

ANALYTICAL REPORT

Job Number: 160-18426-1

Job Description: EA and Cabrera - Hill AFB WR111

For:

EA Engineering, Science, and Technology
7995 E. Prentice Ave, Suite 206E
Greenwood Village, CO 80111

Attention: Pamela J Moss



Approved for release.
Jessica H DeHerrera
Project Manager I
8/29/2016 1:02 PM

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08/29/2016

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

The Lab Certification ID# is 4025.

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

TestAmerica Laboratories, Inc.

TestAmerica St. Louis 13715 Rider Trail North, Earth City, MO 63045
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Definitions/Glossary

Client: EA Engineering, Science, and Technology
Project/Site: EA and Cabrera - Hill AFB WR111

TestAmerica Job ID: 160-18426-1

Qualifiers

Rad

Qualifier	Qualifier Description
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	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, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
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
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)

CASE NARRATIVE

Client: EA Engineering, Science, and Technology

Project: EA and Cabrera - Hill AFB WR111

Report Number: 160-18426-1

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

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

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

RECEIPT

The samples were received on 08/01/2016; the samples arrived in good. The temperature of the coolers at receipt was 19.0 C. Thermal preservation is not required for the requested analyses; therefore, the laboratory will proceed with the requested analyses. Corrective action is deemed unnecessary. The client was notified on 8/1/16.

RADIUM-226 & OTHER GAMMA EMITTERS (GS)

Samples WR111-SP-019-C-P-00 (160-18426-1), WR111-SP-020-C-P-00 (160-18426-2) and WR111-SP-021-C-P-00 (160-18426-3) were analyzed for Radium-226 & Other Gamma Emitters (GS) in accordance with EPA 901.1. The samples were leached on 08/01/2016, prepared on 08/04/2016 and analyzed on 08/25/2016.

Americium-241 and Cesium-137 exceeded the RPD limit for the duplicate of sample WR111-SP-019-C-P-00DU (160-18426-1). Refer to the QC report for details.

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

Isotopic Thorium-230/232 (Alpha Spectrometry)

Samples WR111-SP-019-C-P-00 (160-18426-1), WR111-SP-020-C-P-00 (160-18426-2) and WR111-SP-021-C-P-00 (160-18426-3) were analyzed for Isotopic Thorium-230/232 (Alpha Spectrometry). The samples were leached on 08/01/2016, prepared on 08/12/2016 and analyzed on 08/25/2016.

Thorium prep batch 160-264618: The following sample(s) could not be thoroughly homogenized before sub-sampling was performed due to sample matrix: WR111-SP-019-C-P-00 (160-18426-1), WR111-SP-020-C-P-00 (160-18426-2), WR111-SP-021-C-P-00 (160-18426-3) and (160-18426-A-1-A DU). The samples contained rocks.

Thorium-230 was detected in method blank MB 160-264618/1-A at a level that was above the method detection limit but below the reporting limit. The value should be considered an estimate. If the associated sample reported a result above the RL, the result has been flagged.

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

Detection Summary

Client: EA Engineering, Science, and Technology
Project/Site: EA and Cabrera - Hill AFB WR111

TestAmerica Job ID: 160-18426-1

Client Sample ID: WR111-SP-019-C-P-00

Lab Sample ID: 160-18426-1

No Detections.

Client Sample ID: WR111-SP-020-C-P-00

Lab Sample ID: 160-18426-2

No Detections.

Client Sample ID: WR111-SP-021-C-P-00

Lab Sample ID: 160-18426-3

No Detections.

This Detection Summary does not include radiochemical test results.

TestAmerica St. Louis

Client Sample Results

Client: EA Engineering, Science, and Technology
 Project/Site: EA and Cabrera - Hill AFB WR111

TestAmerica Job ID: 160-18426-1

Client Sample ID: WR111-SP-019-C-P-00

Lab Sample ID: 160-18426-1

Date Collected: 07/29/16 12:00

Matrix: Solid

Date Received: 08/01/16 08:25

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	1.74		0.264	0.320	0.500	0.170	pCi/g	08/04/16 15:01	08/25/16 09:46	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-230	1.62		0.200	0.241	0.100	0.0438	pCi/g	08/12/16 10:25	08/25/16 20:44	1
Thorium-232	1.99		0.220	0.277	0.100	0.0337	pCi/g	08/12/16 10:25	08/25/16 20:44	1
<i>Tracer</i>	<i>%Yield</i>	<i>Qualifier</i>	<i>Limits</i>					<i>Prepared</i>	<i>Analyzed</i>	<i>Dil Fac</i>
Thorium-229	75.1		30 - 110					08/12/16 10:25	08/25/16 20:44	1

Client Sample ID: WR111-SP-020-C-P-00

Lab Sample ID: 160-18426-2

Date Collected: 07/29/16 12:20

Matrix: Solid

Date Received: 08/01/16 08:25

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	1.21		0.244	0.274	0.500	0.200	pCi/g	08/04/16 15:01	08/25/16 09:50	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-230	1.01		0.144	0.168	0.100	0.0154	pCi/g	08/12/16 10:25	08/25/16 20:44	1
Thorium-232	1.18		0.156	0.184	0.100	0.0337	pCi/g	08/12/16 10:25	08/25/16 20:44	1
<i>Tracer</i>	<i>%Yield</i>	<i>Qualifier</i>	<i>Limits</i>					<i>Prepared</i>	<i>Analyzed</i>	<i>Dil Fac</i>
Thorium-229	85.4		30 - 110					08/12/16 10:25	08/25/16 20:44	1

Client Sample ID: WR111-SP-021-C-P-00

Lab Sample ID: 160-18426-3

Date Collected: 07/29/16 12:30

Matrix: Solid

Date Received: 08/01/16 08:25

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	1.21		0.183	0.222	0.500	0.138	pCi/g	08/04/16 15:01	08/25/16 09:52	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-230	0.904		0.139	0.159	0.100	0.0296	pCi/g	08/12/16 10:25	08/25/16 20:44	1
Thorium-232	2.08		0.211	0.274	0.100	0.0295	pCi/g	08/12/16 10:25	08/25/16 20:44	1

Client Sample Results

Client: EA Engineering, Science, and Technology
Project/Site: EA and Cabrera - Hill AFB WR111

TestAmerica Job ID: 160-18426-1

Client Sample ID: WR111-SP-021-C-P-00

Date Collected: 07/29/16 12:30

Date Received: 08/01/16 08:25

Lab Sample ID: 160-18426-3

Matrix: Solid

<i>Tracer</i>	<i>%Yield</i>	<i>Qualifier</i>	<i>Limits</i>	<i>Prepared</i>	<i>Analyzed</i>	<i>Dil Fac</i>
<i>Thorium-229</i>	<i>83.1</i>		<i>30 - 110</i>	<i>08/12/16 10:25</i>	<i>08/25/16 20:44</i>	<i>1</i>

Tracer/Carrier Summary

Client: EA Engineering, Science, and Technology
Project/Site: EA and Cabrera - Hill AFB WR111

TestAmerica Job ID: 160-18426-1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Matrix: Solid

Prep Type: Total/NA

Lab Sample ID	Client Sample ID	Percent Yield (Acceptance Limits)	
		Th-229 (30-110)	
160-18426-1	WR111-SP-019-C-P-00	75.1	
160-18426-1 DU	WR111-SP-019-C-P-00	83.7	
160-18426-2	WR111-SP-020-C-P-00	85.4	
160-18426-3	WR111-SP-021-C-P-00	83.1	
LCS 160-264618/2-A	Lab Control Sample	86.2	
MB 160-264618/1-A	Method Blank	92.0	

Tracer/Carrier Legend

Th-229 = Thorium-229

QC Sample Results

Client: EA Engineering, Science, and Technology
 Project/Site: EA and Cabrera - Hill AFB WR111

TestAmerica Job ID: 160-18426-1

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

Lab Sample ID: MB 160-263537/1-A
Matrix: Solid
Analysis Batch: 266525

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 263537

Analyte	MB MB		Count	Total	LOQ	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Radium-226	-0.1257	U	0.0690	0.0702	0.500	0.356	pCi/g	08/04/16 15:01	08/25/16 10:26	1

Lab Sample ID: LCS 160-263537/2-A
Matrix: Solid
Analysis Batch: 266452

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 263537

Analyte	Spike Added	LCS Result	LCS Qual	Total	LOQ	MDC	Unit	%Rec	%Rec.
				Uncert. (2σ+/-)					Limits
Americium-241	97.1	93.95		9.84		1.00	pCi/g	97	87 - 116
Cesium-137	29.5	29.26		3.12		0.256	pCi/g	99	87 - 120
Cobalt-60	16.7	16.27		1.68		0.0356	pCi/g	98	87 - 115

Lab Sample ID: 160-18426-1 DU
Matrix: Solid
Analysis Batch: 266526

Client Sample ID: WR111-SP-019-C-P-00
Prep Type: Total/NA
Prep Batch: 263537

Analyte	Sample Sample		DU DU		Total	LOQ	MDC	Unit	RER	RER
	Result	Qual	Result	Qual	Uncert. (2σ+/-)					Limit
Radium-226	1.74		1.793		0.323	0.500	0.176	pCi/g	0.09	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Lab Sample ID: MB 160-264618/1-A
Matrix: Solid
Analysis Batch: 266596

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 264618

Analyte	MB MB		Count	Total	LOQ	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Thorium-230	0.08361		0.0417	0.0423	0.100	0.0278	pCi/g	08/12/16 10:25	08/25/16 20:44	1
Thorium-232	-0.001252	U	0.0123	0.0124	0.100	0.0369	pCi/g	08/12/16 10:25	08/25/16 20:44	1

Tracer	MB MB		Limits	Prepared	Analyzed	Dil Fac
	%Yield	Qualifier				
Thorium-229	92.0		30 - 110	08/12/16 10:25	08/25/16 20:44	1

Lab Sample ID: LCS 160-264618/2-A
Matrix: Solid
Analysis Batch: 266597

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 264618

Analyte	Spike Added	LCS Result	LCS Qual	Total	LOQ	MDC	Unit	%Rec	%Rec.
				Uncert. (2σ+/-)					Limits
Thorium-230	24.5	24.85		2.31	0.100	0.0663	pCi/g	101	81 - 118

Tracer	LCS LCS		Limits
	%Yield	Qualifier	
Thorium-229	86.2		30 - 110

QC Sample Results

Client: EA Engineering, Science, and Technology
 Project/Site: EA and Cabrera - Hill AFB WR111

TestAmerica Job ID: 160-18426-1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry) (Continued)

Lab Sample ID: 160-18426-1 DU
Matrix: Solid
Analysis Batch: 266600

Client Sample ID: WR111-SP-019-C-P-00
Prep Type: Total/NA
Prep Batch: 264618

Analyte	Sample	Sample	DU	DU	Total	LOQ	MDC	Unit	RER	Limit
	Result	Qual	Result	Qual	Uncert. (2σ+/-)					
Thorium-230	1.62		1.634		0.231	0.100	0.0293	pCi/g	0.04	1
Thorium-232	1.99		1.996		0.265	0.100	0.0158	pCi/g	0.01	1
Tracer	DU	DU	%Yield	Qualifier	Limits					
Thorium-229	83.7				30 - 110					

QC Association Summary

Client: EA Engineering, Science, and Technology
Project/Site: EA and Cabrera - Hill AFB WR111

TestAmerica Job ID: 160-18426-1

Rad

Leach Batch: 262882

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-18426-1	WR111-SP-019-C-P-00	Total/NA	Solid	Dry and Grind	
160-18426-2	WR111-SP-020-C-P-00	Total/NA	Solid	Dry and Grind	
160-18426-3	WR111-SP-021-C-P-00	Total/NA	Solid	Dry and Grind	
160-18426-1 DU	WR111-SP-019-C-P-00	Total/NA	Solid	Dry and Grind	

Prep Batch: 263537

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-18426-1	WR111-SP-019-C-P-00	Total/NA	Solid	Fill_Geo-21	262882
160-18426-2	WR111-SP-020-C-P-00	Total/NA	Solid	Fill_Geo-21	262882
160-18426-3	WR111-SP-021-C-P-00	Total/NA	Solid	Fill_Geo-21	262882
MB 160-263537/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-263537/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
160-18426-1 DU	WR111-SP-019-C-P-00	Total/NA	Solid	Fill_Geo-21	262882

Prep Batch: 264618

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-18426-1	WR111-SP-019-C-P-00	Total/NA	Solid	ExtChrom	262882
160-18426-2	WR111-SP-020-C-P-00	Total/NA	Solid	ExtChrom	262882
160-18426-3	WR111-SP-021-C-P-00	Total/NA	Solid	ExtChrom	262882
MB 160-264618/1-A	Method Blank	Total/NA	Solid	ExtChrom	
LCS 160-264618/2-A	Lab Control Sample	Total/NA	Solid	ExtChrom	
160-18426-1 DU	WR111-SP-019-C-P-00	Total/NA	Solid	ExtChrom	262882

Lab Chronicle

Client: EA Engineering, Science, and Technology
Project/Site: EA and Cabrera - Hill AFB WR111

TestAmerica Job ID: 160-18426-1

Client Sample ID: WR111-SP-019-C-P-00

Date Collected: 07/29/16 12:00

Date Received: 08/01/16 08:25

Lab Sample ID: 160-18426-1

Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Leach	Dry and Grind			262882	08/01/16 14:43	DRO	TAL SL
Total/NA	Prep	Fill_Geo-21			263537	08/04/16 15:01	R1S	TAL SL
Total/NA	Analysis	901.1		1	266451	08/25/16 09:46	RTM	TAL SL
Total/NA	Leach	Dry and Grind			262882	08/01/16 14:43	DRO	TAL SL
Total/NA	Prep	ExtChrom			264618	08/12/16 10:25	ATS	TAL SL
Total/NA	Analysis	A-01-R		1	266598	08/25/16 20:44	ALD	TAL SL

Client Sample ID: WR111-SP-020-C-P-00

Date Collected: 07/29/16 12:20

Date Received: 08/01/16 08:25

Lab Sample ID: 160-18426-2

Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Leach	Dry and Grind			262882	08/01/16 14:43	DRO	TAL SL
Total/NA	Prep	Fill_Geo-21			263537	08/04/16 15:01	R1S	TAL SL
Total/NA	Analysis	901.1		1	266526	08/25/16 09:50	RTM	TAL SL
Total/NA	Leach	Dry and Grind			262882	08/01/16 14:43	DRO	TAL SL
Total/NA	Prep	ExtChrom			264618	08/12/16 10:25	ATS	TAL SL
Total/NA	Analysis	A-01-R		1	266601	08/25/16 20:44	ALD	TAL SL

Client Sample ID: WR111-SP-021-C-P-00

Date Collected: 07/29/16 12:30

Date Received: 08/01/16 08:25

Lab Sample ID: 160-18426-3

Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Leach	Dry and Grind			262882	08/01/16 14:43	DRO	TAL SL
Total/NA	Prep	Fill_Geo-21			263537	08/04/16 15:01	R1S	TAL SL
Total/NA	Analysis	901.1		1	266525	08/25/16 09:52	RTM	TAL SL
Total/NA	Leach	Dry and Grind			262882	08/01/16 14:43	DRO	TAL SL
Total/NA	Prep	ExtChrom			264618	08/12/16 10:25	ATS	TAL SL
Total/NA	Analysis	A-01-R		1	266602	08/25/16 20:44	ALD	TAL SL

Laboratory References:

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

Certification Summary

Client: EA Engineering, Science, and Technology
 Project/Site: EA and Cabrera - Hill AFB WR111

TestAmerica Job ID: 160-18426-1

Laboratory: TestAmerica St. Louis

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
Alaska	State Program	10	MO00054	06-30-17
California	State Program	9	2886	03-31-18
Connecticut	State Program	1	PH-0241	03-31-17
Florida	NELAP	4	E87689	06-30-17
Illinois	NELAP	5	003757	11-30-16
Iowa	State Program	7	373	12-01-16
Kansas	NELAP	7	E-10236	07-31-16 *
Kentucky (DW)	State Program	4	90125	12-31-16
L-A-B	DoD ELAP		L2305	04-06-19
Louisiana	NELAP	6	04080	06-30-17
Louisiana (DW)	NELAP	6	LA160008	12-31-16
Maryland	State Program	3	310	09-30-17
Missouri	State Program	7	780	06-30-17
Nevada	State Program	9	MO000542016-1	07-31-17
New Jersey	NELAP	2	MO002	06-30-17
New York	NELAP	2	11616	03-31-17
North Dakota	State Program	8	R207	06-30-17
NRC	NRC		24-24817-01	12-31-22
Oklahoma	State Program	6	9997	08-31-16 *
Pennsylvania	NELAP	3	68-00540	02-28-17 *
South Carolina	State Program	4	85002001	06-30-16 *
Texas	NELAP	6	T104704193-15-9	07-31-17
USDA	Federal		P330-07-00122	01-09-17
Utah	NELAP	8	MO000542016-8	07-31-17
Virginia	NELAP	3	460230	06-14-17
Washington	State Program	10	C592	08-30-17
West Virginia DEP	State Program	3	381	08-31-16 *

Laboratory: TestAmerica Denver

The certifications listed below are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
A2LA	DoD ELAP		2907.01	10-31-17
Utah	NELAP	8	CO00026	07-31-16 *

* Certification renewal pending - certification considered valid.

Method Summary

Client: EA Engineering, Science, and Technology
Project/Site: EA and Cabrera - Hill AFB WR111

TestAmerica Job ID: 160-18426-1

Method	Method Description	Protocol	Laboratory
901.1	Radium-226 & Other Gamma Emitters (GS)	EPA	TAL SL
A-01-R	Isotopic Thorium (Alpha Spectrometry)	DOE	TAL SL

Protocol References:

DOE = U.S. Department of Energy

EPA = US Environmental Protection Agency

Laboratory References:

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

Sample Summary

Client: EA Engineering, Science, and Technology
Project/Site: EA and Cabrera - Hill AFB WR111

TestAmerica Job ID: 160-18426-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-18426-1	WR111-SP-019-C-P-00	Solid	07/29/16 12:00	08/01/16 08:25
160-18426-2	WR111-SP-020-C-P-00	Solid	07/29/16 12:20	08/01/16 08:25
160-18426-3	WR111-SP-021-C-P-00	Solid	07/29/16 12:30	08/01/16 08:25

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica St. Louis

Job No.: 160-18426-1

SDG No.: _____

Reagent ID	Exp Date	Prep Date	Dilutant Used	Reagent Final Volume	Parent Reagent		Analyte	Concentration
					Reagent ID	Volume Added		
82232-334_00001	06/03/60		Eckert & Ziegler, Lot 82232-334		(Purchased Reagent)		Americium-241	7.281 Bq
							Pu-239	7.137 Bq
							Thorium-230	7.63 Bq
82233-334_00001	06/03/60		Eckert & Zigler, Lot 82233-334		(Purchased Reagent)		Americium-241	5.114 Bq
							Pu-239	6.064 Bq
							Thorium-230	4.95 Bq
82234-334_00001	06/02/60		Eckert & Zigler, Lot 82234-334		(Purchased Reagent)		Americium-241	5.652 Bq
							Pu-239	5.936 Bq
							Thorium-230	5.685 Bq
82235-334_00001	06/04/60		Eckert & Ziegler, Lot 82235-334		(Purchased Reagent)		Americium-241	7.466 Bq
							Pu-239	6.897 Bq
							Thorium-230	7.167 Bq
82237-334_00003	06/01/60		Eckert & Ziegler, Lot 82237-334		(Purchased Reagent)		Americium-241	5.608 Bq
							Pu-239	6.424 Bq
							Thorium-230	5.856 Bq
82240-334_00001	06/08/60		Eckert & Ziegler, Lot 82240-334		(Purchased Reagent)		Americium-241	8.298 Bq
							Pu-239	7.163 Bq
							Thorium-230	6.304 Bq
82241-334_00001	06/08/60		Eckert & Ziegler, Lot 82241-334		(Purchased Reagent)		Americium-241	6.638 Bq
							Pu-239	6.797 Bq
							Thorium-230	6.629 Bq
82242-334_00001	06/08/60		Eckert & Ziegler, Lot 82242-334		(Purchased Reagent)		Americium-241	7.145 Bq
							Pu-239	6.414 Bq
							Thorium-230	6.583 Bq
82243-334_00001	06/09/60		Eckert & Ziegler, Lot 82243-334		(Purchased Reagent)		Americium-241	6.39 Bq
							Pu-239	5.979 Bq
							Thorium-230	5.856 Bq
82244-334_00001	06/09/60		Eckert & Zigler, Lot 82244-334		(Purchased Reagent)		Americium-241	6.897 Bq
							Pu-239	6.717 Bq
							Thorium-230	7.352 Bq
82245-334_00001	06/09/60		Eckert & Ziegler, Lot 82245-334		(Purchased Reagent)		Americium-241	5.528 Bq
							Pu-239	5.437 Bq
							Thorium-230	6.727 Bq
82247-334_00001	06/10/60		Eckert & Ziegler, Lot 82247-334		(Purchased Reagent)		Americium-241	6.291 Bq
							Pu-239	5.746 Bq
							Thorium-230	6.251 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
							Cesium-137	3729.6 Bq
							Co-57	2951.3 Bq
							Cobalt-60	6200.2 Bq
							Hg-203	9699.6 Bq

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica St. Louis Job No.: 160-18426-1

SDG No.: _____

Reagent ID	Exp Date	Prep Date	Dilutant Used	Reagent Final Volume	Parent Reagent		Analyte	Concentration
					Reagent ID	Volume Added		
							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 G_00001	01/01/61	01/01/11	water, Lot 83725-334	10 mL	Gamma Ampuole_00003	1.8639 g	Americium-241	1693.09 Bq
							Cd-109	24592.1 Bq
							Ce-139	816.481 Bq
							Cesium-137	681.815 Bq
							Co-57	532.386 Bq
							Cobalt-60	1120.87 Bq
							Hg-203	1766.08 Bq
							Sn-113	1445.98 Bq
							Y-88	2359.21 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
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

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica St. Louis Job No.: 160-18426-1

SDG No.: _____

Reagent ID	Exp Date	Prep Date	Dilutant Used	Reagent Final Volume	Parent Reagent		Analyte	Concentration
					Reagent ID	Volume Added		
Th-229_00021	08/01/17	07/20/16	0.1M HNO3, Lot n/a	500 mL	Th-229_00017	15 mL	At-217	67.2296 dpm/mL
							Thorium-229	67.2296 dpm/mL
.Th-229_00017	08/01/17	08/20/14	0.1M HNO3, Lot n/a	100 mL	Th-229_00016	5.0464 g	At-217	2240.99 dpm/mL
							Thorium-229	2240.99 dpm/mL
..Th-229_00016	08/06/64	Analytics, Lot 97790			(Purchased Reagent)		At-217	740.127 Bq/g
		Thorium-229		740.127 Bq/g				
TRM-2_00001	03/20/50	DOE, Lot TRM-2			(Purchased Reagent)		Pb-210	22.1 pCi/g
		Radium-226		25.4 pCi/g				
		Thorium-230		24.5 pCi/g				
		U-234		6.2 pCi/g				
		U-238		6 pCi/g				
Tuna Can LCS_00005	10/29/16	Analytics, Lot 74139-334			(Purchased Reagent)		Americium-241	219 dpm/g
		Cesium-137		82.3 dpm/g				
		Cobalt-60		136 dpm/g				
Tuna Can_00002	02/03/15	Eckert & Ziegler, Lot 81427-334			(Purchased Reagent)		Americium-241	1164 Bq
		Cd-109		16063 Bq				
		Ce-139		546 Bq				
		Cesium-137		465 Bq				
		Co-57		357 Bq				
		Cobalt-60		742 Bq				
		Hg-203		1208 Bq				
		Pb-210		15186 Bq				
		Sn-113		943 Bq				
		Y-88		1571 Bq				
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				
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				

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica St. Louis Job No.: 160-18426-1

SDG No.: _____

Reagent ID	Exp Date	Prep Date	Dilutant Used	Reagent Final Volume	Parent Reagent		Analyte	Concentration
					Reagent ID	Volume Added		
							Y-88	1568 Bq

ALPHA SPECTROSCOPY

Method A-01-R Th

Isotopic Thorium (Alpha
Spectrometry) by Method A-01-R

Prep Batch: 264618

Preparation, Extraction
Chromatography Resin Actinide
Separation

Alpha Spectroscopy Analysis Detail Report

Prep Batch: 264618

Lab ID: MB 160-264618/1-A
 Client ID:
 Sigma: 2

Analyzed: 08/25/16 20:44
 Detector: AV200
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: No
 Ts: 400

Analyte	MB Result	Count Unc	Total Unc	Qualifier	Unit	LOQ	MDC	Anly Batch	
Thorium-230	0.08361	0.0417	0.0423		pCi/g	0.100	0.0278	266596	
Thorium-232	-0.001252	0.0123	0.0124	U	pCi/g	0.100	0.0369	266596	
Tracer	MB Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Thorium-229	2.785	0.228	0.326		pCi/g	0.0373	3.03	92.0	30 - 110

Lab ID: LCS 160-264618/2-A
 Client ID:
 Sigma: 2

Analyzed: 08/25/16 20:44
 Detector: AV203
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: No
 Ts: 400

Analyte	LCS Result	Count Unc	Total Unc	Qualifier	Unit	LOQ	MDC	Anly Batch	
Thorium-230	24.85	1.00	2.31		pCi/g	0.100	0.0663	266597	
Tracer	LCS Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Thorium-229	5.224	0.427	0.612		pCi/g	0.0571	6.06	86.2	30 - 110

Lab ID: 160-18426-1
 Client ID: WR111-SP-019-C-P-00
 Sigma: 2

Analyzed: 08/25/16 20:44
 Detector: AV206
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: No
 Ts: 400

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	LOQ	MDC	Anly Batch	
Thorium-230	1.62	0.200	0.241		pCi/g	0.100	0.0438	266598	
Thorium-232	1.99	0.220	0.277		pCi/g	0.100	0.0337	266598	
Tracer	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Thorium-229	2.27	0.205	0.280		pCi/g	0.0398	3.03	75.1	30 - 110

Lab ID: 160-18426-1 DU
 Client ID: WR111-SP-019-C-P-00
 Sigma: 2

Analyzed: 08/25/16 20:44
 Detector: AV208
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: No
 Ts: 400

Analyte	DU Result	Count Unc	Total Unc	Qualifier	Unit	LOQ	MDC	Anly Batch	
Thorium-230	1.634	0.186	0.231		pCi/g	0.100	0.0293	266600	
Thorium-232	1.996	0.205	0.265		pCi/g	0.100	0.0158	266600	
Tracer	DU Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Thorium-229	2.536	0.212	0.301		pCi/g	0.0291	3.03	83.7	30 - 110

Alpha Spectroscopy Analysis Detail Report

Prep Batch: 264618

Lab ID: 160-18426-2
 Client ID: WR111-SP-020-C-P-00
 Sigma: 2

Analyzed: 08/25/16 20:44
 Detector: AV209
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: No
 Ts: 400

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	LOQ	MDC	Anly Batch	
Thorium-230	1.01	0.144	0.168		pCi/g	0.100	0.0154	266601	
Thorium-232	1.18	0.156	0.184		pCi/g	0.100	0.0337	266601	
Tracer	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Thorium-229	2.59	0.213	0.304		pCi/g	0.0243	3.03	85.4	30 - 110

Lab ID: 160-18426-3
 Client ID: WR111-SP-021-C-P-00
 Sigma: 2

Analyzed: 08/25/16 20:44
 Detector: AV210
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: No
 Ts: 400

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	LOQ	MDC	Anly Batch	
Thorium-230	0.904	0.139	0.159		pCi/g	0.100	0.0296	266602	
Thorium-232	2.08	0.211	0.274		pCi/g	0.100	0.0295	266602	
Tracer	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Thorium-229	2.52	0.212	0.299		pCi/g	0.0134	3.03	83.1	30 - 110

Quality Control Summary

Method Blank ID:	Analyte	Parent Result	Spike Added	MB Result	Qualifier	Unit	% Rec	% Rec Limits	RPD	RER	DER	RER Limit	Z Factor
MB 160-264618/1-A	Thorium-230			0.08361		pCi/g							3.950022
MB 160-264618/1-A	Thorium-232			-0.001252	U	pCi/g							-.2027138
													7
Lab Control Sample ID:	Analyte	Parent Result	Spike Added	LCS Result	Qualifier	Unit	% Rec	% Rec Limits	RPD	RER	DER	RER Limit	Z Factor
LCS 160-264618/2-A	Thorium-230		24.5	24.85		pCi/g	101	81 - 118					.2149116
													759
Duplicate ID:	Analyte	Parent Result	Spike Added	DU Result	Qualifier	Unit	% Rec	% Rec Limits	RPD	RER	DER	RER Limit	Z Factor
160-18426-1	Thorium-230	1.62		1.634		pCi/g			1	0.04	0.1	1	
160-18426-1	Thorium-232	1.99		1.996		pCi/g			0.4	0.01	0.04	1	

Glossary:
 Ts = Count Duration, Sample

ALPHA SPECTROSCOPY BATCH WORKSHEET

Lab Name: TestAmerica St. Louis Job No.: 160-18426-1

SDG No.: _____

Batch Number: 264618 Batch Start Date: 08/12/16 10:25 Batch Analyst: Sherman, Austin T

Batch Method: ExtChrom Batch End Date: 08/24/16 15:37

Lab Sample ID	Client Sample ID	Method Chain	Basis	InitialAmount	Th-229 00021	TRM-2 00001			
MB 160-264618/1		ExtChrom, A-01-R		1.0 g	0.1 mL				
LCS 160-264618/2		ExtChrom, A-01-R		0.4998 g	0.1 mL	0.4998 g			
160-18426-A-1-A	WR111-SP-019-C-P -00	ExtChrom, A-01-R	T	0.9999 g	0.1 mL				
160-18426-A-1-A DU	WR111-SP-019-C-P -00	ExtChrom, A-01-R	T	0.9991 g	0.1 mL				
160-18426-A-2-A	WR111-SP-020-C-P -00	ExtChrom, A-01-R	T	1.0006 g	0.1 mL				
160-18426-A-3-A	WR111-SP-021-C-P -00	ExtChrom, A-01-R	T	0.9993 g	0.1 mL				

Batch Notes	
Balance ID	1123433897
Analyst ID - Column	nmn per scb
Column Date	8/24/16
Analyst ID - CoPrecipitation	scb
CoPrecipitation Date	8/24/16
Pipette ID	rad104
Analyst ID - Reagent Drop Witness	jdl
Analyst ID - Reagent Drop	ats
SOP Number	st-rc-0003, st-rc-0004, st-rc-0100, st-rc-0242

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.

Run Logs

Alpha Spectroscopy Run Log

Detector: AV200

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
10/17/15 18:15	140	IC 160-223497/1		223497			PS
11/01/15 14:26	60	ICV 160-223615/1		223615			PS
07/25/16 13:13	960	ICB 160-262019/1		262019			PS
07/26/16 12:13	60	CCV 160-262177/1		262177			PS
08/25/16 09:43	1	PULSER 160-266596/1		266596			ALD
08/25/16 11:22	240	ZZZZZ		266596			
08/25/16 20:44	400	MB 160-264618/1-A		266596	264618	A-01-R	ALD

Detector: AV203

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
10/18/15 16:18	140	IC 160-223500/1		223500			PS
11/01/15 16:01	60	ICV 160-223618/1		223618			
11/01/15 18:11	60	ICV 160-223618/2		223618			PS
07/25/16 13:14	960	ICB 160-262022/1		262022			PS
07/26/16 17:47	60	CCV 160-262178/1		262178			PS
08/25/16 09:43	1	PULSER 160-266597/1		266597			ALD
08/25/16 11:22	240	ZZZZZ		266597			
08/25/16 20:44	400	LCS 160-264618/2-A		266597	264618	A-01-R	ALD

Detector: AV206

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
10/18/15 16:10	140	IC 160-223503/1		223503			PS
11/01/15 16:02	60	ICV 160-223621/1		223621			PS
07/25/16 13:14	960	ICB 160-262024/1		262024			PS
07/26/16 19:07	60	CCV 160-262180/1		262180			PS
08/25/16 09:43	1	PULSER 160-266598/1		266598			ALD
08/25/16 11:22	240	ZZZZZ		266598			
08/25/16 20:44	400	160-18426-1	WR111-SP-019-C-P-00	266598	264618	A-01-R	ALD

Detector: AV208

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
10/18/15 16:19	140	IC 160-223505/1		223505			PS
11/01/15 16:11	60	ICV 160-223623/1		223623			PS
07/25/16 13:14	960	ICB 160-262025/1		262025			PS
07/26/16 12:14	60	CCV 160-262182/1		262182			PS
08/25/16 09:43	1	PULSER 160-266600/1		266600			ALD
08/25/16 11:22	400	ZZZZZ		266600			
08/25/16 20:44	400	160-18426-1 DU	WR111-SP-019-C-P-00 DU	266600	264618	A-01-R	ALD

Detector: AV209

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
10/18/15 16:11	140	IC 160-223506/1		223506			PS
11/01/15 16:11	60	ICV 160-223624/1		223624			PS
07/25/16 13:14	960	ICB 160-262026/1		262026			PS
07/26/16 13:39	60	CCV 160-262183/1		262183			PS
08/25/16 09:43	1	PULSER 160-266601/1		266601			ALD
08/25/16 11:22	400	ZZZZZ		266601			
08/25/16 20:44	400	160-18426-2	WR111-SP-020-C-P-00	266601	264618	A-01-R	ALD

Alpha Spectroscopy Run Log

Detector: AV210

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
10/18/15 16:19	140	IC 160-223507/1		223507			PS
11/01/15 16:03	60	ICV 160-223625/1		223625			PS
07/25/16 13:14	960	ICB 160-262027/1		262027			PS
07/26/16 10:46	60	CCV 160-262184/1		262184			PS
08/25/16 09:43	1	PULSER 160-266602/1		266602			ALD
08/25/16 11:22	400	ZZZZZ		266602			
08/25/16 20:44	400	160-18426-3	WR111-SP-021-C-P-00	266602	264618	A-01-R	ALD

GAMMA SPECTROSCOPY

Method 901.1

Ra-226

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

Prep Batch: 263537

Fill Geometry, 21-Day In-Growth

Gamma Spectroscopy Analysis Detail Report

Prep Batch: 263537

Quality Control Summary

Method Blank ID:	Analyte	Parent Result	Spike Added	MB Result	Qualifier	Unit	% Rec	% Rec Limits	RPD	RER	DER	RER Limit	Z Factor
MB 160-263537/1-A	Radium-226			-0.1257	U	pCi/g							-3.578249 33
Lab Control Sample ID:	Analyte	Parent Result	Spike Added	LCS Result	Qualifier	Unit	% Rec	% Rec Limits	RPD	RER	DER	RER Limit	Z Factor
LCS 160-263537/2-A	Americium-241		97.1	93.95		pCi/g	97	87 - 116					-.4445991 693
LCS 160-263537/2-A	Cesium-137		29.5	29.26		pCi/g	99	87 - 120					-.1134764 767
LCS 160-263537/2-A	Cobalt-60		16.7	16.27		pCi/g	98	87 - 115					-.3306456 803
Duplicate ID:	Analyte	Parent Result	Spike Added	DU Result	Qualifier	Unit	% Rec	% Rec Limits	RPD	RER	DER	RER Limit	Z Factor
160-18426-1	Radium-226	1.74		1.793		pCi/g			3	0.09	0.26	1	

Glossary:

Ts = Count Duration, Sample

GAMMA SPECTROSCOPY BATCH WORKSHEET

Lab Name: TestAmerica St. Louis Job No.: 160-18426-1

SDG No.: _____

Batch Number: 263537 Batch Start Date: 08/04/16 15:01 Batch Analyst: Sloan, Robert 1

Batch Method: Fill_Geo-21 Batch End Date: 08/04/16 16:00

Lab Sample ID	Client Sample ID	Method Chain	Basis	TareWeight	GrossWeight	InitialAmount	IngDecDate1	IngDecDate3	Geometry
MB 160-263537/1		Fill_Geo-21, 901.1				291.18 g	8/4/2016	8/25/2016	Tuna Can
LCS 160-263537/2		Fill_Geo-21, 901.1				341.9 g	8/4/2016	8/25/2016	Tuna Can
160-18426-A-1-A	WR111-SP-019-C-P-00	Fill_Geo-21, 901.1	T	46.5 g	335.9 g	289.4 g	8/4/2016	8/25/2016	Tuna Can
160-18426-A-1-A DU	WR111-SP-019-C-P-00	Fill_Geo-21, 901.1	T	46.5 g	335.9 g	289.4 g	8/4/2016	8/25/2016	Tuna Can
160-18426-A-2-A	WR111-SP-020-C-P-00	Fill_Geo-21, 901.1	T	46.6 g	324.2 g	277.6 g	8/4/2016	8/25/2016	Tuna Can
160-18426-A-3-A	WR111-SP-021-C-P-00	Fill_Geo-21, 901.1	T	46.7 g	343.8 g	297.1 g	8/4/2016	8/25/2016	Tuna Can

Lab Sample ID	Client Sample ID	Method Chain	Basis	Tuna Can LCS 00005					
MB 160-263537/1		Fill_Geo-21, 901.1							
LCS 160-263537/2		Fill_Geo-21, 901.1		# g					
160-18426-A-1-A	WR111-SP-019-C-P-00	Fill_Geo-21, 901.1	T						
160-18426-A-1-A DU	WR111-SP-019-C-P-00	Fill_Geo-21, 901.1	T						
160-18426-A-2-A	WR111-SP-020-C-P-00	Fill_Geo-21, 901.1	T						
160-18426-A-3-A	WR111-SP-021-C-P-00	Fill_Geo-21, 901.1	T						

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.

Run Logs

Gamma Spectroscopy Run Log

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
01/22/16	13:21	ACVTOP 160-235884/1		235884			PS
07/09/16	18:01	ICB 160-259828/1		259828			RTM
08/25/16	01:24	CCB 160-266525/1		266525			RTM
08/25/16	02:18	CCV 160-266525/2		266525			
08/25/16	02:43	CCV 160-266525/3		266525			RTM
08/25/16	04:29	30 ZZZZZ		266525			
08/25/16	07:28	30 ZZZZZ		266525			
08/25/16	08:01	30 ZZZZZ		266525			
08/25/16	08:34	30 ZZZZZ		266525			
08/25/16	09:09	30 ZZZZZ		266525			
08/25/16	09:52	30 160-18426-3	WR111-SP-021-C-P-00	266525	263537	901.1	RTM
08/25/16	10:26	30 MB 160-263537/1-A		266525	263537	901.1	RTM
08/25/16	10:58	60 ZZZZZ		266525			
08/25/16	12:07	60 ZZZZZ		266525			
08/25/16	13:09	60 ZZZZZ		266525			
08/25/16	14:13	60 ZZZZZ		266525			
08/25/16	15:27	60 ZZZZZ		266525			
08/25/16	16:57	30 ZZZZZ		266525			
08/25/16	17:39	60 ZZZZZ		266525			
08/25/16	19:11	30 ZZZZZ		266525			
08/25/16	20:05	30 ZZZZZ		266525			
08/25/16	20:46	30 ZZZZZ		266525			
08/25/16	21:20	30 ZZZZZ		266525			
08/25/16	21:53	30 ZZZZZ		266525			
08/25/16	22:36	120 ZZZZZ		266525			

Detector: GV12

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
10/02/12	10:16	IC 160-13156/1		13156			JLW
10/04/12	09:10	ICV 160-13156/2		13156			JLW
01/28/16	13:28	ACVTOP 160-235885/1		235885			PS
08/06/16	17:43	ICB 160-263713/1		263713			ALS
08/25/16	00:45	CCB 160-266526/1		266526			RTM
08/25/16	01:23	CCV 160-266526/2		266526			
08/25/16	01:52	CCV 160-266526/3		266526			RTM
08/25/16	02:16	120 ZZZZZ		266526			
08/25/16	04:30	120 ZZZZZ		266526			
08/25/16	07:27	30 ZZZZZ		266526			
08/25/16	08:00	30 ZZZZZ		266526			
08/25/16	08:32	30 ZZZZZ		266526			
08/25/16	09:10	30 ZZZZZ		266526			
08/25/16	09:50	30 160-18426-2	WR111-SP-020-C-P-00	266526	263537	901.1	RTM
08/25/16	10:25	30 160-18426-1 DU	WR111-SP-019-C-P-00 DU	266526	263537	901.1	RTM
08/25/16	11:01	60 ZZZZZ		266526			
08/25/16	12:09	60 ZZZZZ		266526			
08/25/16	13:13	120 ZZZZZ		266526			
08/25/16	15:30	120 ZZZZZ		266526			
08/25/16	17:32	120 ZZZZZ		266526			
08/25/16	20:07	120 ZZZZZ		266526			

Gamma Spectroscopy Run Log

Detector: GV12 (Continued)

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
08/25/16 22:37	120	ZZZZZ		266526			

Detector: GV14

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
04/23/12 09:56		IC 160-12359/1		12359			JLW
04/24/12 08:12		ICV 160-12359/2		12359			JLW
01/25/16 12:29		ACVTOP 160-235877/1		235877			PS
08/06/16 17:41		ICB 160-263717/1		263717			ALS
08/25/16 00:37		CCV 160-266451/1		266451			
08/25/16 01:01		CCV 160-266451/2		266451			RTM
08/25/16 01:21		CCB 160-266451/3		266451			RTM
08/25/16 02:10	120	ZZZZZ		266451			
08/25/16 04:31	120	ZZZZZ		266451			
08/25/16 07:25	30	ZZZZZ		266451			
08/25/16 07:58	30	ZZZZZ		266451			
08/25/16 08:29	30	ZZZZZ		266451			
08/25/16 09:09	30	ZZZZZ		266451			
08/25/16 09:46	30	160-18426-1	WR111-SP-019-C-P-00	266451	263537	901.1	RTM
08/25/16 10:23	60	ZZZZZ		266451			
08/25/16 11:29	60	ZZZZZ		266451			
08/25/16 13:07	120	ZZZZZ		266451			
08/25/16 15:12	120	ZZZZZ		266451			
08/25/16 17:18	120	ZZZZZ		266451			
08/25/16 20:07	120	ZZZZZ		266451			
08/25/16 22:37	120	ZZZZZ		266451			

Detector: GV16

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
07/10/12 10:35		IC 160-12382/1		12382			JLW
07/17/12 11:27		ICV 160-12382/2		12382			JLW
01/22/16 10:56		ACVTOP 160-235879/1		235879			PS
08/06/16 17:37		ICB 160-263719/1		263719			ALS
08/25/16 00:39		CCV 160-266452/1		266452			
08/25/16 01:03		CCV 160-266452/2		266452			ALS
08/25/16 01:22		CCB 160-266452/3		266452			ALS
08/25/16 02:11	30	ZZZZZ		266452			
08/25/16 03:59	30	ZZZZZ		266452			
08/25/16 04:32	30	ZZZZZ		266452			
08/25/16 07:25	30	ZZZZZ		266452			
08/25/16 07:57	30	ZZZZZ		266452			
08/25/16 08:31	30	ZZZZZ		266452			
08/25/16 09:07	30	ZZZZZ		266452			
08/25/16 09:46	30	LCS 160-263537/2-A		266452	263537	901.1	ALS
08/25/16 10:24	60	ZZZZZ		266452			
08/25/16 11:27	60	ZZZZZ		266452			
08/25/16 13:08	60	ZZZZZ		266452			
08/25/16 14:15	60	ZZZZZ		266452			
08/25/16 15:30	60	ZZZZZ		266452			
08/25/16 16:57	30	ZZZZZ		266452			
08/25/16 17:38	60	ZZZZZ		266452			
08/25/16 19:08	30	ZZZZZ		266452			

Gamma Spectroscopy Run Log

Detector: GV16 (Continued)

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
08/25/16 20:08	30	ZZZZZ		266452			
08/25/16 20:47	30	ZZZZZ		266452			
08/25/16 21:20	30	ZZZZZ		266452			
08/25/16 21:54	120	ZZZZZ		266452			
08/25/16 23:58	120	ZZZZZ		266452			

Shipping and Receiving Documents

Client Contact

Cabrera Services, Inc
3355 Myrtle Ave, Suite 210
North Highlands, CA 95660
(916) 334-3740 Phone
(916) 334-4867 FAX
Project Name: WR 111 - Little Mountain Test Annex
Site: Hill Air Force Base, Utah
PO # 11460

Regulatory Program: DW NPDES RCRA Other:

Project Manager: Greg Bright

Tel/Fax: 508-315-6246

Analysis Turnaround Time

CALENDAR DAYS WORKING DAYS
TAT if different from Below ___20___
 2 weeks
 1 week
 2 days
 1 day

TestAmerica Laboratories, Inc.

COC No: 001

Date: 7/29/2016

Carrier:

Site Contact: Bachir Badaoui

Lab Contact: Jessica DeHerrera

Sampler:

For Lab Use Only:

Walk-in Client:

Lab Sampling:

Job / SDG No.:

Sample Specific Notes:



160-18426 Chain of Custody

Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	Radium 226 by Gamma spec	Isotopic Thorium (Th-230, Th-232)
		X	X
		X	X
		X	X

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other

Possible Hazard Identification: Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

Non-Hazard Flammable Skin Irritant Poison B Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

Return to Client Disposal by Lab Archive for _____ Months

Special Instructions/QC Requirements & Comments: Gamma spec analysis for Ra-226 which includes 21 day ingrowth. Alpha Spec/ST-RD-0210 (Th-230 and Th-232). Gamma Spec/ST-RD-0102 for (Ra-226)

Custody Seal No.: _____ Cooler Temp. (°C): Obs'd: _____ Corr'd: _____ Therm ID No.: _____

Relinquished by: **Bachir Badaoui** Company: **Cabrera Services** Date/Time: 7/29/2016 1530

Relinquished by: _____ Company: _____ Date/Time: _____

Relinquished by: _____ Company: _____ Date/Time: _____

Received by: *Bill Clark* Company: *TA STL* Date/Time: 8/16 08:25

Received by: _____ Company: _____ Date/Time: _____

Received in Laboratory by: _____ Company: _____ Date/Time: _____

Login Sample Receipt Checklist

Client: EA Engineering, Science, and Technology

Job Number: 160-18426-1

Login Number: 18426

List Source: TestAmerica St. Louis

List Number: 1

Creator: Clarke, Jill C

Question	Answer	Comment
Radioactivity wasn't checked or is \leq background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
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?	False	
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.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is $<6\text{mm}$ (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	