

# 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: 160-17276-2

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



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Authorized for release by:  
6/2/2016 12:10:24 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: HDP RFP-CBA-022 (7 DAY TAT)

TestAmerica Job ID: 160-17276-2

**Job ID: 160-17276-2**

**Laboratory: TestAmerica St. Louis**

**Narrative**

## CASE NARRATIVE

**Client: Westinghouse Electric Company LLC**

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

**Report Number: 160-17276-2**

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 5/6/2016 11:10 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 3 coolers at receipt time were 20.0° C, 20.0° C and 20.0° C.

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

Samples L04-05-01-P-R-S-00 (160-17276-1), L04-05-02-P-E-S-00 (160-17276-2), L04-05-03-P-S-S-00 (160-17276-3), L04-05-03-P-S-Q-00 (160-17276-4), L04-05-04-P-R-S-00 (160-17276-5), L04-05-06-P-S-S-00 (160-17276-6), L04-05-07-P-R-S-00 (160-17276-7), L04-05-09-P-S-S-00 (160-17276-8), L04-05-10-P-R-S-00 (160-17276-9), L04-05-12-P-S-S-00 (160-17276-10), L04-05-13-P-R-S-00 (160-17276-11), L04-05-15-P-R-S-00 (160-17276-12), L04-05-16-P-E-S-00 (160-17276-13), L04-05-17-P-S-S-00 (160-17276-14), L04-05-18-P-R-S-00 (160-17276-15), L04-05-18-P-R-Q-00 (160-17276-16), L04-05-20-P-S-S-00 (160-17276-17), L04-05-21-P-R-S-00 (160-17276-18), L04-05-23-P-S-B-00 (160-17276-19) and L04-05-24-P-S-B-00 (160-17276-20) were analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA\_01\_R. The samples were leached on 05/06/2016, prepared on 05/10/2016 and analyzed on 06/01/2016.

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

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-050616-01 Page 1/2				Requested Analysis										Laboratory Name:			
Project Name: Westinghouse Electric Company				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: Clark Evers																Laboratory Address: 13715 Rider Trail North	
Phone Number: 314-810-3336																Phone No. 314-298-8566	
Sampler Name Jahmai Williams																Laboratory Contact Person: Ivan Vania	
				Phone No. 708-870-8453													
				Turn Around Time													
				Rush (7 days)													
				Remarks													
Sample ID	Date	Time	Matrix	Comp (C) or Grab (G)	Gamma Spec	Isotopic Uranium	Tc-99	Gamma Spec (21 day ingrow for Ra-226)									
L04-05-01-P-R-S-00	5/4/2016	15:10	S	C	X		X	X						1	LSA 04-05		
L04-05-02-P-E-S-00	5/4/2016	15:13	S	C	X		X	X						1	LSA 04-05		
L04-05-03-P-S-S-00	5/4/2016	14:55	S	G	X		X	X						1	LSA 04-05		
L04-05-03-P-S-Q-00	5/4/2016	14:55	S	G	X		X	X						1	LSA 04-05		
L04-05-04-P-R-S-00	5/4/2016	15:00	S	C	X		X	X						1	LSA 04-05		
L04-05-06-P-S-S-00	5/4/2016	14:40	S	G	X		X	X						1	LSA 04-05		
L04-05-07-P-R-S-00	5/4/2016	14:45	S	C	X		X	X						1	LSA 04-05		
L04-05-09-P-S-S-00	5/5/2016	7:50	S	G	X		X	X						1	LSA 04-05		
L04-05-10-P-R-S-00	5/5/2016	8:00	S	C	X		X	X						1	LSA 04-05		
L04-05-12-P-S-S-00	5/4/2016	14:25	S	G	X		X	X						1	LSA 04-05		
L04-05-13-P-R-S-00	5/4/2016	14:30	S	C	X		X	X						1	LSA 04-05		
L04-05-15-P-R-S-00	5/4/2016	15:31	S	C	X		X	X						1	LSA 04-05		
Relinquished by: <i>Gorsum</i>		Date/Time: 5-6-16 0910		Received by: <i>RGM 3815</i>		Date/Time: 5-6-16 0910		Total: 20		Cooler Temperature: Ambient							
Company Name: <i>WEC</i>				Company Name: <i>CROSSROADS</i>				Cooler ID: see comment		Shipper and Number:							
Received by:		Date/Time:		Relinquished by:		Date/Time:		Comments: Coolers #0505-01/02/03									
Company Name:				Company Name:													
Relinquished by: <i>RGM 3815</i>		Date/Time: 5-6-16 1110		Received by: <i>W. J. ...</i>		Date/Time: 5-6-16 1110		Verified By: <i>C. Gorsum</i>									
Company Name: <i>CROSSROADS</i>				Company Name: <i>...</i>				Date: 5-6-16									



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Hematite Decommissioning Project

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

Revision: 4

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.

<b>Chain of Custody ID No.</b> F-050616-01 <b>Page</b> 2/2				<b>Requested Analysis</b>								<b>Laboratory Name:</b>			
<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> Clark Evers														<b>Phone No.</b> 314-298-8566	
<b>Phone Number:</b> 314-810-3336														<b>Laboratory Contact Person:</b> Ivan Vania	
<b>Sampler Name</b> Jahmai 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>												
L04-05-16-P-E-S-00	5/4/2016	15:35	S	X	X	X						1	LSA 04-05		
L04-05-17-P-S-S-00	5/4/2016	15:50	S	X	X	X						1	LSA 04-05		
L04-05-18-P-R-S-00	5/4/2016	16:05	S	X	X	X						1	LSA 04-05		
L04-05-18-P-R-Q-00	5/4/2016	16:05	S	X	X	X						1	LSA 04-05		
L04-05-20-P-S-S-00	5/5/2016	8:10	S	X	X	X						1	LSA 04-05		
L04-05-21-P-R-S-00	5/5/2016	8:20	S	X	X	X						1	LSA 04-05		
L04-05-23-P-S-B-00	5/5/2016	8:35	S	X	X	X						1	LSA 04-05 Bias		
L04-05-24-P-S-B-00	5/5/2016	8:50	S	X	X	X						1	LSA 04-05 Bias		
<b>Relinquished by:</b> <i>C. Gorsue</i>		<b>Date/Time</b> 5-6-16		<b>Received by:</b> <i>R. Galt</i>		<b>Date/Time</b> 5-6-16		<b>Total</b> 20		<b>Cooler Temperature:</b> Ambient					
<b>Company Name:</b> <i>WEC</i>		0910		<b>Company Name:</b> <i>CROSSROADS</i>		0910		<b>Cooler ID:</b> see comment		<b>Shipper and Number:</b>					
<b>Received by:</b>				<b>Date/Time</b>		<b>Relinquished by:</b>		<b>Date/Time</b>		<b>Comments:</b> Coolers #0505-01/02/03					
<b>Company Name:</b>						<b>Company Name:</b>									
<b>Relinquished by:</b> <i>R. Galt</i>		<b>Date/Time</b> 5-6-16		<b>Received by:</b> <i>J. H. Williams</i>		<b>Date/Time</b> 5-6-16		<b>Verified By:</b> <i>C. Gorsue</i>							
<b>Company Name:</b> <i>CROSSROADS</i>		1110		<b>Company Name:</b> <i>J. H. Williams</i>		1110		<i>C. Gorsue</i> 5-6-16							

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# Login Sample Receipt Checklist

Client: Westinghouse Electric Company LLC

Job Number: 160-17276-2

**Login Number: 17276**

**List Source: TestAmerica St. Louis**

**List Number: 1**

**Creator: Dedner, Connie L**

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.	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?	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 $<6\text{mm}$ (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: HDP RFP-CBA-022 (7 DAY TAT)

TestAmerica Job ID: 160-17276-2

## 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: 160-17276-2

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: 160-17276-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-17276-1	L04-05-01-P-R-S-00	Solid	05/04/16 15:10	05/06/16 11:10
160-17276-2	L04-05-02-P-E-S-00	Solid	05/04/16 15:13	05/06/16 11:10
160-17276-3	L04-05-03-P-S-S-00	Solid	05/04/16 14:55	05/06/16 11:10
160-17276-4	L04-05-03-P-S-Q-00	Solid	05/04/16 14:55	05/06/16 11:10
160-17276-5	L04-05-04-P-R-S-00	Solid	05/04/16 15:00	05/06/16 11:10
160-17276-6	L04-05-06-P-S-S-00	Solid	05/04/16 14:40	05/06/16 11:10
160-17276-7	L04-05-07-P-R-S-00	Solid	05/04/16 14:45	05/06/16 11:10
160-17276-8	L04-05-09-P-S-S-00	Solid	05/05/16 07:50	05/06/16 11:10
160-17276-9	L04-05-10-P-R-S-00	Solid	05/05/16 08:00	05/06/16 11:10
160-17276-10	L04-05-12-P-S-S-00	Solid	05/04/16 14:25	05/06/16 11:10
160-17276-11	L04-05-13-P-R-S-00	Solid	05/04/16 14:30	05/06/16 11:10
160-17276-12	L04-05-15-P-R-S-00	Solid	05/04/16 15:31	05/06/16 11:10
160-17276-13	L04-05-16-P-E-S-00	Solid	05/04/16 15:35	05/06/16 11:10
160-17276-14	L04-05-17-P-S-S-00	Solid	05/04/16 15:50	05/06/16 11:10
160-17276-15	L04-05-18-P-R-S-00	Solid	05/04/16 16:05	05/06/16 11:10
160-17276-16	L04-05-18-P-R-Q-00	Solid	05/04/16 16:05	05/06/16 11:10
160-17276-17	L04-05-20-P-S-S-00	Solid	05/05/16 08:10	05/06/16 11:10
160-17276-18	L04-05-21-P-R-S-00	Solid	05/05/16 08:20	05/06/16 11:10
160-17276-19	L04-05-23-P-S-B-00	Solid	05/05/16 08:35	05/06/16 11:10
160-17276-20	L04-05-24-P-S-B-00	Solid	05/05/16 08:50	05/06/16 11:10

# Client Sample Results

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

TestAmerica Job ID: 160-17276-2

**Client Sample ID: L04-05-01-P-R-S-00**

**Lab Sample ID: 160-17276-1**

Date Collected: 05/04/16 15:10

Matrix: Solid

Date Received: 05/06/16 11:10

**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	1.02		0.141	0.175		0.148	pCi/g	05/10/16 15:27	06/01/16 09:20	1
Bismuth 212	1.53		0.508	0.532		0.428	pCi/g	05/10/16 15:27	06/01/16 09:20	1
Bismuth 214	1.14		0.113	0.164		0.0646	pCi/g	05/10/16 15:27	06/01/16 09:20	1
Lead 212	1.00		0.0760	0.150		0.0671	pCi/g	05/10/16 15:27	06/01/16 09:20	1
Lead 214	1.19		0.117	0.170		0.0849	pCi/g	05/10/16 15:27	06/01/16 09:20	1
Potassium 40	17.8		1.22	2.19		0.338	pCi/g	05/10/16 15:27	06/01/16 09:20	1
Protactinium 231	0.0565	U	0.642	0.642		2.03	pCi/g	05/10/16 15:27	06/01/16 09:20	1
Radium 226	1.14		0.113	0.164	1.00	0.0646	pCi/g	05/10/16 15:27	06/01/16 09:20	1
Thorium 232	1.02		0.141	0.175		0.148	pCi/g	05/10/16 15:27	06/01/16 09:20	1
Thorium 234	1.19		0.517	0.531		0.801	pCi/g	05/10/16 15:27	06/01/16 09:20	1
Uranium 235	0.166	U	0.185	0.186		0.222	pCi/g	05/10/16 15:27	06/01/16 09:20	1
Americium 241	-0.0342	U	0.0804	0.0805		0.113	pCi/g	05/10/16 15:27	06/01/16 09:20	1
Protactinium 234m	1.79	U	2.67	2.68		8.75	pCi/g	05/10/16 15:27	06/01/16 09:20	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	0.326		0.0564	0.0658		0.0437	pCi/g	05/10/16 15:27	06/01/16 09:20	1

**Client Sample ID: L04-05-02-P-E-S-00**

**Lab Sample ID: 160-17276-2**

Date Collected: 05/04/16 15:13

Matrix: Solid

Date Received: 05/06/16 11:10

**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		0.150	0.187		0.123	pCi/g	05/10/16 15:27	06/01/16 09:23	1
Bismuth 212	1.23		0.383	0.404		0.334	pCi/g	05/10/16 15:27	06/01/16 09:23	1
Bismuth 214	1.20		0.120	0.173		0.0811	pCi/g	05/10/16 15:27	06/01/16 09:23	1
Lead 212	1.04		0.0824	0.158		0.0696	pCi/g	05/10/16 15:27	06/01/16 09:23	1
Lead 214	1.26		0.127	0.183		0.0909	pCi/g	05/10/16 15:27	06/01/16 09:23	1
Potassium 40	16.8		1.27	2.14		0.178	pCi/g	05/10/16 15:27	06/01/16 09:23	1
Protactinium 231	-0.576	U	1.69	1.69		2.83	pCi/g	05/10/16 15:27	06/01/16 09:23	1
Radium 226	1.20		0.120	0.173	1.00	0.0811	pCi/g	05/10/16 15:27	06/01/16 09:23	1
Thorium 232	1.09		0.150	0.187		0.123	pCi/g	05/10/16 15:27	06/01/16 09:23	1
Thorium 234	1.12		0.545	0.557		0.850	pCi/g	05/10/16 15:27	06/01/16 09:23	1
Uranium 235	0.165	U	0.159	0.160		0.673	pCi/g	05/10/16 15:27	06/01/16 09:23	1
Americium 241	-0.0376	U	0.108	0.108		0.179	pCi/g	05/10/16 15:27	06/01/16 09:23	1
Protactinium 234m	0.885	U	2.83	2.83		11.9	pCi/g	05/10/16 15:27	06/01/16 09:23	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	0.336		0.0557	0.0657		0.0418	pCi/g	05/10/16 15:27	06/01/16 09:23	1

# Client Sample Results

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

TestAmerica Job ID: 160-17276-2

**Client Sample ID: L04-05-03-P-S-S-00**

**Lab Sample ID: 160-17276-3**

Date Collected: 05/04/16 14:55

Matrix: Solid

Date Received: 05/06/16 11:10

**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	1.01		0.116	0.154		0.100	pCi/g	05/10/16 15:27	06/01/16 09:24	1
Bismuth 212	1.25		0.375	0.396		0.329	pCi/g	05/10/16 15:27	06/01/16 09:24	1
Bismuth 214	0.976		0.0933	0.137		0.0587	pCi/g	05/10/16 15:27	06/01/16 09:24	1
Lead 212	1.04		0.0712	0.153		0.0628	pCi/g	05/10/16 15:27	06/01/16 09:24	1
Lead 214	1.14		0.102	0.157		0.0752	pCi/g	05/10/16 15:27	06/01/16 09:24	1
Potassium 40	19.7		1.13	2.28		0.329	pCi/g	05/10/16 15:27	06/01/16 09:24	1
Protactinium 231	-0.354	U	1.35	1.35		2.26	pCi/g	05/10/16 15:27	06/01/16 09:24	1
Radium 226	0.976		0.0933	0.137	1.00	0.0587	pCi/g	05/10/16 15:27	06/01/16 09:24	1
Thorium 232	1.01		0.116	0.154		0.100	pCi/g	05/10/16 15:27	06/01/16 09:24	1
Thorium 234	1.47		0.491	0.515		0.747	pCi/g	05/10/16 15:27	06/01/16 09:24	1
Uranium 235	0.225		0.129	0.131		0.168	pCi/g	05/10/16 15:27	06/01/16 09:24	1
Americium 241	-0.0122	U	0.0439	0.0439		0.147	pCi/g	05/10/16 15:27	06/01/16 09:24	1
Protactinium 234m	1.79	U	2.54	2.55		8.33	pCi/g	05/10/16 15:27	06/01/16 09:24	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>
<i>Tl-208</i>			<i>0.0479</i>	<i>0.0601</i>		<i>0.0362</i>	<i>pCi/g</i>	<i>05/10/16 15:27</i>	<i>06/01/16 09:24</i>	<i>1</i>

**Client Sample ID: L04-05-03-P-S-Q-00**

**Lab Sample ID: 160-17276-4**

Date Collected: 05/04/16 14:55

Matrix: Solid

Date Received: 05/06/16 11:10

**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		0.154	0.196		0.101	pCi/g	05/10/16 15:27	06/01/16 09:59	1
Bismuth 212	0.217	U	0.374	0.374		0.628	pCi/g	05/10/16 15:27	06/01/16 09:59	1
Bismuth 214	1.04		0.123	0.164		0.0816	pCi/g	05/10/16 15:27	06/01/16 09:59	1
Lead 212	1.06		0.0828	0.160		0.0736	pCi/g	05/10/16 15:27	06/01/16 09:59	1
Lead 214	1.03		0.0977	0.145		0.0773	pCi/g	05/10/16 15:27	06/01/16 09:59	1
Potassium 40	17.4		1.33	2.22		0.491	pCi/g	05/10/16 15:27	06/01/16 09:59	1
Protactinium 231	0.000	U	0.234	0.234		2.20	pCi/g	05/10/16 15:27	06/01/16 09:59	1
Radium 226	1.04		0.123	0.164	1.00	0.0816	pCi/g	05/10/16 15:27	06/01/16 09:59	1
Thorium 232	1.19		0.154	0.196		0.101	pCi/g	05/10/16 15:27	06/01/16 09:59	1
Thorium 234	0.182	U	0.749	0.749		1.25	pCi/g	05/10/16 15:27	06/01/16 09:59	1
Uranium 235	-0.00894	U	0.123	0.123		0.411	pCi/g	05/10/16 15:27	06/01/16 09:59	1
Americium 241	-0.0190	U	0.0857	0.0857		0.121	pCi/g	05/10/16 15:27	06/01/16 09:59	1
Protactinium 234m	2.06	U	3.07	3.08		10.1	pCi/g	05/10/16 15:27	06/01/16 09:59	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>
<i>Tl-208</i>			<i>0.0493</i>	<i>0.0615</i>		<i>0.0335</i>	<i>pCi/g</i>	<i>05/10/16 15:27</i>	<i>06/01/16 09:59</i>	<i>1</i>

TestAmerica St. Louis

# Client Sample Results

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

TestAmerica Job ID: 160-17276-2

**Client Sample ID: L04-05-04-P-R-S-00**

**Lab Sample ID: 160-17276-5**

Date Collected: 05/04/16 15:00

Matrix: Solid

Date Received: 05/06/16 11:10

**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	1.20		0.112	0.165		0.0991	pCi/g	05/10/16 15:27	06/01/16 09:58	1
Bismuth 212	1.65		0.415	0.448		0.333	pCi/g	05/10/16 15:27	06/01/16 09:58	1
Bismuth 214	0.989		0.0947	0.139		0.0635	pCi/g	05/10/16 15:27	06/01/16 09:58	1
Lead 212	1.09		0.0700	0.157		0.0616	pCi/g	05/10/16 15:27	06/01/16 09:58	1
Lead 214	1.15		0.0910	0.151		0.0750	pCi/g	05/10/16 15:27	06/01/16 09:58	1
Potassium 40	19.9		1.08	2.28		0.255	pCi/g	05/10/16 15:27	06/01/16 09:58	1
Protactinium 231	-0.458	U	1.36	1.36		2.26	pCi/g	05/10/16 15:27	06/01/16 09:58	1
Radium 226	0.989		0.0947	0.139	1.00	0.0635	pCi/g	05/10/16 15:27	06/01/16 09:58	1
Thorium 232	1.20		0.112	0.165		0.0991	pCi/g	05/10/16 15:27	06/01/16 09:58	1
Thorium 234	1.35		0.474	0.495		0.728	pCi/g	05/10/16 15:27	06/01/16 09:58	1
Uranium 235	0.222		0.158	0.159		0.202	pCi/g	05/10/16 15:27	06/01/16 09:58	1
Americium 241	0.0289	U	0.0854	0.0855		0.142	pCi/g	05/10/16 15:27	06/01/16 09:58	1
Protactinium 234m	-0.228	U	0.225	0.226		8.57	pCi/g	05/10/16 15:27	06/01/16 09:58	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>
<i>Tl-208</i>			<i>0.0437</i>	<i>0.0582</i>		<i>0.0305</i>	<i>pCi/g</i>	<i>05/10/16 15:27</i>	<i>06/01/16 09:58</i>	<i>1</i>

**Client Sample ID: L04-05-06-P-S-S-00**

**Lab Sample ID: 160-17276-6**

Date Collected: 05/04/16 14:40

Matrix: Solid

Date Received: 05/06/16 11:10

**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	1.07		0.177	0.208		0.0976	pCi/g	05/10/16 15:27	06/01/16 10:03	1
Bismuth 212	1.15		0.514	0.528		0.510	pCi/g	05/10/16 15:27	06/01/16 10:03	1
Bismuth 214	0.968		0.109	0.148		0.0583	pCi/g	05/10/16 15:27	06/01/16 10:03	1
Lead 212	0.900		0.0785	0.140		0.0736	pCi/g	05/10/16 15:27	06/01/16 10:03	1
Lead 214	1.03		0.114	0.156		0.0951	pCi/g	05/10/16 15:27	06/01/16 10:03	1
Potassium 40	16.0		1.30	2.09		0.438	pCi/g	05/10/16 15:27	06/01/16 10:03	1
Protactinium 231	-0.544	U	1.72	1.72		2.87	pCi/g	05/10/16 15:27	06/01/16 10:03	1
Radium 226	0.968		0.109	0.148	1.00	0.0583	pCi/g	05/10/16 15:27	06/01/16 10:03	1
Thorium 232	1.07		0.177	0.208		0.0976	pCi/g	05/10/16 15:27	06/01/16 10:03	1
Thorium 234	1.53		0.354	0.389		0.930	pCi/g	05/10/16 15:27	06/01/16 10:03	1
Uranium 235	0.434		0.154	0.161		0.199	pCi/g	05/10/16 15:27	06/01/16 10:03	1
Americium 241	-0.0167	U	0.0665	0.0665		0.128	pCi/g	05/10/16 15:27	06/01/16 10:03	1
Protactinium 234m	3.67	U	4.44	4.45		7.33	pCi/g	05/10/16 15:27	06/01/16 10:03	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>
<i>Tl-208</i>			<i>0.0542</i>	<i>0.0635</i>		<i>0.0392</i>	<i>pCi/g</i>	<i>05/10/16 15:27</i>	<i>06/01/16 10:03</i>	<i>1</i>

# Client Sample Results

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

TestAmerica Job ID: 160-17276-2

**Client Sample ID: L04-05-07-P-R-S-00**

**Lab Sample ID: 160-17276-7**

Date Collected: 05/04/16 14:45

Matrix: Solid

Date Received: 05/06/16 11:10

**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	1.03		0.108	0.150		0.0858	pCi/g	05/10/16 15:27	06/01/16 10:59	1
Bismuth 212	0.925		0.303	0.317		0.311	pCi/g	05/10/16 15:27	06/01/16 10:59	1
Bismuth 214	0.927		0.0979	0.137		0.0635	pCi/g	05/10/16 15:27	06/01/16 10:59	1
Lead 212	1.10		0.0678	0.157		0.0519	pCi/g	05/10/16 15:27	06/01/16 10:59	1
Lead 214	1.04		0.0877	0.139		0.0584	pCi/g	05/10/16 15:27	06/01/16 10:59	1
Potassium 40	18.7		1.06	2.19		0.270	pCi/g	05/10/16 15:27	06/01/16 10:59	1
Protactinium 231	0.188	U	1.18	1.18		1.98	pCi/g	05/10/16 15:27	06/01/16 10:59	1
Radium 226	0.927		0.0979	0.137	1.00	0.0635	pCi/g	05/10/16 15:27	06/01/16 10:59	1
Thorium 232	1.03		0.108	0.150		0.0858	pCi/g	05/10/16 15:27	06/01/16 10:59	1
Thorium 234	1.11		0.276	0.300		0.764	pCi/g	05/10/16 15:27	06/01/16 10:59	1
Uranium 235	-0.0435	U	0.121	0.121		0.543	pCi/g	05/10/16 15:27	06/01/16 10:59	1
Americium 241	-0.00531	U	0.0582	0.0582		0.146	pCi/g	05/10/16 15:27	06/01/16 10:59	1
Protactinium 234m	1.18	U	1.97	1.97		7.60	pCi/g	05/10/16 15:27	06/01/16 10:59	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>
			(2σ+/-)	(2σ+/-)						
Pb-210	1.70		0.604	0.636		0.742	pCi/g	05/10/16 15:27	06/01/16 10:59	1
Tl-208	0.336		0.0411	0.0539		0.0302	pCi/g	05/10/16 15:27	06/01/16 10:59	1

**Client Sample ID: L04-05-09-P-S-S-00**

**Lab Sample ID: 160-17276-8**

Date Collected: 05/05/16 07:50

Matrix: Solid

Date Received: 05/06/16 11:10

**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	1.04		0.147	0.181		0.112	pCi/g	05/10/16 15:27	06/01/16 11:00	1
Bismuth 212	1.39		0.419	0.443		0.354	pCi/g	05/10/16 15:27	06/01/16 11:00	1
Bismuth 214	0.889		0.122	0.153		0.0912	pCi/g	05/10/16 15:27	06/01/16 11:00	1
Lead 212	0.0152	U	0.117	0.117		0.195	pCi/g	05/10/16 15:27	06/01/16 11:00	1
Lead 214	1.03		0.0823	0.135		0.0734	pCi/g	05/10/16 15:27	06/01/16 11:00	1
Potassium 40	19.4		1.24	2.34		0.233	pCi/g	05/10/16 15:27	06/01/16 11:00	1
Protactinium 231	0.141	U	0.658	0.658		2.03	pCi/g	05/10/16 15:27	06/01/16 11:00	1
Radium 226	0.889		0.122	0.153	1.00	0.0912	pCi/g	05/10/16 15:27	06/01/16 11:00	1
Thorium 232	1.04		0.147	0.181		0.112	pCi/g	05/10/16 15:27	06/01/16 11:00	1
Thorium 234	1.07		0.306	0.326		0.766	pCi/g	05/10/16 15:27	06/01/16 11:00	1
Uranium 235	0.179	U	0.152	0.154		0.196	pCi/g	05/10/16 15:27	06/01/16 11:00	1
Americium 241	-0.0369	U	0.0822	0.0823		0.115	pCi/g	05/10/16 15:27	06/01/16 11:00	1
Protactinium 234m	3.46	U	4.61	4.62		7.39	pCi/g	05/10/16 15:27	06/01/16 11:00	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>
			(2σ+/-)	(2σ+/-)						
Tl-208	0.389		0.0513	0.0653		0.0325	pCi/g	05/10/16 15:27	06/01/16 11:00	1

TestAmerica St. Louis

# Client Sample Results

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

TestAmerica Job ID: 160-17276-2

**Client Sample ID: L04-05-10-P-R-S-00**

**Lab Sample ID: 160-17276-9**

Date Collected: 05/05/16 08:00

Matrix: Solid

Date Received: 05/06/16 11:10

**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+/-)						
<b>Actinium 228</b>	<b>1.02</b>		0.139	0.174		0.134	pCi/g	05/10/16 15:27	06/01/16 11:00	1
Bismuth 212	0.372	U	0.597	0.598		0.995	pCi/g	05/10/16 15:27	06/01/16 11:00	1
<b>Bismuth 214</b>	<b>1.17</b>		0.133	0.180		0.0803	pCi/g	05/10/16 15:27	06/01/16 11:00	1
<b>Lead 212</b>	<b>0.990</b>		0.0808	0.151		0.0692	pCi/g	05/10/16 15:27	06/01/16 11:00	1
<b>Lead 214</b>	<b>1.21</b>		0.104	0.164		0.0733	pCi/g	05/10/16 15:27	06/01/16 11:00	1
<b>Potassium 40</b>	<b>17.0</b>		1.32	2.19		0.330	pCi/g	05/10/16 15:27	06/01/16 11:00	1
Protactinium 231	0.264	U	0.865	0.866		2.75	pCi/g	05/10/16 15:27	06/01/16 11:00	1
<b>Radium 226</b>	<b>1.17</b>		0.133	0.180	1.00	0.0803	pCi/g	05/10/16 15:27	06/01/16 11:00	1
<b>Thorium 232</b>	<b>1.02</b>		0.139	0.174		0.134	pCi/g	05/10/16 15:27	06/01/16 11:00	1
<b>Thorium 234</b>	<b>1.36</b>		0.571	0.588		0.881	pCi/g	05/10/16 15:27	06/01/16 11:00	1
Uranium 235	-0.146	U	0.207	0.207		0.661	pCi/g	05/10/16 15:27	06/01/16 11:00	1
Americium 241	0.0418	U	0.115	0.115		0.191	pCi/g	05/10/16 15:27	06/01/16 11:00	1
Protactinium 234m	-0.192	U	5.99	5.99		10.6	pCi/g	05/10/16 15:27	06/01/16 11:00	1
<b>Other Detected Radionuclides</b>			<b>Count</b>	<b>Total</b>						
	<b>Result</b>	<b>Qualifier</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>
			(2σ+/-)	(2σ+/-)						
Tl-208	0.304		0.0574	0.0655		0.0453	pCi/g	05/10/16 15:27	06/01/16 11:00	1

**Client Sample ID: L04-05-12-P-S-S-00**

**Lab Sample ID: 160-17276-10**

Date Collected: 05/04/16 14:25

Matrix: Solid

Date Received: 05/06/16 11:10

**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+/-)						
<b>Actinium 228</b>	<b>1.10</b>		0.141	0.179		0.115	pCi/g	05/10/16 15:27	06/01/16 11:01	1
<b>Bismuth 212</b>	<b>1.30</b>		0.523	0.539		0.500	pCi/g	05/10/16 15:27	06/01/16 11:01	1
<b>Bismuth 214</b>	<b>1.05</b>		0.109	0.153		0.0674	pCi/g	05/10/16 15:27	06/01/16 11:01	1
<b>Lead 212</b>	<b>1.12</b>		0.0740	0.163		0.0574	pCi/g	05/10/16 15:27	06/01/16 11:01	1
<b>Lead 214</b>	<b>1.13</b>		0.0948	0.151		0.0636	pCi/g	05/10/16 15:27	06/01/16 11:01	1
<b>Potassium 40</b>	<b>21.4</b>		1.23	2.48		0.367	pCi/g	05/10/16 15:27	06/01/16 11:01	1
Protactinium 231	-0.181	U	1.40	1.40		2.35	pCi/g	05/10/16 15:27	06/01/16 11:01	1
<b>Radium 226</b>	<b>1.05</b>		0.109	0.153	1.00	0.0674	pCi/g	05/10/16 15:27	06/01/16 11:01	1
<b>Thorium 232</b>	<b>1.10</b>		0.141	0.179		0.115	pCi/g	05/10/16 15:27	06/01/16 11:01	1
<b>Thorium 234</b>	<b>0.952</b>		0.294	0.311		0.794	pCi/g	05/10/16 15:27	06/01/16 11:01	1
Uranium 235	-0.0143	U	0.0250	0.0251		0.562	pCi/g	05/10/16 15:27	06/01/16 11:01	1
Americium 241	-0.0538	U	0.0647	0.0649		0.174	pCi/g	05/10/16 15:27	06/01/16 11:01	1
Protactinium 234m	0.667	U	2.67	2.68		8.74	pCi/g	05/10/16 15:27	06/01/16 11:01	1
<b>Other Detected Radionuclides</b>			<b>Count</b>	<b>Total</b>						
	<b>Result</b>	<b>Qualifier</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>
			(2σ+/-)	(2σ+/-)						
Pb-210	1.55		0.662	0.687		0.812	pCi/g	05/10/16 15:27	06/01/16 11:01	1
Tl-208	0.344		0.0481	0.0597		0.0363	pCi/g	05/10/16 15:27	06/01/16 11:01	1

# Client Sample Results

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

TestAmerica Job ID: 160-17276-2

**Client Sample ID: L04-05-13-P-R-S-00**

**Lab Sample ID: 160-17276-11**

Date Collected: 05/04/16 14:30

Matrix: Solid

Date Received: 05/06/16 11:10

**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	1.04		0.154	0.187		0.175	pCi/g	05/10/16 15:27	06/01/16 11:05	1
Bismuth 212	1.34		0.556	0.573		0.513	pCi/g	05/10/16 15:27	06/01/16 11:05	1
Bismuth 214	0.830		0.119	0.147		0.0811	pCi/g	05/10/16 15:27	06/01/16 11:05	1
Lead 212	1.06		0.0842	0.161		0.0705	pCi/g	05/10/16 15:27	06/01/16 11:05	1
Lead 214	0.900		0.120	0.152		0.0971	pCi/g	05/10/16 15:27	06/01/16 11:05	1
Potassium 40	17.7		1.36	2.27		0.323	pCi/g	05/10/16 15:27	06/01/16 11:05	1
Protactinium 231	-0.525	U	1.67	1.67		2.80	pCi/g	05/10/16 15:27	06/01/16 11:05	1
Radium 226	0.830		0.119	0.147	1.00	0.0811	pCi/g	05/10/16 15:27	06/01/16 11:05	1
Thorium 232	1.04		0.154	0.187		0.175	pCi/g	05/10/16 15:27	06/01/16 11:05	1
Thorium 234	1.03		0.337	0.354		0.932	pCi/g	05/10/16 15:27	06/01/16 11:05	1
Uranium 235	0.109	U	0.202	0.202		0.583	pCi/g	05/10/16 15:27	06/01/16 11:05	1
Americium 241	-0.0374	U	0.0509	0.0510		0.131	pCi/g	05/10/16 15:27	06/01/16 11:05	1
Protactinium 234m	1.38	U	6.24	6.24		11.0	pCi/g	05/10/16 15:27	06/01/16 11:05	1
<b>Other Detected Radionuclides</b>			<b>Count</b>	<b>Total</b>						
	<b>Result</b>	<b>Qualifier</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>
Tl-208	0.318		0.0589	0.0675		0.0457	pCi/g	05/10/16 15:27	06/01/16 11:05	1

**Client Sample ID: L04-05-15-P-R-S-00**

**Lab Sample ID: 160-17276-12**

Date Collected: 05/04/16 15:31

Matrix: Solid

Date Received: 05/06/16 11:10

**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	0.984		0.154	0.183		0.113	pCi/g	05/10/16 15:27	06/01/16 11:53	1
Bismuth 212	1.13		0.363	0.382		0.307	pCi/g	05/10/16 15:27	06/01/16 11:53	1
Bismuth 214	0.881		0.0841	0.124		0.0518	pCi/g	05/10/16 15:27	06/01/16 11:53	1
Lead 212	0.907		0.0661	0.135		0.0531	pCi/g	05/10/16 15:27	06/01/16 11:53	1
Lead 214	0.910		0.0851	0.127		0.0776	pCi/g	05/10/16 15:27	06/01/16 11:53	1
Potassium 40	16.1		1.04	1.95		0.293	pCi/g	05/10/16 15:27	06/01/16 11:53	1
Protactinium 231	0.000	U	0.288	0.288		2.06	pCi/g	05/10/16 15:27	06/01/16 11:53	1
Radium 226	0.881		0.0841	0.124	1.00	0.0518	pCi/g	05/10/16 15:27	06/01/16 11:53	1
Thorium 232	0.984		0.154	0.183		0.113	pCi/g	05/10/16 15:27	06/01/16 11:53	1
Thorium 234	1.13		0.292	0.316		0.780	pCi/g	05/10/16 15:27	06/01/16 11:53	1
Uranium 235	0.185	U	0.150	0.151		0.186	pCi/g	05/10/16 15:27	06/01/16 11:53	1
Americium 241	-0.0421	U	0.0575	0.0577		0.152	pCi/g	05/10/16 15:27	06/01/16 11:53	1
Protactinium 234m	2.74	U	3.50	3.51		5.66	pCi/g	05/10/16 15:27	06/01/16 11:53	1
<b>Other Detected Radionuclides</b>			<b>Count</b>	<b>Total</b>						
	<b>Result</b>	<b>Qualifier</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>
Pb-210	1.76		0.596	0.630		0.742	pCi/g	05/10/16 15:27	06/01/16 11:53	1
Tl-208	0.282		0.0417	0.0509		0.0320	pCi/g	05/10/16 15:27	06/01/16 11:53	1

# Client Sample Results

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

TestAmerica Job ID: 160-17276-2

**Client Sample ID: L04-05-16-P-E-S-00**

**Lab Sample ID: 160-17276-13**

Date Collected: 05/04/16 15:35

Matrix: Solid

Date Received: 05/06/16 11:10

**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	0.889		0.161	0.185		0.132	pCi/g	05/10/16 15:27	06/01/16 11:54	1
Bismuth 212	1.31		0.431	0.452		0.363	pCi/g	05/10/16 15:27	06/01/16 11:54	1
Bismuth 214	0.877		0.100	0.135		0.0723	pCi/g	05/10/16 15:27	06/01/16 11:54	1
Lead 212	0.848		0.0730	0.132		0.0651	pCi/g	05/10/16 15:27	06/01/16 11:54	1
Lead 214	0.973		0.0922	0.137		0.0757	pCi/g	05/10/16 15:27	06/01/16 11:54	1
Potassium 40	18.7		1.28	2.30		0.259	pCi/g	05/10/16 15:27	06/01/16 11:54	1
Protactinium 231	-0.467	U	1.65	1.65		2.76	pCi/g	05/10/16 15:27	06/01/16 11:54	1
Radium 226	0.877		0.100	0.135	1.00	0.0723	pCi/g	05/10/16 15:27	06/01/16 11:54	1
Thorium 232	0.889		0.161	0.185		0.132	pCi/g	05/10/16 15:27	06/01/16 11:54	1
Thorium 234	0.952		0.543	0.552		0.860	pCi/g	05/10/16 15:27	06/01/16 11:54	1
Uranium 235	0.171	U	0.155	0.156		0.193	pCi/g	05/10/16 15:27	06/01/16 11:54	1
Americium 241	-0.0196	U	0.0774	0.0774		0.109	pCi/g	05/10/16 15:27	06/01/16 11:54	1
Protactinium 234m	1.51	U	2.56	2.57		11.4	pCi/g	05/10/16 15:27	06/01/16 11:54	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>
Tl-208			0.0488	0.0590		0.0326	pCi/g	05/10/16 15:27	06/01/16 11:54	1

**Client Sample ID: L04-05-17-P-S-S-00**

**Lab Sample ID: 160-17276-14**

Date Collected: 05/04/16 15:50

Matrix: Solid

Date Received: 05/06/16 11:10

**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	0.781		0.116	0.141		0.166	pCi/g	05/10/16 15:27	06/01/16 11:54	1
Bismuth 212	0.199	U	0.524	0.525		0.887	pCi/g	05/10/16 15:27	06/01/16 11:54	1
Bismuth 214	0.823		0.106	0.136		0.0755	pCi/g	05/10/16 15:27	06/01/16 11:54	1
Lead 212	0.879		0.0709	0.134		0.0585	pCi/g	05/10/16 15:27	06/01/16 11:54	1
Lead 214	0.964		0.0869	0.133		0.0712	pCi/g	05/10/16 15:27	06/01/16 11:54	1
Potassium 40	15.9		1.17	2.01		0.159	pCi/g	05/10/16 15:27	06/01/16 11:54	1
Protactinium 231	-0.0000000	U	1.42	1.42		2.40	pCi/g	05/10/16 15:27	06/01/16 11:54	1
	77									
Radium 226	0.823		0.106	0.136	1.00	0.0755	pCi/g	05/10/16 15:27	06/01/16 11:54	1
Thorium 232	0.781		0.116	0.141		0.166	pCi/g	05/10/16 15:27	06/01/16 11:54	1
Thorium 234	0.881		0.315	0.328		0.802	pCi/g	05/10/16 15:27	06/01/16 11:54	1
Uranium 235	0.0696	U	0.134	0.134		0.598	pCi/g	05/10/16 15:27	06/01/16 11:54	1
Americium 241	-0.0447	U	0.0959	0.0960		0.159	pCi/g	05/10/16 15:27	06/01/16 11:54	1
Protactinium 234m	1.96	U	3.37	3.37		9.61	pCi/g	05/10/16 15:27	06/01/16 11:54	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>
Tl-208			0.0459	0.0556		0.0350	pCi/g	05/10/16 15:27	06/01/16 11:54	1



# Client Sample Results

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

TestAmerica Job ID: 160-17276-2

**Client Sample ID: L04-05-18-P-R-S-00**

**Lab Sample ID: 160-17276-15**

Date Collected: 05/04/16 16:05

Matrix: Solid

Date Received: 05/06/16 11:10

**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+/-)						
<b>Actinium 228</b>	<b>0.614</b>		0.0767	0.0984		0.0737	pCi/g	05/10/16 15:27	06/01/16 11:55	1
Bismuth 212	0.183	U	0.330	0.331		0.550	pCi/g	05/10/16 15:27	06/01/16 11:55	1
<b>Bismuth 214</b>	<b>0.716</b>		0.0707	0.102		0.0450	pCi/g	05/10/16 15:27	06/01/16 11:55	1
<b>Lead 212</b>	<b>0.569</b>		0.0432	0.0856		0.0418	pCi/g	05/10/16 15:27	06/01/16 11:55	1
<b>Lead 214</b>	<b>0.730</b>		0.0679	0.102		0.0511	pCi/g	05/10/16 15:27	06/01/16 11:55	1
<b>Potassium 40</b>	<b>19.7</b>		0.899	2.18		0.256	pCi/g	05/10/16 15:27	06/01/16 11:55	1
Protactinium 231	-0.375	U	1.09	1.09		1.81	pCi/g	05/10/16 15:27	06/01/16 11:55	1
<b>Radium 226</b>	<b>0.716</b>		0.0707	0.102	1.00	0.0450	pCi/g	05/10/16 15:27	06/01/16 11:55	1
<b>Thorium 232</b>	<b>0.614</b>		0.0767	0.0984		0.0737	pCi/g	05/10/16 15:27	06/01/16 11:55	1
Thorium 234	0.432	U	0.177	0.183		0.473	pCi/g	05/10/16 15:27	06/01/16 11:55	1
Uranium 235	-0.0314	U	0.0603	0.0604		0.370	pCi/g	05/10/16 15:27	06/01/16 11:55	1
Americium 241	-0.0169	U	0.0413	0.0413		0.0960	pCi/g	05/10/16 15:27	06/01/16 11:55	1
Protactinium 234m	1.48	U	2.30	2.30		5.52	pCi/g	05/10/16 15:27	06/01/16 11:55	1
<b>Other Detected Radionuclides</b>			<b>Count</b>	<b>Total</b>						
	<b>Result</b>	<b>Qualifier</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>
			(2σ+/-)	(2σ+/-)						
Tl-208	0.194		0.0322	0.0379		0.0268	pCi/g	05/10/16 15:27	06/01/16 11:55	1

**Client Sample ID: L04-05-18-P-R-Q-00**

**Lab Sample ID: 160-17276-16**

Date Collected: 05/04/16 16:05

Matrix: Solid

Date Received: 05/06/16 11:10

**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+/-)						
<b>Actinium 228</b>	<b>1.08</b>		0.149	0.185		0.100	pCi/g	05/10/16 15:27	06/01/16 11:56	1
<b>Bismuth 212</b>	<b>1.07</b>		0.529	0.540		0.507	pCi/g	05/10/16 15:27	06/01/16 11:56	1
<b>Bismuth 214</b>	<b>1.09</b>		0.141	0.180		0.0911	pCi/g	05/10/16 15:27	06/01/16 11:56	1
<b>Lead 212</b>	<b>0.940</b>		0.0743	0.143		0.0635	pCi/g	05/10/16 15:27	06/01/16 11:56	1
<b>Lead 214</b>	<b>1.12</b>		0.100	0.154		0.0746	pCi/g	05/10/16 15:27	06/01/16 11:56	1
<b>Potassium 40</b>	<b>18.6</b>		1.33	2.32		0.388	pCi/g	05/10/16 15:27	06/01/16 11:56	1
Protactinium 231	0.421	U	1.04	1.05		2.34	pCi/g	05/10/16 15:27	06/01/16 11:56	1
<b>Radium 226</b>	<b>1.09</b>		0.141	0.180	1.00	0.0911	pCi/g	05/10/16 15:27	06/01/16 11:56	1
<b>Thorium 232</b>	<b>1.08</b>		0.149	0.185		0.100	pCi/g	05/10/16 15:27	06/01/16 11:56	1
Thorium 234	0.683	U	0.304	0.312		0.863	pCi/g	05/10/16 15:27	06/01/16 11:56	1
Uranium 235	0.120	U	0.193	0.193		0.329	pCi/g	05/10/16 15:27	06/01/16 11:56	1
Americium 241	0.0195	U	0.0863	0.0863		0.115	pCi/g	05/10/16 15:27	06/01/16 11:56	1
Protactinium 234m	2.63	U	3.69	3.70		9.91	pCi/g	05/10/16 15:27	06/01/16 11:56	1
<b>Other Detected Radionuclides</b>			<b>Count</b>	<b>Total</b>						
	<b>Result</b>	<b>Qualifier</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>
			(2σ+/-)	(2σ+/-)						
Tl-208	0.373		0.0560	0.0681		0.0379	pCi/g	05/10/16 15:27	06/01/16 11:56	1

# Client Sample Results

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

TestAmerica Job ID: 160-17276-2

**Client Sample ID: L04-05-20-P-S-S-00**

**Lab Sample ID: 160-17276-17**

Date Collected: 05/05/16 08:10

Matrix: Solid

Date Received: 05/06/16 11:10

**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+/-)						
<b>Actinium 228</b>	<b>0.513</b>		0.0932	0.107		0.0556	pCi/g	05/10/16 15:27	06/01/16 12:35	1
Bismuth 212	0.258	U	0.551	0.551		0.923	pCi/g	05/10/16 15:27	06/01/16 12:35	1
<b>Bismuth 214</b>	<b>0.594</b>		0.0822	0.103		0.0533	pCi/g	05/10/16 15:27	06/01/16 12:35	1
<b>Lead 212</b>	<b>0.404</b>		0.0486	0.0714		0.0509	pCi/g	05/10/16 15:27	06/01/16 12:35	1
<b>Lead 214</b>	<b>0.681</b>		0.0714	0.101		0.0590	pCi/g	05/10/16 15:27	06/01/16 12:35	1
<b>Potassium 40</b>	<b>14.0</b>		1.06	1.78		0.330	pCi/g	05/10/16 15:27	06/01/16 12:35	1
Protactinium 231	0.167	U	1.07	1.07		1.80	pCi/g	05/10/16 15:27	06/01/16 12:35	1
<b>Radium 226</b>	<b>0.594</b>		0.0822	0.103	1.00	0.0533	pCi/g	05/10/16 15:27	06/01/16 12:35	1
<b>Thorium 232</b>	<b>0.513</b>		0.0932	0.107		0.0556	pCi/g	05/10/16 15:27	06/01/16 12:35	1
<b>Thorium 234</b>	<b>0.816</b>		0.376	0.386		0.581	pCi/g	05/10/16 15:27	06/01/16 12:35	1
Uranium 235	-0.0893	U	0.129	0.130		0.464	pCi/g	05/10/16 15:27	06/01/16 12:35	1
Americium 241	0.00228	U	0.0597	0.0597		0.0804	pCi/g	05/10/16 15:27	06/01/16 12:35	1
Protactinium 234m	3.03	U	4.42	4.43		6.97	pCi/g	05/10/16 15:27	06/01/16 12:35	1
<b>Other Detected Radionuclides</b>			<b>Count</b>	<b>Total</b>						
	<b>Result</b>	<b>Qualifier</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>
			(2σ+/-)	(2σ+/-)						
Tl-208	0.138		0.0339	0.0368		0.0293	pCi/g	05/10/16 15:27	06/01/16 12:35	1

**Client Sample ID: L04-05-21-P-R-S-00**

**Lab Sample ID: 160-17276-18**

Date Collected: 05/05/16 08:20

Matrix: Solid

Date Received: 05/06/16 11:10

**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+/-)						
<b>Actinium 228</b>	<b>0.880</b>		0.109	0.141		0.106	pCi/g	05/10/16 15:27	06/01/16 12:36	1
<b>Bismuth 212</b>	<b>1.37</b>		0.319	0.350		0.229	pCi/g	05/10/16 15:27	06/01/16 12:36	1
<b>Bismuth 214</b>	<b>0.956</b>		0.101	0.141		0.0681	pCi/g	05/10/16 15:27	06/01/16 12:36	1
<b>Lead 212</b>	<b>0.920</b>		0.0673	0.137		0.0541	pCi/g	05/10/16 15:27	06/01/16 12:36	1
<b>Lead 214</b>	<b>1.18</b>		0.0918	0.153		0.0688	pCi/g	05/10/16 15:27	06/01/16 12:36	1
<b>Potassium 40</b>	<b>18.1</b>		1.12	2.17		0.311	pCi/g	05/10/16 15:27	06/01/16 12:36	1
Protactinium 231	0.401	U	1.26	1.26		2.10	pCi/g	05/10/16 15:27	06/01/16 12:36	1
<b>Radium 226</b>	<b>0.956</b>		0.101	0.141	1.00	0.0681	pCi/g	05/10/16 15:27	06/01/16 12:36	1
<b>Thorium 232</b>	<b>0.880</b>		0.109	0.141		0.106	pCi/g	05/10/16 15:27	06/01/16 12:36	1
<b>Thorium 234</b>	<b>1.26</b>		0.515	0.532		0.796	pCi/g	05/10/16 15:27	06/01/16 12:36	1
Uranium 235	0.0495	U	0.123	0.123		0.519	pCi/g	05/10/16 15:27	06/01/16 12:36	1
Americium 241	0.0347	U	0.0922	0.0923		0.153	pCi/g	05/10/16 15:27	06/01/16 12:36	1
Protactinium 234m	1.16	U	1.90	1.91		7.93	pCi/g	05/10/16 15:27	06/01/16 12:36	1
<b>Other Detected Radionuclides</b>			<b>Count</b>	<b>Total</b>						
	<b>Result</b>	<b>Qualifier</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>
			(2σ+/-)	(2σ+/-)						
Tl-208	0.308		0.0445	0.0547		0.0326	pCi/g	05/10/16 15:27	06/01/16 12:36	1

# Client Sample Results

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

TestAmerica Job ID: 160-17276-2

**Client Sample ID: L04-05-23-P-S-B-00**

**Lab Sample ID: 160-17276-19**

Date Collected: 05/05/16 08:35

Matrix: Solid

Date Received: 05/06/16 11:10

**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	1.14		0.158	0.196		0.108	pCi/g	05/10/16 15:27	06/01/16 12:37	1
Bismuth 212	1.31		0.523	0.541		0.466	pCi/g	05/10/16 15:27	06/01/16 12:37	1
Bismuth 214	1.03		0.118	0.159		0.0780	pCi/g	05/10/16 15:27	06/01/16 12:37	1
Lead 212	1.01		0.0834	0.155		0.0791	pCi/g	05/10/16 15:27	06/01/16 12:37	1
Lead 214	1.14		0.111	0.162		0.0785	pCi/g	05/10/16 15:27	06/01/16 12:37	1
Potassium 40	18.3		1.29	2.28		0.269	pCi/g	05/10/16 15:27	06/01/16 12:37	1
Protactinium 231	0.000	U	0.453	0.453		2.25	pCi/g	05/10/16 15:27	06/01/16 12:37	1
Radium 226	1.03		0.118	0.159	1.00	0.0780	pCi/g	05/10/16 15:27	06/01/16 12:37	1
Thorium 232	1.14		0.158	0.196		0.108	pCi/g	05/10/16 15:27	06/01/16 12:37	1
Thorium 234	6.13		0.853	1.07		1.16	pCi/g	05/10/16 15:27	06/01/16 12:37	1
Uranium 235	4.00		0.313	0.514		0.275	pCi/g	05/10/16 15:27	06/01/16 12:37	1
Americium 241	0.000	U	0.0494	0.0494		0.159	pCi/g	05/10/16 15:27	06/01/16 12:37	1
Protactinium 234m	9.79	U	4.51	4.62		10.2	pCi/g	05/10/16 15:27	06/01/16 12:37	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>
<i>Tl-208</i>			<i>0.0484</i>	<i>0.0597</i>		<i>0.0309</i>	<i>pCi/g</i>	<i>05/10/16 15:27</i>	<i>06/01/16 12:37</i>	<i>1</i>

**Client Sample ID: L04-05-24-P-S-B-00**

**Lab Sample ID: 160-17276-20**

Date Collected: 05/05/16 08:50

Matrix: Solid

Date Received: 05/06/16 11:10

**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	1.18		0.166	0.202		0.0990	pCi/g	05/10/16 15:27	06/01/16 12:39	1
Bismuth 212	2.04		0.755	0.781		0.605	pCi/g	05/10/16 15:27	06/01/16 12:39	1
Bismuth 214	0.960		0.129	0.159		0.111	pCi/g	05/10/16 15:27	06/01/16 12:39	1
Lead 212	1.19		0.0980	0.161		0.0763	pCi/g	05/10/16 15:27	06/01/16 12:39	1
Lead 214	1.17		0.118	0.164		0.103	pCi/g	05/10/16 15:27	06/01/16 12:39	1
Potassium 40	19.0		1.55	2.41		0.233	pCi/g	05/10/16 15:27	06/01/16 12:39	1
Protactinium 231	0.619	U	1.41	1.41		3.17	pCi/g	05/10/16 15:27	06/01/16 12:39	1
Radium 226	0.960		0.129	0.159	1.00	0.111	pCi/g	05/10/16 15:27	06/01/16 12:39	1
Thorium 232	1.18		0.166	0.202		0.0990	pCi/g	05/10/16 15:27	06/01/16 12:39	1
Thorium 234	7.31		0.972	1.21		1.27	pCi/g	05/10/16 15:27	06/01/16 12:39	1
Uranium 235	3.78		0.333	0.495		0.353	pCi/g	05/10/16 15:27	06/01/16 12:39	1
Americium 241	0.0682	U	0.175	0.175		0.291	pCi/g	05/10/16 15:27	06/01/16 12:39	1
Protactinium 234m	14.1		4.71	4.90		3.60	pCi/g	05/10/16 15:27	06/01/16 12:39	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>
<i>Tl-208</i>			<i>0.0690</i>	<i>0.0805</i>		<i>0.0494</i>	<i>pCi/g</i>	<i>05/10/16 15:27</i>	<i>06/01/16 12:39</i>	<i>1</i>

# QC Sample Results

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

TestAmerica Job ID: 160-17276-2

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

**Lab Sample ID: MB 160-250644/1-A**  
**Matrix: Solid**  
**Analysis Batch: 254163**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 250644**

Analyte	MB MB		Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium 228	0.01930	U	0.0604	0.0605		0.0770	pCi/g	05/10/16 15:27	06/01/16 08:10	1
Bismuth 212	0.08478	U	0.211	0.211		0.370	pCi/g	05/10/16 15:27	06/01/16 08:10	1
Bismuth 214	0.0000	U	0.0170	0.0170		0.0725	pCi/g	05/10/16 15:27	06/01/16 08:10	1
Lead 212	-0.0001888	U	0.0211	0.0211		0.0375	pCi/g	05/10/16 15:27	06/01/16 08:10	1
Lead 214	0.002134	U	0.00825	0.00825		0.0516	pCi/g	05/10/16 15:27	06/01/16 08:10	1
Potassium 40	-0.1041	U	0.314	0.314		0.295	pCi/g	05/10/16 15:27	06/01/16 08:10	1
Protactinium 231	0.0000	U	0.0856	0.0856		0.784	pCi/g	05/10/16 15:27	06/01/16 08:10	1
Radium 226	0.0000	U	0.0170	0.0170	1.00	0.0725	pCi/g	05/10/16 15:27	06/01/16 08:10	1
Thorium 232	0.01930	U	0.0604	0.0605		0.0770	pCi/g	05/10/16 15:27	06/01/16 08:10	1
Thorium 234	0.1186	U	0.171	0.172		0.270	pCi/g	05/10/16 15:27	06/01/16 08:10	1
Uranium 235	0.02421	U	0.0560	0.0561		0.144	pCi/g	05/10/16 15:27	06/01/16 08:10	1
Americium 241	0.001432	U	0.0201	0.0201		0.0289	pCi/g	05/10/16 15:27	06/01/16 08:10	1
Protactinium 234m	0.5580	U	0.965	0.967		3.95	pCi/g	05/10/16 15:27	06/01/16 08:10	1
Other Detected Radionuclides	MB MB		Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Other Detected Radionuclide	None						pCi/g	05/10/16 15:27	06/01/16 08:10	1

**Lab Sample ID: LCS 160-250644/2-A**  
**Matrix: Solid**  
**Analysis Batch: 254163**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 250644**

Analyte	Spike Added	LCS Result	LCS Qual	Total	RL	MDC	Unit	%Rec	%Rec.
				Uncert. (2σ+/-)					Limits
Americium 241	101	104.0		10.8		0.598	pCi/g	103	87 - 116
Cesium 137	33.9	33.27		3.49		0.210	pCi/g	98	87 - 120
Cobalt 60	31.0	30.93		3.13		0.133	pCi/g	100	87 - 115

**Lab Sample ID: 160-17276-1 DU**  
**Matrix: Solid**  
**Analysis Batch: 254168**

**Client Sample ID: L04-05-01-P-R-S-00**  
**Prep Type: Total/NA**  
**Prep Batch: 250644**

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total	RL	MDC	Unit	RER	RER
					Uncert. (2σ+/-)					Limit
Actinium 228	1.02		1.012		0.174		0.125	pCi/g	0.02	1
Bismuth 212	1.53		1.222		0.541		0.495	pCi/g	0.29	1
Bismuth 214	1.14		1.081		0.167		0.0808	pCi/g	0.19	1
Lead 212	1.00		1.060		0.159		0.0662	pCi/g	0.18	1
Lead 214	1.19		1.228		0.170		0.0692	pCi/g	0.10	1
Potassium 40	17.8		16.48		2.12		0.395	pCi/g	0.30	1
Protactinium 231	0.0565	U	-0.5980	U	1.79		2.98	pCi/g	0.27	1
Radium 226	1.14		1.081		0.167	1.00	0.0808	pCi/g	0.19	1
Thorium 232	1.02		1.012		0.174		0.125	pCi/g	0.02	1
Thorium 234	1.19		0.06437	U	1.01		1.69	pCi/g	0.73	1
Uranium 235	0.166	U	0.04094	U	0.145		0.612	pCi/g	0.38	1
Americium 241	-0.0342	U	0.04586	U	0.109		0.180	pCi/g	0.42	1

TestAmerica St. Louis

# QC Sample Results

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

TestAmerica Job ID: 160-17276-2

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

**Lab Sample ID: 160-17276-1 DU**  
**Matrix: Solid**  
**Analysis Batch: 254168**

**Client Sample ID: L04-05-01-P-R-S-00**  
**Prep Type: Total/NA**  
**Prep Batch: 250644**

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Protactinium 234m	1.79	U	1.751	U	6.32		10.8	pCi/g	0	1

Other Detected Radionuclides	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Tl-208	0.326		0.3332		0.0622		0.0381	pCi/g	0.06	1

# QC Association Summary

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

TestAmerica Job ID: 160-17276-2

## Rad

### Leach Batch: 249824

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-17276-1	L04-05-01-P-R-S-00	Total/NA	Solid	Dry and Grind	
160-17276-1 DU	L04-05-01-P-R-S-00	Total/NA	Solid	Dry and Grind	
160-17276-2	L04-05-02-P-E-S-00	Total/NA	Solid	Dry and Grind	
160-17276-3	L04-05-03-P-S-S-00	Total/NA	Solid	Dry and Grind	
160-17276-4	L04-05-03-P-S-Q-00	Total/NA	Solid	Dry and Grind	
160-17276-5	L04-05-04-P-R-S-00	Total/NA	Solid	Dry and Grind	
160-17276-6	L04-05-06-P-S-S-00	Total/NA	Solid	Dry and Grind	
160-17276-7	L04-05-07-P-R-S-00	Total/NA	Solid	Dry and Grind	
160-17276-8	L04-05-09-P-S-S-00	Total/NA	Solid	Dry and Grind	
160-17276-9	L04-05-10-P-R-S-00	Total/NA	Solid	Dry and Grind	
160-17276-10	L04-05-12-P-S-S-00	Total/NA	Solid	Dry and Grind	
160-17276-11	L04-05-13-P-R-S-00	Total/NA	Solid	Dry and Grind	
160-17276-12	L04-05-15-P-R-S-00	Total/NA	Solid	Dry and Grind	
160-17276-13	L04-05-16-P-E-S-00	Total/NA	Solid	Dry and Grind	
160-17276-14	L04-05-17-P-S-S-00	Total/NA	Solid	Dry and Grind	
160-17276-15	L04-05-18-P-R-S-00	Total/NA	Solid	Dry and Grind	
160-17276-16	L04-05-18-P-R-Q-00	Total/NA	Solid	Dry and Grind	
160-17276-17	L04-05-20-P-S-S-00	Total/NA	Solid	Dry and Grind	
160-17276-18	L04-05-21-P-R-S-00	Total/NA	Solid	Dry and Grind	
160-17276-19	L04-05-23-P-S-B-00	Total/NA	Solid	Dry and Grind	
160-17276-20	L04-05-24-P-S-B-00	Total/NA	Solid	Dry and Grind	

### Prep Batch: 250644

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-17276-1	L04-05-01-P-R-S-00	Total/NA	Solid	Fill_Geo-21	249824
160-17276-1 DU	L04-05-01-P-R-S-00	Total/NA	Solid	Fill_Geo-21	249824
160-17276-2	L04-05-02-P-E-S-00	Total/NA	Solid	Fill_Geo-21	249824
160-17276-3	L04-05-03-P-S-S-00	Total/NA	Solid	Fill_Geo-21	249824
160-17276-4	L04-05-03-P-S-Q-00	Total/NA	Solid	Fill_Geo-21	249824
160-17276-5	L04-05-04-P-R-S-00	Total/NA	Solid	Fill_Geo-21	249824
160-17276-6	L04-05-06-P-S-S-00	Total/NA	Solid	Fill_Geo-21	249824
160-17276-7	L04-05-07-P-R-S-00	Total/NA	Solid	Fill_Geo-21	249824
160-17276-8	L04-05-09-P-S-S-00	Total/NA	Solid	Fill_Geo-21	249824
160-17276-9	L04-05-10-P-R-S-00	Total/NA	Solid	Fill_Geo-21	249824
160-17276-10	L04-05-12-P-S-S-00	Total/NA	Solid	Fill_Geo-21	249824
160-17276-11	L04-05-13-P-R-S-00	Total/NA	Solid	Fill_Geo-21	249824
160-17276-12	L04-05-15-P-R-S-00	Total/NA	Solid	Fill_Geo-21	249824
160-17276-13	L04-05-16-P-E-S-00	Total/NA	Solid	Fill_Geo-21	249824
160-17276-14	L04-05-17-P-S-S-00	Total/NA	Solid	Fill_Geo-21	249824
160-17276-15	L04-05-18-P-R-S-00	Total/NA	Solid	Fill_Geo-21	249824
160-17276-16	L04-05-18-P-R-Q-00	Total/NA	Solid	Fill_Geo-21	249824
160-17276-17	L04-05-20-P-S-S-00	Total/NA	Solid	Fill_Geo-21	249824
160-17276-18	L04-05-21-P-R-S-00	Total/NA	Solid	Fill_Geo-21	249824
160-17276-19	L04-05-23-P-S-B-00	Total/NA	Solid	Fill_Geo-21	249824
160-17276-20	L04-05-24-P-S-B-00	Total/NA	Solid	Fill_Geo-21	249824
LCS 160-250644/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
MB 160-250644/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	