	1925.4	2.185E+05	6.199E+03	0.7	1.1	2.6	HPGe
Y-88	1836.1	106.6	4.444E+05	1.261E+04	0.7	1.1	2.6	HPGe

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

Calibration Methods: 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:
5.31740 grams 4M HCl solution with approximately 30 microg/g each of Cd, Co, Ce, Hg, Sn, Cs, and Y carriers.

This standard will expire one year after the calibration date.

Source Prepared by: [signature] for
W. Mao, Radiochemist

QA Approved: [signature] Date: 5-13-09
D. M. Montgomery, QA Manager

End of Certificate

Corporate Office
24937 Avenue Tibbitts Valencia, California 91355

Laboratory
1380 Seaboard Industrial Blvd. Atlanta, Georgia, 30318

Reagent

Source H_00002

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

83725-334

5 mL Liquid in Flame Sealed Vial

Customer: Test America St. Louis/Earth City, MO
P.O. No.: 2397508, Item 1
Reference Date: 01-Jan-2011 12:00 PM EST **Grams of Master Source:** 0.028066

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Nuclide	Gamma-Ray Energy (keV)	Half-Life, Days	Master Source* γps/gram	This Source γps	Uncertainty, % Type u_A	u_B	U	Calibration Method
Am-241	59.5	1.580E+05	———	3.261E+03	0.1	0.9	1.8	4π LS
Cd-109	88.0	4.626E+02	1.697E+05	4.763E+03	0.8	1.7	3.8	HPGe
Co-57	122.1	2.718E+02	8.711E+04	2.445E+03	0.5	1.3	2.8	HPGe
Ce-139	165.9	1.376E+02	1.247E+05	3.500E+03	0.5	1.1	2.4	HPGe
Hg-203	279.2	4.661E+01	2.753E+05	7.727E+03	0.4	1.1	2.3	HPGe
Sn-113	391.7	1.151E+02	1.769E+05	4.965E+03	0.5	1.1	2.4	HPGe
Cs-137	661.7	1.098E+04	1.109E+05	3.113E+03	0.7	1.2	2.8	HPGe
Y-88	898.0	1.066E+02	4.224E+05	1.186E+04	0.5	1.1	2.4	HPGe
Co-60	1173.2	1.925E+03	2.142E+05	6.012E+03	0.6	1.1	2.5	HPGe
Co-60	1332.5	1.925E+03	2.143E+05	6.015E+03	0.6	1.1	2.5	HPGe
Y-88	1836.1	1.066E+02	4.472E+05	1.255E+04	0.5	1.1	2.4	HPGe

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

Calibration Methods: 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

(Certificate continued on reverse side)

Comments:
5.30203 grams 4M HCl solution with approximately 30 μg/g each of Cd, Co, Ce, Hg, Sn, Cs, and Y carriers.

This standard will expire one year after the reference date.

Source Prepared by: MITaskaeva
M. I. Taskaeva, Radiochemist

QA Approved: _____ Date: 13/JAN/11
J. D. McCorvey, QA Manager Alternate

Reagent

STD TI_00010

1783061
ID STD TI_00010
Exp 08/19/20 Prpd cb Opn 08/19/19
TI 1000PPM

CPI INTERNATIONAL

CERTIFICATE OF ANALYSIS

Single-Element Aqueous CRM — Product #: TA-1000623

SE Std Titanium (Ti) – 1000 µg/mL — Lot #: 987438-5

Matrix: 5% HNO_3/tr. HF

Element	Certified Concentration & Uncertainty
Ti	998 ± 2 µg/mL (w/v)
	978 ± 2 µg/g (w/w)

Intended Use: This solution is intended for use as a certified reference material (CRM) or calibration standard for inductively coupled plasma optical emission spectroscopy (ICP-OES), inductively coupled plasma mass spectrometry (ICP-MS), flame or furnace atomic absorption spectroscopy (AA or GFAA), and other techniques for elemental analysis.

Certification & Traceability: This CRM was manufactured, processed, and certified under a quality management system that is registered/accredited to **ISO 9001**, **ISO 17034**, and **ISO/IEC 17025**. This CRM was prepared to a nominal concentration of 1000 µg/mL by gravimetric methods using 99.99+% pure titanium (Ti) metal dissolved in high purity nitric acid (HNO_3), trace hydrofluoric acid (HF) and diluted with filtered (0.22 µm), 18 M-ohm deionized water. The balances used in the preparation of this CRM are calibrated regularly with traceability to NIST, using a calibration provider that is accredited to ISO/IEC 17025 by a mutually recognized accreditation body. All volumetric dilutions are performed in Class A calibrated glassware. The certified concentration and uncertainty were determined using the "High Performance ICP-OES" protocol developed by NIST, and both the certified concentration and uncertainty values are traceable to **NIST SRM 3162a, lot #130925**. The uncertainty associated with the certified concentration represents the expanded uncertainty at the 95% confidence level using a coverage factor of k=2.

Indicative Values: ICP-MS was used to determine trace metal concentrations for this product (nd = not determined).

Trace Concentrations (µg/L)

Ag	0.7	Co	<1	Ge	<0.5	Lu	<0.2	P	<100	Sb	<0.5	Te	<1
Al	<2	Cs	<0.5	Hf	1	Mg	<5	Pb	<1	Sc	<5	Ti	MAJOR
As	<2	Cr	1	Hg	<0.5	Mn	<1	Pd	<0.5	Se	<2	Tl	<0.5
Au	<0.5	Cu	<1	Ho	<0.2	Mo	15	Pr	<0.2	Si	<100	Tm	<0.2
B	<5	Dy	<0.2	In	nd	Na	<25	Pt	<0.5	Sm	<0.2	V	<1
Ba	<1	Er	<0.2	Ir	<0.2	Nb	0.8	Rb	<0.5	Sn	2	W	<0.5
Bi	<0.2	Eu	<0.2	K	<25	Nd	<0.2	Re	<0.2	Sr	<1	Y	<0.5
Ca	<25	Fe	<10	La	<0.5	Ni	<2	Rh	<0.5	Ta	23	Yb	<0.2
Cd	<0.5	Ga	<0.5	Li	<2	Os	<0.5	Ru	<0.5	Tb	<0.5	Zn	<2
Ce	<0.2	Gd	<0.2										

Instructions for Use: We recommend that the solution be thoroughly mixed by repeated shaking or swirling of the bottle immediately prior to use. To achieve the highest accuracy, the analyst should: (1) use only pre-cleaned containers and transferware, (2) not pipette directly from the CRM's original container, (3) never pour used product back into the original container, (4) make dilutions using calibrated balances or certified class A volumetric flasks and pipettes, (5) use a minimum sub-sample size of 500 µL, and (6) dilute with the same matrix as the original CRM or other chemically suitable matrix. The solution should be kept tightly capped and stored under normal laboratory conditions. Do not freeze, heat, or immerse the bottle or its contents, and avoid exposure to direct sunlight or moisture.

Period of Validity: CPI International ensures the accuracy of this solution for **18 months** from the certification date shown below, provided the instructions for use are followed. During the period of validity, the purchaser will be notified if this product is recalled due to any significant changes in the stability of the solution.

Chuck Goudreau

Chuck Goudreau, Certifying Officer

August 2, 2019
Certification Date

CPI International waives all responsibility for any damages resulting from the usage and/or implementation of the products/data described herein.

USA
5580 Skylane Boulevard P: 707.525.5788
Santa Rosa, CA 95403 P: 800.878.7654
F: 707.545.7901

Europe
Nieuwe Hemweg 7P P: +31 20 638 05 97
1013BG Amsterdam F: +31 20 420 28 36
The Netherlands

www.cpiinternational.com

Health and Safety Information: Refer to the Safety Data Sheet (SDS).

Homogeneity: This solution was determined to be homogeneous by procedures consistent with the requirements of ISO Guide 34 and ISO Guide 35. Replicate samples of the finished solution were analyzed to confirm its homogeneity, in accordance with QSP 6-13 Assessment of Homogeneity and Stability. To ensure homogeneity, users should not take a smaller sub-sample than specified in the Instructions for Use, as doing so will invalidate the certified values and uncertainties.

Quality Manual Rev: No. 5, 03/01/2013

Further Information: Please contact CPI International for further information about this CRM.

Quality Certifications: This CRM was prepared under a quality management system that is registered/accredited to the following:

- ISO 9001 – Quality Management Systems – Requirements (TUV NORD Cert. No. 44 100 16560231)
- ISO/IEC 17025 – General Requirements for the Competence of Testing and Calibration Laboratories (A2LA Cert. No. 2848.01)
- ISO Guide 34 – General Requirements for the Competence of Reference Material Producers (A2LA Cert. No. 2848.02)
    - ISO Guide 34 references additional requirements specified in ISO Guide 31 and ISO Guide 35.

Reagent

Tuna Can LCS_00009

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

St. Louis Radiological Standard Verification

Printed: 9/17/2019 12:40 PM

Standard ID Number: 1798543
True Value = 27.51 pCi/L or g
Date Analyzed: 9/13/2019

Radionuclide: Cs-137

Replicates

#1	28.54	pCi/L or g
#2	26.76	pCi/L or g
#3	26.73	pCi/L or g

Tuna can LCS-00009

Mean = 27.343333

1 sigma = 1.0364523

1.96 sigma = 2.031446

True Value minus 5% = 26.1345 (True Value - 5%)
True Value plus 5% = 28.8855 (True Value + 5%)

Accuracy:
Mean value within 5% of Certified (True) Value? Yes **(Acceptance Criteria)**

Precision:
1.96 sigma Value Within 10% of Mean Value? Yes **(Acceptance Criteria)**

Standard Reverification Acceptable? Yes

Note: Criteria for reverification of radiological standards is taken from the DoD/DOE Consolidated QSM and LANL Statements of Work

1st Reviewed By/Date: cmm 9/17/19

2nd Reviewed By/Date: CAP 9/17/19

TestAmerica

St. Louis Radiological Standard Verification

Printed: 9/17/2019 12:43 PM

Standard ID Number: 1798543
True Value = 11.16 pCi/L or g
Date Analyzed: 9/13/2019

Radionuclide: Co-60

	Replicates	
#1	11	pCi/L or g
#2	10.57	pCi/L or g
#3	10.6	pCi/L or g

Mean = 10.723333

1 sigma = 0.2400694

1.96 sigma = 0.470536

True Value minus 5% = 10.602 (True Value - 5%)
True Value plus 5% = 11.718 (True Value + 5%)

Accuracy:
Mean value within 5% of Certified (True) Value? Yes **(Acceptance Criteria)**

Precision:
1.96 sigma Value Within 10% of Mean Value? Yes **(Acceptance Criteria)**

Standard Reverification Acceptable? Yes

Note: Criteria for reverification of radiological standards is taken from the DoD/DOE Consolidated QSM and LANL Statements of Work

1st Reviewed By/Date: umm 9/17/19

2nd Reviewed By/Date: CJP 9/17/19

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St. Louis Radiological Standard Verification

Printed: 9/17/2019 12:44 PM

Standard ID Number: 1798543
True Value = 96.62 pCi/L or g
Date Analyzed: 9/13/2019

Radionuclide: Am-241

	Replicates	
#1	101.7	pCi/L or g
#2	96.41	pCi/L or g
#3	95.48	pCi/L or g

Mean = 97.863333

1 sigma = 3.355031

1.96 sigma = 6.575861

True Value minus 5% = 91.789 (True Value - 5%)
True Value plus 5% = 101.451 (True Value + 5%)

Accuracy:
Mean value within 5% of Certified (True) Value? Yes **(Acceptance Criteria)**

Precision:
1.96 sigma Value Within 10% of Mean Value? Yes **(Acceptance Criteria)**

Standard Reverification Acceptable? Yes

Note: Criteria for reverification of radiological standards is taken from the DoD/DOE Consolidated QSM and LANL Statements of Work

1st Reviewed By/Date: CMM 9/17/19

2nd Reviewed By/Date: CJP 9/17/19

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Environment Testing
TestAmerica

Analysis Report for Gamma Spectroscopy

Batch: 442821 **Operator:**

MOO

SampID	WRKNO	Aliquot	Sigma	Instrument	Detector	CountDateTime	CountDuration
LCS 160-442821~2-	LCS	341.90g	1.00	GammaVision	GV05	9 / 13 / 19 11:44	30

Analyte	Cmpnd#	Activity	TotalUnc	CountUnc	MDA	MLCC	Act/MDA	
AC-228	11136	4.065E-001pCi/g	3.032E-001	3.025E-001	1.192E+000	5.689E-001	0.34	0.3032
AG-108M	10982	1.185E-001pCi/g	7.877E-002	7.853E-002	3.100E-001	1.503E-001	0.38	0.0788
AG-110M	10973	2.000E-001pCi/g	9.003E-002	8.945E-002	5.914E-001	2.852E-001	0.34	0.0900
AM-241	10818	1.017E+002pCi/g	5.329E+000	7.416E-001	8.130E-001	4.000E-001	125.06	5.3292
BA-133	10469	1.514E-001pCi/g	1.488E-001	1.485E-001	4.938E-001	2.411E-001	0.31	0.1488
BA-140	10463	2.083E-001pCi/g	2.262E-001	2.259E-001	9.621E-001	4.604E-001	0.22	0.2262
BE-7	10435	1.114E+000pCi/g	1.027E+000	1.025E+000	3.407E+000	1.660E+000	0.33	1.0267
BI-207	10195	-2.863E-001pCi/g	2.010E-001	2.004E-001	5.293E-001	2.527E-001	-0.54	0.2010
BI-210M	10173	-1.581E-001pCi/g	2.131E-001	2.129E-001	4.979E-001	2.433E-001	-0.32	0.2131
BI-212	10160	9.310E-001pCi/g	1.149E+000	1.148E+000	3.868E+000	1.848E+000	0.24	1.1488
BI-214	10154	2.326E-001pCi/g	2.064E-001	2.060E-001	1.071E+000	5.232E-001	0.22	0.2064
CD-109	9254	1.444E+000pCi/g	2.033E+000	2.031E+000	6.744E+000	3.327E+000	0.21	2.0327
CD-113M	17462	8.913E+002pCi/g	1.147E+003	1.145E+003	3.822E+003	1.865E+003	0.23	1,146.6992
CE-139	9241	4.620E-002pCi/g	7.074E-002	7.060E-002	2.355E-001	1.154E-001	0.20	0.0707
CE-141	9235	-6.939E-002pCi/g	1.306E-001	1.305E-001	4.344E-001	2.135E-001	-0.21	0.1306
CE-144	9221	-3.028E-002pCi/g	5.116E-001	5.116E-001	1.716E+000	8.424E-001	-0.02	0.5116
CF-249	9215	9.341E-002pCi/g	1.575E-001	1.574E-001	5.640E-001	2.762E-001	0.17	0.1575
CF-251	13690	2.026E-002pCi/g	3.341E-001	3.341E-001	8.977E-001	4.371E-001	0.02	0.3341
CO-56	8704	-5.180E-002pCi/g	6.396E-002	6.391E-002	3.155E-001	1.504E-001	-0.16	0.0640
CO-57	13694	5.022E-002pCi/g	6.294E-002	6.288E-002	2.192E-001	1.077E-001	0.23	0.0629
CO-58	8698	1.213E-001pCi/g	1.166E-001	1.164E-001	3.887E-001	1.872E-001	0.31	0.1166
CO-60	8692	1.100E+001pCi/g	5.892E-001	2.058E-001	5.871E-002	1.856E-002	187.32	0.5892
CR-51	8604	8.324E-001pCi/g	8.498E-001	8.486E-001	2.823E+000	1.378E+000	0.29	0.8498
CS-134	8553	1.015E-001pCi/g	1.246E-001	1.244E-001	4.184E-001	2.010E-001	0.24	0.1246
CS-136	8546	-1.530E-001pCi/g	1.378E-001	1.376E-001	4.578E-001	2.217E-001	-0.33	0.1378
CS-137	8539	2.854E+001pCi/g	1.538E+000	4.012E-001	2.448E-001	1.153E-001	116.69	1.5381
EU-152	7145	3.020E-001pCi/g	2.418E-001	2.413E-001	6.436E-001	3.160E-001	0.47	0.2418
EU-154	7138	2.290E-001pCi/g	2.544E-001	2.542E-001	4.328E-001	2.123E-001	0.53	0.2544
EU-155	7131	-2.454E-001pCi/g	3.675E-001	3.673E-001	1.219E+000	6.019E-001	-0.20	0.3675
FE-59	7073	-3.237E-001pCi/g	3.238E-001	3.234E-001	7.052E-001	3.364E-001	-0.46	0.3238
GA-68	18005	-9.487E-001pCi/g	6.188E+000	6.188E+000	1.372E+001	6.538E+000	-0.07	6.1878
GD-153	6824	1.957E-001pCi/g	1.591E-001	1.586E-001	6.377E-001	3.133E-001	0.31	0.1591
HF-181	6495	-1.709E-001pCi/g	1.588E-001	1.585E-001	5.263E-001	2.574E-001	-0.32	0.1588
HG-203	6466	4.060E-002pCi/g	9.570E-002	9.567E-002	2.441E-001	1.184E-001	0.17	0.0957
I-131	6380	1.133E-001pCi/g	1.081E-001	1.079E-001	2.735E-001	1.323E-001	0.41	0.1081
IR-192	6303	-1.012E-001pCi/g	1.012E-001	1.010E-001	3.357E-001	1.641E-001	-0.30	0.1012
K-40	6148	8.569E-001pCi/g	3.415E-001	3.387E-001	9.090E-001	3.452E-001	0.94	0.3415
KR-85	6111	9.028E+000pCi/g	2.406E+001	2.405E+001	8.100E+001	3.937E+001	0.11	24.0589
LA-140	6096	7.687E-002pCi/g	2.802E-002	2.772E-002	7.164E-002	2.265E-002	1.07	0.0280
MN-54	5382	1.281E-001pCi/g	1.134E-001	1.132E-001	2.567E-001	1.210E-001	0.49	0.1134
NA-22	5201	-5.117E-003pCi/g	3.600E-002	3.600E-002	1.376E-001	5.841E-002	-0.04	0.0360
NB-94	5160	1.861E-002pCi/g	9.748E-002	9.747E-002	2.349E-001	1.110E-001	0.07	0.0975
NB-95	5154	1.187E-001pCi/g	9.088E-002	9.067E-002	3.014E-001	1.439E-001	0.39	0.0909
ND-147	5083	3.185E-001pCi/g	3.051E-001	3.045E-001	1.867E+000	8.952E-001	0.17	0.3051
NP-237	4757	-4.197E-001pCi/g	6.528E-001	6.524E-001	2.166E+000	1.070E+000	-0.19	0.6528
NP-239	4751	2.244E-001pCi/g	3.296E-001	3.293E-001	1.094E+000	5.396E-001	0.21	0.3296
PA-231	4541	1.010E+000pCi/g	4.359E+000	4.359E+000	1.455E+001	7.166E+000	0.07	4.3590
PA-233	4535	2.171E-001pCi/g	3.533E-001	3.532E-001	1.175E+000	5.785E-001	0.18	0.3533
PA-234	4528	2.721E-001pCi/g	3.471E-001	3.468E-001	1.153E+000	5.669E-001	0.24	0.3471

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PA-234M	19453	-2.323E+001pCi/g	1.952E+001	1.948E+001	6.495E+001	3.146E+001	-0.36	19.5162
PB-210	4467	7.535E+002pCi/g	4.494E+001	7.890E+000	1.440E+001	7.124E+000	52.31	44.9442
PB-212	4454	5.468E-001pCi/g	1.148E-001	1.090E-001	3.328E-001	1.605E-001	1.84	0.1148
PB-214	4448	4.716E-001pCi/g	1.908E-001	1.892E-001	8.029E-001	3.920E-001	0.59	0.1908
PM-144	19585	1.555E-002pCi/g	9.547E-002	9.547E-002	2.297E-001	1.085E-001	0.07	0.0955
PM-146	2464	5.132E-002pCi/g	8.496E-002	8.492E-002	4.790E-001	2.327E-001	0.11	0.0850
RH-106	1882	6.982E-001pCi/g	1.483E+000	1.482E+000	4.967E+000	2.426E+000	0.14	1.4829
RU-103	1828	-3.450E-002pCi/g	1.159E-001	1.159E-001	2.848E-001	1.372E-001	-0.12	0.1159
SB-124	1784	1.827E-001pCi/g	1.472E-001	1.469E-001	4.788E-001	2.337E-001	0.38	0.1472
SB-125	1777	2.430E-001pCi/g	3.275E-001	3.273E-001	9.103E-001	4.411E-001	0.27	0.3275
SC-46	1739	-1.702E-001pCi/g	1.569E-001	1.567E-001	5.215E-001	2.531E-001	-0.33	0.1569
SN-113	1570	1.532E-001pCi/g	1.719E-001	1.717E-001	5.714E-001	2.796E-001	0.27	0.1719
SN-126	17459	7.612E-001pCi/g	7.746E-001	7.736E-001	2.567E+000	1.261E+000	0.30	0.7746
TA-182	1301	7.726E-002pCi/g	1.583E-001	1.582E-001	9.973E-001	4.719E-001	0.08	0.1583
TC-99M	17412	5.631E-002pCi/g	7.110E-002	7.103E-002	2.361E-001	1.161E-001	0.24	0.0711
TH-227	1058	4.902E-001pCi/g	6.613E-001	6.608E-001	2.739E+000	1.330E+000	0.18	0.6613
TH-229	1046	5.186E-001pCi/g	1.499E+000	1.498E+000	4.004E+000	1.953E+000	0.13	1.4985
TH-234	1027	4.812E-001pCi/g	1.366E+000	1.366E+000	4.548E+000	2.244E+000	0.11	1.3664
TL-208	929	1.257E-001pCi/g	1.203E-001	1.201E-001	2.658E-001	1.265E-001	0.47	0.1203
TL-210	20861	4.217E-002pCi/g	6.801E-002	6.796E-002	3.680E-001	1.769E-001	0.11	0.0680
U-235	281	5.621E-001pCi/g	5.410E-001	5.402E-001	1.918E+000	9.431E-001	0.29	0.5410
Y-88	74	3.754E-002pCi/g	6.236E-002	6.233E-002	1.503E-001	6.088E-002	0.25	0.0624
ZN-65	31	9.256E-003pCi/g	2.828E-001	2.628E-001	9.678E-001	4.655E-001	0.01	0.2828
ZR-95	7	-1.121E-001pCi/g	1.959E-001	1.958E-001	4.656E-001	2.205E-001	-0.24	0.1959

Laboratory Control Sample Information

Sample ID	WRKNO	Analyte	Activity	StdAdded	Recovery	ZFactor
LCS 160-442821-2-A	LCS 160-442821-2-A	CS-137	2.854E+001 pCi/g	2.751E+001	103.76%	0.6435
		CO-60	1.100E+001 pCi/g	1.116E+001	98.53%	-0.2636
		AM-241	1.017E+002 pCi/g	9.662E+001	105.24%	0.9035

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Samp Activity	Dup Activity	RPD	RER	DER	Flag	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor	
MB 160-442821~1-A	MB	AC-228	4.342E-002	4.965E-002	0.8746	
MB 160-442821~1-A	MB	AG-108M	1.098E-003	9.817E-004	1.1182	
MB 160-442821~1-A	MB	AG-110M	2.340E-002	1.797E-002	1.3022	
MB 160-442821~1-A	MB	AM-241	-5.731E-002	8.274E-002	-0.6926	
MB 160-442821~1-A	MB	BA-133	2.852E-002	3.243E-002	0.8794	
MB 160-442821~1-A	MB	BA-140	5.953E-002	6.662E-002	0.8937	
MB 160-442821~1-A	MB	BE-7	-2.994E-001	3.208E-001	-0.9335	
MB 160-442821~1-A	MB	BI-207	-1.018E-002	4.105E-002	-0.2481	
MB 160-442821~1-A	MB	BI-210M	-9.908E-003	3.572E-002	-0.2774	
MB 160-442821~1-A	MB	BI-212	1.756E-001	3.078E-001	0.5704	
MB 160-442821~1-A	MB	BI-214	1.393E-001	5.312E-002	2.6221	B
MB 160-442821~1-A	MB	CD-109	0.000E+000	1.699E-001	0.0000	
MB 160-442821~1-A	MB	CD-113M	2.503E+002	2.082E+002	1.2023	
MB 160-442821~1-A	MB	CE-139	-2.124E-002	2.417E-002	-0.8787	
MB 160-442821~1-A	MB	CE-141	-2.884E-002	3.258E-002	-0.8852	
MB 160-442821~1-A	MB	CE-144	1.170E-001	2.066E-001	0.5664	
MB 160-442821~1-A	MB	CF-249	1.170E-002	1.645E-002	0.7112	
MB 160-442821~1-A	MB	CF-251	1.837E-002	8.164E-002	0.2250	
MB 160-442821~1-A	MB	CO-56	-4.823E-002	4.988E-002	-0.9671	
MB 160-442821~1-A	MB	CO-57	5.510E-003	2.192E-002	0.2514	
MB 160-442821~1-A	MB	CO-58	4.697E-003	2.933E-002	0.1601	
MB 160-442821~1-A	MB	CO-60	1.531E-002	6.888E-003	2.2223	
MB 160-442821~1-A	MB	CR-51	-3.047E-001	5.786E-001	-0.5267	
MB 160-442821~1-A	MB	CS-134	3.841E-002	1.494E-002	2.5710	
MB 160-442821~1-A	MB	CS-136	1.257E-002	3.856E-003	3.2593	B
MB 160-442821~1-A	MB	CS-137	2.393E-002	2.558E-002	0.9358	
MB 160-442821~1-A	MB	EU-152	6.044E-002	2.721E-002	2.2212	
MB 160-442821~1-A	MB	EU-154	7.072E-002	5.279E-002	1.3396	
MB 160-442821~1-A	MB	EU-155	2.661E-002	4.693E-002	0.5670	
MB 160-442821~1-A	MB	FE-59	2.751E-002	5.674E-002	0.4849	
MB 160-442821~1-A	MB	GA-68	-6.817E-002	1.080E+000	-0.0631	
MB 160-442821~1-A	MB	GD-153	-4.201E-002	6.752E-002	-0.6221	
MB 160-442821~1-A	MB	HF-181	5.102E-003	8.664E-003	0.5889	
MB 160-442821~1-A	MB	HG-203	-1.206E-002	2.101E-002	-0.5742	
MB 160-442821~1-A	MB	I-131	3.155E-003	2.491E-002	0.1267	
MB 160-442821~1-A	MB	IR-192	3.111E-002	6.103E-002	0.5098	
MB 160-442821~1-A	MB	K-40	-5.436E-001	7.228E-001	-0.7520	
MB 160-442821~1-A	MB	KR-85	-4.929E+000	1.024E+001	-0.4813	
MB 160-442821~1-A	MB	LA-140	1.338E-002	1.479E-002	0.9047	
MB 160-442821~1-A	MB	MN-54	-1.909E-002	3.907E-002	-0.4885	
MB 160-442821~1-A	MB	NA-22	1.521E-002	2.411E-002	0.6309	
MB 160-442821~1-A	MB	NB-94	5.593E-002	1.577E-002	3.5459	B
MB 160-442821~1-A	MB	NB-95	7.234E-003	2.219E-002	0.3260	
MB 160-442821~1-A	MB	ND-147	-1.671E-001	2.340E-001	-0.7140	
MB 160-442821~1-A	MB	NP-237	1.084E-001	1.795E-001	0.6038	
MB 160-442821~1-A	MB	NP-239	4.730E-002	7.053E-002	0.6706	
MB 160-442821~1-A	MB	PA-231	-9.465E-001	1.811E+000	-0.5226	
MB 160-442821~1-A	MB	PA-233	0.000E+000	2.543E-002	0.0000	
MB 160-442821~1-A	MB	PA-234	1.397E-001	4.096E-002	3.4108	B
MB 160-442821~1-A	MB	PA-234M	0.000E+000	1.839E+000	0.0000	
MB 160-442821~1-A	MB	PB-210	-1.447E+000	8.300E-001	-1.7435	

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MB 160-442821~1-A	MB	PB-212	-4.364E-002	5.625E-002	-0.7757
MB 160-442821~1-A	MB	PB-214	-1.562E-002	5.292E-002	-0.2952
MB 160-442821~1-A	MB	PM-144	-4.228E-003	3.382E-002	-0.1250
MB 160-442821~1-A	MB	PM-146	1.686E-002	2.497E-002	0.6753
MB 160-442821~1-A	MB	RH-106	-3.312E-001	5.169E-001	-0.6409
MB 160-442821~1-A	MB	RU-103	-2.513E-002	3.575E-002	-0.7031
MB 160-442821~1-A	MB	SB-124	5.135E-002	2.113E-002	2.4307
MB 160-442821~1-A	MB	SB-125	5.517E-002	4.524E-002	1.2193
MB 160-442821~1-A	MB	SC-46	0.000E+000	7.064E-003	0.0000
MB 160-442821~1-A	MB	SN-113	3.065E-002	3.577E-002	0.8568
MB 160-442821~1-A	MB	SN-126	1.684E-001	2.381E-001	0.7074
MB 160-442821~1-A	MB	TA-182	-1.911E-001	1.577E-001	-1.2114
MB 160-442821~1-A	MB	TC-99M	1.568E-009	2.393E-002	0.0000
MB 160-442821~1-A	MB	TH-227	1.868E-001	1.347E-001	1.3870
MB 160-442821~1-A	MB	TH-229	8.086E-001	3.483E-001	2.3215
MB 160-442821~1-A	MB	TH-234	2.642E-001	3.173E-001	0.8327
MB 160-442821~1-A	MB	TL-208	1.480E-002	1.817E-002	0.8144
MB 160-442821~1-A	MB	TL-210	3.150E-002	2.108E-002	1.4946
MB 160-442821~1-A	MB	U-235	-2.885E-002	2.377E-002	-1.2138
MB 160-442821~1-A	MB	Y-88	-3.249E-002	6.078E-002	-0.5346
MB 160-442821~1-A	MB	ZN-65	0.000E+000	1.165E-002	0.0000
MB 160-442821~1-A	MB	ZR-95	3.349E-002	2.726E-002	1.2286

eurofins

Environment Testing
TestAmerica

Analysis Report for Gamma Spectroscopy

Batch: 442120 **Operator:**

MOO

SampID	WRKNO	Aliquot	Sigma	Instrument	Detector	CountDateTime	CountDuration
LCS 160-442120~2-	LCS	341.90g	1.00	GammaVision	GV09	9 / 14 / 19 8:40	60

Analyte	Cmpnd#	Activity	TotalUnc	CountUnc	MDA	MLCC	Act/MDA	
AC-228	11136	7.971E-001pCi/g	1.503E-001	1.447E-001	4.116E-001	1.986E-001	1.94	0.1503
AG-108M	10982	3.273E-002pCi/g	4.460E-002	4.457E-002	1.527E-001	7.503E-002	0.21	0.0446
AG-110M	10973	5.611E-002pCi/g	3.263E-002	3.250E-002	2.862E-001	1.403E-001	0.20	0.0326
AM-241	10818	9.841E+001pCi/g	5.030E+000	5.156E-001	7.152E-001	3.553E-001	134.81	5.0300
BA-133	10489	2.162E-002pCi/g	7.888E-002	7.887E-002	2.627E-001	1.297E-001	0.08	0.0789
BA-140	10463	-1.914E-001pCi/g	1.490E-001	1.486E-001	4.960E-001	2.422E-001	-0.39	0.1490
BE-7	10435	-7.246E-001pCi/g	6.106E-001	6.094E-001	2.407E+000	1.191E+000	-0.30	0.6106
BI-207	10195	5.167E-002pCi/g	2.098E-002	2.083E-002	2.146E-001	1.041E-001	0.24	0.0210
BI-210M	10173	-6.957E-002pCi/g	5.753E-002	5.738E-002	2.573E-001	1.269E-001	-0.27	0.0575
BI-212	10160	-5.523E-002pCi/g	5.526E-001	5.526E-001	1.865E+000	9.090E-001	-0.03	0.5526
BI-214	10154	3.852E-001pCi/g	9.766E-002	9.559E-002	1.944E-001	9.385E-002	1.98	0.0977
CD-109	9254	-1.750E-007pCi/g	1.700E+000	1.700E+000	5.634E+000	2.802E+000	0.00	1.7005
CD-113M	17462	-3.881E+002pCi/g	6.515E+002	6.511E+002	2.163E+003	1.067E+003	-0.18	651.5354
CE-139	9241	3.894E-002pCi/g	2.479E-002	2.452E-002	8.082E-002	3.962E-002	0.48	0.0248
CE-141	9235	-1.547E-002pCi/g	6.406E-002	6.405E-002	1.753E-001	8.643E-002	-0.09	0.0641
CE-144	9221	-3.154E-001pCi/g	4.499E-001	4.498E-001	1.487E+000	7.386E-001	-0.21	0.4499
CF-249	9215	1.781E-001pCi/g	7.734E-002	7.680E-002	1.477E-001	7.216E-002	1.21	0.0773
CF-251	13690	4.070E-002pCi/g	1.991E-001	1.991E-001	5.029E-001	2.476E-001	0.08	0.1991
CO-56	8704	4.653E-002pCi/g	2.373E-002	2.361E-002	1.308E-001	6.340E-002	0.36	0.0237
CO-57	13694	-7.288E-003pCi/g	3.710E-002	3.710E-002	1.234E-001	6.105E-002	-0.06	0.0371
CO-58	8698	-1.897E-003pCi/g	4.758E-002	4.758E-002	1.605E-001	7.834E-002	-0.01	0.0476
CO-60	8692	1.057E+001pCi/g	5.418E-001	1.102E-001	6.740E-002	3.087E-002	156.79	0.5418
CR-51	8604	-4.284E-001pCi/g	4.158E-001	4.152E-001	1.418E+000	6.993E-001	-0.30	0.4158
CS-134	8553	1.120E-001pCi/g	6.138E-002	6.111E-002	1.766E-001	8.810E-002	0.63	0.0614
CS-136	8546	5.864E-002pCi/g	5.392E-002	5.381E-002	1.583E-001	7.721E-002	0.37	0.0539
CS-137	8539	2.676E+001pCi/g	1.407E+000	2.042E-001	1.233E-001	5.972E-002	217.05	1.4070
EU-152	7145	2.923E-003pCi/g	2.591E-003	2.586E-003	3.641E-001	1.801E-001	0.01	0.0026
EU-154	7138	1.735E-001pCi/g	1.133E-001	1.130E-001	2.371E-001	1.172E-001	0.73	0.1133
EU-155	7131	-1.792E-001pCi/g	9.195E-002	9.143E-002	8.405E-001	4.176E-001	-0.21	0.0920
FE-59	7073	8.888E-002pCi/g	1.334E-001	1.333E-001	2.797E-001	1.356E-001	0.32	0.1334
GA-68	18005	1.010E+000pCi/g	2.873E+000	2.873E+000	6.059E+000	2.932E+000	0.17	2.8732
GD-153	6824	-1.271E-001pCi/g	1.790E-001	1.788E-001	5.913E-001	2.938E-001	-0.21	0.1790
HF-181	6495	2.184E-001pCi/g	6.810E-002	6.717E-002	1.316E-001	6.420E-002	1.66	0.0681
HG-203	6466	-6.342E-002pCi/g	4.983E-002	4.970E-002	1.642E-001	8.104E-002	-0.39	0.0498
I-131	6380	-7.256E-002pCi/g	6.388E-002	6.377E-002	1.531E-001	7.523E-002	-0.47	0.0639
IR-192	6303	5.827E-002pCi/g	8.760E-002	8.753E-002	2.897E-001	1.438E-001	0.20	0.0876
K-40	6148	-4.085E-001pCi/g	2.930E-001	2.922E-001	8.645E-001	4.037E-001	-0.47	0.2930
KR-85	6111	0.000E+000pCi/g	5.958E+000	5.958E+000	3.921E+001	1.929E+001	0.00	5.9582
LA-140	6096	4.473E-002pCi/g	5.970E-002	5.965E-002	6.482E-002	2.897E-002	0.69	0.0597
MN-54	5382	-7.301E-002pCi/g	4.126E-002	4.109E-002	1.409E-001	6.850E-002	-0.52	0.0413
NA-22	5201	2.624E-002pCi/g	2.169E-002	2.165E-002	7.265E-002	3.359E-002	0.36	0.0217
NB-94	5160	6.374E-002pCi/g	3.242E-002	3.225E-002	1.519E-001	7.421E-002	0.42	0.0324
NB-95	5154	1.963E-003pCi/g	3.822E-002	3.822E-002	1.295E-001	6.292E-002	0.02	0.0382
ND-147	5083	3.119E-001pCi/g	3.848E-001	3.844E-001	8.917E-001	4.351E-001	0.35	0.3848
NP-237	4757	-2.982E-001pCi/g	4.987E-001	4.984E-001	1.648E+000	8.195E-001	-0.18	0.4987
NP-239	4751	1.640E-001pCi/g	2.323E-001	2.321E-001	7.677E-001	3.814E-001	0.21	0.2323
PA-231	4541	0.000E+000pCi/g	8.169E-001	8.169E-001	8.598E+000	4.266E+000	0.00	0.8169
PA-233	4535	-1.500E-003pCi/g	1.125E-001	1.125E-001	7.025E-001	3.486E-001	0.00	0.1125
PA-234	4528	-1.929E-001pCi/g	2.743E-001	2.742E-001	9.070E-001	4.503E-001	-0.21	0.2743

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PA-234M	19453	-6.978E-002pCi/g	7.541E+000	7.541E+000	2.662E+001	1.304E+001	0.00	7.5414
PB-210	4467	7.539E+002pCi/g	4.451E+001	4.662E+000	8.529E+000	4.237E+000	88.39	44.5104
PB-212	4454	4.619E-001pCi/g	6.836E-002	6.148E-002	1.884E-001	9.237E-002	2.45	0.0684
PB-214	4448	5.844E-001pCi/g	1.236E-001	1.198E-001	2.710E-001	1.327E-001	2.16	0.1236
PM-144	19585	-6.206E-002pCi/g	4.852E-002	4.841E-002	1.603E-001	7.840E-002	-0.39	0.0485
PM-146	2464	-6.084E-002pCi/g	1.020E-001	1.019E-001	2.355E-001	1.159E-001	-0.26	0.1020
RH-106	1882	-5.583E-001pCi/g	4.539E-001	4.529E-001	1.500E+000	7.343E-001	-0.37	0.4539
RU-103	1828	1.549E-002pCi/g	6.208E-002	6.208E-002	1.443E-001	7.070E-002	0.11	0.0621
SB-124	1784	1.007E-001pCi/g	7.453E-002	7.434E-002	2.350E-001	1.160E-001	0.43	0.0745
SB-125	1777	3.494E-002pCi/g	3.557E-002	3.553E-002	4.848E-001	2.384E-001	0.07	0.0356
SC-46	1739	-8.326E-002pCi/g	6.719E-002	6.705E-002	2.219E-001	1.089E-001	-0.38	0.0672
SN-113	1570	2.746E-002pCi/g	8.897E-002	8.896E-002	2.960E-001	1.462E-001	0.09	0.0890
SN-126	17459	-9.609E-001pCi/g	2.197E+000	2.197E+000	7.250E+000	3.617E+000	-0.13	2.1975
TA-182	1301	1.103E-001pCi/g	1.129E-001	1.128E-001	6.531E-001	3.195E-001	0.17	0.1129
TC-99M	17412	0.000E+000pCi/g	2.204E-002	2.204E-002	2.009E-001	9.974E-002	0.00	0.0220
TH-227	1058	1.587E-001pCi/g	6.160E-001	6.159E-001	1.487E+000	7.316E-001	0.11	0.6160
TH-229	1046	8.150E-002pCi/g	9.665E-001	9.665E-001	2.331E+000	1.150E+000	0.03	0.9665
TH-234	1027	-6.906E-001pCi/g	9.853E-001	9.845E-001	3.256E+000	1.618E+000	-0.21	0.9853
TL-208	929	2.594E-001pCi/g	5.669E-002	5.507E-002	1.124E-001	5.442E-002	2.31	0.0567
TL-210	20861	6.163E-002pCi/g	4.864E-002	4.851E-002	1.607E-001	7.843E-002	0.38	0.0486
U-235	281	-7.046E-003pCi/g	2.801E-001	2.801E-001	1.559E+000	7.744E-001	0.00	0.2801
Y-88	74	-2.679E-002pCi/g	3.451E-002	3.447E-002	7.939E-002	3.598E-002	-0.34	0.0345
ZN-65	31	0.000E+000pCi/g	5.246E-002	5.246E-002	4.458E-001	2.180E-001	0.00	0.0525
ZR-95	7	-4.438E-002pCi/g	9.905E-002	9.902E-002	2.154E-001	1.044E-001	-0.21	0.0990

Laboratory Control Sample Information

Sample ID	WRKNO	Analyte	Activity	StdAdded	Recovery	ZFactor
LCS 160-442120-2-A	LCS 160-442120-2-A	CS-137	2.678E+001 pCi/g	2.751E+001	97.29%	-0.5032
		CO-60	1.057E+001 pCi/g	1.116E+001	94.72%	-1.0238
		AM-241	9.641E+001 pCi/g	9.662E+001	99.78%	-0.0397

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Samp Activity	Dup Activity	RPD	RER	DER	Flag	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor	
MB 160-442120~1-A	MB	AC-228	5.038E-002	6.932E-002	0.7269	
MB 160-442120~1-A	MB	AG-108M	-2.019E-003	1.779E-002	-0.1135	
MB 160-442120~1-A	MB	AG-110M	1.355E-002	8.550E-003	1.5843	
MB 160-442120~1-A	MB	AM-241	8.122E-002	3.041E-002	2.6706	B
MB 160-442120~1-A	MB	BA-133	3.808E-002	3.757E-002	1.0134	
MB 160-442120~1-A	MB	BA-140	5.589E-002	6.413E-002	0.8716	
MB 160-442120~1-A	MB	BE-7	-2.362E-001	2.241E-001	-1.0541	
MB 160-442120~1-A	MB	BI-207	-3.482E-002	3.785E-002	-0.9199	
MB 160-442120~1-A	MB	BI-210M	2.544E-002	3.260E-002	0.7805	
MB 160-442120~1-A	MB	BI-212	-8.612E-002	2.928E-001	-0.2941	
MB 160-442120~1-A	MB	BI-214	5.043E-002	2.960E-002	1.7036	
MB 160-442120~1-A	MB	CD-109	0.000E+000	5.558E-002	0.0000	
MB 160-442120~1-A	MB	CD-113M	-2.718E+002	2.332E+002	-1.1655	
MB 160-442120~1-A	MB	CE-139	8.248E-003	1.261E-002	0.6540	
MB 160-442120~1-A	MB	CE-141	1.554E-002	2.028E-002	0.7666	
MB 160-442120~1-A	MB	CE-144	-8.111E-002	1.145E-001	-0.7084	
MB 160-442120~1-A	MB	CF-249	-1.188E-002	1.048E-002	-1.1341	
MB 160-442120~1-A	MB	CF-251	5.139E-002	5.501E-002	0.9341	
MB 160-442120~1-A	MB	CO-56	-2.889E-002	2.222E-002	-1.3004	
MB 160-442120~1-A	MB	CO-57	0.000E+000	3.364E-003	0.0000	
MB 160-442120~1-A	MB	CO-58	-3.584E-002	3.227E-002	-1.1107	
MB 160-442120~1-A	MB	CO-60	4.012E-002	1.616E-002	2.4828	
MB 160-442120~1-A	MB	CR-51	-1.270E-001	1.698E-001	-0.7477	
MB 160-442120~1-A	MB	CS-134	-1.612E-002	1.891E-002	-0.8523	
MB 160-442120~1-A	MB	CS-136	-3.609E-002	3.421E-002	-1.0549	
MB 160-442120~1-A	MB	CS-137	-1.037E-002	2.149E-002	-0.4826	
MB 160-442120~1-A	MB	EU-152	3.567E-002	4.750E-002	0.7510	
MB 160-442120~1-A	MB	EU-154	-2.863E-003	3.819E-003	-0.7496	
MB 160-442120~1-A	MB	EU-155	3.121E-002	5.034E-002	0.6200	
MB 160-442120~1-A	MB	FE-59	0.000E+000	1.408E-002	0.0000	
MB 160-442120~1-A	MB	GA-68	-3.205E-001	1.137E+000	-0.2819	
MB 160-442120~1-A	MB	GD-153	-8.809E-003	2.630E-002	-0.3350	
MB 160-442120~1-A	MB	HF-181	-7.435E-003	1.632E-002	-0.4555	
MB 160-442120~1-A	MB	HG-203	-3.647E-003	1.563E-002	-0.2334	
MB 160-442120~1-A	MB	I-131	1.087E-002	2.227E-002	0.4882	
MB 160-442120~1-A	MB	IR-192	1.725E-002	1.795E-002	0.9608	
MB 160-442120~1-A	MB	K-40	-3.512E-001	2.481E-001	-1.4153	
MB 160-442120~1-A	MB	KR-85	4.077E-001	7.276E+000	0.0560	
MB 160-442120~1-A	MB	LA-140	2.570E-002	3.839E-002	0.6695	
MB 160-442120~1-A	MB	MN-54	3.578E-002	1.805E-002	1.9827	
MB 160-442120~1-A	MB	NA-22	2.253E-002	1.014E-002	2.2222	
MB 160-442120~1-A	MB	NB-94	6.478E-003	2.167E-002	0.2990	
MB 160-442120~1-A	MB	NB-95	1.486E-002	1.298E-002	1.1450	
MB 160-442120~1-A	MB	ND-147	-6.652E-002	1.630E-001	-0.4081	
MB 160-442120~1-A	MB	NP-237	-6.577E-002	1.185E-001	-0.5549	
MB 160-442120~1-A	MB	NP-239	2.935E-002	4.639E-002	0.6326	
MB 160-442120~1-A	MB	PA-231	4.500E-001	7.725E-001	0.5825	
MB 160-442120~1-A	MB	PA-233	-3.527E-003	4.296E-003	-0.8211	
MB 160-442120~1-A	MB	PA-234	7.125E-002	2.403E-002	2.9648	B
MB 160-442120~1-A	MB	PA-234M	-3.788E-001	3.085E+000	-0.1228	
MB 160-442120~1-A	MB	PB-210	4.436E-001	4.168E-001	1.0644	

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MB 160-442120~1-A	MB	PB-212	2.139E-002	3.051E-002	0.7012
MB 160-442120~1-A	MB	PB-214	-8.911E-002	4.874E-002	-1.8281
MB 160-442120~1-A	MB	PM-144	-1.187E-002	2.398E-002	-0.4951
MB 160-442120~1-A	MB	PM-146	2.447E-002	2.423E-002	1.0103
MB 160-442120~1-A	MB	RH-106	1.992E-001	2.993E-001	0.6655
MB 160-442120~1-A	MB	RU-103	1.656E-002	1.646E-002	1.0059
MB 160-442120~1-A	MB	SB-124	0.000E+000	2.446E-003	0.0000
MB 160-442120~1-A	MB	SB-125	-2.440E-002	6.866E-002	-0.3554
MB 160-442120~1-A	MB	SC-46	3.218E-002	3.784E-002	0.8503
MB 160-442120~1-A	MB	SN-113	2.292E-002	3.145E-002	0.7289
MB 160-442120~1-A	MB	SN-126	-8.506E-002	1.236E-001	-0.6881
MB 160-442120~1-A	MB	TA-182	3.492E-002	3.263E-002	1.0702
MB 160-442120~1-A	MB	TC-99M	8.082E-003	1.222E-002	0.6612
MB 160-442120~1-A	MB	TH-227	9.868E-002	7.124E-002	1.3853
MB 160-442120~1-A	MB	TH-229	-1.062E-001	2.439E-001	-0.4355
MB 160-442120~1-A	MB	TH-234	3.187E-001	1.473E-001	2.1643
MB 160-442120~1-A	MB	TL-208	2.143E-002	2.075E-002	1.0326
MB 160-442120~1-A	MB	TL-210	0.000E+000	6.153E-003	0.0000
MB 160-442120~1-A	MB	U-235	0.000E+000	6.083E-002	0.0000
MB 160-442120~1-A	MB	Y-88	-8.251E-003	3.406E-002	-0.2423
MB 160-442120~1-A	MB	ZN-65	0.000E+000	1.591E-002	0.0000
MB 160-442120~1-A	MB	ZR-95	-5.364E-002	4.850E-002	-1.1060

eurofins

Environment Testing
TestAmerica

Analysis Report for Gamma Spectroscopy

Batch: 442823 **Operator:**

MQO

SampID	WRKNO	Aliquot	Sigma	Instrument	Detector	CountDateTime	CountDuration
LCS 160-442823~2-	LCS	341.90g	1.00	GammaVision	GV09	9 / 16 / 19 12:14	30

Analyte	Cmpndid	Activity	TotalUnc	CountUnc	MDA	MLCC	Act/MDA	
AC-228	11136	6.724E-001pCi/g	2.591E-001	2.568E-001	7.430E-001	3.570E-001	0.91	0.2591
AG-108M	10982	-1.190E-001pCi/g	9.958E-002	9.939E-002	2.499E-001	1.223E-001	-0.48	0.0996
AG-110M	10973	1.853E-001pCi/g	9.373E-002	9.325E-002	2.068E-001	9.777E-002	0.90	0.0937
AM-241	10818	9.548E+001pCi/g	5.008E+000	7.231E-001	1.000E+000	4.956E-001	95.46	5.0078
BA-133	10469	-1.290E-001pCi/g	1.142E-001	1.140E-001	3.776E-001	1.854E-001	-0.34	0.1142
BA-140	10463	1.955E-001pCi/g	2.786E-001	2.784E-001	6.644E-001	3.207E-001	0.29	0.2786
BE-7	10435	-9.489E-001pCi/g	9.176E-001	9.163E-001	3.134E+000	1.542E+000	-0.30	0.9176
BI-207	10195	2.664E-001pCi/g	1.265E-001	1.258E-001	2.603E-001	1.238E-001	1.02	0.1265
BI-210M	10173	1.661E-001pCi/g	1.132E-001	1.127E-001	3.306E-001	1.619E-001	0.50	0.1132
BI-212	10160	2.393E-001pCi/g	7.710E-001	7.709E-001	2.616E+000	1.261E+000	0.09	0.7710
BI-214	10154	7.373E-001pCi/g	1.497E-001	1.447E-001	3.057E-001	1.462E-001	2.41	0.1497
CD-109	9254	0.000E+000pCi/g	2.460E+000	2.460E+000	8.144E+000	4.041E+000	0.00	2.4597
CD-113M	17462	6.783E+002pCi/g	7.899E+002	7.887E+002	2.626E+003	1.285E+003	0.26	789.9314
CE-139	9241	1.721E-002pCi/g	5.608E-002	5.606E-002	1.873E-001	9.206E-002	0.09	0.0561
CE-141	9235	1.046E-001pCi/g	1.449E-001	1.448E-001	4.799E-001	2.375E-001	0.22	0.1449
CE-144	9221	-4.470E-001pCi/g	6.207E-001	6.203E-001	2.056E+000	1.017E+000	-0.22	0.6207
CF-249	9215	1.160E-001pCi/g	1.282E-001	1.280E-001	4.248E-001	2.090E-001	0.27	0.1282
CF-251	13690	5.206E-001pCi/g	2.747E-001	2.706E-001	6.761E-001	3.304E-001	0.77	0.2747
CO-56	8704	-8.547E-002pCi/g	1.448E-002	1.380E-002	2.127E-001	1.024E-001	-0.40	0.0145
CO-57	13694	2.886E-002pCi/g	4.356E-002	4.353E-002	1.450E-001	7.119E-002	0.20	0.0436
CO-58	8698	-9.765E-002pCi/g	7.729E-002	7.712E-002	2.558E-001	1.241E-001	-0.38	0.0773
CO-60	8692	1.060E+001pCi/g	5.540E-001	1.547E-001	9.301E-002	4.084E-002	113.91	0.5540
CR-51	8604	7.292E-001pCi/g	1.114E+000	1.113E+000	3.690E+000	1.826E+000	0.20	1.1135
CS-134	8553	7.654E-002pCi/g	7.075E-002	7.064E-002	2.642E-001	1.277E-001	0.29	0.0708
CS-136	8546	6.184E-002pCi/g	7.324E-002	7.315E-002	1.602E-001	7.624E-002	0.39	0.0732
CS-137	8539	2.673E+001pCi/g	1.418E+000	2.785E-001	1.324E-001	6.235E-002	201.85	1.4182
EU-152	7145	2.260E-001pCi/g	1.711E-001	1.706E-001	5.105E-001	2.513E-001	0.44	0.1711
EU-154	7138	2.733E-001pCi/g	2.123E-001	2.119E-001	3.313E-001	1.629E-001	0.82	0.2123
EU-155	7131	-7.752E-004pCi/g	8.424E-001	8.424E-001	9.424E-001	4.659E-001	0.00	0.8424
FE-59	7073	1.249E-001pCi/g	1.787E-001	1.786E-001	3.787E-001	1.808E-001	0.33	0.1787
GA-68	18005	3.556E+000pCi/g	3.616E+000	3.610E+000	7.614E+000	3.637E+000	0.47	3.6158
GD-153	6824	-1.813E-003pCi/g	3.058E-001	3.058E-001	1.015E+000	5.038E-001	0.00	0.3058
HF-181	6495	-5.114E-002pCi/g	3.197E-002	3.186E-002	4.147E-001	2.041E-001	-0.12	0.0320
HG-203	6486	0.000E+000pCi/g	4.588E-002	4.588E-002	2.137E-001	1.047E-001	0.00	0.0459
I-131	6380	-2.889E-002pCi/g	8.399E-002	8.398E-002	2.043E-001	9.955E-002	-0.14	0.0840
IR-192	6303	2.376E-002pCi/g	2.199E-002	2.194E-002	4.211E-001	2.083E-001	0.06	0.0220
K-40	6148	6.048E-001pCi/g	4.192E-001	4.181E-001	9.646E-001	4.251E-001	0.63	0.4192
KR-85	6111	1.568E+001pCi/g	1.702E+001	1.700E+001	5.656E+001	2.765E+001	0.28	17.0214
LA-140	6096	3.176E-002pCi/g	2.687E-002	2.682E-002	1.433E-001	6.478E-002	0.22	0.0269
MN-54	5382	8.473E-002pCi/g	7.587E-002	7.575E-002	1.653E-001	7.874E-002	0.51	0.0759
NA-22	5201	2.692E-002pCi/g	3.216E-002	3.213E-002	1.111E-001	5.008E-002	0.24	0.0322
NB-94	5160	5.878E-002pCi/g	6.815E-002	6.808E-002	2.277E-001	1.103E-001	0.26	0.0682
NB-95	5154	-4.254E-002pCi/g	6.355E-002	6.351E-002	2.136E-001	1.031E-001	-0.20	0.0636
ND-147	5083	6.142E-001pCi/g	5.324E-001	5.312E-001	1.235E+000	5.958E-001	0.50	0.5324
NP-237	4757	0.000E+000pCi/g	7.137E-001	7.137E-001	2.383E+000	1.173E+000	0.00	0.7137
NP-239	4751	2.218E-001pCi/g	2.468E-001	2.465E-001	8.166E-001	4.034E-001	0.27	0.2468
PA-231	4541	1.832E-007pCi/g	3.612E+000	3.612E+000	1.203E+001	5.951E+000	0.00	3.8123
PA-233	4535	-2.068E-001pCi/g	1.061E-001	1.055E-001	1.003E+000	4.961E-001	-0.21	0.1061
PA-234	4528	1.561E-001pCi/g	1.386E-001	1.383E-001	1.273E+000	6.304E-001	0.12	0.1386

			MQO					
PA-234M	19453	1.368E+001pCi/g	1.117E+001	1.115E+001	3.699E+001	1.796E+001	0.37	11.1677
PB-210	4467	7.468E+002pCi/g	4.435E+001	6.596E+000	1.224E+001	6.066E+000	61.01	44.3456
PB-212	4454	1.469E-001pCi/g	1.416E-001	1.412E-001	4.680E-001	2.303E-001	0.31	0.1416
PB-214	4448	3.138E-001pCi/g	1.033E-001	1.020E-001	3.489E-001	1.689E-001	0.90	0.1033
PM-144	19585	-7.643E-002pCi/g	6.127E-002	6.114E-002	2.031E-001	9.808E-002	-0.38	0.0613
PM-146	2464	-1.680E-001pCi/g	1.637E-001	1.635E-001	5.415E-001	2.669E-001	-0.31	0.1637
RA-226	1950	-6.088E-001pCi/g	1.720E+000	1.719E+000	4.352E+000	2.135E+000	-0.14	1.7203
RH-106	1882	-1.486E-002pCi/g	1.004E+000	1.004E+000	3.371E+000	1.654E+000	0.00	1.0040
RU-103	1828	-7.203E-002pCi/g	8.998E-002	8.990E-002	2.091E-001	1.016E-001	-0.34	0.0900
SB-124	1784	6.042E-002pCi/g	5.935E-002	5.926E-002	1.535E-001	6.235E-002	0.39	0.0594
SB-125	1777	6.502E-002pCi/g	8.889E-002	8.883E-002	6.829E-001	3.334E-001	0.10	0.0889
SC-46	1739	9.829E-002pCi/g	7.906E-002	7.890E-002	2.619E-001	1.268E-001	0.38	0.0791
SN-113	1570	1.196E-001pCi/g	1.325E-001	1.324E-001	4.393E-001	2.161E-001	0.27	0.1325
SN-126	17459	-1.363E+000pCi/g	3.097E+000	3.097E+000	1.023E+001	5.098E+000	-0.13	3.0975
TA-182	1301	9.317E-002pCi/g	1.172E-001	1.171E-001	4.631E-001	2.120E-001	0.20	0.1172
TC-99M	17412	9.948E-003pCi/g	8.246E-002	8.246E-002	2.742E-001	1.358E-001	0.04	0.0825
TH-227	1058	4.056E-001pCi/g	8.725E-001	8.721E-001	2.114E+000	1.033E+000	0.19	0.8725
TH-229	1046	2.328E-001pCi/g	1.336E+000	1.336E+000	3.238E+000	1.587E+000	0.07	1.3360
TH-234	1027	1.014E+000pCi/g	1.182E+000	1.181E+000	3.911E+000	1.935E+000	0.26	1.1823
TL-208	929	9.316E-002pCi/g	9.328E-002	9.316E-002	2.088E-001	1.009E-001	0.45	0.0933
TL-210	20861	-6.981E-002pCi/g	6.709E-002	6.697E-002	2.234E-001	1.079E-001	-0.31	0.0671
U-235	281	2.461E-001pCi/g	6.522E-001	6.520E-001	2.165E+000	1.072E+000	0.11	0.6522
Y-88	74	1.431E-002pCi/g	3.545E-002	3.544E-002	7.939E-002	3.227E-002	0.18	0.0355
ZN-65	31	2.116E-001pCi/g	1.817E-001	1.814E-001	6.031E-001	2.918E-001	0.35	0.1817
ZR-95	7	9.079E-002pCi/g	6.198E-002	6.180E-002	3.173E-001	1.520E-001	0.29	0.0620

Laboratory Control Sample Information

Sample ID	WRKNO	Analyte	Activity	StdAdded	Recovery	ZFactor
LCS 160-442823~2-A	LCS 160-442823~2-A	CS-137	2.678E+001 pCi/g	2.750E+001	97.19%	-0.5172
		CO-60	1.060E+001 pCi/g	1.115E+001	95.04%	-0.9417
		AM-241	9.548E+001 pCi/g	9.662E+001	98.82%	-0.2149

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Samp Activity	Dup Activity	RPD	RER	DER	Flag	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor	
MB 160-442823~1-A	MB	AC-228	-2.670E-001	1.221E-001	-2.1868	
MB 160-442823~1-A	MB	AG-108M	8.076E-003	2.308E-002	0.3499	
MB 160-442823~1-A	MB	AG-110M	2.302E-002	2.088E-002	1.1024	
MB 160-442823~1-A	MB	AM-241	-9.497E-003	4.616E-002	-0.2058	
MB 160-442823~1-A	MB	BA-133	2.048E-002	2.342E-002	0.8744	
MB 160-442823~1-A	MB	BA-140	-5.370E-002	1.253E-001	-0.4285	
MB 160-442823~1-A	MB	BE-7	4.138E-001	1.266E-001	3.2697	B
MB 160-442823~1-A	MB	BI-207	-3.668E-003	2.589E-002	-0.1417	
MB 160-442823~1-A	MB	BI-210M	-1.420E-002	3.524E-002	-0.4029	
MB 160-442823~1-A	MB	BI-212	-4.888E-002	4.215E-001	-0.1160	
MB 160-442823~1-A	MB	BI-214	-3.981E-002	6.986E-002	-0.5698	
MB 160-442823~1-A	MB	CD-109	1.223E-001	5.078E-001	0.2408	
MB 160-442823~1-A	MB	CD-113M	2.431E+002	2.488E+002	0.9773	
MB 160-442823~1-A	MB	CE-139	9.176E-003	1.152E-002	0.7962	
MB 160-442823~1-A	MB	CE-141	1.703E-002	1.988E-002	0.8563	
MB 160-442823~1-A	MB	CE-144	0.000E+000	3.266E-002	0.0000	
MB 160-442823~1-A	MB	CF-249	1.966E-002	3.165E-002	0.6213	
MB 160-442823~1-A	MB	CF-251	4.419E-002	7.716E-002	0.5727	
MB 160-442823~1-A	MB	CO-56	4.158E-002	1.830E-002	2.2722	
MB 160-442823~1-A	MB	CO-57	8.727E-003	1.124E-002	0.7767	
MB 160-442823~1-A	MB	CO-58	2.064E-002	2.951E-002	0.6997	
MB 160-442823~1-A	MB	CO-60	-6.800E-004	1.850E-003	-0.3677	
MB 160-442823~1-A	MB	CR-51	-5.597E-002	2.692E-001	-0.2079	
MB 160-442823~1-A	MB	CS-134	5.739E-002	2.362E-002	2.4301	
MB 160-442823~1-A	MB	CS-136	4.922E-003	1.775E-002	0.2773	
MB 160-442823~1-A	MB	CS-137	-1.613E-002	3.318E-002	-0.4862	
MB 160-442823~1-A	MB	EU-152	2.338E-001	7.497E-002	3.1193	B
MB 160-442823~1-A	MB	EU-154	-2.806E-002	3.302E-002	-0.8499	
MB 160-442823~1-A	MB	EU-155	2.834E-002	4.016E-002	0.7056	
MB 160-442823~1-A	MB	FE-59	7.038E-002	3.167E-002	2.2222	
MB 160-442823~1-A	MB	GA-68	2.782E-001	1.396E+000	0.1993	
MB 160-442823~1-A	MB	GD-153	-3.444E-002	4.289E-002	-0.8028	
MB 160-442823~1-A	MB	HF-181	-9.881E-003	1.492E-002	-0.6621	
MB 160-442823~1-A	MB	HG-203	1.554E-003	1.954E-002	0.0796	
MB 160-442823~1-A	MB	I-131	-3.610E-002	4.098E-002	-0.8810	
MB 160-442823~1-A	MB	IR-192	-4.305E-003	2.237E-002	-0.1924	
MB 160-442823~1-A	MB	K-40	-3.196E-001	3.711E-001	-0.8614	
MB 160-442823~1-A	MB	KR-85	-3.262E-001	9.021E+000	-0.0362	
MB 160-442823~1-A	MB	LA-140	5.449E-002	2.532E-002	2.1521	
MB 160-442823~1-A	MB	MN-54	2.105E-002	3.117E-002	0.6753	
MB 160-442823~1-A	MB	NA-22	4.506E-002	2.028E-002	2.2222	
MB 160-442823~1-A	MB	NB-94	-3.259E-002	3.136E-002	-1.0392	
MB 160-442823~1-A	MB	NB-95	3.923E-003	2.587E-002	0.1516	
MB 160-442823~1-A	MB	ND-147	-9.977E-002	2.329E-001	-0.4284	
MB 160-442823~1-A	MB	NP-237	5.696E-002	1.302E-001	0.4375	
MB 160-442823~1-A	MB	NP-239	1.829E-002	6.185E-002	0.2957	
MB 160-442823~1-A	MB	PA-231	5.165E-001	7.402E-001	0.6977	
MB 160-442823~1-A	MB	PA-233	5.654E-002	9.581E-002	0.5902	
MB 160-442823~1-A	MB	PA-234	5.529E-002	7.081E-002	0.7808	
MB 160-442823~1-A	MB	PA-234M	-3.788E-001	4.634E+000	-0.0817	
MB 160-442823~1-A	MB	PB-210	-5.436E-001	5.026E-001	-1.0817	

			MQO		
MB 160-442823~1-A	MB	PB-212	2.182E-002	5.574E-002	0.3915
MB 160-442823~1-A	MB	PB-214	-1.606E-002	2.120E-002	-0.7576
MB 160-442823~1-A	MB	PM-144	2.009E-002	2.556E-002	0.7861
MB 160-442823~1-A	MB	PM-146	0.000E+000	1.429E-002	0.0000
MB 160-442823~1-A	MB	RA-226	-8.911E-001	5.769E-001	-1.5448
MB 160-442823~1-A	MB	RH-106	-3.984E-001	5.691E-001	-0.7001
MB 160-442823~1-A	MB	RU-103	-1.800E-002	3.639E-002	-0.4947
MB 160-442823~1-A	MB	SB-124	-1.501E-002	3.062E-002	-0.4903
MB 160-442823~1-A	MB	SB-125	7.401E-002	1.104E-001	0.6704
MB 160-442823~1-A	MB	SC-46	0.000E+000	6.658E-003	0.0000
MB 160-442823~1-A	MB	SN-113	2.050E-002	3.589E-002	0.5713
MB 160-442823~1-A	MB	SN-126	-1.522E-001	2.089E-001	-0.7283
MB 160-442823~1-A	MB	TA-182	-2.146E-001	2.532E-001	-0.8474
MB 160-442823~1-A	MB	TC-99M	1.200E-002	8.068E-003	1.4873
MB 160-442823~1-A	MB	TH-227	5.859E-002	4.199E-002	1.3951
MB 160-442823~1-A	MB	TH-229	2.743E-001	2.554E-001	1.0741
MB 160-442823~1-A	MB	TH-234	4.142E-001	2.246E-001	1.8439
MB 160-442823~1-A	MB	TL-208	1.547E-002	2.050E-002	0.7547
MB 160-442823~1-A	MB	TL-210	2.520E-002	2.582E-002	0.9760
MB 160-442823~1-A	MB	U-235	-7.543E-003	1.229E-001	-0.0613
MB 160-442823~1-A	MB	Y-88	-2.074E-003	4.228E-002	-0.0491
MB 160-442823~1-A	MB	ZN-65	0.000E+000	3.183E-002	0.0000
MB 160-442823~1-A	MB	ZR-95	0.000E+000	1.068E-002	0.0000

Reagent

Tuna Can_00003

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404·352·8677
Fax 404·352·2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

90099

1.0 Liter Sand in 1 Liter Wide Mouth HDPE Silgan Jar

Customer: TestAmerica St. Louis / Earth City, MO
P.O. No.: 2454150, Item 1
Reference Date: 01-Jan-2012 12:00 PM EST **Grams of Master Source:** 0.017180

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Additional radionuclides were added gravimetrically from solutions calibrated by gamma-ray spectrometry, ionization chamber, or liquid scintillation counting. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Nuclide	Gamma-Ray Energy (keV)	Half-Life, Days	Master Source* γps/gram	This Source γps	Uncertainty*, % Type u_A	u_B	U	Calibration Method*
Pb-210	46.5	8.109E+03	———	3.094E+03	0.1	2.1	4.1	4π LS
Am-241	59.5	1.580E-05	———	2.037E+03	0.1	1.7	3.5	4π LS
Cd-109	88.0	4.626E-02	1.677E+05	2.881E+03	0.5	2.3	4.7	HPGe
Co-57	122.1	2.718E-02	8.795E+04	1.511E+03	0.4	2.0	4.1	HPGe
Ce-139	165.9	1.376E+02	1.245E+05	2.139E+03	0.4	1.9	3.9	HPGe
Hg-203	279.2	4.661E+01	2.707E+05	4.651E+03	0.3	1.9	3.8	HPGe
Sn-113	391.7	1.151E+02	1.755E+05	3.015E+03	0.4	1.9	3.9	HPGe
Cs-137	661.7	1.098E+04	1.128E+05	1.938E+03	0.7	1.9	4.0	HPGe
Y-88	898.0	1.066E+02	4.228E+05	7.264E+03	0.5	1.9	3.9	HPGe
Co-60	1173.2	1.925E+03	2.084E+05	3.580E+03	0.6	1.9	4.0	HPGe
Co-60	1332.5	1.925E+03	2.084E+05	3.581E+03	0.7	1.9	4.0	HPGe
Y-88	1836.1	1.066E+02	4.476E+05	7.690E+03	0.7	1.9	4.0	HPGe

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

Calibration Methods: 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

(Certificate continued on reverse side)

Comments:
1550 grams of sand. Homogenous down to 10 grams aliquot.
This standard will expire one year after the reference date.

Source Prepared by: _____
Z. Dimitrova, Radiochemist

QA Approved: _____ Date: 30 JAN 12
J.D. McCorvey, Counting Room Manager

Reagent

Tuna Can_00006

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404·352·8677
Fax 404·352·2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

83814-334

1.0 Liter Sand in 1 Liter Wide Mouth HDPE Silgan Jar

Customer: Test America St. Louis
P.O. No.: 2395112, Item 1
Reference Date: 01-Jan-2011 12:00 PM EST **Grams of Master Source:** 0.016927

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Nuclide	Gamma-Ray Energy (keV)	Half-Life, Days	Master Source* γps/gram	This Source γps	Uncertainty, % Type u_A	u_B	U	Calibration Method
Pb-210	46.5	8.120E+03	———	3.021E+03	0.1	2.1	4.1	4π LS
Am-241	59.5	1.580E+05	———	2.090E+03	0.1	1.7	3.5	4π LS
Cd-109	88.0	4.626E+02	1.697E+05	2.873E+03	0.8	2.3	4.9	HPGe
Co-57	122.1	2.718E+02	8.711E+04	1.475E+03	0.5	2.0	4.1	HPGe
Ce-139	165.9	1.376E+02	1.247E+05	2.111E+03	0.5	1.9	3.9	HPGe
Hg-203	279.2	4.661E+01	2.753E+05	4.660E+03	0.4	1.9	3.9	HPGe
Sn-113	391.7	1.151E+02	1.769E+05	2.994E+03	0.5	1.9	3.9	HPGe
Cs-137	661.7	1.098E+04	1.109E+05	1.877E+03	0.7	1.9	4.0	HPGe
Y-88	898.0	1.066E+02	4.224E+05	7.150E+03	0.5	1.9	3.9	HPGe
Co-60	1173.2	1.925E+03	2.142E+05	3.626E+03	0.6	1.9	4.0	HPGe
Co-60	1332.5	1.925E+03	2.143E+05	3.627E+03	0.6	1.9	4.0	HPGe
Y-88	1836.1	1.066E+02	4.472E+05	7.570E+03	0.5	1.9	3.9	HPGe

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

Calibration Methods: 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

(Certificate continued on reverse side)

Comments:
1550 grams of sand. Homogeneous down to 10 gram aliquot.
This standard will expire one year after the reference date.

Source Prepared by: _____
Z. Dimitrova, Radiochemist

QA Approved: _____ Date: 2/11/11
J. D. McCorvey, QA Manager Alternate