

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: 160-17426-3

Client Project/Site: HDP RFP-CBA-022 (3 DAY TAT)

For:

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

Attn: Mr. Martin Swanson



Authorized for release by:
6/14/2016 10:12:55 AM

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

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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 (3 DAY TAT)

TestAmerica Job ID: 160-17426-3

Job ID: 160-17426-3

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Westinghouse Electric Company LLC

Project: HDP RFP-CBA-022 (3 DAY TAT)

Report Number: 160-17426-3

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 5/17/2016 5:08 PM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 2 coolers at receipt time were 20.0° C and 20.0° C.

RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)

Samples L11-02-25-P-S-B-00 (160-17426-1), L11-02-26-P-S-B-00 (160-17426-2), L11-02-27-P-S-B-00 (160-17426-3), L11-02-28-P-S-B-00 (160-17426-4), L11-02-29-P-S-B-00 (160-17426-5), L11-02-30-P-R-B-00 (160-17426-6), L11-02-31-P-R-B-00 (160-17426-7), L11-02-32-P-R-B-00 (160-17426-8), L11-02-33-P-R-B-00 (160-17426-9), L11-02-34-P-R-B-00 (160-17426-10), L11-02-35-P-S-B-00 (160-17426-11), L11-02-36-P-R-B-00 (160-17426-12), L11-02-37-P-S-B-00 (160-17426-13), L11-02-38-P-R-B-00 (160-17426-14), L11-02-39-P-S-B-00 (160-17426-15), L11-02-40-P-R-B-00 (160-17426-16), L11-02-41-P-S-B-00 (160-17426-17) and L11-02-42-P-R-B-00 (160-17426-18) were analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA_01_R. The samples were leached on 05/18/2016, prepared on 05/23/2016 and analyzed on 06/13/2016.

Batch 160-251742:

The samples were very wet and required 20 hours for drying. L11-02-25-P-S-B-00 (160-17426-1), L11-02-26-P-S-B-00 (160-17426-2),

Case Narrative

Client: Westinghouse Electric Company LLC
Project/Site: HDP RFP-CBA-022 (3 DAY TAT)

TestAmerica Job ID: 160-17426-3

Job ID: 160-17426-3 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

L11-02-27-P-S-B-00 (160-17426-3), L11-02-28-P-S-B-00 (160-17426-4), L11-02-29-P-S-B-00 (160-17426-5), L11-02-30-P-R-B-00 (160-17426-6), L11-02-31-P-R-B-00 (160-17426-7), L11-02-32-P-R-B-00 (160-17426-8), L11-02-33-P-R-B-00 (160-17426-9), L11-02-34-P-R-B-00 (160-17426-10), L11-02-35-P-S-B-00 (160-17426-11), L11-02-36-P-R-B-00 (160-17426-12), L11-02-37-P-S-B-00 (160-17426-13), L11-02-38-P-R-B-00 (160-17426-14), L11-02-39-P-S-B-00 (160-17426-15), L11-02-40-P-R-B-00 (160-17426-16), L11-02-41-P-S-B-00 (160-17426-17) and L11-02-42-P-R-B-00 (160-17426-18)

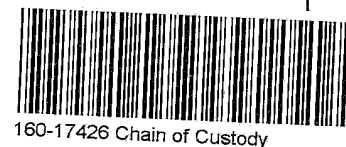
No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.



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-051716-01 Page 1/2				Requested Analysis								Laboratory Name:			
Project Name: Westinghouse Electric Company				Comp (C) or Grab (G)	Gamma Spec	Isotopic Uranium	Tb-99	Gamma Spec (21 day ingrow for Ra-226)					Total Containers	Laboratory Address: 13715 Rider Trail North	
Contact Person: Clark Evers														Phone No. 314-298-8566	
Phone Number: 314-810-3336														Laboratory Contact Person: Ivan Vania	
Sampler Name: John Michel														Phone No. 708-870-8453	
				Turn Around Time											
				Rush (3 days)											
				Remarks											
Sample ID	Date	Time	Matrix	Comp (C) or Grab (G)	Gamma Spec	Isotopic Uranium	Tb-99	Gamma Spec (21 day ingrow for Ra-226)							
L11-02-25-P-S-B-00	5/17/2016	13:00	S	G	X			X					1	LSA 11-02 Bias	
L11-02-26-P-S-B-00	5/17/2016	13:10	S	G	X			X					1	LSA 11-02 Bias	
L11-02-27-P-S-B-00	5/17/2016	13:20	S	G	X			X					1	LSA 11-02 Bias	
L11-02-28-P-S-B-00	5/17/2016	13:30	S	G	X			X					1	LSA 11-02 Bias	
L11-02-29-P-S-B-00	5/17/2016	13:40	S	G	X			X					1	LSA 11-02 Bias	
L11-02-30-P-R-B-00	5/17/2016	13:05	S	G	X		X	X					1	LSA 11-02 Bias	
L11-02-31-P-R-B-00	5/17/2016	13:15	S	G	X		X	X					1	LSA 11-02 Bias	
L11-02-32-P-R-B-00	5/17/2016	13:25	S	G	X		X	X					1	LSA 11-02 Bias	
L11-02-33-P-R-B-00	5/17/2016	13:35	S	G	X		X	X					1	LSA 11-02 Bias	
L11-02-34-P-R-B-00	5/17/2016	13:45	S	G	X		X	X					1	LSA 11-02 Bias	
L11-02-35-P-S-B-00	5/17/2016	13:50	S	G	X		X	X					1	LSA 11-02 Bias	
L11-02-36-P-R-B-00	5/17/2016	13:55	S	G	X		X	X					1	LSA 11-02 Bias	
Relinquished by: <i>C. Gorsur</i>		Date/Time: 5-17-16 1610		Received by: <i>[Signature]</i>		Date/Time: 5-17-16 1610		Total: 18		Cooler Temperature: Ambient					
Company Name: WEC				Company Name: WEC				Cooler ID: 0517-01/02		Shipper and Number:					
Received by:		Date/Time:		Relinquished by: <i>[Signature]</i>		Date/Time: 5/17/16 1708		Comments: N/A							
Company Name:				Company Name: WEC											
Relinquished by:		Date/Time:		Received by: <i>C. Gorsur</i>		Date/Time: 5-17-16 1708		Verified By: <i>C. Gorsur</i> : 5-17-16							
Company Name:				Company Name: TA-St. Louis											



Login Sample Receipt Checklist

Client: Westinghouse Electric Company LLC

Job Number: 160-17426-3

Login Number: 17426

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.	False	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (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 (3 DAY TAT)

TestAmerica Job ID: 160-17426-3

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 (3 DAY TAT)

TestAmerica Job ID: 160-17426-3

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 (3 DAY TAT)

TestAmerica Job ID: 160-17426-3

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-17426-1	L11-02-25-P-S-B-00	Solid	05/17/16 13:00	05/17/16 17:08
160-17426-2	L11-02-26-P-S-B-00	Solid	05/17/16 13:10	05/17/16 17:08
160-17426-3	L11-02-27-P-S-B-00	Solid	05/17/16 13:20	05/17/16 17:08
160-17426-4	L11-02-28-P-S-B-00	Solid	05/17/16 13:30	05/17/16 17:08
160-17426-5	L11-02-29-P-S-B-00	Solid	05/17/16 13:40	05/17/16 17:08
160-17426-6	L11-02-30-P-R-B-00	Solid	05/17/16 13:05	05/17/16 17:08
160-17426-7	L11-02-31-P-R-B-00	Solid	05/17/16 13:15	05/17/16 17:08
160-17426-8	L11-02-32-P-R-B-00	Solid	05/17/16 13:25	05/17/16 17:08
160-17426-9	L11-02-33-P-R-B-00	Solid	05/17/16 13:35	05/17/16 17:08
160-17426-10	L11-02-34-P-R-B-00	Solid	05/17/16 13:45	05/17/16 17:08
160-17426-11	L11-02-35-P-S-B-00	Solid	05/17/16 13:50	05/17/16 17:08
160-17426-12	L11-02-36-P-R-B-00	Solid	05/17/16 13:55	05/17/16 17:08
160-17426-13	L11-02-37-P-S-B-00	Solid	05/17/16 14:00	05/17/16 17:08
160-17426-14	L11-02-38-P-R-B-00	Solid	05/17/16 14:05	05/17/16 17:08
160-17426-15	L11-02-39-P-S-B-00	Solid	05/17/16 09:35	05/17/16 17:08
160-17426-16	L11-02-40-P-R-B-00	Solid	05/17/16 09:45	05/17/16 17:08
160-17426-17	L11-02-41-P-S-B-00	Solid	05/17/16 09:55	05/17/16 17:08
160-17426-18	L11-02-42-P-R-B-00	Solid	05/17/16 10:00	05/17/16 17:08

Client Sample Results

Client: Westinghouse Electric Company LLC
 Project/Site: HDP RFP-CBA-022 (3 DAY TAT)

TestAmerica Job ID: 160-17426-3

Client Sample ID: L11-02-25-P-S-B-00

Lab Sample ID: 160-17426-1

Date Collected: 05/17/16 13:00

Matrix: Solid

Date Received: 05/17/16 17:08

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	0.909		0.146	0.173		0.135	pCi/g	05/23/16 04:51	06/13/16 08:07	1
Bismuth 212	-0.00969	U	0.617	0.617		1.07	pCi/g	05/23/16 04:51	06/13/16 08:07	1
Bismuth 214	1.08		0.120	0.164		0.0642	pCi/g	05/23/16 04:51	06/13/16 08:07	1
Lead 212	0.832		0.0760	0.132		0.0647	pCi/g	05/23/16 04:51	06/13/16 08:07	1
Lead 214	1.13		0.101	0.155		0.0785	pCi/g	05/23/16 04:51	06/13/16 08:07	1
Potassium 40	14.2		1.26	1.93		0.391	pCi/g	05/23/16 04:51	06/13/16 08:07	1
Protactinium 231	0.495	U	1.13	1.14		2.55	pCi/g	05/23/16 04:51	06/13/16 08:07	1
Radium 226	1.08		0.120	0.164	1.00	0.0642	pCi/g	05/23/16 04:51	06/13/16 08:07	1
Thorium 232	0.909		0.146	0.173		0.135	pCi/g	05/23/16 04:51	06/13/16 08:07	1
Thorium 234	1.05		0.342	0.360		0.921	pCi/g	05/23/16 04:51	06/13/16 08:07	1
Uranium 235	0.207		0.163	0.164		0.195	pCi/g	05/23/16 04:51	06/13/16 08:07	1
Americium 241	-0.0499	U	0.108	0.108		0.179	pCi/g	05/23/16 04:51	06/13/16 08:07	1
Protactinium 234m	3.70	U	6.21	6.23		9.37	pCi/g	05/23/16 04:51	06/13/16 08:07	1
Other Detected Radionuclides			Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
<i>Tl-208</i>	0.308		0.0501	0.0594		0.0315	pCi/g	05/23/16 04:51	06/13/16 08:07	1

Client Sample ID: L11-02-26-P-S-B-00

Lab Sample ID: 160-17426-2

Date Collected: 05/17/16 13:10

Matrix: Solid

Date Received: 05/17/16 17:08

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	0.962		0.181	0.206		0.116	pCi/g	05/23/16 04:51	06/13/16 08:04	1
Bismuth 212	0.438	U	0.772	0.773		1.29	pCi/g	05/23/16 04:51	06/13/16 08:04	1
Bismuth 214	1.08		0.128	0.170		0.0757	pCi/g	05/23/16 04:51	06/13/16 08:04	1
Lead 212	0.850		0.0782	0.135		0.0687	pCi/g	05/23/16 04:51	06/13/16 08:04	1
Lead 214	1.17		0.111	0.165		0.0738	pCi/g	05/23/16 04:51	06/13/16 08:04	1
Potassium 40	14.6		1.27	1.96		0.288	pCi/g	05/23/16 04:51	06/13/16 08:04	1
Protactinium 231	0.252	U	0.828	0.829		2.68	pCi/g	05/23/16 04:51	06/13/16 08:04	1
Radium 226	1.08		0.128	0.170	1.00	0.0757	pCi/g	05/23/16 04:51	06/13/16 08:04	1
Thorium 232	0.962		0.181	0.206		0.116	pCi/g	05/23/16 04:51	06/13/16 08:04	1
Thorium 234	0.927		0.320	0.334		0.903	pCi/g	05/23/16 04:51	06/13/16 08:04	1
Uranium 235	0.168	U	0.185	0.185		0.201	pCi/g	05/23/16 04:51	06/13/16 08:04	1
Americium 241	-0.0448	U	0.0996	0.0997		0.132	pCi/g	05/23/16 04:51	06/13/16 08:04	1
Protactinium 234m	4.88	U	6.07	6.09		7.94	pCi/g	05/23/16 04:51	06/13/16 08:04	1
Other Detected Radionuclides			Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
<i>Pb-210</i>	2.11		0.851	0.887		0.962	pCi/g	05/23/16 04:51	06/13/16 08:04	1
<i>Tl-208</i>	0.368		0.0605	0.0715		0.0413	pCi/g	05/23/16 04:51	06/13/16 08:04	1

TestAmerica St. Louis

Client Sample Results

Client: Westinghouse Electric Company LLC
 Project/Site: HDP RFP-CBA-022 (3 DAY TAT)

TestAmerica Job ID: 160-17426-3

Client Sample ID: L11-02-27-P-S-B-00

Lab Sample ID: 160-17426-3

Date Collected: 05/17/16 13:20

Matrix: Solid

Date Received: 05/17/16 17:08

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	0.873		0.128	0.156		0.0982	pCi/g	05/23/16 04:51	06/13/16 08:43	1
Bismuth 212	0.833		0.446	0.454		0.449	pCi/g	05/23/16 04:51	06/13/16 08:43	1
Bismuth 214	0.955		0.112	0.150		0.0761	pCi/g	05/23/16 04:51	06/13/16 08:43	1
Lead 212	0.856		0.0723	0.132		0.0659	pCi/g	05/23/16 04:51	06/13/16 08:43	1
Lead 214	1.17		0.102	0.159		0.0745	pCi/g	05/23/16 04:51	06/13/16 08:43	1
Potassium 40	16.2		1.17	2.03		0.264	pCi/g	05/23/16 04:51	06/13/16 08:43	1
Protactinium 231	0.000	U	0.512	0.512		1.99	pCi/g	05/23/16 04:51	06/13/16 08:43	1
Radium 226	0.955		0.112	0.150	1.00	0.0761	pCi/g	05/23/16 04:51	06/13/16 08:43	1
Thorium 232	0.873		0.128	0.156		0.0982	pCi/g	05/23/16 04:51	06/13/16 08:43	1
Thorium 234	1.16		0.475	0.490		0.727	pCi/g	05/23/16 04:51	06/13/16 08:43	1
Uranium 235	0.0812	U	0.222	0.222		0.370	pCi/g	05/23/16 04:51	06/13/16 08:43	1
Americium 241	0.00104	U	0.0757	0.0757		0.108	pCi/g	05/23/16 04:51	06/13/16 08:43	1
Protactinium 234m	2.05	U	3.62	3.63		8.94	pCi/g	05/23/16 04:51	06/13/16 08:43	1
Other Detected			Count	Total						
Radionuclides			Uncert.	Uncert.	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
<i>Tl-208</i>			<i>0.0443</i>	<i>0.0540</i>		<i>0.0312</i>	<i>pCi/g</i>	<i>05/23/16 04:51</i>	<i>06/13/16 08:43</i>	<i>1</i>

Client Sample ID: L11-02-28-P-S-B-00

Lab Sample ID: 160-17426-4

Date Collected: 05/17/16 13:30

Matrix: Solid

Date Received: 05/17/16 17:08

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	1.08		0.154	0.190		0.0714	pCi/g	05/23/16 04:51	06/13/16 08:45	1
Bismuth 212	1.29		0.449	0.468		0.395	pCi/g	05/23/16 04:51	06/13/16 08:45	1
Bismuth 214	0.891		0.113	0.146		0.0769	pCi/g	05/23/16 04:51	06/13/16 08:45	1
Lead 212	0.922		0.0741	0.140		0.0636	pCi/g	05/23/16 04:51	06/13/16 08:45	1
Lead 214	0.958		0.0944	0.137		0.0764	pCi/g	05/23/16 04:51	06/13/16 08:45	1
Potassium 40	14.8		1.20	1.94		0.413	pCi/g	05/23/16 04:51	06/13/16 08:45	1
Protactinium 231	-0.535	U	1.61	1.61		2.69	pCi/g	05/23/16 04:51	06/13/16 08:45	1
Radium 226	0.891		0.113	0.146	1.00	0.0769	pCi/g	05/23/16 04:51	06/13/16 08:45	1
Thorium 232	1.08		0.154	0.190		0.0714	pCi/g	05/23/16 04:51	06/13/16 08:45	1
Thorium 234	1.19		0.521	0.536		0.709	pCi/g	05/23/16 04:51	06/13/16 08:45	1
Uranium 235	0.127	U	0.217	0.217		0.380	pCi/g	05/23/16 04:51	06/13/16 08:45	1
Americium 241	0.0411	U	0.0899	0.0900		0.149	pCi/g	05/23/16 04:51	06/13/16 08:45	1
Protactinium 234m	1.52	U	2.38	2.39		9.97	pCi/g	05/23/16 04:51	06/13/16 08:45	1
Other Detected			Count	Total						
Radionuclides			Uncert.	Uncert.	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
<i>Tl-208</i>			<i>0.0520</i>	<i>0.0605</i>		<i>0.0398</i>	<i>pCi/g</i>	<i>05/23/16 04:51</i>	<i>06/13/16 08:45</i>	<i>1</i>

TestAmerica St. Louis

Client Sample Results

Client: Westinghouse Electric Company LLC
 Project/Site: HDP RFP-CBA-022 (3 DAY TAT)

TestAmerica Job ID: 160-17426-3

Client Sample ID: L11-02-29-P-S-B-00

Lab Sample ID: 160-17426-5

Date Collected: 05/17/16 13:40

Matrix: Solid

Date Received: 05/17/16 17:08

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	1.06		0.157	0.190		0.109	pCi/g	05/23/16 04:51	06/13/16 08:47	1
Bismuth 212	0.702		0.340	0.348		0.467	pCi/g	05/23/16 04:51	06/13/16 08:47	1
Bismuth 214	1.04		0.117	0.160		0.0668	pCi/g	05/23/16 04:51	06/13/16 08:47	1
Lead 212	0.798		0.0737	0.127		0.0677	pCi/g	05/23/16 04:51	06/13/16 08:47	1
Lead 214	1.27		0.104	0.168		0.0904	pCi/g	05/23/16 04:51	06/13/16 08:47	1
Potassium 40	13.6		1.21	1.85		0.410	pCi/g	05/23/16 04:51	06/13/16 08:47	1
Protactinium 231	-0.509	U	1.56	1.56		2.60	pCi/g	05/23/16 04:51	06/13/16 08:47	1
Radium 226	1.04		0.117	0.160	1.00	0.0668	pCi/g	05/23/16 04:51	06/13/16 08:47	1
Thorium 232	1.06		0.157	0.190		0.109	pCi/g	05/23/16 04:51	06/13/16 08:47	1
Thorium 234	1.45		0.639	0.657		0.831	pCi/g	05/23/16 04:51	06/13/16 08:47	1
Uranium 235	0.0857	U	0.313	0.313		0.521	pCi/g	05/23/16 04:51	06/13/16 08:47	1
Americium 241	0.00489	U	0.0868	0.0868		0.117	pCi/g	05/23/16 04:51	06/13/16 08:47	1
Protactinium 234m	3.89	U	5.35	5.36		7.39	pCi/g	05/23/16 04:51	06/13/16 08:47	1
Other Detected Radionuclides			Count	Total						
	Result	Qualifier	Uncert.	Uncert.	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
TI-208	0.307		0.0574	0.0657		0.0428	pCi/g	05/23/16 04:51	06/13/16 08:47	1

Client Sample ID: L11-02-30-P-R-B-00

Lab Sample ID: 160-17426-6

Date Collected: 05/17/16 13:05

Matrix: Solid

Date Received: 05/17/16 17:08

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	0.842		0.0945	0.128		0.0832	pCi/g	05/23/16 04:51	06/13/16 09:14	1
Bismuth 212	1.13		0.346	0.366		0.319	pCi/g	05/23/16 04:51	06/13/16 09:14	1
Bismuth 214	1.02		0.0869	0.137		0.0512	pCi/g	05/23/16 04:51	06/13/16 09:14	1
Lead 212	0.964		0.0618	0.139		0.0534	pCi/g	05/23/16 04:51	06/13/16 09:14	1
Lead 214	1.13		0.0764	0.140		0.0683	pCi/g	05/23/16 04:51	06/13/16 09:14	1
Potassium 40	16.2		1.00	1.94		0.390	pCi/g	05/23/16 04:51	06/13/16 09:14	1
Protactinium 231	-0.404	U	1.28	1.28		2.13	pCi/g	05/23/16 04:51	06/13/16 09:14	1
Radium 226	1.02		0.0869	0.137	1.00	0.0512	pCi/g	05/23/16 04:51	06/13/16 09:14	1
Thorium 232	0.842		0.0945	0.128		0.0832	pCi/g	05/23/16 04:51	06/13/16 09:14	1
Thorium 234	0.815		0.258	0.272		0.727	pCi/g	05/23/16 04:51	06/13/16 09:14	1
Uranium 235	0.0596	U	0.152	0.152		0.468	pCi/g	05/23/16 04:51	06/13/16 09:14	1
Americium 241	-0.00267	U	0.0846	0.0846		0.141	pCi/g	05/23/16 04:51	06/13/16 09:14	1
Protactinium 234m	2.44	U	3.19	3.20		6.27	pCi/g	05/23/16 04:51	06/13/16 09:14	1
Other Detected Radionuclides			Count	Total						
	Result	Qualifier	Uncert.	Uncert.	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
TI-208	0.241		0.0380	0.0455		0.0323	pCi/g	05/23/16 04:51	06/13/16 09:14	1

TestAmerica St. Louis

Client Sample Results

Client: Westinghouse Electric Company LLC
 Project/Site: HDP RFP-CBA-022 (3 DAY TAT)

TestAmerica Job ID: 160-17426-3

Client Sample ID: L11-02-31-P-R-B-00

Lab Sample ID: 160-17426-7

Date Collected: 05/17/16 13:15

Matrix: Solid

Date Received: 05/17/16 17:08

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	1.06		0.131	0.170		0.0983	pCi/g	05/23/16 04:51	06/13/16 09:16	1
Bismuth 212	1.17		0.460	0.476		0.457	pCi/g	05/23/16 04:51	06/13/16 09:16	1
Bismuth 214	1.14		0.130	0.175		0.0884	pCi/g	05/23/16 04:51	06/13/16 09:16	1
Lead 212	0.962		0.0812	0.149		0.0811	pCi/g	05/23/16 04:51	06/13/16 09:16	1
Lead 214	1.23		0.125	0.179		0.0962	pCi/g	05/23/16 04:51	06/13/16 09:16	1
Potassium 40	17.6		1.23	2.19		0.271	pCi/g	05/23/16 04:51	06/13/16 09:16	1
Protactinium 231	-0.491	U	1.41	1.41		2.36	pCi/g	05/23/16 04:51	06/13/16 09:16	1
Radium 226	1.14		0.130	0.175	1.00	0.0884	pCi/g	05/23/16 04:51	06/13/16 09:16	1
Thorium 232	1.06		0.131	0.170		0.0983	pCi/g	05/23/16 04:51	06/13/16 09:16	1
Thorium 234	1.20		0.524	0.539		0.810	pCi/g	05/23/16 04:51	06/13/16 09:16	1
Uranium 235	0.0549	U	0.133	0.133		0.409	pCi/g	05/23/16 04:51	06/13/16 09:16	1
Americium 241	-0.00643	U	0.0805	0.0805		0.114	pCi/g	05/23/16 04:51	06/13/16 09:16	1
Protactinium 234m	0.523	U	5.42	5.42		9.39	pCi/g	05/23/16 04:51	06/13/16 09:16	1
Other Detected Radionuclides			Count	Total						
	Result	Qualifier	Uncert.	Uncert.	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
TI-208	0.308		0.0553	0.0639		0.0448	pCi/g	05/23/16 04:51	06/13/16 09:16	1

Client Sample ID: L11-02-32-P-R-B-00

Lab Sample ID: 160-17426-8

Date Collected: 05/17/16 13:25

Matrix: Solid

Date Received: 05/17/16 17:08

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	0.909		0.135	0.164		0.126	pCi/g	05/23/16 04:51	06/13/16 09:18	1
Bismuth 212	1.60		0.571	0.595		0.475	pCi/g	05/23/16 04:51	06/13/16 09:18	1
Bismuth 214	1.02		0.121	0.160		0.0823	pCi/g	05/23/16 04:51	06/13/16 09:18	1
Lead 212	0.957		0.0748	0.145		0.0643	pCi/g	05/23/16 04:51	06/13/16 09:18	1
Lead 214	1.07		0.0907	0.144		0.0774	pCi/g	05/23/16 04:51	06/13/16 09:18	1
Potassium 40	16.4		1.23	2.08		0.328	pCi/g	05/23/16 04:51	06/13/16 09:18	1
Protactinium 231	-0.537	U	1.62	1.62		2.70	pCi/g	05/23/16 04:51	06/13/16 09:18	1
Radium 226	1.02		0.121	0.160	1.00	0.0823	pCi/g	05/23/16 04:51	06/13/16 09:18	1
Thorium 232	0.909		0.135	0.164		0.126	pCi/g	05/23/16 04:51	06/13/16 09:18	1
Thorium 234	0.970		0.311	0.327		0.847	pCi/g	05/23/16 04:51	06/13/16 09:18	1
Uranium 235	-0.140	U	0.0916	0.0927		0.665	pCi/g	05/23/16 04:51	06/13/16 09:18	1
Americium 241	-0.0427	U	0.103	0.103		0.170	pCi/g	05/23/16 04:51	06/13/16 09:18	1
Protactinium 234m	3.21	U	5.36	5.37		9.53	pCi/g	05/23/16 04:51	06/13/16 09:18	1
Other Detected Radionuclides			Count	Total						
	Result	Qualifier	Uncert.	Uncert.	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
TI-208	0.319		0.0492	0.0593		0.0350	pCi/g	05/23/16 04:51	06/13/16 09:18	1

Client Sample Results

Client: Westinghouse Electric Company LLC
 Project/Site: HDP RFP-CBA-022 (3 DAY TAT)

TestAmerica Job ID: 160-17426-3

Client Sample ID: L11-02-33-P-R-B-00

Lab Sample ID: 160-17426-9

Date Collected: 05/17/16 13:35

Matrix: Solid

Date Received: 05/17/16 17:08

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	0.927		0.135	0.165		0.130	pCi/g	05/23/16 04:51	06/13/16 09:18	1
Bismuth 212	1.28		0.461	0.479		0.426	pCi/g	05/23/16 04:51	06/13/16 09:18	1
Bismuth 214	1.17		0.121	0.172		0.0675	pCi/g	05/23/16 04:51	06/13/16 09:18	1
Lead 212	0.951		0.0796	0.147		0.0760	pCi/g	05/23/16 04:51	06/13/16 09:18	1
Lead 214	1.34		0.128	0.189		0.0905	pCi/g	05/23/16 04:51	06/13/16 09:18	1
Potassium 40	18.3		1.34	2.31		0.383	pCi/g	05/23/16 04:51	06/13/16 09:18	1
Protactinium 231	0.242	U	0.778	0.779		2.50	pCi/g	05/23/16 04:51	06/13/16 09:18	1
Radium 226	1.17		0.121	0.172	1.00	0.0675	pCi/g	05/23/16 04:51	06/13/16 09:18	1
Thorium 232	0.927		0.135	0.165		0.130	pCi/g	05/23/16 04:51	06/13/16 09:18	1
Thorium 234	1.51		0.751	0.767		0.964	pCi/g	05/23/16 04:51	06/13/16 09:18	1
Uranium 235	0.0921	U	0.333	0.333		0.554	pCi/g	05/23/16 04:51	06/13/16 09:18	1
Americium 241	0.0401	U	0.0947	0.0948		0.126	pCi/g	05/23/16 04:51	06/13/16 09:18	1
Protactinium 234m	4.98	U	5.69	5.71		9.68	pCi/g	05/23/16 04:51	06/13/16 09:18	1
Other Detected Radionuclides			Count	Total						
	Result	Qualifier	Uncert.	Uncert.	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
TI-208	0.334		0.0571	0.0668		0.0454	pCi/g	05/23/16 04:51	06/13/16 09:18	1

Client Sample ID: L11-02-34-P-R-B-00

Lab Sample ID: 160-17426-10

Date Collected: 05/17/16 13:45

Matrix: Solid

Date Received: 05/17/16 17:08

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	0.919		0.0977	0.135		0.0889	pCi/g	05/23/16 04:51	06/13/16 09:55	1
Bismuth 212	1.39		0.382	0.408		0.301	pCi/g	05/23/16 04:51	06/13/16 09:55	1
Bismuth 214	0.934		0.0854	0.129		0.0548	pCi/g	05/23/16 04:51	06/13/16 09:55	1
Lead 212	0.988		0.0611	0.142		0.0511	pCi/g	05/23/16 04:51	06/13/16 09:55	1
Lead 214	1.08		0.0964	0.148		0.0726	pCi/g	05/23/16 04:51	06/13/16 09:55	1
Potassium 40	17.2		1.03	2.04		0.415	pCi/g	05/23/16 04:51	06/13/16 09:55	1
Protactinium 231	-0.396	U	1.25	1.26		2.09	pCi/g	05/23/16 04:51	06/13/16 09:55	1
Radium 226	0.934		0.0854	0.129	1.00	0.0548	pCi/g	05/23/16 04:51	06/13/16 09:55	1
Thorium 232	0.919		0.0977	0.135		0.0889	pCi/g	05/23/16 04:51	06/13/16 09:55	1
Thorium 234	0.834		0.267	0.281		0.732	pCi/g	05/23/16 04:51	06/13/16 09:55	1
Uranium 235	-0.0450	U	0.135	0.135		0.513	pCi/g	05/23/16 04:51	06/13/16 09:55	1
Americium 241	-0.0374	U	0.0847	0.0848		0.140	pCi/g	05/23/16 04:51	06/13/16 09:55	1
Protactinium 234m	-0.660	U	0.727	0.730		8.45	pCi/g	05/23/16 04:51	06/13/16 09:55	1
Other Detected Radionuclides			Count	Total						
	Result	Qualifier	Uncert.	Uncert.	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
TI-208	0.303		0.0391	0.0502		0.0300	pCi/g	05/23/16 04:51	06/13/16 09:55	1

Client Sample Results

Client: Westinghouse Electric Company LLC
 Project/Site: HDP RFP-CBA-022 (3 DAY TAT)

TestAmerica Job ID: 160-17426-3

Client Sample ID: L11-02-35-P-S-B-00

Lab Sample ID: 160-17426-11

Date Collected: 05/17/16 13:50

Matrix: Solid

Date Received: 05/17/16 17:08

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	0.562		0.0878	0.105		0.0742	pCi/g	05/23/16 04:51	06/13/16 09:56	1
Bismuth 212	0.673		0.324	0.331		0.309	pCi/g	05/23/16 04:51	06/13/16 09:56	1
Bismuth 214	0.919		0.0895	0.131		0.0533	pCi/g	05/23/16 04:51	06/13/16 09:56	1
Lead 212	0.528		0.0509	0.0852		0.0497	pCi/g	05/23/16 04:51	06/13/16 09:56	1
Lead 214	0.965		0.0744	0.125		0.0609	pCi/g	05/23/16 04:51	06/13/16 09:56	1
Potassium 40	9.55		0.805	1.27		0.279	pCi/g	05/23/16 04:51	06/13/16 09:56	1
Protactinium 231	0.000	U	0.141	0.141		1.53	pCi/g	05/23/16 04:51	06/13/16 09:56	1
Radium 226	0.919		0.0895	0.131	1.00	0.0533	pCi/g	05/23/16 04:51	06/13/16 09:56	1
Thorium 232	0.562		0.0878	0.105		0.0742	pCi/g	05/23/16 04:51	06/13/16 09:56	1
Thorium 234	0.798		0.384	0.393		0.600	pCi/g	05/23/16 04:51	06/13/16 09:56	1
Uranium 235	0.0193	U	0.0947	0.0947		0.300	pCi/g	05/23/16 04:51	06/13/16 09:56	1
Americium 241	0.0110	U	0.0583	0.0584		0.0825	pCi/g	05/23/16 04:51	06/13/16 09:56	1
Protactinium 234m	2.27	U	3.94	3.95		6.61	pCi/g	05/23/16 04:51	06/13/16 09:56	1
Other Detected Radionuclides			Count	Total						
	Result	Qualifier	Uncert.	Uncert.	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
TI-208	0.221		0.0430	0.0487		0.0331	pCi/g	05/23/16 04:51	06/13/16 09:56	1

Client Sample ID: L11-02-36-P-R-B-00

Lab Sample ID: 160-17426-12

Date Collected: 05/17/16 13:55

Matrix: Solid

Date Received: 05/17/16 17:08

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	0.874		0.122	0.151		0.0864	pCi/g	05/23/16 04:51	06/13/16 09:57	1
Bismuth 212	1.09		0.415	0.430		0.415	pCi/g	05/23/16 04:51	06/13/16 09:57	1
Bismuth 214	1.09		0.120	0.165		0.0772	pCi/g	05/23/16 04:51	06/13/16 09:57	1
Lead 212	0.943		0.0739	0.143		0.0616	pCi/g	05/23/16 04:51	06/13/16 09:57	1
Lead 214	1.10		0.0980	0.151		0.0686	pCi/g	05/23/16 04:51	06/13/16 09:57	1
Potassium 40	16.1		1.21	2.04		0.301	pCi/g	05/23/16 04:51	06/13/16 09:57	1
Protactinium 231	0.332	U	1.00	1.00		2.47	pCi/g	05/23/16 04:51	06/13/16 09:57	1
Radium 226	1.09		0.120	0.165	1.00	0.0772	pCi/g	05/23/16 04:51	06/13/16 09:57	1
Thorium 232	0.874		0.122	0.151		0.0864	pCi/g	05/23/16 04:51	06/13/16 09:57	1
Thorium 234	1.06		0.536	0.547		0.843	pCi/g	05/23/16 04:51	06/13/16 09:57	1
Uranium 235	0.177	U	0.155	0.156		0.193	pCi/g	05/23/16 04:51	06/13/16 09:57	1
Americium 241	0.0419	U	0.0957	0.0958		0.159	pCi/g	05/23/16 04:51	06/13/16 09:57	1
Protactinium 234m	1.87	U	3.25	3.25		8.98	pCi/g	05/23/16 04:51	06/13/16 09:57	1
Other Detected Radionuclides			Count	Total						
	Result	Qualifier	Uncert.	Uncert.	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
TI-208	0.325		0.0518	0.0618		0.0387	pCi/g	05/23/16 04:51	06/13/16 09:57	1

TestAmerica St. Louis

Client Sample Results

Client: Westinghouse Electric Company LLC
 Project/Site: HDP RFP-CBA-022 (3 DAY TAT)

TestAmerica Job ID: 160-17426-3

Client Sample ID: L11-02-37-P-S-B-00

Lab Sample ID: 160-17426-13

Date Collected: 05/17/16 14:00

Matrix: Solid

Date Received: 05/17/16 17:08

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	0.954		0.135	0.166		0.129	pCi/g	05/23/16 04:51	06/13/16 09:58	1
Bismuth 212	0.940		0.367	0.379		0.385	pCi/g	05/23/16 04:51	06/13/16 09:58	1
Bismuth 214	0.873		0.103	0.137		0.0658	pCi/g	05/23/16 04:51	06/13/16 09:58	1
Lead 212	0.952		0.0719	0.143		0.0609	pCi/g	05/23/16 04:51	06/13/16 09:58	1
Lead 214	0.951		0.0931	0.136		0.0731	pCi/g	05/23/16 04:51	06/13/16 09:58	1
Potassium 40	16.5		1.18	2.05		0.222	pCi/g	05/23/16 04:51	06/13/16 09:58	1
Protactinium 231	-0.488	U	1.56	1.56		2.60	pCi/g	05/23/16 04:51	06/13/16 09:58	1
Radium 226	0.873		0.103	0.137	1.00	0.0658	pCi/g	05/23/16 04:51	06/13/16 09:58	1
Thorium 232	0.954		0.135	0.166		0.129	pCi/g	05/23/16 04:51	06/13/16 09:58	1
Thorium 234	1.28		0.609	0.624		0.798	pCi/g	05/23/16 04:51	06/13/16 09:58	1
Uranium 235	-0.114	U	0.140	0.141		0.582	pCi/g	05/23/16 04:51	06/13/16 09:58	1
Americium 241	0.0105	U	0.0875	0.0875		0.117	pCi/g	05/23/16 04:51	06/13/16 09:58	1
Protactinium 234m	1.63	U	3.94	3.94		9.84	pCi/g	05/23/16 04:51	06/13/16 09:58	1
Other Detected			Count	Total						
Radionuclides			Uncert.	Uncert.	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
<i>Tl-208</i>			<i>0.0566</i>	<i>0.0638</i>		<i>0.0452</i>	<i>pCi/g</i>	<i>05/23/16 04:51</i>	<i>06/13/16 09:58</i>	<i>1</i>

Client Sample ID: L11-02-38-P-R-B-00

Lab Sample ID: 160-17426-14

Date Collected: 05/17/16 14:05

Matrix: Solid

Date Received: 05/17/16 17:08

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		0.117	0.157		0.121	pCi/g	05/23/16 04:51	06/13/16 10:05	1
Bismuth 212	1.14		0.337	0.357		0.308	pCi/g	05/23/16 04:51	06/13/16 10:05	1
Bismuth 214	1.09		0.0819	0.138		0.0539	pCi/g	05/23/16 04:51	06/13/16 10:05	1
Lead 212	1.01		0.0597	0.144		0.0477	pCi/g	05/23/16 04:51	06/13/16 10:05	1
Lead 214	1.23		0.0905	0.157		0.0696	pCi/g	05/23/16 04:51	06/13/16 10:05	1
Potassium 40	18.5		0.989	2.11		0.339	pCi/g	05/23/16 04:51	06/13/16 10:05	1
Protactinium 231	-0.400	U	1.17	1.17		1.95	pCi/g	05/23/16 04:51	06/13/16 10:05	1
Radium 226	1.09		0.0819	0.138	1.00	0.0539	pCi/g	05/23/16 04:51	06/13/16 10:05	1
Thorium 232	1.04		0.117	0.157		0.121	pCi/g	05/23/16 04:51	06/13/16 10:05	1
Thorium 234	1.43		0.446	0.470		0.682	pCi/g	05/23/16 04:51	06/13/16 10:05	1
Uranium 235	-0.111	U	0.110	0.111		0.477	pCi/g	05/23/16 04:51	06/13/16 10:05	1
Americium 241	-0.0275	U	0.0526	0.0527		0.134	pCi/g	05/23/16 04:51	06/13/16 10:05	1
Protactinium 234m	-3.32	U	3.57	3.59		7.82	pCi/g	05/23/16 04:51	06/13/16 10:05	1
Other Detected			Count	Total						
Radionuclides			Uncert.	Uncert.	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
<i>Tl-208</i>			<i>0.0425</i>	<i>0.0543</i>		<i>0.0330</i>	<i>pCi/g</i>	<i>05/23/16 04:51</i>	<i>06/13/16 10:05</i>	<i>1</i>

TestAmerica St. Louis

Client Sample Results

Client: Westinghouse Electric Company LLC
 Project/Site: HDP RFP-CBA-022 (3 DAY TAT)

TestAmerica Job ID: 160-17426-3

Client Sample ID: L11-02-39-P-S-B-00

Lab Sample ID: 160-17426-15

Date Collected: 05/17/16 09:35

Matrix: Solid

Date Received: 05/17/16 17:08

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	0.279		0.0653	0.0712		0.0493	pCi/g	05/23/16 04:51	06/13/16 10:38	1
Bismuth 212	0.130	U	0.207	0.207		0.346	pCi/g	05/23/16 04:51	06/13/16 10:38	1
Bismuth 214	0.407		0.0533	0.0680		0.0366	pCi/g	05/23/16 04:51	06/13/16 10:38	1
Lead 212	0.221		0.0299	0.0413		0.0304	pCi/g	05/23/16 04:51	06/13/16 10:38	1
Lead 214	0.471		0.0483	0.0688		0.0434	pCi/g	05/23/16 04:51	06/13/16 10:38	1
Potassium 40	10.3		0.703	1.27		0.202	pCi/g	05/23/16 04:51	06/13/16 10:38	1
Protactinium 231	-0.288	U	0.889	0.890		1.48	pCi/g	05/23/16 04:51	06/13/16 10:38	1
Radium 226	0.407		0.0533	0.0680	1.00	0.0366	pCi/g	05/23/16 04:51	06/13/16 10:38	1
Thorium 232	0.279		0.0653	0.0712		0.0493	pCi/g	05/23/16 04:51	06/13/16 10:38	1
Thorium 234	0.329	U	0.152	0.156		0.447	pCi/g	05/23/16 04:51	06/13/16 10:38	1
Uranium 235	0.0706	U	0.131	0.131		0.280	pCi/g	05/23/16 04:51	06/13/16 10:38	1
Americium 241	-0.0234	U	0.0551	0.0551		0.0916	pCi/g	05/23/16 04:51	06/13/16 10:38	1
Protactinium 234m	1.44	U	2.32	2.33		4.86	pCi/g	05/23/16 04:51	06/13/16 10:38	1
Other Detected Radionuclides			Count	Total						
	Result	Qualifier	Uncert.	Uncert.	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
TI-208	0.0854		0.0231	0.0247		0.0195	pCi/g	05/23/16 04:51	06/13/16 10:38	1

Client Sample ID: L11-02-40-P-R-B-00

Lab Sample ID: 160-17426-16

Date Collected: 05/17/16 09:45

Matrix: Solid

Date Received: 05/17/16 17:08

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	0.324		0.0793	0.0859		0.0889	pCi/g	05/23/16 04:51	06/13/16 10:39	1
Bismuth 212	-0.00278	U	0.270	0.270		0.515	pCi/g	05/23/16 04:51	06/13/16 10:39	1
Bismuth 214	0.400		0.0643	0.0766		0.0655	pCi/g	05/23/16 04:51	06/13/16 10:39	1
Lead 212	0.217		0.0358	0.0455		0.0403	pCi/g	05/23/16 04:51	06/13/16 10:39	1
Lead 214	0.525		0.0680	0.0872		0.0487	pCi/g	05/23/16 04:51	06/13/16 10:39	1
Potassium 40	12.0		0.889	1.52		0.206	pCi/g	05/23/16 04:51	06/13/16 10:39	1
Protactinium 231	-0.267	U	0.764	0.765		1.28	pCi/g	05/23/16 04:51	06/13/16 10:39	1
Radium 226	0.400		0.0643	0.0766	1.00	0.0655	pCi/g	05/23/16 04:51	06/13/16 10:39	1
Thorium 232	0.324		0.0793	0.0859		0.0889	pCi/g	05/23/16 04:51	06/13/16 10:39	1
Thorium 234	0.388	U	0.306	0.309		0.446	pCi/g	05/23/16 04:51	06/13/16 10:39	1
Uranium 235	0.0354	U	0.0748	0.0749		0.232	pCi/g	05/23/16 04:51	06/13/16 10:39	1
Americium 241	-0.00163	U	0.0454	0.0454		0.0649	pCi/g	05/23/16 04:51	06/13/16 10:39	1
Protactinium 234m	0.616	U	1.13	1.14		7.05	pCi/g	05/23/16 04:51	06/13/16 10:39	1
Other Detected Radionuclides			Count	Total						
	Result	Qualifier	Uncert.	Uncert.	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
TI-208	0.0887		0.0272	0.0287		0.0231	pCi/g	05/23/16 04:51	06/13/16 10:39	1

Client Sample Results

Client: Westinghouse Electric Company LLC
 Project/Site: HDP RFP-CBA-022 (3 DAY TAT)

TestAmerica Job ID: 160-17426-3

Client Sample ID: L11-02-41-P-S-B-00

Lab Sample ID: 160-17426-17

Date Collected: 05/17/16 09:55

Matrix: Solid

Date Received: 05/17/16 17:08

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	0.176		0.0827	0.0846		0.119	pCi/g	05/23/16 04:51	06/13/16 10:40	1
Bismuth 212	0.156	U	0.257	0.257		0.432	pCi/g	05/23/16 04:51	06/13/16 10:40	1
Bismuth 214	0.446		0.0672	0.0816		0.0483	pCi/g	05/23/16 04:51	06/13/16 10:40	1
Lead 212	0.224		0.0365	0.0466		0.0400	pCi/g	05/23/16 04:51	06/13/16 10:40	1
Lead 214	0.429		0.0569	0.0722		0.0514	pCi/g	05/23/16 04:51	06/13/16 10:40	1
Potassium 40	7.55		0.753	1.08		0.239	pCi/g	05/23/16 04:51	06/13/16 10:40	1
Protactinium 231	-0.354	U	1.11	1.11		1.86	pCi/g	05/23/16 04:51	06/13/16 10:40	1
Radium 226	0.446		0.0672	0.0816	1.00	0.0483	pCi/g	05/23/16 04:51	06/13/16 10:40	1
Thorium 232	0.176		0.0827	0.0846		0.119	pCi/g	05/23/16 04:51	06/13/16 10:40	1
Thorium 234	0.495		0.190	0.197		0.485	pCi/g	05/23/16 04:51	06/13/16 10:40	1
Uranium 235	-0.0847	U	0.192	0.192		0.366	pCi/g	05/23/16 04:51	06/13/16 10:40	1
Americium 241	0.00219	U	0.0555	0.0555		0.0936	pCi/g	05/23/16 04:51	06/13/16 10:40	1
Protactinium 234m	0.000	U	0.633	0.633		5.75	pCi/g	05/23/16 04:51	06/13/16 10:40	1
Other Detected Radionuclides			Count	Total						
	Result	Qualifier	Uncert.	Uncert.	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Tl-208	0.0811		0.0216	0.0231		0.0166	pCi/g	05/23/16 04:51	06/13/16 10:40	1

Client Sample ID: L11-02-42-P-R-B-00

Lab Sample ID: 160-17426-18

Date Collected: 05/17/16 10:00

Matrix: Solid

Date Received: 05/17/16 17:08

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	0.824		0.101	0.131		0.121	pCi/g	05/23/16 04:51	06/13/16 10:41	1
Bismuth 212	1.34		0.284	0.316		0.175	pCi/g	05/23/16 04:51	06/13/16 10:41	1
Bismuth 214	1.17		0.108	0.162		0.0663	pCi/g	05/23/16 04:51	06/13/16 10:41	1
Lead 212	0.840		0.0636	0.126		0.0547	pCi/g	05/23/16 04:51	06/13/16 10:41	1
Lead 214	1.28		0.0867	0.159		0.0731	pCi/g	05/23/16 04:51	06/13/16 10:41	1
Potassium 40	16.7		1.04	1.97		0.303	pCi/g	05/23/16 04:51	06/13/16 10:41	1
Protactinium 231	0.117	U	0.657	0.657		2.07	pCi/g	05/23/16 04:51	06/13/16 10:41	1
Radium 226	1.17		0.108	0.162	1.00	0.0663	pCi/g	05/23/16 04:51	06/13/16 10:41	1
Thorium 232	0.824		0.101	0.131		0.121	pCi/g	05/23/16 04:51	06/13/16 10:41	1
Thorium 234	0.765	U	0.277	0.289		0.798	pCi/g	05/23/16 04:51	06/13/16 10:41	1
Uranium 235	0.287		0.177	0.180		0.185	pCi/g	05/23/16 04:51	06/13/16 10:41	1
Americium 241	0.0304	U	0.0907	0.0908		0.151	pCi/g	05/23/16 04:51	06/13/16 10:41	1
Protactinium 234m	3.79	U	4.39	4.41		6.82	pCi/g	05/23/16 04:51	06/13/16 10:41	1
Other Detected Radionuclides			Count	Total						
	Result	Qualifier	Uncert.	Uncert.	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Pb-210	1.50		0.664	0.687		0.785	pCi/g	05/23/16 04:51	06/13/16 10:41	1
Tl-208	0.249		0.0386	0.0463		0.0315	pCi/g	05/23/16 04:51	06/13/16 10:41	1

TestAmerica St. Louis

QC Sample Results

Client: Westinghouse Electric Company LLC
 Project/Site: HDP RFP-CBA-022 (3 DAY TAT)

TestAmerica Job ID: 160-17426-3

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

Lab Sample ID: MB 160-252519/1-A
Matrix: Solid
Analysis Batch: 256163

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 252519

Analyte	MB MB		Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium 228	0.02312	U	0.0277	0.0278		0.0414	pCi/g	05/23/16 04:51	06/13/16 16:14	1
Bismuth 212	0.0000	U	0.0352	0.0352		0.307	pCi/g	05/23/16 04:51	06/13/16 16:14	1
Bismuth 214	0.01203	U	0.0396	0.0396		0.0694	pCi/g	05/23/16 04:51	06/13/16 16:14	1
Lead 212	0.02243	U	0.0172	0.0175		0.0254	pCi/g	05/23/16 04:51	06/13/16 16:14	1
Lead 214	0.004353	U	0.0203	0.0203		0.0372	pCi/g	05/23/16 04:51	06/13/16 16:14	1
Potassium 40	0.07389	U	0.144	0.144		0.251	pCi/g	05/23/16 04:51	06/13/16 16:14	1
Protactinium 231	0.07626	U	0.256	0.256		0.899	pCi/g	05/23/16 04:51	06/13/16 16:14	1
Radium 226	0.01203	U	0.0396	0.0396	1.00	0.0694	pCi/g	05/23/16 04:51	06/13/16 16:14	1
Thorium 232	0.02312	U	0.0277	0.0278		0.0414	pCi/g	05/23/16 04:51	06/13/16 16:14	1
Thorium 234	0.08614	U	0.176	0.176		0.296	pCi/g	05/23/16 04:51	06/13/16 16:14	1
Uranium 235	0.01908	U	0.0521	0.0521		0.0894	pCi/g	05/23/16 04:51	06/13/16 16:14	1
Americium 241	-0.01010	U	0.0232	0.0232		0.0320	pCi/g	05/23/16 04:51	06/13/16 16:14	1
Protactinium 234m	-0.06096	U	1.18	1.18		3.42	pCi/g	05/23/16 04:51	06/13/16 16:14	1
Other Detected Radionuclides	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Other Detected Radionuclide	None						pCi/g	05/23/16 04:51	06/13/16 16:14	1

Lab Sample ID: LCS 160-252519/2-A
Matrix: Solid
Analysis Batch: 256153

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 252519

Analyte	Spike Added	LCS Result	LCS Qual	Total	RL	MDC	Unit	%Rec	%Rec.
				Uncert. (2σ+/-)					Limits
Americium 241	101	101.3		10.5		0.496	pCi/g	101	87 - 116
Cesium 137	33.9	33.63		3.52		0.152	pCi/g	99	87 - 120
Cobalt 60	30.9	30.32		3.06		0.0817	pCi/g	98	87 - 115

Lab Sample ID: 160-17426-1 DU
Matrix: Solid
Analysis Batch: 256157

Client Sample ID: L11-02-25-P-S-B-00
Prep Type: Total/NA
Prep Batch: 252519

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total	RL	MDC	Unit	RER	RER
					Uncert. (2σ+/-)					Limit
Actinium 228	0.909		0.8996		0.143		0.109	pCi/g	0.03	1
Bismuth 212	-0.00969	U	0.2220	U	0.394		0.658	pCi/g	0.23	1
Bismuth 214	1.08		1.111		0.150		0.0485	pCi/g	0.09	1
Lead 212	0.832		0.9305		0.138		0.0562	pCi/g	0.36	1
Lead 214	1.13		1.120		0.146		0.0723	pCi/g	0.04	1
Potassium 40	14.2		15.62		1.93		0.433	pCi/g	0.37	1
Protactinium 231	0.495	U	0.2054	U	0.668		2.13	pCi/g	0.16	1
Radium 226	1.08		1.111		0.150	1.00	0.0485	pCi/g	0.09	1
Thorium 232	0.909		0.8996		0.143		0.109	pCi/g	0.03	1
Thorium 234	1.05		1.266		0.525		0.784	pCi/g	0.24	1
Uranium 235	0.207		-0.05071	U	0.152		0.500	pCi/g	0.82	1
Americium 241	-0.0499	U	-0.02905	U	0.0908		0.151	pCi/g	0.10	1

TestAmerica St. Louis

QC Sample Results

Client: Westinghouse Electric Company LLC
 Project/Site: HDP RFP-CBA-022 (3 DAY TAT)

TestAmerica Job ID: 160-17426-3

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

Lab Sample ID: 160-17426-1 DU
 Matrix: Solid
 Analysis Batch: 256157

Client Sample ID: L11-02-25-P-S-B-00
 Prep Type: Total/NA
 Prep Batch: 252519

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Protactinium 234m	3.70	U	3.582	U	4.20		5.99	pCi/g	0.01	1

Other Detected Radionuclides	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Tl-208	0.308		0.2729		0.0514		0.0338	pCi/g	0.31	1

QC Association Summary

Client: Westinghouse Electric Company LLC
 Project/Site: HDP RFP-CBA-022 (3 DAY TAT)

TestAmerica Job ID: 160-17426-3

Rad

Leach Batch: 251742

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-17426-1	L11-02-25-P-S-B-00	Total/NA	Solid	Dry and Grind	
160-17426-1 DU	L11-02-25-P-S-B-00	Total/NA	Solid	Dry and Grind	
160-17426-2	L11-02-26-P-S-B-00	Total/NA	Solid	Dry and Grind	
160-17426-3	L11-02-27-P-S-B-00	Total/NA	Solid	Dry and Grind	
160-17426-4	L11-02-28-P-S-B-00	Total/NA	Solid	Dry and Grind	
160-17426-5	L11-02-29-P-S-B-00	Total/NA	Solid	Dry and Grind	
160-17426-6	L11-02-30-P-R-B-00	Total/NA	Solid	Dry and Grind	
160-17426-7	L11-02-31-P-R-B-00	Total/NA	Solid	Dry and Grind	
160-17426-8	L11-02-32-P-R-B-00	Total/NA	Solid	Dry and Grind	
160-17426-9	L11-02-33-P-R-B-00	Total/NA	Solid	Dry and Grind	
160-17426-10	L11-02-34-P-R-B-00	Total/NA	Solid	Dry and Grind	
160-17426-11	L11-02-35-P-S-B-00	Total/NA	Solid	Dry and Grind	
160-17426-12	L11-02-36-P-R-B-00	Total/NA	Solid	Dry and Grind	
160-17426-13	L11-02-37-P-S-B-00	Total/NA	Solid	Dry and Grind	
160-17426-14	L11-02-38-P-R-B-00	Total/NA	Solid	Dry and Grind	
160-17426-15	L11-02-39-P-S-B-00	Total/NA	Solid	Dry and Grind	
160-17426-16	L11-02-40-P-R-B-00	Total/NA	Solid	Dry and Grind	
160-17426-17	L11-02-41-P-S-B-00	Total/NA	Solid	Dry and Grind	
160-17426-18	L11-02-42-P-R-B-00	Total/NA	Solid	Dry and Grind	

Prep Batch: 252519

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-17426-1	L11-02-25-P-S-B-00	Total/NA	Solid	Fill_Geo-21	251742
160-17426-1 DU	L11-02-25-P-S-B-00	Total/NA	Solid	Fill_Geo-21	251742
160-17426-2	L11-02-26-P-S-B-00	Total/NA	Solid	Fill_Geo-21	251742
160-17426-3	L11-02-27-P-S-B-00	Total/NA	Solid	Fill_Geo-21	251742
160-17426-4	L11-02-28-P-S-B-00	Total/NA	Solid	Fill_Geo-21	251742
160-17426-5	L11-02-29-P-S-B-00	Total/NA	Solid	Fill_Geo-21	251742
160-17426-6	L11-02-30-P-R-B-00	Total/NA	Solid	Fill_Geo-21	251742
160-17426-7	L11-02-31-P-R-B-00	Total/NA	Solid	Fill_Geo-21	251742
160-17426-8	L11-02-32-P-R-B-00	Total/NA	Solid	Fill_Geo-21	251742
160-17426-9	L11-02-33-P-R-B-00	Total/NA	Solid	Fill_Geo-21	251742
160-17426-10	L11-02-34-P-R-B-00	Total/NA	Solid	Fill_Geo-21	251742
160-17426-11	L11-02-35-P-S-B-00	Total/NA	Solid	Fill_Geo-21	251742
160-17426-12	L11-02-36-P-R-B-00	Total/NA	Solid	Fill_Geo-21	251742
160-17426-13	L11-02-37-P-S-B-00	Total/NA	Solid	Fill_Geo-21	251742
160-17426-14	L11-02-38-P-R-B-00	Total/NA	Solid	Fill_Geo-21	251742
160-17426-15	L11-02-39-P-S-B-00	Total/NA	Solid	Fill_Geo-21	251742
160-17426-16	L11-02-40-P-R-B-00	Total/NA	Solid	Fill_Geo-21	251742
160-17426-17	L11-02-41-P-S-B-00	Total/NA	Solid	Fill_Geo-21	251742
160-17426-18	L11-02-42-P-R-B-00	Total/NA	Solid	Fill_Geo-21	251742
LCS 160-252519/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
MB 160-252519/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	