

# 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: 160-16715-1

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

For:

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

Attn: Mr. Martin Swanson



Authorized for release by:  
4/6/2016 11:19:29 AM

Ivan Vania, Project Manager II  
(314)298-8566  
[ivan.vania@testamericainc.com](mailto:ivan.vania@testamericainc.com)

### LINKS

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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: HDP RFP-CBA-022 (7 DAY TAT)

TestAmerica Job ID: 160-16715-1

**Job ID: 160-16715-1**

**Laboratory: TestAmerica St. Louis**

**Narrative**

## CASE NARRATIVE

**Client: Westinghouse Electric Company LLC**

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

**Report Number: 160-16715-1**

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 3/30/2016 11:10 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 1.4° C.

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

Samples L04-02-25-P-S-B-00 (160-16715-1), L04-02-26-P-S-B-00 (160-16715-2) and L04-02-27-P-S-B-00 (160-16715-3) were analyzed for Technetium-99 (ICPMS) in accordance with EPA SW-846 Method 6020A. The samples were prepared on 04/01/2016 and analyzed on 04/05/2016.

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

### **PERCENT SOLIDS**

Samples L04-02-25-P-S-B-00 (160-16715-1), L04-02-26-P-S-B-00 (160-16715-2) and L04-02-27-P-S-B-00 (160-16715-3) were analyzed for percent solids in accordance with EPA Method 160.3 MOD. The samples were analyzed on 03/31/2016.

# Case Narrative

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

TestAmerica Job ID: 160-16715-1

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## Job ID: 160-16715-1 (Continued)

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

Percent Moisture exceeded the RPD limit for the duplicate of sample L04-02-25-P-S-B-00DU (160-16715-1). 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.

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

Samples L04-02-25-P-S-B-00 (160-16715-1), L04-02-26-P-S-B-00 (160-16715-2) and L04-02-27-P-S-B-00 (160-16715-3) were analyzed for Cesium-137 & Other Gamma Emitters (GS) in accordance with DOE GA-01-R. The samples were leached on 03/30/2016, and prepared and analyzed on 04/01/2016.

Preparation Batch 160-243328:

Radium-226 is reported in these samples at the client's request. Radium-226 is reported from the 609.31 keV line of bismuth-214. Because the samples have not had 21-days of ingrowth, the activity for radium-226 is an estimated value and may be biased low. This bias is caused by the disruption of secular equilibrium between radium-226 and bismuth-214 by the loss of radon-222 during sample preparation. The samples are reported with the MDC achieved. L04-02-25-P-S-B-00 (160-16715-1), L04-02-26-P-S-B-00 (160-16715-2), L04-02-27-P-S-B-00 (160-16715-3), (LCS 160-243328/2-A), (MB 160-243328/1-A), (160-16732-A-1-D) and (160-16732-A-1-E DU)

The following samples, analyzed by gamma spectroscopy, did not meet the thorium-234 detection goal; L04-02-27-P-S-B-00 (160-16715-3). The samples final activity was above the MDC. The results are reported with the MDC achieved.

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

Hematite Decommissioning Project

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

Revision: 4

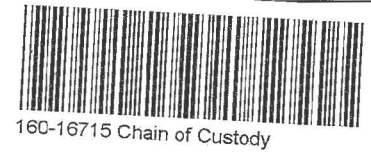
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Westinghouse Non-Proprietary Class 3

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-032916-01 Page 1/1				Requested Analysis								Laboratory Name:			
<b>Project Name:</b> Westinghouse Electric Company  <b>Contact Person:</b> Clark Evers  <b>Phone Number:</b> 314-810-3336 <b>Sampler Name:</b> Donte Love				Comp (C) or Grab (G)	Gamma Spec	Isotopic Uranium	Te-99	Gamma Spec (21 day ingrow for Ra-226)					Total Containers	TA-MO	
														Laboratory Address: 13715 Rider Trail North	
														Phone No. 314-298-8566	
														Laboratory Contact Person: Ivan Vania	
Phone No. 708-870-8453															
													Turn Around Time		
													Rush (7 days)		
													Remarks		
Sample ID	Date	Time	Matrix												
L04-02-25-P-S-B-00	3/29/2016	8:00	S	G	X		X	X					1	LSA 04-02 Sidewall Bias	
L04-02-26-P-S-B-00	3/29/2016	8:30	S	G	X		X	X					1	LSA 04-02 Bias	
L04-02-27-P-S-B-00	3/29/2016	8:15	S	G	X		X	X					1	LSA 04-02 Bias	



Relinquished by: <i>Gooski</i> <i>Cen 1/21</i>	Date/Time 3/30/16	Received by: <i>KGM/3815</i>	Date/Time 3/30/16	Total 3	Cooler Temperature: Ambient
Company Name: <i>WEC</i>	0915	Company Name: <i>CROSSROADS</i>	0915	Cooler ID: 0329-02	Shipper and Number:
Received by:	Date/Time	Relinquished by:	Date/Time	Comments: N/A	
Company Name:		Company Name:			
Relinquished by: <i>KGM/3815</i>	Date/Time 3/30/16	Received by: <i>[Signature]</i>	Date/Time 3/30/16	Verified By: <i>Gooski</i> <i>Cen 1/21</i> - 3/30/16	
Company Name: <i>Cross Roads</i>	11:10	Company Name: <i>[Signature]</i>	11:10		

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# Login Sample Receipt Checklist

Client: Westinghouse Electric Company LLC

Job Number: 160-16715-1

**Login Number: 16715**  
**List Number: 1**  
**Creator: Dedner, Connie L**

**List Source: 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.	N/A	
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.	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 <6mm (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: HDP RFP-CBA-022 (7 DAY TAT)

TestAmerica Job ID: 160-16715-1

## Qualifiers

### Metals

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

### 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.
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)

# Method Summary

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

TestAmerica Job ID: 160-16715-1

Method	Method Description	Protocol	Laboratory
6020A	Metals (ICP/MS), Tc-99	SW846	TAL SL
Moisture	Percent Moisture	EPA	TAL SL
6020A	Metals (ICP/MS), Tc-99 in Activity	SW846	TAL SL
GA-01-R	Cesium-137 & Other Gamma Emitters (GS)	DOE	TAL SL

#### Protocol References:

DOE = U.S. Department of Energy

EPA = US Environmental Protection Agency

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

#### 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: HDP RFP-CBA-022 (7 DAY TAT)

TestAmerica Job ID: 160-16715-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-16715-1	L04-02-25-P-S-B-00	Solid	03/29/16 08:00	03/30/16 11:10
160-16715-2	L04-02-26-P-S-B-00	Solid	03/29/16 08:30	03/30/16 11:10
160-16715-3	L04-02-27-P-S-B-00	Solid	03/29/16 08:15	03/30/16 11:10

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# Client Sample Results

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

TestAmerica Job ID: 160-16715-1

**Client Sample ID: L04-02-25-P-S-B-00**

**Lab Sample ID: 160-16715-1**

Date Collected: 03/29/16 08:00

Matrix: Solid

Date Received: 03/30/16 11:10

**Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>0.907</b>		0.110	0.143		0.113	pCi/g	04/01/16 14:08	04/01/16 17:45	1
Americium 241	-0.0272	U	0.125	0.125		0.0998	pCi/g	04/01/16 14:08	04/01/16 17:45	1
<b>Bismuth 212</b>	<b>1.21</b>		0.342	0.364		0.306	pCi/g	04/01/16 14:08	04/01/16 17:45	1
<b>Bismuth 214</b>	<b>0.684</b>		0.0888	0.113		0.0673	pCi/g	04/01/16 14:08	04/01/16 17:45	1
<b>Lead 212</b>	<b>1.01</b>		0.0841	0.155		0.0716	pCi/g	04/01/16 14:08	04/01/16 17:45	1
<b>Lead 214</b>	<b>0.821</b>		0.0794	0.117		0.0551	pCi/g	04/01/16 14:08	04/01/16 17:45	1
<b>Potassium 40</b>	<b>17.7</b>		1.07	2.08		0.289	pCi/g	04/01/16 14:08	04/01/16 17:45	1
Protactinium 231	0.724	U	0.364	0.373		1.04	pCi/g	04/01/16 14:08	04/01/16 17:45	1
<b>Radium 226</b>	<b>0.684</b>		0.0888	0.113	1.00	0.0673	pCi/g	04/01/16 14:08	04/01/16 17:45	1
<b>Thorium 234</b>	<b>1.84</b>		0.511	0.547	1.00	0.775	pCi/g	04/01/16 14:08	04/01/16 17:45	1
<b>Uranium 235</b>	<b>0.353</b>		0.138	0.142		0.177	pCi/g	04/01/16 14:08	04/01/16 17:45	1
Protactinium 234m	4.47	U	2.79	2.83		4.52	pCi/g	04/01/16 14:08	04/01/16 17:45	1
<b>Thorium 232</b>	<b>0.907</b>		0.110	0.143		0.113	pCi/g	04/01/16 14:08	04/01/16 17:45	1
<b>Other Detected Radionuclides</b>			<b>Count Uncert. (2σ+/-)</b>	<b>Total Uncert. (2σ+/-)</b>	<b>RL</b>	<b>MDC</b>	<b>Unit</b>	<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
<i>Tl-208</i>	0.314		0.0414	0.0525		0.0301	pCi/g	04/01/16 14:08	04/01/16 17:45	1

**Client Sample ID: L04-02-25-P-S-B-00**

**Lab Sample ID: 160-16715-1**

Date Collected: 03/29/16 08:00

Matrix: Solid

Date Received: 03/30/16 11:10

Percent Solids: 90.5

**Method: 6020A - Metals (ICP/MS), Tc-99**

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
<b>Technetium 99</b>	<b>0.000050</b>	<b>J</b>	0.000058	0.000018	mg/Kg	☼	04/01/16 05:05	04/05/16 14:15	1

**Method: 6020A - Metals (ICP/MS), Tc-99 in Activity**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
<b>Technetium 99</b>	<b>0.848</b>		0.0987	0.126	1.17	0.200	pCi/g	04/01/16 05:05	04/05/16 14:15	1
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
<i>Re</i>	95		30 - 110					04/01/16 05:05	04/05/16 14:15	1

**Client Sample ID: L04-02-26-P-S-B-00**

**Lab Sample ID: 160-16715-2**

Date Collected: 03/29/16 08:30

Matrix: Solid

Date Received: 03/30/16 11:10

**Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>1.21</b>		0.137	0.185		0.0902	pCi/g	04/01/16 14:08	04/01/16 17:46	1
Americium 241	0.0173	U	0.0574	0.0574		0.0961	pCi/g	04/01/16 14:08	04/01/16 17:46	1
<b>Bismuth 212</b>	<b>1.54</b>		0.444	0.472		0.379	pCi/g	04/01/16 14:08	04/01/16 17:46	1
<b>Bismuth 214</b>	<b>0.750</b>		0.0879	0.117		0.0595	pCi/g	04/01/16 14:08	04/01/16 17:46	1
<b>Lead 212</b>	<b>1.13</b>		0.0780	0.166		0.0610	pCi/g	04/01/16 14:08	04/01/16 17:46	1

TestAmerica St. Louis

# Client Sample Results

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

TestAmerica Job ID: 160-16715-1

**Client Sample ID: L04-02-26-P-S-B-00**

**Lab Sample ID: 160-16715-2**

Date Collected: 03/29/16 08:30

Matrix: Solid

Date Received: 03/30/16 11:10

**Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS) (Continued)**

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
<b>Lead 214</b>	<b>0.856</b>		0.0846	0.123		0.0648	pCi/g	04/01/16 14:08	04/01/16 17:46	1
<b>Potassium 40</b>	<b>20.1</b>		1.16	2.36		0.299	pCi/g	04/01/16 14:08	04/01/16 17:46	1
Protactinium 231	0.651	U	0.344	0.351		1.12	pCi/g	04/01/16 14:08	04/01/16 17:46	1
<b>Radium 226</b>	<b>0.750</b>		0.0879	0.117	1.00	0.0595	pCi/g	04/01/16 14:08	04/01/16 17:46	1
<b>Thorium 234</b>	<b>1.25</b>		0.489	0.507	1.00	0.770	pCi/g	04/01/16 14:08	04/01/16 17:46	1
Uranium 235	0.0787	U	0.136	0.136		0.226	pCi/g	04/01/16 14:08	04/01/16 17:46	1
Protactinium 234m	0.288	U	2.84	2.84		5.03	pCi/g	04/01/16 14:08	04/01/16 17:46	1
<b>Thorium 232</b>	<b>1.21</b>		0.137	0.185		0.0902	pCi/g	04/01/16 14:08	04/01/16 17:46	1
<b>Other Detected</b>			<b>Count</b>	<b>Total</b>						
<b>Radionuclides</b>			<b>Uncert.</b>	<b>Uncert.</b>	<b>RL</b>	<b>MDC</b>	<b>Unit</b>	<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
	<b>Result</b>	<b>Qualifier</b>	<b>(2σ+/-)</b>	<b>(2σ+/-)</b>						
Pb-210	1.86		0.635	0.671		0.774	pCi/g	04/01/16 14:08	04/01/16 17:46	1
Tl-208	0.393		0.0474	0.0625		0.0338	pCi/g	04/01/16 14:08	04/01/16 17:46	1

**Client Sample ID: L04-02-26-P-S-B-00**

**Lab Sample ID: 160-16715-2**

Date Collected: 03/29/16 08:30

Matrix: Solid

Date Received: 03/30/16 11:10

Percent Solids: 81.8

**Method: 6020A - Metals (ICP/MS), Tc-99**

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99	ND		0.000066	0.000020	mg/Kg	☼	04/01/16 05:05	04/05/16 14:28	1

**Method: 6020A - Metals (ICP/MS), Tc-99 in Activity**

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
<b>Technetium 99</b>	<b>0.324</b>		0.0606	0.0675	1.31	0.225	pCi/g	04/01/16 05:05	04/05/16 14:28	1
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Re	93		30 - 110					04/01/16 05:05	04/05/16 14:28	1

**Client Sample ID: L04-02-27-P-S-B-00**

**Lab Sample ID: 160-16715-3**

Date Collected: 03/29/16 08:15

Matrix: Solid

Date Received: 03/30/16 11:10

**Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)**

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
<b>Actinium 228</b>	<b>1.17</b>		0.147	0.189		0.158	pCi/g	04/01/16 14:08	04/01/16 18:23	1
Americium 241	-0.0429	U	0.0947	0.0948		0.157	pCi/g	04/01/16 14:08	04/01/16 18:23	1
<b>Bismuth 212</b>	<b>1.04</b>		0.524	0.535		0.524	pCi/g	04/01/16 14:08	04/01/16 18:23	1
<b>Bismuth 214</b>	<b>0.798</b>		0.118	0.144		0.0875	pCi/g	04/01/16 14:08	04/01/16 18:23	1
<b>Lead 212</b>	<b>1.16</b>		0.0995	0.180		0.0864	pCi/g	04/01/16 14:08	04/01/16 18:23	1
<b>Lead 214</b>	<b>0.760</b>		0.103	0.130		0.0869	pCi/g	04/01/16 14:08	04/01/16 18:23	1
<b>Potassium 40</b>	<b>17.1</b>		1.30	2.18		0.371	pCi/g	04/01/16 14:08	04/01/16 18:23	1
Protactinium 231	0.859	U	0.432	0.442		1.39	pCi/g	04/01/16 14:08	04/01/16 18:23	1
<b>Radium 226</b>	<b>0.798</b>		0.118	0.144	1.00	0.0875	pCi/g	04/01/16 14:08	04/01/16 18:23	1

TestAmerica St. Louis

# Client Sample Results

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

TestAmerica Job ID: 160-16715-1

**Client Sample ID: L04-02-27-P-S-B-00**

**Lab Sample ID: 160-16715-3**

Date Collected: 03/29/16 08:15

Matrix: Solid

Date Received: 03/30/16 11:10

**Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS) (Continued)**

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Thorium 234	8.92		0.903	1.30	1.00	1.17	pCi/g	04/01/16 14:08	04/01/16 18:23	1
Uranium 235	2.87		0.292	0.413		0.331	pCi/g	04/01/16 14:08	04/01/16 18:23	1
Protactinium 234m	9.36		4.23	4.34		6.09	pCi/g	04/01/16 14:08	04/01/16 18:23	1
Thorium 232	1.17		0.147	0.189		0.158	pCi/g	04/01/16 14:08	04/01/16 18:23	1
<i>Other Detected</i>			<i>Count</i>	<i>Total</i>						
<i>Radionuclides</i>	<i>Result</i>	<i>Qualifier</i>	<i>Uncert.</i>	<i>Uncert.</i>	<i>RL</i>	<i>MDC</i>	<i>Unit</i>	<i>Prepared</i>	<i>Analyzed</i>	<i>Dil Fac</i>
Tl-208	0.415		0.0562	0.0708		0.0371	pCi/g	04/01/16 14:08	04/01/16 18:23	1

**Client Sample ID: L04-02-27-P-S-B-00**

**Lab Sample ID: 160-16715-3**

Date Collected: 03/29/16 08:15

Matrix: Solid

Date Received: 03/30/16 11:10

Percent Solids: 87.4

**Method: 6020A - Metals (ICP/MS), Tc-99**

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99	0.00041		0.000061	0.000018	mg/Kg	☼	04/01/16 05:05	04/05/16 14:32	1

**Method: 6020A - Metals (ICP/MS), Tc-99 in Activity**

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Technetium 99	7.06		0.246	0.695	1.21	0.207	pCi/g	04/01/16 05:05	04/05/16 14:32	1
<i>Carrier</i>	<i>%Yield</i>	<i>Qualifier</i>	<i>Limits</i>					<i>Prepared</i>	<i>Analyzed</i>	<i>Dil Fac</i>
Re	94		30 - 110					04/01/16 05:05	04/05/16 14:32	1

# QC Sample Results

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

TestAmerica Job ID: 160-16715-1

## Method: 6020A - Metals (ICP/MS), Tc-99

**Lab Sample ID: MB 160-243094/1-A**  
**Matrix: Solid**  
**Analysis Batch: 244372**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 243094**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Technetium 99	ND		0.000050	0.000015	mg/Kg		04/01/16 05:05	04/05/16 14:06	1

**Lab Sample ID: LCS 160-243094/2-A**  
**Matrix: Solid**  
**Analysis Batch: 244372**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 243094**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	Limits
Technetium 99	0.00119	0.00113		mg/Kg		95	80 - 120

**Lab Sample ID: 160-16715-1 MS**  
**Matrix: Solid**  
**Analysis Batch: 244372**

**Client Sample ID: L04-02-25-P-S-B-00**  
**Prep Type: Total/NA**  
**Prep Batch: 243094**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	Limits
Technetium 99	0.000050	J	0.00132	0.00132		mg/Kg	☼	97	75 - 125

**Lab Sample ID: 160-16715-1 MSD**  
**Matrix: Solid**  
**Analysis Batch: 244372**

**Client Sample ID: L04-02-25-P-S-B-00**  
**Prep Type: Total/NA**  
**Prep Batch: 243094**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Technetium 99	0.000050	J	0.00132	0.00131		mg/Kg	☼	96	75 - 125	1	30

## Method: 6020A - Metals (ICP/MS), Tc-99 in Activity

**Lab Sample ID: MB 160-243094/1-A**  
**Matrix: Solid**  
**Analysis Batch: 244373**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 243094**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Technetium 99	0.03930	U	0.0285	0.0287	0.998	0.171	pCi/g	04/01/16 05:05	04/05/16 14:06	1

Carrier	MB %Yield	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
Re	100		30 - 110	04/01/16 05:05	04/05/16 14:06	1

**Lab Sample ID: LCS 160-243094/2-A**  
**Matrix: Solid**  
**Analysis Batch: 244373**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 243094**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	Limits
Technetium 99	20.3	19.33		1.80	0.993	0.170	pCi/g	95	80 - 120

Carrier	LCS %Yield	LCS Qualifier	Limits
Re	101		30 - 110

TestAmerica St. Louis

# QC Sample Results

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

TestAmerica Job ID: 160-16715-1

## Method: 6020A - Metals (ICP/MS), Tc-99 in Activity (Continued)

**Lab Sample ID: 160-16715-1 MS**

**Matrix: Solid**

**Analysis Batch: 244373**

**Client Sample ID: L04-02-25-P-S-B-00**

**Prep Type: Total/NA**

**Prep Batch: 243094**

Analyte	Sample Result	Sample Qual	Spike Added	MS Result	MS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Technetium 99	0.848		22.6	22.65		2.13	1.17	0.200	pCi/g	97	75 - 125
<b>MS MS</b>											
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>								
Re	95		30 - 110								

**Lab Sample ID: 160-16715-1 MSD**

**Matrix: Solid**

**Analysis Batch: 244373**

**Client Sample ID: L04-02-25-P-S-B-00**

**Prep Type: Total/NA**

**Prep Batch: 243094**

Analyte	Sample Result	Sample Qual	Spike Added	MSD Result	MSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Technetium 99	0.848		22.5	22.40		2.14	1.16	0.198	pCi/g	96	75 - 125	0.06	1
<b>MSD MSD</b>													
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>										
Re	96		30 - 110										

## Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

**Lab Sample ID: MB 160-243328/1-A**

**Matrix: Solid**

**Analysis Batch: 243329**

**Client Sample ID: Method Blank**

**Prep Type: Total/NA**

**Prep Batch: 243328**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.01161	U	0.0294	0.0294		0.0556	pCi/g	04/01/16 14:08	04/01/16 16:15	1
Americium 241	-0.0007794	U	0.0102	0.0102		0.0195	pCi/g	04/01/16 14:08	04/01/16 16:15	1
Bismuth 212	-0.01854	U	0.145	0.145		0.278	pCi/g	04/01/16 14:08	04/01/16 16:15	1
Bismuth 214	-0.01028	U	0.107	0.107		0.0522	pCi/g	04/01/16 14:08	04/01/16 16:15	1
Lead 212	0.002493	U	0.0141	0.0141		0.0282	pCi/g	04/01/16 14:08	04/01/16 16:15	1
Lead 214	-0.004754	U	0.0499	0.0499		0.0364	pCi/g	04/01/16 14:08	04/01/16 16:15	1
Potassium 40	-0.0006656	U	0.0873	0.0873		0.254	pCi/g	04/01/16 14:08	04/01/16 16:15	1
Protactinium 231	0.0000	U	0.105	0.105		0.265	pCi/g	04/01/16 14:08	04/01/16 16:15	1
Radium 226	-0.01028	U	0.107	0.107	1.00	0.0522	pCi/g	04/01/16 14:08	04/01/16 16:15	1
Thorium 234	0.03316	U	0.137	0.137	1.00	0.281	pCi/g	04/01/16 14:08	04/01/16 16:15	1
Uranium 235	-0.01312	U	0.525	0.525		0.0749	pCi/g	04/01/16 14:08	04/01/16 16:15	1
Protactinium 234m	-0.3801	U	15.2	15.2		5.24	pCi/g	04/01/16 14:08	04/01/16 16:15	1
Thorium 232	0.01161	U	0.0294	0.0294		0.0556	pCi/g	04/01/16 14:08	04/01/16 16:15	1
<b>Count Total</b>										
<b>Other Detected Radionuclides</b>	<b>MB Result</b>	<b>MB Qualifier</b>	<b>Count Uncert. (2σ+/-)</b>	<b>Total Uncert. (2σ+/-)</b>	<b>RL</b>	<b>MDC</b>	<b>Unit</b>	<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Other Detected Radionuclide	None						pCi/g	04/01/16 14:08	04/01/16 16:15	1

TestAmerica St. Louis

# QC Sample Results

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

TestAmerica Job ID: 160-16715-1

## Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS) (Continued)

**Lab Sample ID: LCS 160-243328/2-A**  
**Matrix: Solid**  
**Analysis Batch: 243330**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 243328**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Americium 241	101	95.81		9.97		0.498	pCi/g	95	87 - 116
Cesium 137	34.1	32.43		3.39	0.200	0.151	pCi/g	95	87 - 120
Cobalt 60	31.7	29.61		2.99		0.120	pCi/g	93	87 - 115

**Lab Sample ID: 160-16732-A-1-E DU**  
**Matrix: Solid**  
**Analysis Batch: 243333**

**Client Sample ID: Duplicate**  
**Prep Type: Total/NA**  
**Prep Batch: 243328**

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Actinium 228	1.25		1.359		0.221		0.111	pCi/g	0.28	1
Americium 241	-0.0178	U	-0.00840	U	0.792		0.100	pCi/g	0.01	1
Bismuth 212	0.963		1.862		0.476		0.327	pCi/g	1.01	1
Bismuth 214	0.779		0.8501		0.129		0.0664	pCi/g	0.27	1
Lead 212	1.01		1.181		0.183		0.0851	pCi/g	0.49	1
Lead 214	0.889		0.9323		0.127		0.0720	pCi/g	0.17	1
Potassium 40	17.9		22.96		2.62		0.350	pCi/g	1.04	1
Protactinium 231	0.694	U	0.5724	U	0.234		1.25	pCi/g	0.24	1
Radium 226	0.779		0.8501		0.129	1.00	0.0664	pCi/g	0.27	1
Thorium 234	1.08		1.721		0.589	1.00	0.872	pCi/g	0.67	1
Uranium 235	0.927		1.007		0.245		0.248	pCi/g	0.17	1
Protactinium 234m	1.44	U	4.256	U	2.66		5.63	pCi/g	0.58	1
Thorium 232	1.25		1.359		0.221		0.111	pCi/g	0.28	1
<b>Other Detected Radionuclides</b>	<b>Sample Result</b>	<b>Sample Qual</b>	<b>DU Result</b>	<b>DU Qual</b>	<b>Total Uncert. (2σ+/-)</b>	<b>RL</b>	<b>MDC</b>	<b>Unit</b>	<b>RER</b>	<b>RER Limit</b>
Tl-208	0.340		0.4108		0.0653		0.0352	pCi/g	0.55	1

# QC Association Summary

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

TestAmerica Job ID: 160-16715-1

## Metals

### Prep Batch: 243094

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-16715-1	L04-02-25-P-S-B-00	Total/NA	Solid	None	
160-16715-1 MS	L04-02-25-P-S-B-00	Total/NA	Solid	None	
160-16715-1 MSD	L04-02-25-P-S-B-00	Total/NA	Solid	None	
160-16715-2	L04-02-26-P-S-B-00	Total/NA	Solid	None	
160-16715-3	L04-02-27-P-S-B-00	Total/NA	Solid	None	
LCS 160-243094/2-A	Lab Control Sample	Total/NA	Solid	None	
MB 160-243094/1-A	Method Blank	Total/NA	Solid	None	

### Analysis Batch: 244372

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-16715-1	L04-02-25-P-S-B-00	Total/NA	Solid	6020A	243094
160-16715-1 MS	L04-02-25-P-S-B-00	Total/NA	Solid	6020A	243094
160-16715-1 MSD	L04-02-25-P-S-B-00	Total/NA	Solid	6020A	243094
160-16715-2	L04-02-26-P-S-B-00	Total/NA	Solid	6020A	243094
160-16715-3	L04-02-27-P-S-B-00	Total/NA	Solid	6020A	243094
LCS 160-243094/2-A	Lab Control Sample	Total/NA	Solid	6020A	243094
MB 160-243094/1-A	Method Blank	Total/NA	Solid	6020A	243094

## General Chemistry

### Analysis Batch: 242984

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-16715-1	L04-02-25-P-S-B-00	Total/NA	Solid	Moisture	
160-16715-1 DU	L04-02-25-P-S-B-00	Total/NA	Solid	Moisture	
160-16715-2	L04-02-26-P-S-B-00	Total/NA	Solid	Moisture	
160-16715-3	L04-02-27-P-S-B-00	Total/NA	Solid	Moisture	
160-16715-3 DU	L04-02-27-P-S-B-00	Total/NA	Solid	Moisture	

## Rad

### Leach Batch: 242944

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-16715-1	L04-02-25-P-S-B-00	Total/NA	Solid	Dry and Grind	
160-16715-2	L04-02-26-P-S-B-00	Total/NA	Solid	Dry and Grind	
160-16715-3	L04-02-27-P-S-B-00	Total/NA	Solid	Dry and Grind	

### Leach Batch: 243044

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-16732-A-1-E DU	Duplicate	Total/NA	Solid	Dry and Grind	

### Prep Batch: 243094

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-16715-1	L04-02-25-P-S-B-00	Total/NA	Solid	None	
160-16715-1 MS	L04-02-25-P-S-B-00	Total/NA	Solid	None	
160-16715-1 MSD	L04-02-25-P-S-B-00	Total/NA	Solid	None	
160-16715-2	L04-02-26-P-S-B-00	Total/NA	Solid	None	
160-16715-3	L04-02-27-P-S-B-00	Total/NA	Solid	None	
LCS 160-243094/2-A	Lab Control Sample	Total/NA	Solid	None	
MB 160-243094/1-A	Method Blank	Total/NA	Solid	None	

TestAmerica St. Louis



# QC Association Summary

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

TestAmerica Job ID: 160-16715-1

## Rad (Continued)

### Prep Batch: 243328

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-16715-1	L04-02-25-P-S-B-00	Total/NA	Solid	Fill_Geo-0	242944
160-16715-2	L04-02-26-P-S-B-00	Total/NA	Solid	Fill_Geo-0	242944
160-16715-3	L04-02-27-P-S-B-00	Total/NA	Solid	Fill_Geo-0	242944
160-16732-A-1-E DU	Duplicate	Total/NA	Solid	Fill_Geo-0	243044
LCS 160-243328/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-0	
MB 160-243328/1-A	Method Blank	Total/NA	Solid	Fill_Geo-0	

# Tracer/Carrier Summary

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

TestAmerica Job ID: 160-16715-1

**Method: 6020A - Metals (ICP/MS), Tc-99 in Activity**

**Matrix: Solid**

**Prep Type: Total/NA**

## Percent Yield (Acceptance Limits)

Lab Sample ID	Client Sample ID	Re (30-110)
160-16715-1	L04-02-25-P-S-B-00	95
160-16715-1 MS	L04-02-25-P-S-B-00	95
160-16715-1 MSD	L04-02-25-P-S-B-00	96
160-16715-2	L04-02-26-P-S-B-00	93
160-16715-3	L04-02-27-P-S-B-00	94
LCS 160-243094/2-A	Lab Control Sample	101
MB 160-243094/1-A	Method Blank	100

### Tracer/Carrier Legend

Re = Re