

# TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

## ANALYTICAL REPORT

TestAmerica Laboratories, Inc.

TestAmerica St. Louis  
13715 Rider Trail North  
Earth City, MO 63045  
Tel: (314)298-8566

TestAmerica Job ID: 160-3891-2

Client Project/Site: RFP-CBA-022 (7 DAY TAT)

For:

Westinghouse Electric Company LLC  
3300 State Road P  
Festus, Missouri 63028

Attn: Martin Swanson



Authorized for release by:

10/22/2013 3:08:16 PM

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*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.*

*Results relate only to the items tested and the sample(s) as received by the laboratory.*

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## Case Narrative

Client: Westinghouse Electric Company LLC  
Project/Site: RFP-CBA-022 (7 DAY TAT)

TestAmerica Job ID: 160-3891-2

**Job ID: 160-3891-2**

**Laboratory: TestAmerica St. Louis**

**Narrative**

### CASE NARRATIVE

**Client: Westinghouse Electric Company LLC**

**Project: RFP-CBA-022 (7 DAY TAT)**

**Report Number: 160-3891-1**

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.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. 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."

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

#### **RECEIPT**

The samples were received on 09/25/2013; the samples arrived in good condition, properly preserved and on ice. The temperature of the coolers at receipt was 20.0 C.

#### **TECHNETIUM-99 (ICPMS)**

Samples L100901BES00 (160-3891-1), L100902BES00 (160-3891-2), L100903BES00 (160-3891-3), L100904BEQ00 (160-3891-4), L100904BES00 (160-3891-5), L100905BES00 (160-3891-6), L100906BES00 (160-3891-7), L100907BES00 (160-3891-8), L100908BUB00 (160-3891-9), L100909BUB00 (160-3891-10) and L100910BUB00 (160-3891-11) were analyzed for Technetium-99 (ICPMS) in accordance with EPA SW-846 Method 6020A. The samples were prepared on 09/26/2013 and analyzed on 09/27/2013.

No difficulties were encountered during the Tc-99 analysis. All quality control parameters were within the acceptance limits.

#### **PERCENT SOLIDS**

Samples L100901BES00 (160-3891-1), L100902BES00 (160-3891-2), L100903BES00 (160-3891-3), L100904BEQ00 (160-3891-4), L100904BES00 (160-3891-5), L100905BES00 (160-3891-6), L100906BES00 (160-3891-7), L100907BES00 (160-3891-8),

## Case Narrative

Client: Westinghouse Electric Company LLC  
Project/Site: RFP-CBA-022 (7 DAY TAT)

TestAmerica Job ID: 160-3891-2

### Job ID: 160-3891-2 (Continued)

#### Laboratory: TestAmerica St. Louis (Continued)

L100908BUB00 (160-3891-9), L100909BUB00 (160-3891-10) and L100910BUB00 (160-3891-11) were analyzed for percent solids in accordance with EPA Method 160.3 MOD. The samples were analyzed on 09/26/2013.

No difficulties were encountered during the % solids analysis. All quality control parameters were within the acceptance limits.

#### CESIUM-137 & OTHER GAMMA EMITTERS (GS)

Samples L100901BES00 (160-3891-1), L100902BES00 (160-3891-2), L100903BES00 (160-3891-3), L100904BEQ00 (160-3891-4), L100904BES00 (160-3891-5), L100905BES00 (160-3891-6), L100906BES00 (160-3891-7), L100907BES00 (160-3891-8), L100908BUB00 (160-3891-9), L100909BUB00 (160-3891-10) and L100910BUB00 (160-3891-11) were analyzed for Cesium-137 & Other Gamma Emitters (GS) in accordance with DOE GA-01-R. The samples were leached on 09/26/2013, prepared on 09/30/2013 and analyzed on 09/30/2013 and 10/01/2013.

Radium 226 was detected in method blank MB 160-75266/1-A at a level that was above the method detection limit but below the reporting limit. The value should be considered an estimate, and has been flagged. If the associated sample reported a result above the MDL and/or RL, the result has been flagged. Refer to the QC report for details.

No other difficulties were encountered during the Gamma spec analysis. All other quality control parameters were within the acceptance limits.

## Hematite Decommissioning Project

Procedure HDP-PR-QA-006, Chain of Custody

Revision: 3

Page 1 of 1

Westinghouse Non-Proprietary Class 3

FORM HDP-PR-QA-006-1

## CHAIN OF CUSTODY

Instructions: Each time the container is transferred to another organization, a person from each organization should sign the CoC. The Laboratory/End User must verify that the sample is correctly identified before the sample is released for use or analysis and send the completed CoC to HDP.

Chain of Custody ID No. F-092513-01 Page 1/1				Requested Analysis												Laboratory Name:	
Project Name:				Comp (C) or Grab (G)	Gamma Spec	Isotopic Uranium	Tc-99	Gamma Spec (21 day ingrow for Ra-226)							Total Containers	TA-MO	
Contact Person:																Laboratory Address:	
Phone Number:																Phone No.	
Sampler Name																Laboratory Contact Person:	
																Phone No.	
				Turn Around Time													
				Rush (7 days)													
				Remarks													
Sample ID	Date	Time	Matrix														
L100901BES00	9/19/2013	13:20	S	C	X		X	X							1	FSS 10-09 SYS	
L100902BES00	9/19/2013	13:25	S	C	X		X	X							1		
L100903BES00	9/19/2013	13:30	S	C	X		X	X							1		
L100904BEQ00	9/19/2013	14:25	S	C	X		X	X							1		
L100904BES00	9/19/2013	14:20	S	C	X		X	X							1		
L100905BES00	9/19/2013	14:30	S	C	X		X	X							1		
L100906BES00	9/19/2013	15:00	S	C	X		X	X							1		
L100907BES00	9/19/2013	15:05	S	C	X		X	X							1	FSS 10-09 SYS	
L100908BUB00	9/19/2013	15:55	S	C	X		X	X							1	FSS 10-09 Bias	
L100909BUB00	9/19/2013	16:00	S	C	X		X	X							1		
L100910BUB00	9/23/2013	15:40	S	C	X		X	X							1	FSS 10-09 Bias	

Relinquished by:	Date/Time	Received by:	Date/Time	Total	Cooler Temperature:
<i>C. J. ...</i>	9-25-13 1630	<i>Joe Bradshaw</i>	9-25 1630	11	Ambient
Company Name:		Company Name:		Cooler ID:	Shipper and Number:
<i>WEC</i>		<i>Crossroads</i>		0924-01	
Received by:	Date/Time	Relinquished by:	Date/Time	Comments: Please re-analyze samples after 21-day ingrowth period.	
Company Name:		<i>Joe Bradshaw</i>	9-25 1830		
		Company Name:			
		<i>Crossroads</i>		Verified By:	
Relinquished by:	Date/Time	Received by:	Date/Time		
Company Name:		<i>M. L. ...</i>	9-25-13 1830		
		Company Name:			
		<i>Test America</i>			

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## Login Sample Receipt Checklist

Client: Westinghouse Electric Company LLC

Job Number: 160-3891-2

Login Number: 3891

List Source: TestAmerica St. Louis

List Number: 1

Creator: Daniels, Brian J

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.	True	
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.	False	
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.	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	

## Definitions/Glossary

Client: Westinghouse Electric Company LLC  
Project/Site: RFP-CBA-022 (7 DAY TAT)

TestAmerica Job ID: 160-3891-2

### Qualifiers

#### Rad

Qualifier	Qualifier Description
U	Indicates the analyte was analyzed for but not detected.

### 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
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)

# Method Summary

Client: Westinghouse Electric Company LLC  
Project/Site: RFP-CBA-022 (7 DAY TAT)

TestAmerica Job ID: 160-3891-2

Method	Method Description	Protocol	Laboratory
GA-01-R	Radium-226 & Other Gamma Emitters (GS)	DOE	TAL SL

**Protocol References:**

DOE = U.S. Department of Energy

**Laboratory References:**

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



## Sample Summary

Client: Westinghouse Electric Company LLC  
Project/Site: RFP-CBA-022 (7 DAY TAT)

TestAmerica Job ID: 160-3891-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-3891-1	L100901BES00	Solid	09/19/13 13:20	09/25/13 18:30
160-3891-2	L100902BES00	Solid	09/19/13 13:25	09/25/13 18:30
160-3891-3	L100903BES00	Solid	09/19/13 13:30	09/25/13 18:30
160-3891-4	L100904BEQ00	Solid	09/19/13 14:25	09/25/13 18:30
160-3891-5	L100904BES00	Solid	09/19/13 14:20	09/25/13 18:30
160-3891-6	L100905BES00	Solid	09/19/13 14:30	09/25/13 18:30
160-3891-7	L100906BES00	Solid	09/19/13 15:00	09/25/13 18:30
160-3891-8	L100907BES00	Solid	09/19/13 15:05	09/25/13 18:30
160-3891-9	L100908BUB00	Solid	09/19/13 15:55	09/25/13 18:30
160-3891-10	L100909BUB00	Solid	09/19/13 16:00	09/25/13 18:30
160-3891-11	L100910BUB00	Solid	09/23/13 15:40	09/25/13 18:30

# Client Sample Results

Client: Westinghouse Electric Company LLC  
Project/Site: RFP-CBA-022 (7 DAY TAT)

TestAmerica Job ID: 160-3891-2

**Client Sample ID: L100901BES00**

**Date Collected: 09/19/13 13:20**

**Date Received: 09/25/13 18:30**

**Lab Sample ID: 160-3891-1**

**Matrix: Solid**

**Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	1.09		0.124	0.166		0.101	pCi/g	09/30/13 11:27	10/21/13 02:10	1
Bismuth 212	1.31		0.472	0.491		0.427	pCi/g	09/30/13 11:27	10/21/13 02:10	1
Bismuth 214	1.20		0.113	0.168		0.0594	pCi/g	09/30/13 11:27	10/21/13 02:10	1
Lead 212	1.15		0.0753	0.167		0.0583	pCi/g	09/30/13 11:27	10/21/13 02:10	1
Lead 214	1.27		0.105	0.169		0.0713	pCi/g	09/30/13 11:27	10/21/13 02:10	1
Potassium 40	20.2		1.25	2.42		0.309	pCi/g	09/30/13 11:27	10/21/13 02:10	1
Protactinium 231	0.319	U	0.195	0.198		1.16	pCi/g	09/30/13 11:27	10/21/13 02:10	1
Radium 226	1.20		0.113	0.168	1.00	0.0594	pCi/g	09/30/13 11:27	10/21/13 02:10	1
Thorium 232	1.09		0.124	0.166		0.101	pCi/g	09/30/13 11:27	10/21/13 02:10	1
Thorium 234	1.33		0.617	0.632		0.836	pCi/g	09/30/13 11:27	10/21/13 02:10	1
Uranium 235	0.179	U	0.149	0.150		0.253	pCi/g	09/30/13 11:27	10/21/13 02:10	1
Americium 241	0.0239	U	0.0522	0.0523		0.0875	pCi/g	09/30/13 11:27	10/21/13 02:10	1
Protactinium 234m	3.95	U	3.16	3.18		5.48	pCi/g	09/30/13 11:27	10/21/13 02:10	1

**Client Sample ID: L100902BES00**

**Date Collected: 09/19/13 13:25**

**Date Received: 09/25/13 18:30**

**Lab Sample ID: 160-3891-2**

**Matrix: Solid**

**Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	1.24		0.247	0.279		0.122	pCi/g	09/30/13 11:27	10/21/13 20:12	1
Bismuth 212	1.28	U	0.927	0.937		1.41	pCi/g	09/30/13 11:27	10/21/13 20:12	1
Bismuth 214	1.37		0.249	0.287		0.196	pCi/g	09/30/13 11:27	10/21/13 20:12	1
Lead 212	1.20		0.172	0.311		0.180	pCi/g	09/30/13 11:27	10/21/13 20:12	1
Lead 214	1.60		0.264	0.338		0.244	pCi/g	09/30/13 11:27	10/21/13 20:12	1
Potassium 40	19.2		2.39	3.10		1.38	pCi/g	09/30/13 11:27	10/21/13 20:12	1
Protactinium 231	0.887	U	0.925	0.936		2.61	pCi/g	09/30/13 11:27	10/21/13 20:12	1
Radium 226	1.37		0.249	0.287	1.00	0.196	pCi/g	09/30/13 11:27	10/21/13 20:12	1
Thorium 232	1.24		0.247	0.279		0.122	pCi/g	09/30/13 11:27	10/21/13 20:12	1
Thorium 234	0.989	U	0.896	0.902		2.53	pCi/g	09/30/13 11:27	10/21/13 20:12	1
Uranium 235	0.158	U	0.249	0.249		0.624	pCi/g	09/30/13 11:27	10/21/13 20:12	1
Americium 241	-0.0147	U	0.234	0.234		0.349	pCi/g	09/30/13 11:27	10/21/13 20:12	1
Protactinium 234m	0.000	U	1.74	1.74		17.8	pCi/g	09/30/13 11:27	10/21/13 20:12	1

**Client Sample ID: L100903BES00**

**Date Collected: 09/19/13 13:30**

**Date Received: 09/25/13 18:30**

**Lab Sample ID: 160-3891-3**

**Matrix: Solid**

**Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	1.14		0.179	0.213		0.0961	pCi/g	09/30/13 11:27	10/21/13 02:10	1
Bismuth 212	1.44		0.523	0.544		0.456	pCi/g	09/30/13 11:27	10/21/13 02:10	1
Bismuth 214	1.09		0.125	0.169		0.0796	pCi/g	09/30/13 11:27	10/21/13 02:10	1
Lead 212	1.08		0.0869	0.165		0.0806	pCi/g	09/30/13 11:27	10/21/13 02:10	1

TestAmerica St. Louis

# Client Sample Results

Client: Westinghouse Electric Company LLC  
Project/Site: RFP-CBA-022 (7 DAY TAT)

TestAmerica Job ID: 160-3891-2

**Client Sample ID: L100903BES00**

**Lab Sample ID: 160-3891-3**

Date Collected: 09/19/13 13:30

Matrix: Solid

Date Received: 09/25/13 18:30

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Lead 214	1.27		0.117	0.176		0.0913	pCi/g	09/30/13 11:27	10/21/13 02:10	1
Potassium 40	17.5		1.37	2.25		0.451	pCi/g	09/30/13 11:27	10/21/13 02:10	1
Protactinium 231	0.479	U	0.280	0.285		1.25	pCi/g	09/30/13 11:27	10/21/13 02:10	1
Radium 226	1.09		0.125	0.169	1.00	0.0796	pCi/g	09/30/13 11:27	10/21/13 02:10	1
Thorium 232	1.14		0.179	0.213		0.0961	pCi/g	09/30/13 11:27	10/21/13 02:10	1
Thorium 234	0.952	U	0.434	0.445		1.19	pCi/g	09/30/13 11:27	10/21/13 02:10	1
Uranium 235	0.123	U	0.160	0.160		0.281	pCi/g	09/30/13 11:27	10/21/13 02:10	1
Americium 241	0.0298	U	0.0704	0.0705		0.117	pCi/g	09/30/13 11:27	10/21/13 02:10	1
Protactinium 234m	0.000	U	1.39	1.39		9.20	pCi/g	09/30/13 11:27	10/21/13 02:10	1

**Client Sample ID: L100904BEQ00**

**Lab Sample ID: 160-3891-4**

Date Collected: 09/19/13 14:25

Matrix: Solid

Date Received: 09/25/13 18:30

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	1.19		0.145	0.190		0.118	pCi/g	09/30/13 11:27	10/21/13 03:00	1
Bismuth 212	1.17		0.328	0.350		0.410	pCi/g	09/30/13 11:27	10/21/13 03:00	1
Bismuth 214	1.21		0.103	0.163		0.0637	pCi/g	09/30/13 11:27	10/21/13 03:00	1
Lead 212	1.16		0.0719	0.167		0.0573	pCi/g	09/30/13 11:27	10/21/13 03:00	1
Lead 214	1.45		0.0917	0.176		0.0776	pCi/g	09/30/13 11:27	10/21/13 03:00	1
Potassium 40	18.6		1.07	2.18		0.251	pCi/g	09/30/13 11:27	10/21/13 03:00	1
Protactinium 231	0.396	U	0.208	0.212		1.09	pCi/g	09/30/13 11:27	10/21/13 03:00	1
Radium 226	1.21		0.103	0.163	1.00	0.0637	pCi/g	09/30/13 11:27	10/21/13 03:00	1
Thorium 232	1.19		0.145	0.190		0.118	pCi/g	09/30/13 11:27	10/21/13 03:00	1
Thorium 234	1.44		0.622	0.640		0.819	pCi/g	09/30/13 11:27	10/21/13 03:00	1
Uranium 235	0.169	U	0.153	0.154		0.236	pCi/g	09/30/13 11:27	10/21/13 03:00	1
Americium 241	0.0147	U	0.0621	0.0621		0.104	pCi/g	09/30/13 11:27	10/21/13 03:00	1
Protactinium 234m	6.72		2.70	2.79		5.07	pCi/g	09/30/13 11:27	10/21/13 03:00	1

**Client Sample ID: L100904BES00**

**Lab Sample ID: 160-3891-5**

Date Collected: 09/19/13 14:20

Matrix: Solid

Date Received: 09/25/13 18:30

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	1.24		0.164	0.207		0.0928	pCi/g	09/30/13 11:27	10/21/13 03:01	1
Bismuth 212	1.63		0.452	0.483		0.369	pCi/g	09/30/13 11:27	10/21/13 03:01	1
Bismuth 214	1.13		0.111	0.162		0.0781	pCi/g	09/30/13 11:27	10/21/13 03:01	1
Lead 212	1.10		0.0800	0.163		0.0827	pCi/g	09/30/13 11:27	10/21/13 03:01	1
Lead 214	1.45		0.0994	0.180		0.0763	pCi/g	09/30/13 11:27	10/21/13 03:01	1
Potassium 40	20.1		1.16	2.36		0.351	pCi/g	09/30/13 11:27	10/21/13 03:01	1
Protactinium 231	0.697	U	0.359	0.367		1.19	pCi/g	09/30/13 11:27	10/21/13 03:01	1
Radium 226	1.13		0.111	0.162	1.00	0.0781	pCi/g	09/30/13 11:27	10/21/13 03:01	1

TestAmerica St. Louis

# Client Sample Results

Client: Westinghouse Electric Company LLC  
Project/Site: RFP-CBA-022 (7 DAY TAT)

TestAmerica Job ID: 160-3891-2

**Client Sample ID: L100904BES00**

**Lab Sample ID: 160-3891-5**

**Date Collected: 09/19/13 14:20**

**Matrix: Solid**

**Date Received: 09/25/13 18:30**

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium 232	1.24		0.164	0.207		0.0928	pCi/g	09/30/13 11:27	10/21/13 03:01	1
Thorium 234	1.68		0.716	0.737		0.896	pCi/g	09/30/13 11:27	10/21/13 03:01	1
Uranium 235	0.0456	U	0.153	0.153		0.265	pCi/g	09/30/13 11:27	10/21/13 03:01	1
Americium 241	-0.0131	U	0.0694	0.0695		0.116	pCi/g	09/30/13 11:27	10/21/13 03:01	1
Protactinium 234m	2.43	U	3.05	3.06		5.03	pCi/g	09/30/13 11:27	10/21/13 03:01	1

**Client Sample ID: L100905BES00**

**Lab Sample ID: 160-3891-6**

**Date Collected: 09/19/13 14:30**

**Matrix: Solid**

**Date Received: 09/25/13 18:30**

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	1.06		0.138	0.176		0.130	pCi/g	09/30/13 11:27	10/21/13 03:00	1
Bismuth 212	1.15		0.366	0.385		0.349	pCi/g	09/30/13 11:27	10/21/13 03:00	1
Bismuth 214	1.57		0.132	0.210		0.0694	pCi/g	09/30/13 11:27	10/21/13 03:00	1
Lead 212	1.08		0.0774	0.159		0.0652	pCi/g	09/30/13 11:27	10/21/13 03:00	1
Lead 214	1.60		0.114	0.202		0.0737	pCi/g	09/30/13 11:27	10/21/13 03:00	1
Potassium 40	18.9		1.27	2.31		0.361	pCi/g	09/30/13 11:27	10/21/13 03:00	1
Protactinium 231	0.214	U	0.177	0.179		1.25	pCi/g	09/30/13 11:27	10/21/13 03:00	1
Radium 226	1.57		0.132	0.210	1.00	0.0694	pCi/g	09/30/13 11:27	10/21/13 03:00	1
Thorium 232	1.06		0.138	0.176		0.130	pCi/g	09/30/13 11:27	10/21/13 03:00	1
Thorium 234	1.15		0.533	0.546		0.763	pCi/g	09/30/13 11:27	10/21/13 03:00	1
Uranium 235	0.102	U	0.153	0.154		0.256	pCi/g	09/30/13 11:27	10/21/13 03:00	1
Americium 241	-0.0329	U	0.0953	0.0953		0.108	pCi/g	09/30/13 11:27	10/21/13 03:00	1
Protactinium 234m	6.06		2.92	2.98		6.06	pCi/g	09/30/13 11:27	10/21/13 03:00	1

**Client Sample ID: L100906BES00**

**Lab Sample ID: 160-3891-7**

**Date Collected: 09/19/13 15:00**

**Matrix: Solid**

**Date Received: 09/25/13 18:30**

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	1.08		0.154	0.189		0.144	pCi/g	09/30/13 11:27	10/21/13 03:01	1
Bismuth 212	1.45		0.592	0.611		0.528	pCi/g	09/30/13 11:27	10/21/13 03:01	1
Bismuth 214	1.20		0.123	0.175		0.0733	pCi/g	09/30/13 11:27	10/21/13 03:01	1
Lead 212	1.07		0.0811	0.160		0.0671	pCi/g	09/30/13 11:27	10/21/13 03:01	1
Lead 214	1.24		0.112	0.170		0.0850	pCi/g	09/30/13 11:27	10/21/13 03:01	1
Potassium 40	18.7		1.36	2.35		0.406	pCi/g	09/30/13 11:27	10/21/13 03:01	1
Protactinium 231	-0.594	U	0.884	0.886		1.47	pCi/g	09/30/13 11:27	10/21/13 03:01	1
Radium 226	1.20		0.123	0.175	1.00	0.0733	pCi/g	09/30/13 11:27	10/21/13 03:01	1
Thorium 232	1.08		0.154	0.189		0.144	pCi/g	09/30/13 11:27	10/21/13 03:01	1
Thorium 234	1.25		0.759	0.770		0.969	pCi/g	09/30/13 11:27	10/21/13 03:01	1
Uranium 235	0.172	U	0.146	0.147		0.180	pCi/g	09/30/13 11:27	10/21/13 03:01	1
Americium 241	0.00267	U	0.0710	0.0710		0.120	pCi/g	09/30/13 11:27	10/21/13 03:01	1

TestAmerica St. Louis

# Client Sample Results

Client: Westinghouse Electric Company LLC  
Project/Site: RFP-CBA-022 (7 DAY TAT)

TestAmerica Job ID: 160-3891-2

**Client Sample ID: L100906BES00**

**Lab Sample ID: 160-3891-7**

**Date Collected: 09/19/13 15:00**

**Matrix: Solid**

**Date Received: 09/25/13 18:30**

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Protactinium 234m	6.02	U	2.83	2.90		9.44	pCi/g	09/30/13 11:27	10/21/13 03:01	1

**Client Sample ID: L100907BES00**

**Lab Sample ID: 160-3891-8**

**Date Collected: 09/19/13 15:05**

**Matrix: Solid**

**Date Received: 09/25/13 18:30**

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	1.12		0.116	0.163		0.125	pCi/g	09/30/13 11:27	10/21/13 03:35	1
Bismuth 212	1.67		0.443	0.476		0.364	pCi/g	09/30/13 11:27	10/21/13 03:35	1
Bismuth 214	1.15		0.113	0.165		0.0754	pCi/g	09/30/13 11:27	10/21/13 03:35	1
Lead 212	1.13		0.0703	0.162		0.0495	pCi/g	09/30/13 11:27	10/21/13 03:35	1
Lead 214	1.22		0.0987	0.161		0.0665	pCi/g	09/30/13 11:27	10/21/13 03:35	1
Potassium 40	17.9		1.09	2.13		0.324	pCi/g	09/30/13 11:27	10/21/13 03:35	1
Protactinium 231	0.576	U	0.251	0.259		1.22	pCi/g	09/30/13 11:27	10/21/13 03:35	1
Radium 226	1.15		0.113	0.165	1.00	0.0754	pCi/g	09/30/13 11:27	10/21/13 03:35	1
Thorium 232	1.12		0.116	0.163		0.125	pCi/g	09/30/13 11:27	10/21/13 03:35	1
Thorium 234	1.54		0.769	0.786		0.929	pCi/g	09/30/13 11:27	10/21/13 03:35	1
Uranium 235	0.0888	U	0.145	0.145		0.250	pCi/g	09/30/13 11:27	10/21/13 03:35	1
Americium 241	-0.0125	U	0.0646	0.0646		0.108	pCi/g	09/30/13 11:27	10/21/13 03:35	1
Protactinium 234m	0.426	U	2.86	2.86		5.03	pCi/g	09/30/13 11:27	10/21/13 03:35	1

**Client Sample ID: L100908BUB00**

**Lab Sample ID: 160-3891-9**

**Date Collected: 09/19/13 15:55**

**Matrix: Solid**

**Date Received: 09/25/13 18:30**

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	1.13		0.126	0.171		0.110	pCi/g	09/30/13 11:27	10/21/13 03:36	1
Bismuth 212	1.06		0.353	0.370		0.343	pCi/g	09/30/13 11:27	10/21/13 03:36	1
Bismuth 214	1.13		0.102	0.155		0.0600	pCi/g	09/30/13 11:27	10/21/13 03:36	1
Lead 212	0.926		0.0742	0.141		0.0797	pCi/g	09/30/13 11:27	10/21/13 03:36	1
Lead 214	1.29		0.0895	0.162		0.0804	pCi/g	09/30/13 11:27	10/21/13 03:36	1
Potassium 40	19.5		1.15	2.30		0.364	pCi/g	09/30/13 11:27	10/21/13 03:36	1
Protactinium 231	0.374	U	0.204	0.208		1.08	pCi/g	09/30/13 11:27	10/21/13 03:36	1
Radium 226	1.13		0.102	0.155	1.00	0.0600	pCi/g	09/30/13 11:27	10/21/13 03:36	1
Thorium 232	1.13		0.126	0.171		0.110	pCi/g	09/30/13 11:27	10/21/13 03:36	1
Thorium 234	1.36		0.647	0.662		0.834	pCi/g	09/30/13 11:27	10/21/13 03:36	1
Uranium 235	0.0996	U	0.128	0.128		0.242	pCi/g	09/30/13 11:27	10/21/13 03:36	1
Americium 241	0.00339	U	0.0514	0.0514		0.0870	pCi/g	09/30/13 11:27	10/21/13 03:36	1
Protactinium 234m	2.45	U	1.91	1.92		5.51	pCi/g	09/30/13 11:27	10/21/13 03:36	1

TestAmerica St. Louis

# Client Sample Results

Client: Westinghouse Electric Company LLC  
Project/Site: RFP-CBA-022 (7 DAY TAT)

TestAmerica Job ID: 160-3891-2

**Client Sample ID: L100909BUB00**

**Lab Sample ID: 160-3891-10**

**Date Collected: 09/19/13 16:00**

**Matrix: Solid**

**Date Received: 09/25/13 18:30**

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	1.10		0.131	0.172		0.107	pCi/g	09/30/13 11:27	10/21/13 03:35	1
Bismuth 212	0.913		0.353	0.366		0.470	pCi/g	09/30/13 11:27	10/21/13 03:35	1
Bismuth 214	1.16		0.119	0.170		0.0716	pCi/g	09/30/13 11:27	10/21/13 03:35	1
Lead 212	1.15		0.0800	0.169		0.0632	pCi/g	09/30/13 11:27	10/21/13 03:35	1
Lead 214	1.35		0.105	0.175		0.0755	pCi/g	09/30/13 11:27	10/21/13 03:35	1
Potassium 40	20.0		1.32	2.44		0.366	pCi/g	09/30/13 11:27	10/21/13 03:35	1
Protactinium 231	0.371	U	0.221	0.224		1.26	pCi/g	09/30/13 11:27	10/21/13 03:35	1
Radium 226	1.16		0.119	0.170	1.00	0.0716	pCi/g	09/30/13 11:27	10/21/13 03:35	1
Thorium 232	1.10		0.131	0.172		0.107	pCi/g	09/30/13 11:27	10/21/13 03:35	1
Thorium 234	1.02		0.328	0.345		0.912	pCi/g	09/30/13 11:27	10/21/13 03:35	1
Uranium 235	0.122	U	0.150	0.151		0.243	pCi/g	09/30/13 11:27	10/21/13 03:35	1
Americium 241	-0.0347	U	0.0980	0.0980		0.112	pCi/g	09/30/13 11:27	10/21/13 03:35	1
Protactinium 234m	5.76	U	3.10	3.16		6.38	pCi/g	09/30/13 11:27	10/21/13 03:35	1

**Client Sample ID: L100910BUB00**

**Lab Sample ID: 160-3891-11**

**Date Collected: 09/23/13 15:40**

**Matrix: Solid**

**Date Received: 09/25/13 18:30**

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	1.25		0.184	0.224		0.0814	pCi/g	09/30/13 11:27	10/21/13 03:36	1
Bismuth 212	1.29		0.430	0.451		0.532	pCi/g	09/30/13 11:27	10/21/13 03:36	1
Bismuth 214	1.26		0.147	0.197		0.0964	pCi/g	09/30/13 11:27	10/21/13 03:36	1
Lead 212	1.10		0.0871	0.167		0.0740	pCi/g	09/30/13 11:27	10/21/13 03:36	1
Lead 214	1.33		0.114	0.179		0.0840	pCi/g	09/30/13 11:27	10/21/13 03:36	1
Potassium 40	18.7		1.44	2.39		0.457	pCi/g	09/30/13 11:27	10/21/13 03:36	1
Protactinium 231	0.761	U	0.443	0.451		1.28	pCi/g	09/30/13 11:27	10/21/13 03:36	1
Radium 226	1.26		0.147	0.197	1.00	0.0964	pCi/g	09/30/13 11:27	10/21/13 03:36	1
Thorium 232	1.25		0.184	0.224		0.0814	pCi/g	09/30/13 11:27	10/21/13 03:36	1
Thorium 234	0.822	U	0.408	0.417		1.20	pCi/g	09/30/13 11:27	10/21/13 03:36	1
Uranium 235	0.167	U	0.149	0.150		0.242	pCi/g	09/30/13 11:27	10/21/13 03:36	1
Americium 241	-0.00979	U	0.0749	0.0749		0.126	pCi/g	09/30/13 11:27	10/21/13 03:36	1
Protactinium 234m	1.55	U	3.97	3.97		6.86	pCi/g	09/30/13 11:27	10/21/13 03:36	1

TestAmerica St. Louis

# QC Sample Results

Client: Westinghouse Electric Company LLC  
Project/Site: RFP-CBA-022 (7 DAY TAT)

TestAmerica Job ID: 160-3891-2

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-75280/1-A

Matrix: Solid

Analysis Batch: 80126

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 75280

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.01828	U	0.0220	0.0221		0.0298	pCi/g	09/30/13 11:27	10/21/13 02:09	1
Bismuth 212	-0.0005792	U	0.0955	0.0955		0.187	pCi/g	09/30/13 11:27	10/21/13 02:09	1
Bismuth 214	-0.0003736	U	0.0206	0.0206		0.0421	pCi/g	09/30/13 11:27	10/21/13 02:09	1
Lead 212	0.009142	U	0.0135	0.0136		0.0254	pCi/g	09/30/13 11:27	10/21/13 02:09	1
Lead 214	0.008476	U	0.0175	0.0175		0.0358	pCi/g	09/30/13 11:27	10/21/13 02:09	1
Potassium 40	-0.1238	U	4.95	4.95		0.233	pCi/g	09/30/13 11:27	10/21/13 02:09	1
Protactinium 231	0.02238	U	0.176	0.176		0.324	pCi/g	09/30/13 11:27	10/21/13 02:09	1
Radium 226	-0.0003736	U	0.0206	0.0206	1.00	0.0421	pCi/g	09/30/13 11:27	10/21/13 02:09	1
Thorium 232	0.01828	U	0.0220	0.0221		0.0298	pCi/g	09/30/13 11:27	10/21/13 02:09	1
Thorium 234	0.01166	U	0.0448	0.0448		0.265	pCi/g	09/30/13 11:27	10/21/13 02:09	1
Uranium 235	0.002143	U	0.0298	0.0298		0.0663	pCi/g	09/30/13 11:27	10/21/13 02:09	1
Americium 241	0.005807	U	0.0130	0.0130		0.0224	pCi/g	09/30/13 11:27	10/21/13 02:09	1
Protactinium 234m	0.01092	U	0.0494	0.0494		2.12	pCi/g	09/30/13 11:27	10/21/13 02:09	1

Lab Sample ID: LCS 160-75280/2-A

Matrix: Solid

Analysis Batch: 80124

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 75280

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Americium 241	97.7	94.20		9.80		0.479	pCi/g	96	87 - 116
Cesium 137	31.5	31.06		3.25		0.130	pCi/g	98	87 - 120
Cobalt 60	24.3	23.62		2.38		0.0871	pCi/g	97	87 - 115

Lab Sample ID: 160-3891-11 DU

Matrix: Solid

Analysis Batch: 80127

Client Sample ID: L100910BUB00

Prep Type: Total/NA

Prep Batch: 75280

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Actinium 228	1.25		1.111		0.182		0.156	pCi/g	0.34	1
Bismuth 212	1.29		1.510		0.477		0.384	pCi/g	0.24	1
Bismuth 214	1.26		1.258		0.183		0.0771	pCi/g	0	1
Lead 212	1.10		1.167		0.172		0.0676	pCi/g	0.19	1
Lead 214	1.33		1.459		0.183		0.0933	pCi/g	0.36	1
Potassium 40	18.7		19.45		2.38		0.278	pCi/g	0.16	1
Protactinium 231	0.761	U	0.5601	U	0.420		1.23	pCi/g	0.23	1
Radium 226	1.26		1.258		0.183	1.00	0.0771	pCi/g	0	1
Thorium 232	1.25		1.111		0.182		0.156	pCi/g	0.34	1
Thorium 234	0.822	U	1.330		0.686		0.892	pCi/g	0.46	1
Uranium 235	0.167	U	0.1606	U	0.136		0.256	pCi/g	0.02	1
Americium 241	-0.00979	U	0.001473	U	0.0629		0.107	pCi/g	0.08	1
Protactinium 234m	1.55	U	5.846	U	2.63		6.32	pCi/g	0.65	1

TestAmerica St. Louis

## QC Association Summary

Client: Westinghouse Electric Company LLC  
Project/Site: RFP-CBA-022 (7 DAY TAT)

TestAmerica Job ID: 160-3891-2

### Rad

#### Leach Batch: 74888

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-3891-1	L100901BES00	Total/NA	Solid	Dry and Grind	
160-3891-2	L100902BES00	Total/NA	Solid	Dry and Grind	
160-3891-3	L100903BES00	Total/NA	Solid	Dry and Grind	
160-3891-4	L100904BEQ00	Total/NA	Solid	Dry and Grind	
160-3891-5	L100904BES00	Total/NA	Solid	Dry and Grind	
160-3891-6	L100905BES00	Total/NA	Solid	Dry and Grind	
160-3891-7	L100906BES00	Total/NA	Solid	Dry and Grind	
160-3891-8	L100907BES00	Total/NA	Solid	Dry and Grind	
160-3891-9	L100908BUB00	Total/NA	Solid	Dry and Grind	
160-3891-10	L100909BUB00	Total/NA	Solid	Dry and Grind	
160-3891-11	L100910BUB00	Total/NA	Solid	Dry and Grind	
160-3891-11 DU	L100910BUB00	Total/NA	Solid	Dry and Grind	

#### Prep Batch: 75280

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-3891-1	L100901BES00	Total/NA	Solid	Fill_Geo-21	74888
160-3891-2	L100902BES00	Total/NA	Solid	Fill_Geo-21	74888
160-3891-3	L100903BES00	Total/NA	Solid	Fill_Geo-21	74888
160-3891-4	L100904BEQ00	Total/NA	Solid	Fill_Geo-21	74888
160-3891-5	L100904BES00	Total/NA	Solid	Fill_Geo-21	74888
160-3891-6	L100905BES00	Total/NA	Solid	Fill_Geo-21	74888
160-3891-7	L100906BES00	Total/NA	Solid	Fill_Geo-21	74888
160-3891-8	L100907BES00	Total/NA	Solid	Fill_Geo-21	74888
160-3891-9	L100908BUB00	Total/NA	Solid	Fill_Geo-21	74888
160-3891-10	L100909BUB00	Total/NA	Solid	Fill_Geo-21	74888
160-3891-11	L100910BUB00	Total/NA	Solid	Fill_Geo-21	74888
160-3891-11 DU	L100910BUB00	Total/NA	Solid	Fill_Geo-21	74888
LCS 160-75280/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
MB 160-75280/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	