

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: 160-4704-2

Client Project/Site: RFP-CBA-022 (21 DAY TAT)

For:

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

Attn: Martin Swanson



Authorized for release by:

1/13/2014 4:30:35 PM

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

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

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Case Narrative

Client: Westinghouse Electric Company LLC
Project/Site: RFP-CBA-022 (21 DAY TAT)

TestAmerica Job ID: 160-4704-2

Job ID: 160-4704-2

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Westinghouse Electric Company LLC

Project: RFP-CBA-022 (21 DAY TAT)

Report Number: 160-4704-2

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 11/27/2013; the samples arrived in good condition, properly preserved and on ice. The temperature of the coolers at receipt was 2.2 C.

RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)

Samples L100601BES00 (160-4704-1), L100602BES00 (160-4704-2), L100603BES00 (160-4704-3), L100604BES00 (160-4704-4), L100605BRQ00 (160-4704-5), L100605BRS00 (160-4704-6), L100606BES00 (160-4704-7), L100607BES00 (160-4704-8), L100608BES00 (160-4704-9) and L100609BES00 (160-4704-10) were analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA_01_R. The samples were leached on 12/18/2013, prepared on 12/20/2013 and analyzed on 01/10/2014.

No other difficulties were encountered during the Radium 226 analysis. All other quality control parameters were within the acceptance limits.

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.

4704

Login Sample Receipt Checklist

Client: Westinghouse Electric Company LLC

Job Number: 160-4704-2

Login Number: 4704

List Source: TestAmerica St. Louis

List Number: 1

Creator: Clarke, Jill C

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	Thermal preservation not required.
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is $<6\text{mm}$ (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Westinghouse Electric Company LLC
Project/Site: RFP-CBA-022 (21 DAY TAT)

TestAmerica Job ID: 160-4704-2

Qualifiers

Rad

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

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: Westinghouse Electric Company LLC
Project/Site: RFP-CBA-022 (21 DAY TAT)

TestAmerica Job ID: 160-4704-2

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

Protocol References:

DOE = U.S. Department of Energy

Laboratory References:

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

Sample Summary

Client: Westinghouse Electric Company LLC
Project/Site: RFP-CBA-022 (21 DAY TAT)

TestAmerica Job ID: 160-4704-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-4704-1	L100601BES00	Solid	11/26/13 11:20	11/27/13 15:00
160-4704-2	L100602BES00	Solid	11/26/13 11:05	11/27/13 15:00
160-4704-3	L100603BES00	Solid	11/26/13 10:45	11/27/13 15:00
160-4704-4	L100604BES00	Solid	11/26/13 10:55	11/27/13 15:00
160-4704-5	L100605BRQ00	Solid	11/26/13 09:50	11/27/13 15:00
160-4704-6	L100605BRS00	Solid	11/26/13 09:50	11/27/13 15:00
160-4704-7	L100606BES00	Solid	11/26/13 09:55	11/27/13 15:00
160-4704-8	L100607BES00	Solid	11/26/13 10:20	11/27/13 15:00
160-4704-9	L100608BES00	Solid	11/26/13 10:00	11/27/13 15:00
160-4704-10	L100609BES00	Solid	11/26/13 10:15	11/27/13 15:00

Client Sample Results

Client: Westinghouse Electric Company LLC
Project/Site: RFP-CBA-022 (21 DAY TAT)

TestAmerica Job ID: 160-4704-2

Client Sample ID: L100601BES00

Date Collected: 11/26/13 11:20

Date Received: 11/27/13 15:00

Lab Sample ID: 160-4704-1

Matrix: Solid

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	1.04		0.156	0.189		0.184	pCi/g	12/20/13 10:21	01/10/14 17:09	1
Bismuth 212	0.819		0.348	0.359		0.469	pCi/g	12/20/13 10:21	01/10/14 17:09	1
Bismuth 214	1.26		0.135	0.188		0.0864	pCi/g	12/20/13 10:21	01/10/14 17:09	1
Lead 212	1.00		0.0783	0.151		0.0683	pCi/g	12/20/13 10:21	01/10/14 17:09	1
Lead 214	1.44		0.101	0.180		0.0726	pCi/g	12/20/13 10:21	01/10/14 17:09	1
Potassium 40	16.6		1.22	2.09		0.259	pCi/g	12/20/13 10:21	01/10/14 17:09	1
Protactinium 231	-0.591	U	0.853	0.856		1.41	pCi/g	12/20/13 10:21	01/10/14 17:09	1
Radium 226	1.26		0.135	0.188	1.00	0.0864	pCi/g	12/20/13 10:21	01/10/14 17:09	1
Thorium 232	1.04		0.156	0.189		0.184	pCi/g	12/20/13 10:21	01/10/14 17:09	1
Thorium 234	1.84		0.839	0.861		1.01	pCi/g	12/20/13 10:21	01/10/14 17:09	1
Uranium 235	0.142	U	0.160	0.160		0.278	pCi/g	12/20/13 10:21	01/10/14 17:09	1
Americium 241	0.000206	U	0.0672	0.0672		0.114	pCi/g	12/20/13 10:21	01/10/14 17:09	1
Protactinium 234m	0.0192	U	3.69	3.69		6.62	pCi/g	12/20/13 10:21	01/10/14 17:09	1

Client Sample ID: L100602BES00

Date Collected: 11/26/13 11:05

Date Received: 11/27/13 15:00

Lab Sample ID: 160-4704-2

Matrix: Solid

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	1.06		0.108	0.153		0.113	pCi/g	12/20/13 10:21	01/10/14 17:10	1
Bismuth 212	1.09		0.351	0.369		0.335	pCi/g	12/20/13 10:21	01/10/14 17:10	1
Bismuth 214	1.03		0.101	0.147		0.0695	pCi/g	12/20/13 10:21	01/10/14 17:10	1
Lead 212	1.14		0.0694	0.163		0.0546	pCi/g	12/20/13 10:21	01/10/14 17:10	1
Lead 214	1.24		0.0876	0.156		0.0684	pCi/g	12/20/13 10:21	01/10/14 17:10	1
Potassium 40	19.9		1.14	2.33		0.377	pCi/g	12/20/13 10:21	01/10/14 17:10	1
Protactinium 231	0.491	U	0.272	0.277		1.02	pCi/g	12/20/13 10:21	01/10/14 17:10	1
Radium 226	1.03		0.101	0.147	1.00	0.0695	pCi/g	12/20/13 10:21	01/10/14 17:10	1
Thorium 232	1.06		0.108	0.153		0.113	pCi/g	12/20/13 10:21	01/10/14 17:10	1
Thorium 234	1.06		0.323	0.342		0.813	pCi/g	12/20/13 10:21	01/10/14 17:10	1
Uranium 235	0.165	U	0.129	0.130		0.171	pCi/g	12/20/13 10:21	01/10/14 17:10	1
Americium 241	0.00379	U	0.0579	0.0579		0.0975	pCi/g	12/20/13 10:21	01/10/14 17:10	1
Protactinium 234m	0.594	U	2.46	2.46		4.40	pCi/g	12/20/13 10:21	01/10/14 17:10	1

Client Sample ID: L100603BES00

Date Collected: 11/26/13 10:45

Date Received: 11/27/13 15:00

Lab Sample ID: 160-4704-3

Matrix: Solid

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	1.04		0.211	0.236		0.145	pCi/g	12/20/13 10:21	01/10/14 17:13	1
Bismuth 212	1.42		0.554	0.573		0.536	pCi/g	12/20/13 10:21	01/10/14 17:13	1
Bismuth 214	1.22		0.138	0.187		0.0880	pCi/g	12/20/13 10:21	01/10/14 17:13	1
Lead 212	1.07		0.0838	0.162		0.0747	pCi/g	12/20/13 10:21	01/10/14 17:13	1

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Client Sample Results

Client: Westinghouse Electric Company LLC
Project/Site: RFP-CBA-022 (21 DAY TAT)

TestAmerica Job ID: 160-4704-2

Client Sample ID: L100603BES00

Lab Sample ID: 160-4704-3

Date Collected: 11/26/13 10:45

Matrix: Solid

Date Received: 11/27/13 15:00

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

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Lead 214	1.20		0.125	0.177		0.0931	pCi/g	12/20/13 10:21	01/10/14 17:13	1
Potassium 40	18.9		1.36	2.36		0.299	pCi/g	12/20/13 10:21	01/10/14 17:13	1
Protactinium 231	0.608	U	0.333	0.340		1.43	pCi/g	12/20/13 10:21	01/10/14 17:13	1
Radium 226	1.22		0.138	0.187	1.00	0.0880	pCi/g	12/20/13 10:21	01/10/14 17:13	1
Thorium 232	1.04		0.211	0.236		0.145	pCi/g	12/20/13 10:21	01/10/14 17:13	1
Thorium 234	1.58		0.399	0.432		1.01	pCi/g	12/20/13 10:21	01/10/14 17:13	1
Uranium 235	0.385		0.178	0.183		0.227	pCi/g	12/20/13 10:21	01/10/14 17:13	1
Americium 241	0.0137	U	0.0593	0.0593		0.0999	pCi/g	12/20/13 10:21	01/10/14 17:13	1
Protactinium 234m	0.000	U	1.24	1.24		5.68	pCi/g	12/20/13 10:21	01/10/14 17:13	1

Client Sample ID: L100604BES00

Lab Sample ID: 160-4704-4

Date Collected: 11/26/13 10:55

Matrix: Solid

Date Received: 11/27/13 15:00

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	1.09		0.136	0.176		0.134	pCi/g	12/20/13 10:21	01/10/14 17:46	1
Bismuth 212	1.25		0.484	0.501		0.461	pCi/g	12/20/13 10:21	01/10/14 17:46	1
Bismuth 214	1.17		0.130	0.178		0.0756	pCi/g	12/20/13 10:21	01/10/14 17:46	1
Lead 212	1.10		0.0841	0.165		0.0680	pCi/g	12/20/13 10:21	01/10/14 17:46	1
Lead 214	1.05		0.110	0.155		0.0795	pCi/g	12/20/13 10:21	01/10/14 17:46	1
Potassium 40	14.9		1.24	1.96		0.316	pCi/g	12/20/13 10:21	01/10/14 17:46	1
Protactinium 231	0.572	U	0.367	0.372		1.30	pCi/g	12/20/13 10:21	01/10/14 17:46	1
Radium 226	1.17		0.130	0.178	1.00	0.0756	pCi/g	12/20/13 10:21	01/10/14 17:46	1
Thorium 232	1.09		0.136	0.176		0.134	pCi/g	12/20/13 10:21	01/10/14 17:46	1
Thorium 234	1.48		0.724	0.740		0.936	pCi/g	12/20/13 10:21	01/10/14 17:46	1
Uranium 235	0.108	U	0.147	0.147		0.249	pCi/g	12/20/13 10:21	01/10/14 17:46	1
Americium 241	-0.00108	U	0.0690	0.0690		0.117	pCi/g	12/20/13 10:21	01/10/14 17:46	1
Protactinium 234m	1.51	U	3.76	3.76		6.50	pCi/g	12/20/13 10:21	01/10/14 17:46	1

Client Sample ID: L100605BRQ00

Lab Sample ID: 160-4704-5

Date Collected: 11/26/13 09:50

Matrix: Solid

Date Received: 11/27/13 15:00

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		0.150	0.190		0.135	pCi/g	12/20/13 10:21	01/10/14 17:51	1
Bismuth 212	1.12		0.445	0.460		0.450	pCi/g	12/20/13 10:21	01/10/14 17:51	1
Bismuth 214	1.15		0.112	0.164		0.0609	pCi/g	12/20/13 10:21	01/10/14 17:51	1
Lead 212	1.14		0.0805	0.168		0.0678	pCi/g	12/20/13 10:21	01/10/14 17:51	1
Lead 214	1.25		0.0977	0.162		0.0730	pCi/g	12/20/13 10:21	01/10/14 17:51	1
Potassium 40	18.2		1.25	2.24		0.352	pCi/g	12/20/13 10:21	01/10/14 17:51	1
Protactinium 231	0.552	U	0.284	0.290		1.14	pCi/g	12/20/13 10:21	01/10/14 17:51	1
Radium 226	1.15		0.112	0.164	1.00	0.0609	pCi/g	12/20/13 10:21	01/10/14 17:51	1

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Client Sample Results

Client: Westinghouse Electric Company LLC
Project/Site: RFP-CBA-022 (21 DAY TAT)

TestAmerica Job ID: 160-4704-2

Client Sample ID: L100605BRQ00

Lab Sample ID: 160-4704-5

Date Collected: 11/26/13 09:50

Matrix: Solid

Date Received: 11/27/13 15:00

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium 232	1.14		0.150	0.190		0.135	pCi/g	12/20/13 10:21	01/10/14 17:51	1
Thorium 234	0.960		0.312	0.328		0.807	pCi/g	12/20/13 10:21	01/10/14 17:51	1
Uranium 235	0.0297	U	0.150	0.150		0.254	pCi/g	12/20/13 10:21	01/10/14 17:51	1
Americium 241	-0.00586	U	0.769	0.769		0.114	pCi/g	12/20/13 10:21	01/10/14 17:51	1
Protactinium 234m	1.82	U	3.13	3.13		5.28	pCi/g	12/20/13 10:21	01/10/14 17:51	1

Client Sample ID: L100605BRS00

Lab Sample ID: 160-4704-6

Date Collected: 11/26/13 09:50

Matrix: Solid

Date Received: 11/27/13 15:00

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	1.07		0.150	0.186		0.187	pCi/g	12/20/13 10:21	01/10/14 17:52	1
Bismuth 212	1.72		0.640	0.664		0.523	pCi/g	12/20/13 10:21	01/10/14 17:52	1
Bismuth 214	1.07		0.119	0.162		0.0931	pCi/g	12/20/13 10:21	01/10/14 17:52	1
Lead 212	1.03		0.0836	0.158		0.0727	pCi/g	12/20/13 10:21	01/10/14 17:52	1
Lead 214	1.33		0.132	0.191		0.0919	pCi/g	12/20/13 10:21	01/10/14 17:52	1
Potassium 40	17.7		1.37	2.27		0.430	pCi/g	12/20/13 10:21	01/10/14 17:52	1
Protactinium 231	0.0103	U	4.44	4.44		0.984	pCi/g	12/20/13 10:21	01/10/14 17:52	1
Radium 226	1.07		0.119	0.162	1.00	0.0931	pCi/g	12/20/13 10:21	01/10/14 17:52	1
Thorium 232	1.07		0.150	0.186		0.187	pCi/g	12/20/13 10:21	01/10/14 17:52	1
Thorium 234	1.43		0.856	0.869		1.04	pCi/g	12/20/13 10:21	01/10/14 17:52	1
Uranium 235	0.152	U	0.149	0.150		0.196	pCi/g	12/20/13 10:21	01/10/14 17:52	1
Americium 241	0.0456	U	0.0730	0.0731		0.121	pCi/g	12/20/13 10:21	01/10/14 17:52	1
Protactinium 234m	2.89	U	3.84	3.85		6.36	pCi/g	12/20/13 10:21	01/10/14 17:52	1

Client Sample ID: L100606BES00

Lab Sample ID: 160-4704-7

Date Collected: 11/26/13 09:55

Matrix: Solid

Date Received: 11/27/13 15:00

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		0.106	0.154		0.0822	pCi/g	12/20/13 10:21	01/10/14 17:52	1
Bismuth 212	1.38		0.492	0.513		0.421	pCi/g	12/20/13 10:21	01/10/14 17:52	1
Bismuth 214	1.12		0.104	0.156		0.0652	pCi/g	12/20/13 10:21	01/10/14 17:52	1
Lead 212	1.10		0.0707	0.159		0.0569	pCi/g	12/20/13 10:21	01/10/14 17:52	1
Lead 214	1.24		0.0923	0.159		0.0593	pCi/g	12/20/13 10:21	01/10/14 17:52	1
Potassium 40	17.4		1.04	2.07		0.204	pCi/g	12/20/13 10:21	01/10/14 17:52	1
Protactinium 231	0.420	U	0.238	0.242		1.03	pCi/g	12/20/13 10:21	01/10/14 17:52	1
Radium 226	1.12		0.104	0.156	1.00	0.0652	pCi/g	12/20/13 10:21	01/10/14 17:52	1
Thorium 232	1.09		0.106	0.154		0.0822	pCi/g	12/20/13 10:21	01/10/14 17:52	1
Thorium 234	1.22		0.668	0.680		0.874	pCi/g	12/20/13 10:21	01/10/14 17:52	1
Uranium 235	0.0879	U	0.116	0.116		0.186	pCi/g	12/20/13 10:21	01/10/14 17:52	1
Americium 241	0.0116	U	0.0571	0.0571		0.0959	pCi/g	12/20/13 10:21	01/10/14 17:52	1

TestAmerica St. Louis

Client Sample Results

Client: Westinghouse Electric Company LLC
Project/Site: RFP-CBA-022 (21 DAY TAT)

TestAmerica Job ID: 160-4704-2

Client Sample ID: L100606BES00

Lab Sample ID: 160-4704-7

Date Collected: 11/26/13 09:55

Matrix: Solid

Date Received: 11/27/13 15:00

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Protactinium 234m	-0.504	U	63.4	63.4		5.01	pCi/g	12/20/13 10:21	01/10/14 17:52	1

Client Sample ID: L100607BES00

Lab Sample ID: 160-4704-8

Date Collected: 11/26/13 10:20

Matrix: Solid

Date Received: 11/27/13 15:00

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	1.20		0.150	0.193		0.137	pCi/g	12/20/13 10:21	01/10/14 18:20	1
Bismuth 212	2.06		0.719	0.750		0.586	pCi/g	12/20/13 10:21	01/10/14 18:20	1
Bismuth 214	1.17		0.138	0.184		0.0915	pCi/g	12/20/13 10:21	01/10/14 18:20	1
Lead 212	1.27		0.0944	0.189		0.0740	pCi/g	12/20/13 10:21	01/10/14 18:20	1
Lead 214	1.34		0.135	0.194		0.0918	pCi/g	12/20/13 10:21	01/10/14 18:20	1
Potassium 40	19.3		1.49	2.47		0.350	pCi/g	12/20/13 10:21	01/10/14 18:20	1
Protactinium 231	-0.627	U	0.893	0.896		1.48	pCi/g	12/20/13 10:21	01/10/14 18:20	1
Radium 226	1.17		0.138	0.184	1.00	0.0915	pCi/g	12/20/13 10:21	01/10/14 18:20	1
Thorium 232	1.20		0.150	0.193		0.137	pCi/g	12/20/13 10:21	01/10/14 18:20	1
Thorium 234	1.00	U	0.397	0.410		1.09	pCi/g	12/20/13 10:21	01/10/14 18:20	1
Uranium 235	0.118	U	0.190	0.191		0.301	pCi/g	12/20/13 10:21	01/10/14 18:20	1
Americium 241	0.0502	U	0.0751	0.0753		0.124	pCi/g	12/20/13 10:21	01/10/14 18:20	1
Protactinium 234m	1.05	U	3.73	3.73		7.29	pCi/g	12/20/13 10:21	01/10/14 18:20	1

Client Sample ID: L100608BES00

Lab Sample ID: 160-4704-9

Date Collected: 11/26/13 10:00

Matrix: Solid

Date Received: 11/27/13 15:00

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	1.11		0.148	0.187		0.113	pCi/g	12/20/13 10:21	01/10/14 18:23	1
Bismuth 212	1.07		0.362	0.379		0.354	pCi/g	12/20/13 10:21	01/10/14 18:23	1
Bismuth 214	1.08		0.101	0.151		0.0644	pCi/g	12/20/13 10:21	01/10/14 18:23	1
Lead 212	1.11		0.0715	0.161		0.0567	pCi/g	12/20/13 10:21	01/10/14 18:23	1
Lead 214	1.21		0.0962	0.159		0.0724	pCi/g	12/20/13 10:21	01/10/14 18:23	1
Potassium 40	19.0		1.11	2.24		0.316	pCi/g	12/20/13 10:21	01/10/14 18:23	1
Protactinium 231	0.494	U	0.282	0.287		1.15	pCi/g	12/20/13 10:21	01/10/14 18:23	1
Radium 226	1.08		0.101	0.151	1.00	0.0644	pCi/g	12/20/13 10:21	01/10/14 18:23	1
Thorium 232	1.11		0.148	0.187		0.113	pCi/g	12/20/13 10:21	01/10/14 18:23	1
Thorium 234	0.949		0.339	0.353		0.949	pCi/g	12/20/13 10:21	01/10/14 18:23	1
Uranium 235	0.121	U	0.154	0.154		0.240	pCi/g	12/20/13 10:21	01/10/14 18:23	1
Americium 241	-0.000466	U	0.0692	0.0692		0.116	pCi/g	12/20/13 10:21	01/10/14 18:23	1
Protactinium 234m	0.347	U	2.99	2.99		5.38	pCi/g	12/20/13 10:21	01/10/14 18:23	1

TestAmerica St. Louis

Client Sample Results

Client: Westinghouse Electric Company LLC
Project/Site: RFP-CBA-022 (21 DAY TAT)

TestAmerica Job ID: 160-4704-2

Client Sample ID: L100609BES00

Lab Sample ID: 160-4704-10

Date Collected: 11/26/13 10:15

Matrix: Solid

Date Received: 11/27/13 15:00

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	1.07		0.151	0.187		0.116	pCi/g	12/20/13 10:21	01/10/14 18:24	1
Bismuth 212	1.33		0.431	0.452		0.403	pCi/g	12/20/13 10:21	01/10/14 18:24	1
Bismuth 214	1.11		0.117	0.164		0.0851	pCi/g	12/20/13 10:21	01/10/14 18:24	1
Lead 212	1.05		0.0820	0.159		0.0866	pCi/g	12/20/13 10:21	01/10/14 18:24	1
Lead 214	1.23		0.107	0.166		0.0818	pCi/g	12/20/13 10:21	01/10/14 18:24	1
Potassium 40	20.0		1.20	2.37		0.366	pCi/g	12/20/13 10:21	01/10/14 18:24	1
Protactinium 231	0.476	U	0.255	0.260		1.24	pCi/g	12/20/13 10:21	01/10/14 18:24	1
Radium 226	1.11		0.117	0.164	1.00	0.0851	pCi/g	12/20/13 10:21	01/10/14 18:24	1
Thorium 232	1.07		0.151	0.187		0.116	pCi/g	12/20/13 10:21	01/10/14 18:24	1
Thorium 234	0.981	U	0.382	0.395		0.985	pCi/g	12/20/13 10:21	01/10/14 18:24	1
Uranium 235	0.139	U	0.156	0.157		0.257	pCi/g	12/20/13 10:21	01/10/14 18:24	1
Americium 241	-0.0232	U	0.0715	0.0716		0.119	pCi/g	12/20/13 10:21	01/10/14 18:24	1
Protactinium 234m	0.590	U	3.17	3.17		5.55	pCi/g	12/20/13 10:21	01/10/14 18:24	1

QC Sample Results

Client: Westinghouse Electric Company LLC
Project/Site: RFP-CBA-022 (21 DAY TAT)

TestAmerica Job ID: 160-4704-2

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

Lab Sample ID: MB 160-93557/1-A

Matrix: Solid

Analysis Batch: 97316

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 93557

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.0000	U	0.0222	0.0222		0.0537	pCi/g	12/20/13 10:21	01/10/14 17:04	1
Bismuth 212	0.02844	U	0.0829	0.0829		0.152	pCi/g	12/20/13 10:21	01/10/14 17:04	1
Bismuth 214	-0.002331	U	0.0208	0.0208		0.0360	pCi/g	12/20/13 10:21	01/10/14 17:04	1
Lead 212	-0.005957	U	0.0322	0.0322		0.0244	pCi/g	12/20/13 10:21	01/10/14 17:04	1
Lead 214	-0.01237	U	0.119	0.119		0.0323	pCi/g	12/20/13 10:21	01/10/14 17:04	1
Potassium 40	-0.07423	U	2.97	2.97		0.182	pCi/g	12/20/13 10:21	01/10/14 17:04	1
Protactinium 231	0.009655	U	0.0847	0.0847		0.300	pCi/g	12/20/13 10:21	01/10/14 17:04	1
Radium 226	-0.002331	U	0.0208	0.0208	1.00	0.0360	pCi/g	12/20/13 10:21	01/10/14 17:04	1
Thorium 232	0.0000	U	0.0222	0.0222		0.0537	pCi/g	12/20/13 10:21	01/10/14 17:04	1
Thorium 234	-0.01643	U	0.175	0.175		0.273	pCi/g	12/20/13 10:21	01/10/14 17:04	1
Uranium 235	0.02249	U	0.0371	0.0372		0.0579	pCi/g	12/20/13 10:21	01/10/14 17:04	1
Americium 241	0.0000	U	0.0126	0.0126		0.0291	pCi/g	12/20/13 10:21	01/10/14 17:04	1
Protactinium 234m	0.0000	U	0.241	0.241		2.86	pCi/g	12/20/13 10:21	01/10/14 17:04	1

Lab Sample ID: LCS 160-93557/2-A

Matrix: Solid

Analysis Batch: 97309

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 93557

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Americium 241	101	99.73		10.4		0.492	pCi/g	99	87 - 116
Cesium 137	35.9	35.17		3.69		0.202	pCi/g	98	87 - 120
Cobalt 60	42.5	41.32		4.17		0.117	pCi/g	97	87 - 115

Lab Sample ID: 160-4704-1 DU

Matrix: Solid

Analysis Batch: 97314

Client Sample ID: L100601BES00

Prep Type: Total/NA

Prep Batch: 93557

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	Limit
Actinium 228	1.04		1.033		0.167		0.0602	pCi/g	0.01	1
Bismuth 212	0.819		1.068		0.381		0.361	pCi/g	0.34	1
Bismuth 214	1.26		1.402		0.182		0.0605	pCi/g	0.37	1
Lead 212	1.00		1.028		0.149		0.0509	pCi/g	0.09	1
Lead 214	1.44		1.485		0.187		0.0806	pCi/g	0.13	1
Potassium 40	16.6		17.24		2.05		0.312	pCi/g	0.16	1
Protactinium 231	-0.591	U	-0.6256	U	0.716		1.17	pCi/g	0.02	1
Radium 226	1.26		1.402		0.182	1.00	0.0605	pCi/g	0.37	1
Thorium 232	1.04		1.033		0.167		0.0602	pCi/g	0.01	1
Thorium 234	1.84		1.457		0.707		0.871	pCi/g	0.24	1
Uranium 235	0.142	U	0.09667	U	0.141		0.242	pCi/g	0.15	1
Americium 241	0.000206	U	-0.01055	U	0.0639		0.107	pCi/g	0.08	1
Protactinium 234m	0.0192	U	0.7795	U	2.86		5.05	pCi/g	0.12	1

TestAmerica St. Louis

QC Association Summary

Client: Westinghouse Electric Company LLC
Project/Site: RFP-CBA-022 (21 DAY TAT)

TestAmerica Job ID: 160-4704-2

Rad

Leach Batch: 92866

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-4704-1	L100601BES00	Total/NA	Solid	Dry and Grind	
160-4704-1 DU	L100601BES00	Total/NA	Solid	Dry and Grind	
160-4704-2	L100602BES00	Total/NA	Solid	Dry and Grind	
160-4704-3	L100603BES00	Total/NA	Solid	Dry and Grind	
160-4704-4	L100604BES00	Total/NA	Solid	Dry and Grind	
160-4704-5	L100605BRQ00	Total/NA	Solid	Dry and Grind	
160-4704-6	L100605BRS00	Total/NA	Solid	Dry and Grind	
160-4704-7	L100606BES00	Total/NA	Solid	Dry and Grind	
160-4704-8	L100607BES00	Total/NA	Solid	Dry and Grind	
160-4704-9	L100608BES00	Total/NA	Solid	Dry and Grind	
160-4704-10	L100609BES00	Total/NA	Solid	Dry and Grind	

Prep Batch: 93557

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-4704-1	L100601BES00	Total/NA	Solid	Fill_Geo-21	92866
160-4704-1 DU	L100601BES00	Total/NA	Solid	Fill_Geo-21	92866
160-4704-2	L100602BES00	Total/NA	Solid	Fill_Geo-21	92866
160-4704-3	L100603BES00	Total/NA	Solid	Fill_Geo-21	92866
160-4704-4	L100604BES00	Total/NA	Solid	Fill_Geo-21	92866
160-4704-5	L100605BRQ00	Total/NA	Solid	Fill_Geo-21	92866
160-4704-6	L100605BRS00	Total/NA	Solid	Fill_Geo-21	92866
160-4704-7	L100606BES00	Total/NA	Solid	Fill_Geo-21	92866
160-4704-8	L100607BES00	Total/NA	Solid	Fill_Geo-21	92866
160-4704-9	L100608BES00	Total/NA	Solid	Fill_Geo-21	92866
160-4704-10	L100609BES00	Total/NA	Solid	Fill_Geo-21	92866
LCS 160-93557/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
MB 160-93557/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	