

# 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: 160-16070-2

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

*Rhonda Ridenhower*

Authorized for release by:

3/8/2016 3:06:00 PM

Rhonda Ridenhower, Manager of Project Management  
[rhonda.ridenhower@testamericainc.com](mailto:rhonda.ridenhower@testamericainc.com)

Designee for

Ivan Vania, Project Manager II  
(314)298-8566

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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: 160-16070-2

**Job ID: 160-16070-2**

**Laboratory: TestAmerica St. Louis**

**Narrative**

## CASE NARRATIVE

**Client: Westinghouse Electric Company LLC**

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

**Report Number: 160-16070-2**

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

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 02/11/2016; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 18.3 C.

### **RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)**

Samples L040421PEB00 (160-16070-1) and L040422PEB00 (160-16070-2) were analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA\_01\_R. The samples were dried on 02/11/2016, prepared on 02/15/2016 and analyzed on 03/07/2016.

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

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.

<b>Chain of Custody ID No.</b> F-021016-03 <b>Page</b> 1/1				<b>Requested Analysis</b>										<b>Laboratory Name:</b> TA-MO			
<b>Project Name:</b> Westinghouse Electric Company				Comp (C) or Grab (G)	Gamma Spec	Isotopic Uranium	Tc-99	Gamma Spec (21 day ingrow for Ra-226)							Total Containers	<b>Laboratory Address:</b> 13715 Rider Trail North	
<b>Contact Person:</b> Gerald Rood																<b>Phone No.</b> 314-298-8566	
<b>Phone Number:</b> 314-810-3382																<b>Laboratory Contact Person:</b> Ivan Vania	
<b>Sampler Name:</b> Williams																<b>Phone No.</b> 708-870-8453	
														<b>Turn Around Time</b>			
														Rush (7 days)			
														Remarks			
<b>Sample ID</b>	<b>Date</b>	<b>Time</b>	<b>Matrix</b>														
L040421PEB00	2/10/2016	13:30	S	G	X		X	X								1	LSA 04-04 Bias
L040422PEB00	2/10/2016	13:25	S	G	X		X	X								1	LSA 04-04 Bias



<b>Relinquished by:</b> <i>C. J.</i>	<b>Date/Time</b> 2-11-16	<b>Received by:</b> <i>KG</i>	<b>Date/Time</b> 2-11-16	<b>Total</b> 2	<b>Cooler Temperature:</b> Ambient
<b>Company Name:</b> <i>WEC</i>	<b>Date/Time</b> 09:05	<b>Company Name:</b> <i>CROSS ROADS</i>	<b>Date/Time</b> 09:05	<b>Cooler ID:</b> 0210-02	<b>Shipper and Number:</b>
<b>Received by:</b>	<b>Date/Time</b>	<b>Relinquished by:</b>	<b>Date/Time</b>	0	
<b>Company Name:</b>		<b>Company Name:</b>			
<b>Relinquished by:</b> <i>KG</i>	<b>Date/Time</b> 2-11-16	<b>Received by:</b> <i>Wilder</i>	<b>Date/Time</b> 2-11-16	<b>Verified By:</b> <i>Curtis Wilder</i>	
<b>Company Name:</b> <i>CROSS ROADS</i>	<b>Date/Time</b> 10:45	<b>Company Name:</b> <i>AS</i>	<b>Date/Time</b> 10:45		



## Login Sample Receipt Checklist

Client: Westinghouse Electric Company LLC

Job Number: 160-16070-2

**Login Number: 16070**

**List Source: TestAmerica St. Louis**

**List Number: 1**

**Creator: Dedner, Connie L**

Question	Answer	Comment
Radioactivity wasn't checked or is <math>\leq</math> 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 <math><6\text{mm}</math> (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: 160-16070-2

## Qualifiers

### Rad

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

## Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
▫	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, 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: 160-16070-2

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

TestAmerica Job ID: 160-16070-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-16070-1	L040421PEB00	Solid	02/10/16 13:30	02/11/16 10:09
160-16070-2	L040422PEB00	Solid	02/10/16 13:25	02/11/16 10:09

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# Client Sample Results

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

TestAmerica Job ID: 160-16070-2

**Client Sample ID: L040421PEB00**

**Lab Sample ID: 160-16070-1**

Date Collected: 02/10/16 13:30

Matrix: Solid

Date Received: 02/11/16 10:09

**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		0.167	0.204		0.154	pCi/g	02/15/16 12:46	03/07/16 08:44	1
Bismuth 212	0.728		0.431	0.438		0.634	pCi/g	02/15/16 12:46	03/07/16 08:44	1
Bismuth 214	1.04		0.146	0.182		0.107	pCi/g	02/15/16 12:46	03/07/16 08:44	1
Lead 212	1.09		0.107	0.177		0.0869	pCi/g	02/15/16 12:46	03/07/16 08:44	1
Lead 214	1.24		0.127	0.181		0.0899	pCi/g	02/15/16 12:46	03/07/16 08:44	1
Potassium 40	19.2		1.52	2.48		0.305	pCi/g	02/15/16 12:46	03/07/16 08:44	1
Protactinium 231	0.742	U	0.557	0.563		1.41	pCi/g	02/15/16 12:46	03/07/16 08:44	1
Radium 226	1.04		0.146	0.182	1.00	0.107	pCi/g	02/15/16 12:46	03/07/16 08:44	1
Thorium 232	1.14		0.167	0.204		0.154	pCi/g	02/15/16 12:46	03/07/16 08:44	1
Thorium 234	1.47		0.578	0.598		0.892	pCi/g	02/15/16 12:46	03/07/16 08:44	1
Uranium 235	0.216	U	0.173	0.175		0.237	pCi/g	02/15/16 12:46	03/07/16 08:44	1
Americium 241	0.0120	U	0.0721	0.0721		0.122	pCi/g	02/15/16 12:46	03/07/16 08:44	1
Protactinium 234m	4.28	U	4.80	4.82		7.90	pCi/g	02/15/16 12:46	03/07/16 08:44	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>
Tl-208	0.338		0.0629	0.0720		0.0488	pCi/g	02/15/16 12:46	03/07/16 08:44	1

**Client Sample ID: L040422PEB00**

**Lab Sample ID: 160-16070-2**

Date Collected: 02/10/16 13:25

Matrix: Solid

Date Received: 02/11/16 10:09

**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	1.01		0.162	0.191		0.135	pCi/g	02/15/16 12:46	03/07/16 09:40	1
Bismuth 212	1.96		0.453	0.495		0.347	pCi/g	02/15/16 12:46	03/07/16 09:40	1
Bismuth 214	1.23		0.121	0.175		0.0818	pCi/g	02/15/16 12:46	03/07/16 09:40	1
Lead 212	1.06		0.0913	0.165		0.0802	pCi/g	02/15/16 12:46	03/07/16 09:40	1
Lead 214	1.39		0.0960	0.174		0.0746	pCi/g	02/15/16 12:46	03/07/16 09:40	1
Potassium 40	22.5		1.21	2.57		0.338	pCi/g	02/15/16 12:46	03/07/16 09:40	1
Protactinium 231	0.476	U	0.298	0.303		1.21	pCi/g	02/15/16 12:46	03/07/16 09:40	1
Radium 226	1.23		0.121	0.175	1.00	0.0818	pCi/g	02/15/16 12:46	03/07/16 09:40	1
Thorium 232	1.01		0.162	0.191		0.135	pCi/g	02/15/16 12:46	03/07/16 09:40	1
Thorium 234	1.13		0.331	0.352		0.848	pCi/g	02/15/16 12:46	03/07/16 09:40	1
Uranium 235	0.0713	U	0.134	0.135		0.256	pCi/g	02/15/16 12:46	03/07/16 09:40	1
Americium 241	0.0105	U	0.0617	0.0617		0.104	pCi/g	02/15/16 12:46	03/07/16 09:40	1
Protactinium 234m	6.80		2.91	2.99		5.62	pCi/g	02/15/16 12:46	03/07/16 09:40	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>
Tl-208	0.366		0.0504	0.0629		0.0390	pCi/g	02/15/16 12:46	03/07/16 09:40	1

TestAmerica St. Louis

# QC Sample Results

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

TestAmerica Job ID: 160-16070-2

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

**Lab Sample ID: MB 160-236808/1-A**  
**Matrix: Solid**  
**Analysis Batch: 239441**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 236808**

Analyte	MB MB		Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert.	Uncert.						
Actinium 228	0.009681	U	0.0218	0.0218		0.0395	pCi/g	02/15/16 12:46	03/07/16 08:35	1
Bismuth 212	-0.01154	U	0.0951	0.0951		0.180	pCi/g	02/15/16 12:46	03/07/16 08:35	1
Bismuth 214	-0.008905	U	0.0944	0.0944		0.0372	pCi/g	02/15/16 12:46	03/07/16 08:35	1
Lead 212	-0.01267	U	0.0945	0.0945		0.0247	pCi/g	02/15/16 12:46	03/07/16 08:35	1
Lead 214	0.006876	U	0.0133	0.0133		0.0309	pCi/g	02/15/16 12:46	03/07/16 08:35	1
Potassium 40	-0.06570	U	2.63	2.63		0.322	pCi/g	02/15/16 12:46	03/07/16 08:35	1
Protactinium 231	0.01587	U	0.173	0.173		0.318	pCi/g	02/15/16 12:46	03/07/16 08:35	1
Radium 226	-0.008905	U	0.0944	0.0944	1.00	0.0372	pCi/g	02/15/16 12:46	03/07/16 08:35	1
Thorium 232	0.009681	U	0.0218	0.0218		0.0395	pCi/g	02/15/16 12:46	03/07/16 08:35	1
Thorium 234	0.004379	U	0.120	0.120		0.243	pCi/g	02/15/16 12:46	03/07/16 08:35	1
Uranium 235	0.01574	U	0.0292	0.0292		0.0624	pCi/g	02/15/16 12:46	03/07/16 08:35	1
Americium 241	0.004575	U	0.0127	0.0127		0.0222	pCi/g	02/15/16 12:46	03/07/16 08:35	1
Protactinium 234m	-0.4442	U	7.34	7.34		2.28	pCi/g	02/15/16 12:46	03/07/16 08:35	1
<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	02/15/16 12:46	03/07/16 08:35	1

**Lab Sample ID: LCS 160-236808/2-A**  
**Matrix: Solid**  
**Analysis Batch: 239444**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 236808**

Analyte	Spike Added	LCS Result	LCS Qual	Total	RL	MDC	Unit	%Rec	%Rec.
				Uncert. (2σ+/-)					Limits
Americium 241	101	100.9		10.5		0.530	pCi/g	100	87 - 116
Cesium 137	34.1	36.74		3.80		0.142	pCi/g	108	87 - 120
Cobalt 60	32.0	34.02		3.37		0.0928	pCi/g	106	87 - 115

**Lab Sample ID: 160-16068-A-1-I DU**  
**Matrix: Solid**  
**Analysis Batch: 239441**

**Client Sample ID: Duplicate**  
**Prep Type: Total/NA**  
**Prep Batch: 236808**

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total	RL	MDC	Unit	RER	RER
					Uncert. (2σ+/-)					Limit
Actinium 228	0.873		0.9139		0.153		0.0977	pCi/g	0.13	1
Bismuth 212	0.747		1.109		0.342		0.268	pCi/g	0.54	1
Bismuth 214	0.863		0.8469		0.136		0.0761	pCi/g	0.06	1
Lead 212	0.909		0.8784		0.135		0.0620	pCi/g	0.11	1
Lead 214	1.00		1.008		0.132		0.0590	pCi/g	0.03	1
Potassium 40	15.5		15.21		1.83		0.271	pCi/g	0.07	1
Protactinium 231	0.370	U	0.2825	U	0.172		0.920	pCi/g	0.24	1
Radium 226	0.863		0.8469		0.136	1.00	0.0761	pCi/g	0.06	1
Thorium 232	0.873		0.9139		0.153		0.0977	pCi/g	0.13	1
Thorium 234	2.62		2.682		0.619		0.802	pCi/g	0.05	1
Uranium 235	0.769		0.7596		0.182		0.224	pCi/g	0.02	1
Americium 241	0.0402	U	0.01740	U	0.0631		0.106	pCi/g	0.19	1

TestAmerica St. Louis

# QC Sample Results

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

TestAmerica Job ID: 160-16070-2

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

**Lab Sample ID: 160-16068-A-1-I DU**  
**Matrix: Solid**  
**Analysis Batch: 239441**

**Client Sample ID: Duplicate**  
**Prep Type: Total/NA**  
**Prep Batch: 236808**

Analyte	Sample	Sample	DU	DU	Total	RL	MDC	Unit	RER	RER
	Result	Qual	Result	Qual	Uncert. (2σ+/-)					
Protactinium 234m	4.84		5.064		2.40		4.91	pCi/g	0.04	1
<i>Total</i>										
<i>Other Detected Radionuclides</i>	<i>Sample Result</i>	<i>Sample Qual</i>	<i>DU Result</i>	<i>DU Qual</i>	<i>Uncert. (2σ+/-)</i>	<i>RL</i>	<i>MDC</i>	<i>Unit</i>	<i>RER</i>	<i>RER Limit</i>
<i>Tl-208</i>	<i>0.248</i>		<i>0.2706</i>		<i>0.0508</i>		<i>0.0331</i>	<i>pCi/g</i>	<i>0.23</i>	<i>1</i>



# QC Association Summary

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

TestAmerica Job ID: 160-16070-2

## Rad

### Leach Batch: 236447

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-16068-A-1-I DU	Duplicate	Total/NA	Solid	Dry and Grind	
160-16070-1	L040421PEB00	Total/NA	Solid	Dry and Grind	
160-16070-2	L040422PEB00	Total/NA	Solid	Dry and Grind	

### Prep Batch: 236808

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-16068-A-1-I DU	Duplicate	Total/NA	Solid	Fill_Geo-21	236447
160-16070-1	L040421PEB00	Total/NA	Solid	Fill_Geo-21	236447
160-16070-2	L040422PEB00	Total/NA	Solid	Fill_Geo-21	236447
LCS 160-236808/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
MB 160-236808/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	