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Data Validation Report
Tennessee Valley Authority
Johnsonville Fossil Plant
Environmental Investigation Plan
Sediment Samples

The report was revised to update the identification (ID) for laboratory sample ID 180-86185-20 from JOF-SED-IC02-CORRB-0.0/0.**5**-20190122 to JOF-SED-IC02-CORRB-0.0/0.**7**-20190122.

This quality assurance (QA) review is based upon an examination of the data generated from the analyses of the 30 sediment samples and six aqueous blanks collected on January 22, 23, and 24, 2019, at the Tennessee Valley Authority (TVA) Johnsonville Fossil Plant facility. These samples were collectively analyzed by Eurofins TestAmerica, of St. Louis, Missouri, for radium-226 and for radium-228 by US EPA Method 901.1.

This review was performed in accordance with the Environmental Investigation Plan for the Tennessee Valley Authority Johnsonville Fossil Plant Environmental Investigation (JOF EIP, Revision 4, December 2018). This review was performed with guidance from the National Functional Guidelines for Inorganic Data Review (US EPA, October 2004); the US EPA Region IV Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (November 2001); and the US EPA Region IV Data Validation Standard Operating Procedures. These validation guidance documents specifically address analyses performed in accordance with the Contract Laboratory Program (CLP) analytical methods and are not completely applicable to the type of analyses and analytical protocols performed for the US EPA Methods utilized by the laboratory for these samples. Environmental Standards, Inc. (Environmental Standards) used professional judgment to determine the usability of the analytical results and compliance relative to the US EPA Methods utilized by the laboratory.

Summary

The analytical results and associated laboratory quality control (QC) samples were reviewed to determine the integrity of the reported analytical results and to ensure that the data met the established data quality objectives. This QA review includes all samples in Eurofins TestAmerica Job Number 180-86185-2.

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The samples that have undergone Stage 4 data validation are listed below:

Sample Identification	Laboratory Sample Identification	Job Number	Matrix	Date Sample Collected	Parameters Examined
JOF-SED-CV01-EB01-20190122 (Equipment Blank)	180-86185-1	180-86185-2	Aq	1/22/19	Ra-226, Ra-228, Ra-226/228
JOF-SED-CV01-FB01-20190122 (Field Blank)	180-86185-2	180-86185-2	Aq	1/22/19	Ra-226, Ra-228, Ra-226/228
JOF-SED-CV01-CORRB-0.0/0.5-20190122	180-86185-3	180-86185-2	Sed	1/22/19	Ra-226, Ra-228, Ra-226/228
JOF-SED-CV01-CORCC-0.0/0.5-20190122	180-86185-4	180-86185-2	Sed	1/22/19	Ra-226, Ra-228, Ra-226/228
JOF-SED-CV01-CORLB-0.0/0.5-20190122	180-86185-5	180-86185-2	Sed	1/22/19	Ra-226, Ra-228, Ra-226/228
JOF-SED-IC01-CORRB-0.0/0.5-20190122	180-86185-8	180-86185-2	Sed	1/22/19	Ra-226, Ra-228, Ra-226/228
JOF-SED-IC01-CORCC-0.0/0.5-20190122	180-86185-10	180-86185-2	Sed	1/22/19	Ra-226, Ra-228, Ra-226/228
JOF-SED-IC01-CORLB-0.0/0.5-20190122	180-86185-12	180-86185-2	Sed	1/22/19	Ra-226, Ra-228, Ra-226/228
JOF-SED-IC02-CORLB-0.0/0.5-20190122	180-86185-13	180-86185-2	Sed	1/22/19	Ra-226, Ra-228, Ra-226/228
JOF-SED-IC02-CORCC-0.0/0.5-20190122	180-86185-17	180-86185-2	Sed	1/22/19	Ra-226, Ra-228, Ra-226/228
JOF-SED-IC02-CORRB-0.0/0.7-20190122	180-86185-20	180-86185-2	Sed	1/22/19	Ra-226, Ra-228, Ra-226/228
JOF-SED-BH01-CORLB-0.0/0.5-20190122	180-86185-21	180-86185-2	Sed	1/22/19	Ra-226, Ra-228, Ra-226/228
JOF-SED-BH01-CORCC-0.0/0.5-20190122	180-86185-23	180-86185-2	Sed	1/22/19	Ra-226, Ra-228, Ra-226/228
JOF-SED-BH01-CORRB-0.0/0.5-20190122	180-86185-25	180-86185-2	Sed	1/22/19	Ra-226, Ra-228, Ra-226/228
JOF-SED-BH03-CORRB-0.0/0.5-20190122	180-86185-26	180-86185-2	Sed	1/22/19	Ra-226, Ra-228, Ra-226/228
JOF-SED-BH03-CORCC-0.0/0.5-20190122	180-86185-29	180-86185-2	Sed	1/22/19	Ra-226, Ra-228, Ra-226/228
JOF-SED-BH03-CORLB-0.0/0.5-20190122	180-86185-31	180-86185-2	Sed	1/22/19	Ra-226, Ra-228, Ra-226/228
JOF-SED-IC01-DUP01-20190122 (Field Duplicate of JOF-SED-IC01-CORLB-0.0/0.5-20190122)	180-86185-34	180-86185-2	Sed	1/22/19	Ra-226, Ra-228, Ra-226/228
JOF-SED-CV03-EB01-20190123 (Equipment Blank)	180-86185-35	180-86185-2	Aq	1/23/19	Ra-226, Ra-228, Ra-226/228
JOF-SED-CV03-FB01-20190123 (Field Blank)	180-86185-36	180-86185-2	Aq	1/23/19	Ra-226, Ra-228, Ra-226/228

Sample Identification	Laboratory Sample Identification	Job Number	Matrix	Date Sample Collected	Parameters Examined
JOF-SED-CV03-CORLB-0.0/0.5-20190123	180-86185-37	180-86185-2	Sed	1/23/19	Ra-226, Ra-228, Ra-226/228
JOF-SED-CV03-CORCC-0.0/0.5-20190123	180-86185-40	180-86185-2	Sed	1/23/19	Ra-226, Ra-228, Ra-226/228
JOF-SED-CV03-CORRB-0.0/0.5-20190123	180-86185-41	180-86185-2	Sed	1/23/19	Ra-226, Ra-228, Ra-226/228
JOF-SED-CV02-CORLB-0.0/0.5-20190123	180-86185-44	180-86185-2	Sed	1/23/19	Ra-226, Ra-228, Ra-226/228
JOF-SED-CV02-CORCC-0.0/0.5-20190123	180-86185-46	180-86185-2	Sed	1/23/19	Ra-226, Ra-228, Ra-226/228
JOF-SED-CV02-CORRB-0.0/0.5-20190123	180-86185-48	180-86185-2	Sed	1/23/19	Ra-226, Ra-228, Ra-226/228
JOF-SED-CV02-DUP01-20190123 (Field Duplicate of JOF-SED-CV02-CORRB-0.0/0.5-20190123)	180-86185-49	180-86185-2	Sed	1/23/19	Ra-226, Ra-228, Ra-226/228
JOF-SED-BH02-FB01-20190124 (Field Blank)	180-86185-50	180-86185-2	Aq	1/24/19	Ra-226, Ra-228, Ra-226/228
JOF-SED-BH02-CORLB-0.0/0.5-20190124	180-86185-51	180-86185-2	Sed	1/24/19	Ra-226, Ra-228, Ra-226/228
JOF-SED-BH02-EB01-20190124 (Equipment Blank)	180-86185-55	180-86185-2	Aq	1/24/19	Ra-226, Ra-228, Ra-226/228
JOF-SED-BH02-CORCC-0.0/0.5-20190124	180-86185-56	180-86185-2	Sed	1/24/19	Ra-226, Ra-228, Ra-226/228
JOF-SED-BH02-CORRB-0.0/0.5-20190124	180-86185-60	180-86185-2	Sed	1/24/19	Ra-226, Ra-228, Ra-226/228
JOF-SED-IC01-CORRB-0.0/0.5-20190124	180-86185-61	180-86185-2	Sed	1/24/19	Ra-226, Ra-228, Ra-226/228
JOF-SED-IC01-CORCC-0.0/0.5-20190124	180-86185-62	180-86185-2	Sed	1/24/19	Ra-226, Ra-228, Ra-226/228
JOF-SED-IC01-CORLB-0.0/0.5-20190124	180-86185-63	180-86185-2	Sed	1/24/19	Ra-226, Ra-228, Ra-226/228
JOF-SED-BH02-DUP01-20190124 (Field Duplicate of JOF-SED-BH02-CORRB-0.0/0.5-20190124)	180-86185-64	180-86185-2	Sed	1/24/19	Ra-226, Ra-228, Ra-226/228

Parameters Examined

Ra-226 - Radium-226 by US EPA Method 901.1.
Ra-228 - Radium-228 by US EPA Method 901.1.
Ra-226/228 - Radium-226/228 Calculation by US EPA Method 901.1.
Aq - Aqueous.

Items Reviewed	
Holding Times	Calibrations
Sample Preservation	Blank Results
Chain-of-Custody (COC) Records and Case Narratives	Sample Preparation
Laboratory Control Sample (LCS) Results	Laboratory and Field Duplicate Results
Chemical Yield	Quantitation of Positive Results

Comments and Exceptions

- During a data inquiry associated with a TVA sediment SDG, it was discovered that soil and sediment radium samples were prepared and analyzed on a wet-weight basis. Per the associated QAPP, all radium soil and sediment data must be reported on a dry-weight basis. After several discussions, a decision was made that all radium analyses for soil and sediment samples must be performed using dried, ground material moving forward. In addition, TestAmerica was requested to re-analyze and re-report radium results for all sediment samples using dried and ground material (see Project Correspondence [Section 5]).

- During data review associated with a TVA SDG, it was discovered that the combined radium-226+228 uncertainty for samples was not calculated correctly when either the individual radium-226 or radium-228 activity results were negative. In these instances, the uncertainty for the analyte with the negative activity was set to zero when the combined radium-226+228 uncertainty was calculated. Environmental Standards provided TestAmerica a spreadsheet with all impacted samples, and the corresponding corrected uncertainty. The corrected uncertainty values were validated by TestAmerica and a spreadsheet of validated corrected radium-226+228 uncertainty values was provided by Environmental Standards. The spreadsheet provided to Environmental Standards was used to update all impacted uncertainties in the database. Additionally, TestAmerica has confirmed they corrected the calculation for all future TVA SDGs (see Section 5).

- Radium-226+228 was reported as the summation of the calculated activities for radium-226 and radium-228. The reported results for radium-226+228 for the samples included in this report may have been adjusted and/or qualified in accordance with the TVA reporting protocols and assigned an “S” reason code.

Qualifier Summary

Analyte(s)	Job Number	Sample(s)	Validation Qualifier(s)	Reason(s) for Qualification
Ra-226/Ra-228 and Ra-226	180-86185-2	JOF-SED-CV03-CORLB-0.0/0.5-20190123, JOF-SED-CV03-CORCC-0.0/0.5-20190123, JOF-SED-CV03-CORRB-0.0/0.5-20190123, JOF-SED-CV02-CORLB-0.0/0.5-20190123, JOF-SED-CV02-CORCC-0.0/0.5-20190123, JOF-SED-BH02-CORLB-0.0/0.5-20190124, JOF-SED-BH02-CORCC-0.0/0.5-20190124, JOF-SED-BH02-CORRB-0.0/0.5-20190124, JOF-SED-IC01-CORRB-0.0/0.5-20190124, and JOF-SED-BH02-DUP01-20190124	J	ZZ
Ra-226/Ra-228 and Ra-228	180-86185-2	JOF-SED-CV02-CORLB-0.0/0.5-20190123, JOF-SED-CV02-CORCC-0.0/0.5-20190123, JOF-SED-CV02-CORRB-0.0/0.5-20190123, JOF-SED-CV02-DUP01-20190123, JOF-SED-BH02-CORLB-0.0/0.5-20190124, JOF-SED-BH02-CORCC-0.0/0.5-20190124, JOF-SED-BH02-CORRB-0.0/0.5-20190124, JOF-SED-IC01-CORRB-0.0/0.5-20190124, JOF-SED-IC01-CORCC-0.0/0.5-20190124, JOF-SED-IC01-CORLB-0.0/0.5-20190124, and JOF-SED-BH02-DUP01-20190124	J	LD

- Any radium-226+228 result reported from the summation of one isotope activity less than the MDA (non-negative value) and one isotope activity greater than the MDA should be considered estimated and have been flagged “J” on the data tables.

Review performed by: Danielle Coles, Quality Assurance Chemist
Review reviewed by: Amanda J. Cover, Senior Quality Assurance Chemist
Review approved by: Andrew L. Piasecki, Senior Quality Assurance Chemist
Review approved by: Rock J. Vitale, CEAC, Technical Director of Chemistry/Principal
Date review completed: 4/22/21

SECTION 2

ANALYTICAL RESULTS

INORGANIC DATA QUALIFIERS

U* This result should be considered “not-detected” because it was detected in a rinsate blank or laboratory blank at a similar level.

UR Unreliable reporting limit; analyte may or may not be present in sample.

R Unreliable positive result; analyte may or may not be present in sample.

J Quantitation is approximate due to limitations identified during data validation.

UJ This analyte was not detected, but the reporting limit may or may not be higher due to a bias identified during data validation.

REASON CODES AND EXPLANATIONS

Reason Code	Explanation
BE	Equipment blank contamination. The result should be considered “not-detected.”
BF	Field blank contamination. The result should be considered “not-detected.”
BL	Laboratory blank contamination. The result should be considered “not-detected.”
BN	Negative laboratory blank contamination.
C	Initial and/or Continuing Calibration issue, indeterminate bias.
C+	Initial and/or Continuing Calibration issue. The result may be biased high.
C-	Initial and/or Continuing Calibration issue. The result may be biased low.
FD	Field duplicate imprecision.
FG	Total versus Dissolved Imprecision.
H	Holding time exceeded.
I	Internal standard recovery outside of acceptance limits.
L	LCS and LCSD recoveries outside of acceptance limits, indeterminate bias.
L+	LCS and/or LCSD recoveries outside of acceptance limits. The result may be biased high.
L-	LCS and/or LCSD recoveries outside of acceptance limits. The result may be biased low.
LD	Laboratory duplicate imprecision.
LP	LCS/LCSD imprecision.
M	MS and MSD recoveries outside of acceptance limits, indeterminate bias.
M+	MS and/or MSD recoveries outside of acceptance limits. The result may be biased high.
M-	MS and/or MSD recoveries outside of acceptance limits. The result may be biased low.
MP	MS/MSD imprecision.
P	Post-digestion spike recoveries outside of acceptance limits, indeterminate bias.
P+	Post-digestion spike recovery outside of acceptance limits. The result may be biased high.
P-	Post-digestion spike recovery outside of acceptance limits. The result may be biased low.
Q	Chemical Preservation issue.
R	RL standards outside of acceptance limits, indeterminate bias.
R+	RL standard(s) outside of acceptance limits. The result may be biased high.
R-	RL standard(s) outside of acceptance limits. The result may be biased low.
RL	Reported result between the MDL and the QL.
S	Radium-226+228 flagged due to reporting protocol for combine results.
T	Temperature preservation issue.
SD	Serial Dilution imprecision.
X	Percent solids < 50%.
Y+	Chemical Yield outside of acceptance limits. The result may be biased high.
Y-	Chemical yield outside of acceptance limits. The result may be biased low.
Z	ICP or ICP/MS Interference.
ZZ	Other.

TVA CCR Program
Facility: Johnsonville Fossil Plant
SDG: 180861852

Lab Sample ID	180-86185-1
Sys Sample Code	JOF-SED-CV01-EB01-20190122
Sample Name	JOF-SED-CV01-EB01-20190122
Sample Date	1/22/2019 7:00:00 AM
Location	SED-CV01
Sample Type	EB
Matrix	SED
Parent Sample	

Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Uncertainty	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
EPA 901.1	Radium 226 + radium 228	RA226/228	T	PCI/L	11.5	U	S	25.2				N	Yes	1	NA
	Radium 228	15262-20-1	T	PCI/L	11.5	U		14.5	20.3	20.3	50.0	N	Yes	1	NA
	Radium-226	13982-63-3	T	PCI/L	-13.2	U		20.6	35.2	35.2	50.0	N	Yes	1	NA

TVA CCR Program
Facility: Johnsonville Fossil Plant
SDG: 180861852

Lab Sample ID	180-86185-10
Sys Sample Code	JOF-SED-IC01-CORCC-0.0/0.5-20190122
Sample Name	JOF-SED-IC01-CORCC-0.0/0.5-20190122
Sample Date	1/22/2019 10:35:00 AM
Location	SED-IC01-CC
Sample Type	N
Matrix	SED
Parent Sample	

Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Uncertainty	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
EPA 901.1	Radium 226 + radium 228	RA226/228	T	PCI/G	2.96			0.521				Y	Yes	1	NA
	Radium 228	15262-20-1	T	PCI/G	1.56			0.409	0.169	0.169	1.00	Y	Yes	1	NA
	Radium-226	13982-63-3	T	PCI/G	1.40			0.323	0.224	0.224	1.00	Y	Yes	1	NA

TVA CCR Program
Facility: Johnsonville Fossil Plant
SDG: 180861852

Lab Sample ID	180-86185-12
Sys Sample Code	JOF-SED-IC01-CORLB-0.0/0.5-20190122
Sample Name	JOF-SED-IC01-CORLB-0.0/0.5-20190122
Sample Date	1/22/2019 11:00:00 AM
Location	SED-IC01-LB
Sample Type	N
Matrix	SED
Parent Sample	

Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Uncertainty	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
EPA 901.1	Radium 226 + radium 228	RA226/228	T	PCI/G	2.79			0.477				Y	Yes	1	NA
	Radium 228	15262-20-1	T	PCI/G	1.32			0.367	0.482	0.482	1.00	Y	Yes	1	NA
	Radium-226	13982-63-3	T	PCI/G	1.47			0.305	0.178	0.178	1.00	Y	Yes	1	NA

TVA CCR Program
Facility: Johnsonville Fossil Plant
SDG: 180861852

Lab Sample ID	180-86185-13
Sys Sample Code	JOF-SED-IC02-CORLB-0.0/0.5-20190122
Sample Name	JOF-SED-IC02-CORLB-0.0/0.5-20190122
Sample Date	1/22/2019 11:40:00 AM
Location	SED-IC02-LB
Sample Type	N
Matrix	SED
Parent Sample	

Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Uncertainty	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
EPA 901.1	Radium 226 + radium 228	RA226/228	T	PCI/G	2.21			0.437				Y	Yes	1	NA
	Radium 228	15262-20-1	T	PCI/G	1.10			0.318	0.273	0.273	1.00	Y	Yes	1	NA
	Radium-226	13982-63-3	T	PCI/G	1.11			0.300	0.251	0.251	1.00	Y	Yes	1	NA

TVA CCR Program
Facility: Johnsonville Fossil Plant
SDG: 180861852

Lab Sample ID	180-86185-17
Sys Sample Code	JOF-SED-IC02-CORCC-0.0/0.5-20190122
Sample Name	JOF-SED-IC02-CORCC-0.0/0.5-20190122
Sample Date	1/22/2019 12:20:00 PM
Location	SED-IC02-CC
Sample Type	N
Matrix	SED
Parent Sample	

Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Uncertainty	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
EPA 901.1	Radium 226 + radium 228	RA226/228	T	PCI/G	3.31			0.548				Y	Yes	1	NA
	Radium 228	15262-20-1	T	PCI/G	2.03			0.446	0.239	0.239	1.00	Y	Yes	1	NA
	Radium-226	13982-63-3	T	PCI/G	1.28			0.319	0.297	0.297	1.00	Y	Yes	1	NA

TVA CCR Program
Facility: Johnsonville Fossil Plant
SDG: 180861852

Lab Sample ID	180-86185-2
Sys Sample Code	JOF-SED-CV01-FB01-20190122
Sample Name	JOF-SED-CV01-FB01-20190122
Sample Date	1/22/2019 7:10:00 AM
Location	SED-CV01
Sample Type	FB
Matrix	SED
Parent Sample	

Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Uncertainty	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
EPA 901.1	Radium 226 + radium 228	RA226/228	T	PCI/L	8.11	U	S	32.5				N	Yes	1	NA
	Radium 228	15262-20-1	T	PCI/L	8.11	U		27.1	36.6	36.6	50.0	N	Yes	1	NA
	Radium-226	13982-63-3	T	PCI/L	-8.72	U		17.9	45.2	45.2	50.0	N	Yes	1	NA

TVA CCR Program
Facility: Johnsonville Fossil Plant
SDG: 180861852

Lab Sample ID	180-86185-20
Sys Sample Code	JOF-SED-IC02-CORRB-0.0/0.7-20190122
Sample Name	JOF-SED-IC02-CORRB-0.0/0.7-20190122
Sample Date	1/22/2019 12:50:00 PM
Location	SED-IC02-RB
Sample Type	N
Matrix	SED
Parent Sample	

Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Uncertainty	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
EPA 901.1	Radium 226 + radium 228	RA226/228	T	PCI/G	3.20			0.588				Y	Yes	1	NA
	Radium 228	15262-20-1	T	PCI/G	1.74			0.495	0.305	0.305	1.00	Y	Yes	1	NA
	Radium-226	13982-63-3	T	PCI/G	1.46			0.318	0.199	0.199	1.00	Y	Yes	1	NA

Lab Sample ID	180-86185-21
Sys Sample Code	JOF-SED-BH01-CORLB-0.0/0.5-20190122
Sample Name	JOF-SED-BH01-CORLB-0.0/0.5-20190122
Sample Date	1/22/2019 1:35:00 PM
Location	SED-BH01-LB
Sample Type	N
Matrix	SED
Parent Sample	

Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Uncertainty	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
EPA 901.1	Radium 226 + radium 228	RA226/228	T	PCI/G	1.78	J	S	0.391				Y	Yes	1	NA
	Radium 228	15262-20-1	T	PCI/G	0.391	U		0.208	0.679	0.679	1.00	N	Yes	1	NA
	Radium-226	13982-63-3	T	PCI/G	1.39			0.331	0.201	0.201	1.00	Y	Yes	1	NA

Lab Sample ID	180-86185-23
Sys Sample Code	JOF-SED-BH01-CORCC-0.0/0.5-20190122
Sample Name	JOF-SED-BH01-CORCC-0.0/0.5-20190122
Sample Date	1/22/2019 2:00:00 PM
Location	SED-BH01-CC
Sample Type	N
Matrix	SED
Parent Sample	

Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Uncertainty	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
EPA 901.1	Radium 226 + radium 228	RA226/228	T	PCI/G	2.40			0.627				Y	Yes	1	NA
	Radium 228	15262-20-1	T	PCI/G	0.765			0.516	0.630	0.630	1.00	Y	Yes	1	NA
	Radium-226	13982-63-3	T	PCI/G	1.63			0.356	0.195	0.195	1.00	Y	Yes	1	NA

Lab Sample ID	180-86185-25
Sys Sample Code	JOF-SED-BH01-CORRB-0.0/0.5-20190122
Sample Name	JOF-SED-BH01-CORRB-0.0/0.5-20190122
Sample Date	1/22/2019 2:25:00 PM
Location	SED-BH01-RB
Sample Type	N
Matrix	SED
Parent Sample	

Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Uncertainty	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
EPA 901.1	Radium 226 + radium 228	RA226/228	T	PCI/G	3.45			0.604				Y	Yes	1	NA
	Radium 228	15262-20-1	T	PCI/G	1.75			0.450	0.184	0.184	1.00	Y	Yes	1	NA
	Radium-226	13982-63-3	T	PCI/G	1.70			0.403	0.293	0.293	1.00	Y	Yes	1	NA

Lab Sample ID	180-86185-26
Sys Sample Code	JOF-SED-BH03-CORRB-0.0/0.5-20190122
Sample Name	JOF-SED-BH03-CORRB-0.0/0.5-20190122
Sample Date	1/22/2019 2:45:00 PM
Location	SED-BH03-RB
Sample Type	N
Matrix	SED
Parent Sample	

Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Uncertainty	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
EPA 901.1	Radium 226 + radium 228	RA226/228	T	PCI/G	2.65			0.487				Y	Yes	1	NA
	Radium 228	15262-20-1	T	PCI/G	1.37			0.345	0.214	0.214	1.00	Y	Yes	1	NA
	Radium-226	13982-63-3	T	PCI/G	1.28			0.344	0.232	0.232	1.00	Y	Yes	1	NA

Lab Sample ID	180-86185-29
Sys Sample Code	JOF-SED-BH03-CORCC-0.0/0.5-20190122
Sample Name	JOF-SED-BH03-CORCC-0.0/0.5-20190122
Sample Date	1/22/2019 3:20:00 PM
Location	SED-BH03-CC
Sample Type	N
Matrix	SED
Parent Sample	

Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Uncertainty	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
EPA 901.1	Radium 226 + radium 228	RA226/228	T	PCI/G	3.03			0.464				Y	Yes	1	NA
	Radium 228	15262-20-1	T	PCI/G	1.54			0.326	0.143	0.143	1.00	Y	Yes	1	NA
	Radium-226	13982-63-3	T	PCI/G	1.49			0.330	0.209	0.209	1.00	Y	Yes	1	NA

Lab Sample ID	180-86185-3
Sys Sample Code	JOF-SED-CV01-CORRB-0.0/0.5-20190122
Sample Name	JOF-SED-CV01-CORRB-0.0/0.5-20190122
Sample Date	1/22/2019 8:30:00 AM
Location	SED-CV01-RB
Sample Type	N
Matrix	SED
Parent Sample	

Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Uncertainty	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
EPA 901.1	Radium 226 + radium 228	RA226/228	T	PCI/G	2.62			0.403				Y	Yes	1	NA
	Radium 228	15262-20-1	T	PCI/G	1.45			0.321	0.109	0.109	1.00	Y	Yes	1	NA
	Radium-226	13982-63-3	T	PCI/G	1.17			0.243	0.160	0.160	1.00	Y	Yes	1	NA

Lab Sample ID	180-86185-31
Sys Sample Code	JOF-SED-BH03-CORLB-0.0/0.5-20190122
Sample Name	JOF-SED-BH03-CORLB-0.0/0.5-20190122
Sample Date	1/22/2019 3:45:00 PM
Location	SED-BH03-LB
Sample Type	N
Matrix	SED
Parent Sample	

Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Uncertainty	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
EPA 901.1	Radium 226 + radium 228	RA226/228	T	PCI/G	3.23			0.569				Y	Yes	1	NA
	Radium 228	15262-20-1	T	PCI/G	1.66			0.448	0.230	0.230	1.00	Y	Yes	1	NA
	Radium-226	13982-63-3	T	PCI/G	1.57			0.351	0.184	0.184	1.00	Y	Yes	1	NA

Lab Sample ID	180-86185-34
Sys Sample Code	JOF-SED-IC01-DUP01-20190122
Sample Name	JOF-SED-IC01-DUP01-20190122
Sample Date	1/22/2019 12:00:00 AM
Location	SED-IC01-LB
Sample Type	FD
Matrix	SED
Parent Sample	JOF-SED-IC01-CORLB-0.0/0.5-20190122

Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Uncertainty	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
EPA 901.1	Radium 226 + radium 228	RA226/228	T	PCI/G	2.97			0.589				Y	Yes	1	NA
	Radium 228	15262-20-1	T	PCI/G	1.56			0.391	0.195	0.195	1.00	Y	Yes	1	NA
	Radium-226	13982-63-3	T	PCI/G	1.41			0.440	0.376	0.376	1.00	Y	Yes	1	NA

Lab Sample ID	180-86185-35
Sys Sample Code	JOF-SED-CV03-EB01-20190123
Sample Name	JOF-SED-CV03-EB01-20190123
Sample Date	1/23/2019 9:45:00 AM
Location	CV03
Sample Type	EB
Matrix	WQ
Parent Sample	

Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Uncertainty	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
EPA 901.1	Radium 226 + radium 228	RA226/228	T	PCI/L	41.1	J	S	23.4				Y	Yes	1	NA
	Radium 228	15262-20-1	T	PCI/L	11.9	U		19.1	28.7	28.7	50.0	N	Yes	1	NA
	Radium-226	13982-63-3	T	PCI/L	29.2			13.6	15.3	15.3	50.0	Y	Yes	1	NA

Lab Sample ID	180-86185-36
Sys Sample Code	JOF-SED-CV03-FB01-20190123
Sample Name	JOF-SED-CV03-FB01-20190123
Sample Date	1/23/2019 9:55:00 AM
Location	CV03
Sample Type	FB
Matrix	WQ
Parent Sample	

Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Uncertainty	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
EPA 901.1	Radium 226 + radium 228	RA226/228	T	PCI/L	20.6	J	S	19.9				Y	Yes	1	NA
	Radium 228	15262-20-1	T	PCI/L	1.55	U		16.3	26.0	26.0	50.0	N	Yes	1	NA
	Radium-226	13982-63-3	T	PCI/L	19.0			11.5	16.2	16.2	50.0	Y	Yes	1	NA

Lab Sample ID	180-86185-37
Sys Sample Code	JOF-SED-CV03-CORLB-0.0/0.5-20190123
Sample Name	JOF-SED-CV03-CORLB-0.0/0.5-20190123
Sample Date	1/23/2019 10:00:00 AM
Location	SED-CV03-LB
Sample Type	N
Matrix	SED
Parent Sample	

Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Uncertainty	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
EPA 901.1	Radium 226 + radium 228	RA226/228	T	PCI/G	3.12	J	ZZ	0.424				Y	Yes	1	NA
	Radium 228	15262-20-1	T	PCI/G	1.48			0.293	0.203	0.203	1.00	Y	Yes	1	NA
	Radium-226	13982-63-3	T	PCI/G	1.64	J	ZZ	0.307	0.187	0.187	1.00	Y	Yes	1	NA

Lab Sample ID	180-86185-4
Sys Sample Code	JOF-SED-CV01-CORCC-0.0/0.5-20190122
Sample Name	JOF-SED-CV01-CORCC-0.0/0.5-20190122
Sample Date	1/22/2019 9:00:00 AM
Location	SED-CV01-CC
Sample Type	N
Matrix	SED
Parent Sample	

Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Uncertainty	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
EPA 901.1	Radium 226 + radium 228	RA226/228	T	PCI/G	5.81			0.784				Y	Yes	1	NA
	Radium 228	15262-20-1	T	PCI/G	1.90			0.474	0.182	0.182	1.00	Y	Yes	1	NA
	Radium-226	13982-63-3	T	PCI/G	3.91			0.624	0.277	0.277	1.00	Y	Yes	1	NA

Lab Sample ID	180-86185-40
Sys Sample Code	JOF-SED-CV03-CORCC-0.0/0.5-20190123
Sample Name	JOF-SED-CV03-CORCC-0.0/0.5-20190123
Sample Date	1/23/2019 10:53:00 AM
Location	SED-CV03-CC
Sample Type	N
Matrix	SED
Parent Sample	

Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Uncertainty	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
EPA 901.1	Radium 226 + radium 228	RA226/228	T	PCI/G	3.04	J	ZZ	0.541				Y	Yes	1	NA
	Radium 228	15262-20-1	T	PCI/G	1.19			0.405	0.322	0.322	1.00	Y	Yes	1	NA
	Radium-226	13982-63-3	T	PCI/G	1.85	J	ZZ	0.359	0.209	0.209	1.00	Y	Yes	1	NA

Lab Sample ID	180-86185-41
Sys Sample Code	JOF-SED-CV03-CORRB-0.0/0.5-20190123
Sample Name	JOF-SED-CV03-CORRB-0.0/0.5-20190123
Sample Date	1/23/2019 11:10:00 AM
Location	SED-CV03-RB
Sample Type	N
Matrix	SED
Parent Sample	

Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Uncertainty	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
EPA 901.1	Radium 226 + radium 228	RA226/228	T	PCI/G	2.84	J	ZZ	0.415				Y	Yes	1	NA
	Radium 228	15262-20-1	T	PCI/G	1.31			0.307	0.274	0.274	1.00	Y	Yes	1	NA
	Radium-226	13982-63-3	T	PCI/G	1.53	J	ZZ	0.279	0.199	0.199	1.00	Y	Yes	1	NA

Lab Sample ID	180-86185-44
Sys Sample Code	JOF-SED-CV02-CORLB-0.0/0.5-20190123
Sample Name	JOF-SED-CV02-CORLB-0.0/0.5-20190123
Sample Date	1/23/2019 12:25:00 PM
Location	SED-CV02-LB
Sample Type	N
Matrix	SED
Parent Sample	

Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Uncertainty	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
EPA 901.1	Radium 226 + radium 228	RA226/228	T	PCI/G	3.18	J	LD,ZZ	0.474				Y	Yes	1	NA
	Radium 228	15262-20-1	T	PCI/G	1.67	J	LD	0.365	0.350	0.350	1.00	Y	Yes	1	NA
	Radium-226	13982-63-3	T	PCI/G	1.51	J	ZZ	0.303	0.227	0.227	1.00	Y	Yes	1	NA

Lab Sample ID	180-86185-46
Sys Sample Code	JOF-SED-CV02-CORCC-0.0/0.5-20190123
Sample Name	JOF-SED-CV02-CORCC-0.0/0.5-20190123
Sample Date	1/23/2019 12:45:00 PM
Location	SED-CV02-CC
Sample Type	N
Matrix	SED
Parent Sample	

Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Uncertainty	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
EPA 901.1	Radium 226 + radium 228	RA226/228	T	PCI/G	2.39	J	LD,ZZ	0.348				Y	Yes	1	NA
	Radium 228	15262-20-1	T	PCI/G	1.05	J	LD	0.233	0.153	0.153	1.00	Y	Yes	1	NA
	Radium-226	13982-63-3	T	PCI/G	1.34	J	ZZ	0.259	0.172	0.172	1.00	Y	Yes	1	NA

Lab Sample ID	180-86185-48
Sys Sample Code	JOF-SED-CV02-CORRB-0.0/0.5-20190123
Sample Name	JOF-SED-CV02-CORRB-0.0/0.5-20190123
Sample Date	1/23/2019 1:05:00 PM
Location	SED-CV02-RB
Sample Type	N
Matrix	SED
Parent Sample	

Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Uncertainty	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
EPA 901.1	Radium 226 + radium 228	RA226/228	T	PCI/G	2.28	J	LD	0.403				Y	Yes	1	NA
	Radium 228	15262-20-1	T	PCI/G	1.29	J	LD	0.317	0.162	0.162	1.00	Y	Yes	1	NA
	Radium-226	13982-63-3	T	PCI/G	0.989			0.249	0.164	0.164	1.00	Y	Yes	1	NA

Lab Sample ID	180-86185-49
Sys Sample Code	JOF-SED-CV02-DUP01-20190123
Sample Name	JOF-SED-CV02-DUP01-20190123
Sample Date	1/23/2019 12:00:00 AM
Location	SED-CV02-RB
Sample Type	FD
Matrix	SED
Parent Sample	JOF-SED-CV02-CORRB-0.0/0.5-20190123

Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Uncertainty	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
EPA 901.1	Radium 226 + radium 228	RA226/228	T	PCI/G	2.97	J	LD	0.533				Y	Yes	1	NA
	Radium 228	15262-20-1	T	PCI/G	1.64	J	LD	0.433	0.180	0.180	1.00	Y	Yes	1	NA
	Radium-226	13982-63-3	T	PCI/G	1.33			0.311	0.211	0.211	1.00	Y	Yes	1	NA

Lab Sample ID	180-86185-5
Sys Sample Code	JOF-SED-CV01-CORLB-0.0/0.5-20190122
Sample Name	JOF-SED-CV01-CORLB-0.0/0.5-20190122
Sample Date	1/22/2019 9:20:00 AM
Location	SED-CV01-LB
Sample Type	N
Matrix	SED
Parent Sample	

Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Uncertainty	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
EPA 901.1	Radium 226 + radium 228	RA226/228	T	PCI/G	3.01			0.484				Y	Yes	1	NA
	Radium 228	15262-20-1	T	PCI/G	1.48			0.324	0.276	0.276	1.00	Y	Yes	1	NA
	Radium-226	13982-63-3	T	PCI/G	1.53			0.359	0.227	0.227	1.00	Y	Yes	1	NA

Lab Sample ID	180-86185-50
Sys Sample Code	JOF-SED-BH02-FB01-20190124
Sample Name	JOF-SED-BH02-FB01-20190124
Sample Date	1/24/2019 7:35:00 AM
Location	BH02
Sample Type	FB
Matrix	WQ
Parent Sample	

Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Uncertainty	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
EPA 901.1	Radium 226 + radium 228	RA226/228	T	PCI/L	25.1	J	S	25.1				Y	Yes	1	NA
	Radium 228	15262-20-1	T	PCI/L	-1.65	U		19.6	26.3	26.3	50.0	N	Yes	1	NA
	Radium-226	13982-63-3	T	PCI/L	25.1			15.6	17.7	17.7	50.0	Y	Yes	1	NA

Lab Sample ID	180-86185-51
Sys Sample Code	JOF-SED-BH02-CORLB-0.0/0.5-20190124
Sample Name	JOF-SED-BH02-CORLB-0.0/0.5-20190124
Sample Date	1/24/2019 8:55:00 AM
Location	SED-BH02-LB
Sample Type	N
Matrix	SED
Parent Sample	

Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Uncertainty	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
EPA 901.1	Radium 226 + radium 228	RA226/228	T	PCI/G	2.34	J	LD,ZZ	0.444				Y	Yes	1	NA
	Radium 228	15262-20-1	T	PCI/G	1.11	J	LD	0.333	0.361	0.361	1.00	Y	Yes	1	NA
	Radium-226	13982-63-3	T	PCI/G	1.23	J	ZZ	0.293	0.219	0.219	1.00	Y	Yes	1	NA

TVA CCR Program
Facility: Johnsonville Fossil Plant
SDG: 180861852

Lab Sample ID	180-86185-55
Sys Sample Code	JOF-SED-BH02-EB01-20190124
Sample Name	JOF-SED-BH02-EB01-20190124
Sample Date	1/24/2019 9:35:00 AM
Location	BH02
Sample Type	EB
Matrix	WQ
Parent Sample	

Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Uncertainty	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
EPA 901.1	Radium 226 + radium 228	RA226/228	T	PCI/L	16.7	U	S	34.8				N	Yes	1	NA
	Radium 228	15262-20-1	T	PCI/L	16.7	U		19.5	24.1	24.1	50.0	N	Yes	1	NA
	Radium-226	13982-63-3	T	PCI/L	-8.29	U		28.8	49.4	49.4	50.0	N	Yes	1	NA

Lab Sample ID	180-86185-56
Sys Sample Code	JOF-SED-BH02-CORCC-0.0/0.5-20190124
Sample Name	JOF-SED-BH02-CORCC-0.0/0.5-20190124
Sample Date	1/24/2019 9:45:00 AM
Location	SED-BH02-CC
Sample Type	N
Matrix	SED
Parent Sample	

Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Uncertainty	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
EPA 901.1	Radium 226 + radium 228	RA226/228	T	PCI/G	2.75	J	LD,ZZ	0.516				Y	Yes	1	NA
	Radium 228	15262-20-1	T	PCI/G	1.14	J	LD	0.370	0.634	0.634	1.00	Y	Yes	1	NA
	Radium-226	13982-63-3	T	PCI/G	1.61	J	ZZ	0.359	0.283	0.283	1.00	Y	Yes	1	NA

Lab Sample ID	180-86185-60
Sys Sample Code	JOF-SED-BH02-CORRB-0.0/0.5-20190124
Sample Name	JOF-SED-BH02-CORRB-0.0/0.5-20190124
Sample Date	1/24/2019 11:00:00 AM
Location	SED-BH02-RB
Sample Type	N
Matrix	SED
Parent Sample	

Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Uncertainty	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
EPA 901.1	Radium 226 + radium 228	RA226/228	T	PCI/G	3.32	J	LD,ZZ	0.615				Y	Yes	1	NA
	Radium 228	15262-20-1	T	PCI/G	1.50	J	LD	0.415	0.537	0.537	1.00	Y	Yes	1	NA
	Radium-226	13982-63-3	T	PCI/G	1.82	J	ZZ	0.454	0.388	0.388	1.00	Y	Yes	1	NA

Lab Sample ID	180-86185-61
Sys Sample Code	JOF-SED-IC01-CORRB-0.0/0.5-20190124
Sample Name	JOF-SED-IC01-CORRB-0.0/0.5-20190124
Sample Date	1/24/2019 12:05:00 PM
Location	SED-IC01-RB
Sample Type	N
Matrix	SED
Parent Sample	

Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Uncertainty	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
EPA 901.1	Radium 226 + radium 228	RA226/228	T	PCI/G	2.32	J	LD,ZZ	0.414				Y	Yes	1	NA
	Radium 228	15262-20-1	T	PCI/G	1.35	J	LD	0.326	0.218	0.218	1.00	Y	Yes	1	NA
	Radium-226	13982-63-3	T	PCI/G	0.965	J	ZZ	0.255	0.191	0.191	1.00	Y	Yes	1	NA

Lab Sample ID	180-86185-62
Sys Sample Code	JOF-SED-IC01-CORCC-0.0/0.5-20190124
Sample Name	JOF-SED-IC01-CORCC-0.0/0.5-20190124
Sample Date	1/24/2019 12:25:00 PM
Location	SED-IC01-CC
Sample Type	N
Matrix	SED
Parent Sample	

Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Uncertainty	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
EPA 901.1	Radium 226 + radium 228	RA226/228	T	PCI/G	2.32	J	LD	0.420				Y	Yes	1	NA
	Radium 228	15262-20-1	T	PCI/G	1.30	J	LD	0.312	0.185	0.185	1.00	Y	Yes	1	NA
	Radium-226	13982-63-3	T	PCI/G	1.02			0.281	0.217	0.217	1.00	Y	Yes	1	NA

Lab Sample ID	180-86185-63
Sys Sample Code	JOF-SED-IC01-CORLB-0.0/0.5-20190124
Sample Name	JOF-SED-IC01-CORLB-0.0/0.5-20190124
Sample Date	1/24/2019 12:35:00 PM
Location	SED-IC01-LB
Sample Type	N
Matrix	SED
Parent Sample	

Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Uncertainty	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
EPA 901.1	Radium 226 + radium 228	RA226/228	T	PCI/G	3.36	J	LD	0.651				Y	Yes	1	NA
	Radium 228	15262-20-1	T	PCI/G	1.76	J	LD	0.542	0.360	0.360	1.00	Y	Yes	1	NA
	Radium-226	13982-63-3	T	PCI/G	1.60			0.360	0.210	0.210	1.00	Y	Yes	1	NA

Lab Sample ID	180-86185-64
Sys Sample Code	JOF-SED-BH02-DUP01-20190124
Sample Name	JOF-SED-BH02-DUP01-20190124
Sample Date	1/24/2019 12:00:00 AM
Location	SED-BH02-RB
Sample Type	FD
Matrix	SED
Parent Sample	JOF-SED-BH02-CORRB-0.0/0.5-20190124

Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Uncertainty	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
EPA 901.1	Radium 226 + radium 228	RA226/228	T	PCI/G	3.57	J	LD,ZZ	0.644				Y	Yes	1	NA
	Radium 228	15262-20-1	T	PCI/G	1.88	J	LD	0.487	0.233	0.233	1.00	Y	Yes	1	NA
	Radium-226	13982-63-3	T	PCI/G	1.69	J	ZZ	0.422	0.320	0.320	1.00	Y	Yes	1	NA

Lab Sample ID	180-86185-8
Sys Sample Code	JOF-SED-IC01-CORRB-0.0/0.5-20190122
Sample Name	JOF-SED-IC01-CORRB-0.0/0.5-20190122
Sample Date	1/22/2019 10:15:00 AM
Location	SED-IC01-RB
Sample Type	N
Matrix	SED
Parent Sample	

Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Uncertainty	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
EPA 901.1	Radium 226 + radium 228	RA226/228	T	PCI/G	2.33			0.473				Y	Yes	1	NA
	Radium 228	15262-20-1	T	PCI/G	1.39			0.397	0.197	0.197	1.00	Y	Yes	1	NA
	Radium-226	13982-63-3	T	PCI/G	0.942			0.258	0.179	0.179	1.00	Y	Yes	1	NA

SECTION 3

SUPPORTING DOCUMENTATION FOR QUALIFIERS

ENVIRONMENTAL STANDARDS

RADIOLOGICAL ANALYSIS SUPPORT DOCUMENTATION

ESI project name:	TVA JOF EI Implementation	Reviewed by:	Danielle Coles
Sample Collection Dates:	1/22-1/24/19	Approved by:	
Job Number:	**20188360.A000**	Completion Date:	
Project Manager:	AJC		
Laboratory:	TestAmerica-St. Louis		

Applicable Sample No's (X) — Refer to Table 1 in the Quality Assurance Review

			Sample No.	Lab Control No.
Deliverable:	Level IV (Full)	(X)	180-86185-2	
	Limited	( )		
	Other:			

The following table indicates criteria that were examined, the identified problems, and support documentation attachments

	Criteria Examined in Detail Check (√) if Yes or Footnote Letter for Comments Below					Problems Identified Check (√) if Yes or Footnote Letter for Comments Below					Support Documentation Attachments Check (√) if Yes or Footnote Letter for Comments Below				
	901.1					901.1					901.1				
Holding Times	X														
Blank Analysis Results	X														
Laboratory Control Standard (LCS)	X														
Tracer/Chemical Yield															
Duplicate Analysis: (X) Field (X) Lab	X					X					X				
Matrix Spike Results															
Quantitation of Results	X														
Detection Limit															
Efficiency/Energy Calibrations	X														
Initial Calibration Verifications	X														
Annual Calibration Verifications															
Continuing Calibration Checks	X														
Continuing Calibration Backgrounds	X														
Sample Preservation	X														
Condition on Receipt	X														
Others: Headspace	X					X					X				

Comments: All results are usable unless otherwise qualified.

RADIOLOGICAL FIELD DUPLICATE EVALUATION

Replicate Error Ratio (RER) = $\dfrac{\text{ABS (Sample Activity - Duplicate Activity)}}{\sqrt{(\text{Sample } 2\sigma \text{ Error})^2 + (\text{Duplicate } 2\sigma \text{ Error})^2}}$

2σ RER = RER × 2

Laboratory SDG **180861852**
Qualification Limit: < 2
Qualifier J/UJ

Sample ID	Duplicate ID	Analyte	Sample Activity	Sample 2σ Error*	Duplicate Activity	Duplicate 2σ Error*	2σ RER	Qualifier
JOF-SED-IC01-CORLB-(	JOF-SED-IC01-DUP01-2	radium-226	1.47	0.305	1.41	0.44	0.2	
JOF-SED-IC01-CORLB-(	JOF-SED-IC01-DUP01-2	radium-228	1.32	0.367	1.56	0.391	0.9	
JOF-SED-CV02-CORRB	JOF-SED-CV02-DUP01-	radium-226	0.989	0.249	1.33	0.311	1.7	
JOF-SED-CV02-CORRB	JOF-SED-CV02-DUP01-	radium-228	1.29	0.317	1.64	0.433	1.3	
JOF-SED-BH02-CORRB	JOF-SED-BH02-DUP01-	radium-226	1.82	0.454	1.69	0.422	0.4	
JOF-SED-BH02-CORRB	JOF-SED-BH02-DUP01-	radium-228	1.5	0.415	1.88	0.487	1.2	
JOF-SED-IC01-CORLB-(	180-86185-12 LD	radium-226	1.47	0.305	1.752	0.383	1.2	
JOF-SED-IC01-CORLB-(	180-86185-12 LD	radium-228	1.32	0.367	1.781	0.417	1.7	
180-86185-22 LD	180-86185-22 LD	radium-226	1.43	0.388	1.594	0.364	0.6	
180-86185-22 LD	180-86185-22 LD	radium-228	1.43	0.4	1.226	0.393	0.7	
JOF-SED-CV02-CORRB	180-86185-48 LD	radium-226	0.989	0.249	1.114	0.233	0.7	
JOF-SED-CV02-CORRB	180-86185-48 LD	radium-228	1.29	0.317	1.844	0.34	2.4	J/UJ

* TPU 2σ or CSU 2σ. Not the counting error.

Client Sample Results

Client: Environmental Standards Inc.
Project/Site: JOF_SED_20190122_1B

Job ID: 180-86185-2

Client Sample ID: JOF-SED-CV01-EB01-20190122

Lab Sample ID: 180-86185-1

Date Collected: 01/22/19 07:00
Date Received: 01/29/19 09:30

Matrix: Water

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-13.2	U	20.5	20.6	50.0	35.2	pCi/L	01/31/19 16:57	02/21/19 01:48	1
Radium-228	11.5	U	14.5	14.5	50.0	20.3	pCi/L	01/31/19 16:57	02/21/19 01:48	1
Radium 226 and 228 (positive only)	11.5	U,S	14.5	~~14.5~~ 25.2			pCi/L	01/31/19 16:57	02/21/19 01:48	1

Clear

Client Sample Results

Client: Environmental Standards Inc.
Project/Site: JOF_SED_20190122_1B

Job ID: 180-86185-2

Client Sample ID: JOF-SED-CV01-FB01-20190122

Date Collected: 01/22/19 07:10
Date Received: 01/29/19 09:30

Lab Sample ID: 180-86185-2

Matrix: Water

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-8.72	U	17.9	17.9	50.0	45.2	pCi/L	01/31/19 16:57	02/21/19 01:51	1
Radium-228	8.11	U	27.1	27.1	50.0	36.6	pCi/L	01/31/19 16:57	02/21/19 01:51	1
Radium 226 and 228 (positive only)	8.11	U ,S	27.1	~~27.1~~ 32.5			pCi/L	01/31/19 16:57	02/21/19 01:51	1

clear

Client Sample Results

Client: Environmental Standards Inc.
Project/Site: JOF_SED_20190122_1B

Job ID: 180-86185-2

Client Sample ID: JOF-SED-BH01-CORLB-0.0/0.5-20190122

Lab Sample ID: 180-86185-21

Date Collected: 01/22/19 13:35
Date Received: 01/29/19 09:30

Matrix: Solid

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228 (positive only)	**1.78**	J,S	0.363	0.391			pCi/g	05/18/19 23:03	06/10/19 15:47	1
Radium-226	**1.39**		0.300	0.331	1.00	0.201	pCi/g	05/18/19 23:03	06/10/19 15:47	1
Radium-228	0.391	U	0.205	0.208		0.679	pCi/g	05/18/19 23:03	06/10/19 15:47	1

Client Sample Results

Client: Environmental Standards Inc.
Project/Site: JOF_SED_20190122_1B

Job ID: 180-86185-2

Client Sample ID: JOF-SED-CV03-EB01-20190123

Lab Sample ID: 180-86185-35

Date Collected: 01/23/19 09:45
Date Received: 01/29/19 09:30

Matrix: Water

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	29.2		13.3	13.6	50.0	15.3	pCi/L	01/31/19 16:57	02/21/19 04:02	1
Radium-228 NA072-50, no qual	11.9	U	19.1	19.1	50.0	28.7	pCi/L	01/31/19 16:57	02/21/19 04:02	1
Radium 226 and 228 (positive only)	41.1	J,S	23.3	23.4			pCi/L	01/31/19 16:57	02/21/19 04:02	1

Client Sample Results

Client: Environmental Standards Inc.
Project/Site: JOF_SED_20190122_1B

Job ID: 180-86185-2

Client Sample ID: JOF-SED-CV03-FB01-20190123

Lab Sample ID: 180-86185-36

Date Collected: 01/23/19 09:55
Date Received: 01/29/19 09:30

Matrix: Water

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	19.0		11.4	11.5	50.0	16.2	pCi/L	01/31/19 16:57	02/21/19 04:03	1
Radium-228 MDA > 250	1.55	U	16.3	16.3	50.0	26.0	pCi/L	01/31/19 16:57	02/21/19 04:03	1
Radium 226 and 228 (positive only) No qual	20.6	U J, S	19.9	19.9			pCi/L	01/31/19 16:57	02/21/19 04:03	1

Client Sample Results

Client: Environmental Standards Inc.
Project/Site: JOF_SED_20190122_1B

Job ID: 180-86185-2

Client Sample ID: JOF-SED-CV03-CORLB-0.0/0.5-20190123

Lab Sample ID: 180-86185-37

Date Collected: 01/23/19 10:00
Date Received: 01/29/19 09:30

Matrix: Solid

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228 (positive only)	3.12		0.366	0.424			pCi/g	05/22/19 22:55	06/12/19 10:57	1
Radium-226 J,ZZ	1.64		0.262	0.307	1.00	0.187	pCi/g	05/22/19 22:55	06/12/19 10:57	1
Radium-228	1.48		0.256	0.293		0.203	pCi/g	05/22/19 22:55	06/12/19 10:57	1

Client Sample Results

Client: Environmental Standards Inc.
Project/Site: JOF_SED_20190122_1B

Job ID: 180-86185-2

Client Sample ID: JOF-SED-CV03-CORCC-0.0/0.5-20190123

Lab Sample ID: 180-86185-40

Date Collected: 01/23/19 10:53
Date Received: 01/29/19 09:30

Matrix: Solid

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228 (positive only)	3.04		0.498	0.541			pCi/g	05/22/19 22:55	06/12/19 11:01	1
Radium-226 J,ZZ	1.85		0.311	0.359	1.00	0.209	pCi/g	05/22/19 22:55	06/12/19 11:01	1
Radium-228	1.19		0.389	0.405		0.322	pCi/g	05/22/19 22:55	06/12/19 11:01	1

Client Sample Results

Client: Environmental Standards Inc.
Project/Site: JOF_SED_20190122_1B

Job ID: 180-86185-2

Client Sample ID: JOF-SED-CV03-CORRB-0.0/0.5-20190123

Lab Sample ID: 180-86185-41

Date Collected: 01/23/19 11:10
Date Received: 01/29/19 09:30

Matrix: Solid

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228 (positive only)	2.84		0.361	0.415			pCi/g	05/22/19 22:55	06/12/19 11:14	1
Radium-226 J,22	1.53		0.232	0.279	1.00	0.199	pCi/g	05/22/19 22:55	06/12/19 11:14	1
Radium-228	1.31		0.277	0.307		0.274	pCi/g	05/22/19 22:55	06/12/19 11:14	1

Client Sample Results

Client: Environmental Standards Inc.
Project/Site: JOF_SED_20190122_1B

Job ID: 180-86185-2

Client Sample ID: JOF-SED-CV02-CORLB-0.0/0.5-20190123

Lab Sample ID: 180-86185-44

Date Collected: 01/23/19 12:25
Date Received: 01/29/19 09:30

Matrix: Solid

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228 (positive only)	3.18		0.421	0.474			pCi/g	05/23/19 01:22	06/13/19 10:42	1
Radium-226 J,22	1.51		0.265	0.303	1.00	0.227	pCi/g	05/23/19 01:22	06/13/19 10:42	1
Radium-228 J,LD	1.67		0.327	0.365		0.350	pCi/g	05/23/19 01:22	06/13/19 10:42	1

Client Sample Results

Client: Environmental Standards Inc.
Project/Site: JOF_SED_20190122_1B

Job ID: 180-86185-2

Client Sample ID: JOF-SED-CV02-CORCC-0.0/0.5-20190123

Lab Sample ID: 180-86185-46

Date Collected: 01/23/19 12:45
Date Received: 01/29/19 09:30

Matrix: Solid

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228 (positive only)	2.39		0.303	0.348			pCi/g	05/23/19 01:22	06/13/19 10:35	1
Radium-226 J,ZZ	1.34		0.221	0.259	1.00	0.172	pCi/g	05/23/19 01:22	06/13/19 10:35	1
Radium-228 J,LD	1.05		0.208	0.233		0.153	pCi/g	05/23/19 01:22	06/13/19 10:35	1

Client Sample Results

Client: Environmental Standards Inc.
Project/Site: JOF_SED_20190122_1B

Job ID: 180-86185-2

Client Sample ID: JOF-SED-CV02-CORRB-0.0/0.5-20190123

Lab Sample ID: 180-86185-48

Date Collected: 01/23/19 13:05
Date Received: 01/29/19 09:30

Matrix: Solid

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228 (positive only)	2.28		0.366	0.403			pCi/g	05/23/19 01:22	06/13/19 10:40	1
Radium-226	0.989		0.226	0.249	1.00	0.164	pCi/g	05/23/19 01:22	06/13/19 10:40	1
Radium-228 J, LD	1.29		0.288	0.317		0.162	pCi/g	05/23/19 01:22	06/13/19 10:40	1

Client Sample Results

Client: Environmental Standards Inc.
Project/Site: JOF_SED_20190122_1B

Job ID: 180-86185-2

Client Sample ID: JOF-SED-CV02-DUP01-20190123 pment -78

Lab Sample ID: 180-86185-49

Date Collected: 01/23/19 00:00

Matrix: Solid

Date Received: 01/29/19 09:30

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228 (positive only)	2.97		0.488	0.533			pCi/g	05/23/19 01:22	06/13/19 10:32	1
Radium-226	1.33		0.280	0.311	1.00	0.211	pCi/g	05/23/19 01:22	06/13/19 10:32	1
Radium-228 J, LQ	1.64		0.400	0.433		0.180	pCi/g	05/23/19 01:22	06/13/19 10:32	1

Client Sample Results

Client: Environmental Standards Inc.
Project/Site: JOF_SED_20190122_1B

Job ID: 180-86185-2

Client Sample ID: JOF-SED-BH02-FB01-20190124

Lab Sample ID: 180-86185-50

Date Collected: 01/24/19 07:35
Date Received: 01/29/19 09:30

Matrix: Water

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	25.1		15.4	15.6	50.0	17.7	pCi/L	01/31/19 16:57	02/21/19 04:04	1
Radium-228 NAD 72 58, Negual	-1.65	U	19.6	19.6	50.0	26.3	pCi/L	01/31/19 16:57	02/21/19 04:04	1
Radium 226 and 228 (positive only)	25.1	U J,S	15.4	~~15.6~~ 25.1			pCi/L	01/31/19 16:57	02/21/19 04:04	1

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Client Sample Results

Client: Environmental Standards Inc.
Project/Site: JOF_SED_20190122_1B

Job ID: 180-86185-2

Client Sample ID: JOF-SED-BH02-CORLB-0.0/0.5-20190124

Lab Sample ID: 180-86185-51

Date Collected: 01/24/19 08:55
Date Received: 01/29/19 09:30

Matrix: Solid

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228 (positive only)	2.34		0.413	0.444			pCi/g	05/23/19 01:22	06/13/19 11:04	1
Radium-226 J,ZZ	1.23		0.267	0.293	1.00	0.219	pCi/g	05/23/19 01:22	06/13/19 11:04	1
Radium-228 J,LD	1.11		0.315	0.333		0.361	pCi/g	05/23/19 01:22	06/13/19 11:04	1

Client Sample Results

Client: Environmental Standards Inc.
Project/Site: JOF_SED_20190122_1B

Job ID: 180-86185-2

Client Sample ID: JOF-SED-BH02-EB01-20190124

Lab Sample ID: 180-86185-55

Date Collected: 01/24/19 09:35
Date Received: 01/29/19 09:30

Matrix: Water

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-8.29	U	28.8	28.8	50.0	49.4	pCi/L	01/31/19 16:57	02/21/19 04:06	1
Radium-228	16.7	U	19.4	19.5	50.0	24.1	pCi/L	01/31/19 16:57	02/21/19 04:06	1
Radium 226 and 228 (positive only)	16.7	U, S	19.4	~~19.5~~ 34.8			pCi/L	01/31/19 16:57	02/21/19 04:06	1

clear

Client Sample Results

Client: Environmental Standards Inc.
Project/Site: JOF_SED_20190122_1B

Job ID: 180-86185-2

Client Sample ID: JOF-SED-BH02-CORCC-0.0/0.5-20190124

Lab Sample ID: 180-86185-56

Date Collected: 01/24/19 09:45
Date Received: 01/29/19 09:30

Matrix: Solid

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228 (positive only)	2.75		0.478	0.516			pCi/g	05/23/19 01:22	06/13/19 11:47	1
Radium-226 J,ZZ	1.61		0.323	0.359	1.00	0.283	pCi/g	05/23/19 01:22	06/13/19 11:47	1
Radium-228 J,LD	1.14		0.353	0.370		0.634	pCi/g	05/23/19 01:22	06/13/19 11:47	1

Client Sample Results

Client: Environmental Standards Inc.
Project/Site: JOF_SED_20190122_1B

Job ID: 180-86185-2

Client Sample ID: JOF-SED-BH02-CORRB-0.0/0.5-20190124

Lab Sample ID: 180-86185-60

Date Collected: 01/24/19 11:00
Date Received: 01/29/19 09:30

Matrix: Solid

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228 (positive only)	3.32		0.571	0.615			pCi/g	05/23/19 01:22	06/13/19 12:51	1
Radium-226 J,ZZ	1.82		0.418	0.454	1.00	0.388	pCi/g	05/23/19 01:22	06/13/19 12:51	1
Radium-228 J,LD	1.50		0.389	0.415		0.537	pCi/g	05/23/19 01:22	06/13/19 12:51	1

Client Sample Results

Client: Environmental Standards Inc.
Project/Site: JOF_SED_20190122_1B

Job ID: 180-86185-2

Client Sample ID: JOF-SED-IC01-CORRB-0.0/0.5-20190124

Lab Sample ID: 180-86185-61

Date Collected: 01/24/19 12:05
Date Received: 01/29/19 09:30

Matrix: Solid

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228 (positive only)	2.32		0.378	0.414			pCi/g	05/23/19 01:22	06/13/19 11:55	1
Radium-226 J,ZZ	0.965		0.235	0.255	1.00	0.191	pCi/g	05/23/19 01:22	06/13/19 11:55	1
Radium-228 J,LD	1.35		0.296	0.326		0.218	pCi/g	05/23/19 01:22	06/13/19 11:55	1

Client Sample Results

Client: Environmental Standards Inc.
Project/Site: JOF_SED_20190122_1B

Job ID: 180-86185-2

Client Sample ID: JOF-SED-IC01-CORCC-0.0/0.5-20190124

Lab Sample ID: 180-86185-62

Date Collected: 01/24/19 12:25
Date Received: 01/29/19 09:30

Matrix: Solid

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228 (positive only)	2.32		0.385	0.420			pCi/g	05/23/19 01:22	06/13/19 12:27	1
Radium-226	1.02		0.261	0.281	1.00	0.217	pCi/g	05/23/19 01:22	06/13/19 12:27	1
Radium-228 J, LO	1.30		0.283	0.312		0.185	pCi/g	05/23/19 01:22	06/13/19 12:27	1

Client Sample Results

Client: Environmental Standards Inc.
Project/Site: JOF_SED_20190122_1B

Job ID: 180-86185-2

Client Sample ID: JOF-SED-IC01-CORLB-0.0/0.5-20190124

Lab Sample ID: 180-86185-63

Date Collected: 01/24/19 12:35
Date Received: 01/29/19 09:30

Matrix: Solid

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228 (positive only)	3.36		0.604	0.651			pCi/g	05/23/19 01:22	06/13/19 12:58	1
Radium-226	1.60		0.321	0.360	1.00	0.210	pCi/g	05/23/19 01:22	06/13/19 12:58	1
Radium-228 J, LD	1.76		0.512	0.542		0.360	pCi/g	05/23/19 01:22	06/13/19 12:58	1

Client Sample Results

Client: Environmental Standards Inc.
Project/Site: JOF_SED_20190122_1B

Job ID: 180-86185-2

Client Sample ID: JOF-SED-BH02-DUP01-20190124

Lab Sample ID: 180-86185-64

Date Collected: 01/24/19 00:00

parent -60

Matrix: Solid

Date Received: 01/29/19 09:30

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228 (positive only)	3.57		0.596	0.644			pCi/g	05/23/19 01:22	06/13/19 15:27	1
Radium-226 J,ZZ	1.69		0.389	0.422	1.00	0.320	pCi/g	05/23/19 01:22	06/13/19 15:27	1
Radium-228 J,LD	1.88		0.452	0.487		0.233	pCi/g	05/23/19 01:22	06/13/19 15:27	1

QC Sample Results

Client: Environmental Standards Inc.
Project/Site: JOF_SED_20190122_1B

Job ID: 180-86185-2

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: LCS 160-429544/2-A
Matrix: Solid
Analysis Batch: 431521

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 429544

80-120%

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Americium-241	96.7	104.5		11.0		1.11	pCi/g	108	87 - 116
Cesium-137	27.7	27.69		2.97		0.243	pCi/g	100	87 - 120
Cobalt-60	11.5	11.23		1.19		0.138	pCi/g	97	87 - 115

Lab Sample ID: 180-86185-48 DU
Matrix: Solid
Analysis Batch: 431828

Client Sample ID: JOF-SED-CV02-CORRB-0.0/0.5-20190123
Prep Type: Total/NA
Prep Batch: 429544

<2

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit		RER	RER Limit
Radium 226 and 228 (positive only)	2.28		2.958		0.412			pCi/g		0.83	
Radium-226	0.989		1.114		0.233	1.00	0.137	pCi/g	0.7	0.26	1
Radium-228	1.29		1.844		0.340		0.116	pCi/g	2.4	0.84	1

J, LD: 44, 46, 48, 49, 51, 56, 60, 61, 62, 63, 64

SECTION 4

CASE NARRATIVE AND CHAIN-OF-CUSTODY RECORD

Job Narrative
180-86185-2

Revised Report
This report was revised to change the sample ID for sample 180-86185-20 based on a revised chain of custody. This replaces the previous final report.

Receipt
The samples were received on 1/29/2019 9:30 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 4 coolers at receipt time were 2.0º C, 2.5º C, 3.7º C and 4.9º C.

RAD
Method(s) 901.1: Gamma Prep Batch 160-429032
Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.

Many isotopes requested for analysis do not have any gamma emissions, or the gamma emissions they do have are very poor. Often, such analytes are reported by gamma spectrometry assuming secular equilibrium with a longer-lived parent. The client should ensure that such inference is acceptable for their sample based upon process knowledge. The following assumptions were made for this report:
Inferred from Reported to Analyte
Ac-228 Ra-228
Bi-214 Ra-226
JOF-SED-CV01-CORRB-0.0/0.5-20190122 (180-86185-3), JOF-SED-CV01-CORCC-0.0/0.5-20190122 (180-86185-4), JOF-SED-CV01-CORLB-0.0/0.5-20190122 (180-86185-5), JOF-SED-CV01-CORLB-0.5/2.0-20190122 (180-86185-6), JOF-SED-CV01-CORLB-2.0/3.8-20190122 (180-86185-7), JOF-SED-IC01-CORRB-0.0/0.5-20190122 (180-86185-8), JOF-SED-IC01-CORRB-0.5/1.5-20190122 (180-86185-9), JOF-SED-IC01-CORCC-0.0/0.5-20190122 (180-86185-10), JOF-SED-IC01-CORCC-0.5/1.6-20190122 (180-86185-11), JOF-SED-IC01-CORLB-0.0/0.5-20190122 (180-86185-12), JOF-SED-IC01-CORLB-0.0/0.5-20190122 (180-86185-12[DU]), JOF-SED-IC02-CORLB-0.0/0.5-20190122 (180-86185-13), JOF-SED-IC02-CORLB-0.5/2.0-20190122 (180-86185-14), JOF-SED-IC02-CORLB-2.0/3.0-20190122 (180-86185-15), JOF-SED-IC02-CORLB-3.0/3.7-20190122 (180-86185-16), JOF-SED-IC02-CORCC-0.0/0.5-20190122 (180-86185-17), JOF-SED-IC02-CORCC-0.5/3.0-20190122 (180-86185-18), JOF-SED-IC02-CORCC-3.0/5.4-20190122 (180-86185-19), JOF-SED-IC02-CORRB-0.0/0.7-20190122 (180-86185-20), JOF-SED-BH01-CORLB-0.0/0.5-20190122 (180-86185-21), (LCS 160-429032/2-A) and (MB 160-429032/1-A)

Method(s) 901.1: Gamma Prep Batch 160-429541
Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.

Many isotopes requested for analysis do not have any gamma emissions, or the gamma emissions they do have are very poor. Often, such analytes are reported by gamma spectrometry assuming secular equilibrium with a longer-lived parent. The client should ensure that such inference is acceptable for their sample based upon process knowledge. The following assumptions were made for this report:
Inferred from Reported to Analyte
Ac-228 Ra-228
Bi-214 Ra-226
JOF-SED-BH01-CORLB-0.5/1.5-20190122 (180-86185-22), JOF-SED-BH01-CORCC-0.0/0.5-20190122 (180-86185-23), JOF-SED-BH01-CORCC-0.5/1.6-20190122 (180-86185-24), JOF-SED-BH01-CORRB-0.0/0.5-20190122 (180-86185-25), JOF-SED-BH03-CORRB-0.0/0.5-20190122 (180-86185-26), JOF-SED-BH03-CORRB-0.5/3.0-20190122 (180-86185-27), JOF-SED-BH03-CORRB-3.0/5.5-20190122 (180-86185-28), JOF-SED-BH03-CORCC-0.0/0.5-20190122 (180-86185-29), JOF-SED-BH03-CORCC-0.5/2.5-20190122 (180-86185-30), JOF-SED-BH03-CORLB-0.0/0.5-20190122 (180-86185-31), JOF-SED-BH03-CORLB-0.5/2.5-20190122 (180-86185-32), JOF-SED-BH03-CORLB-2.5/4.1-20190122 (180-86185-33), JOF-SED-IC01-DUP01-20190122 (180-86185-34), JOF-SED-CV03-CORLB-0.0/0.5-20190123 (180-86185-37), JOF-SED-CV03-CORLB-0.5/2.5-20190123 (180-86185-38), JOF-SED-CV03-CORLB-2.5/5.3-20190123 (180-86185-39), JOF-SED-CV03-CORCC-0.0/0.5-20190123 (180-86185-40), JOF-SED-CV03-CORRB-0.0/0.5-20190123 (180-86185-41), JOF-SED-CV03-CORRB-0.5/1.5-20190123 (180-86185-42), JOF-SED-CV03-CORRB-1.5/2.7-20190123 (180-86185-43), (LCS 160-429541/2-A), (MB 160-429541/1-A) and (180-86185-A-22-C DU)

Method(s) 901.1: Gamma Prep Batch 160-429544
Insufficient samples were provided for the following samples to fill a geometry (e.g. tuna can) calibrated for Ra-226 analysis by gamma spectroscopy: JOF-SED-CV02-CORLB-0.0/0.5-20190123 (180-86185-44), JOF-SED-CV02-CORCC-0.0/0.5-20190123 (180-86185-46), JOF-SED-BH02-CORLB-0.0/0.5-20190124 (180-86185-51), JOF-SED-BH02-CORCC-0.0/0.5-20190124 (180-86185-56), JOF-SED-BH02-CORRB-0.0/0.5-20190124 (180-86185-60), JOF-SED-IC01-CORRB-0.0/0.5-20190124 (180-86185-61) and JOF-SED-BH02-DUP01-20190124 (180-86185-64). The use of a different geometry could potentially bias the results low due to the loss

of radon into the headspace of the container.

Method(s) 901.1: Gamma Prep Batch 160-429544
Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.

Many isotopes requested for analysis do not have any gamma emissions, or the gamma emissions they do have are very poor. Often, such analytes are reported by gamma spectrometry assuming secular equilibrium with a longer-lived parent. The client should ensure that such inference is acceptable for their sample based upon process knowledge. The following assumptions were made for this report:

Inferred from	Reported to Analyte
Ac-228	Ra-228
Bi-214	Ra-226

JOF-SED-CV02-CORLB-0.0/0.5-20190123 (180-86185-44), JOF-SED-CV02-CORLB-0.5/2.5-20190123 (180-86185-45), JOF-SED-CV02-CORCC-0.0/0.5-20190123 (180-86185-46), JOF-SED-CV02-CORCC-0.5/1.6-20190123 (180-86185-47), JOF-SED-CV02-CORRB-0.0/0.5-20190123 (180-86185-48), JOF-SED-CV02-CORRB-0.0/0.5-20190123 (180-86185-48[DU]), JOF-SED-CV02-DUP01-20190123 (180-86185-49), JOF-SED-BH02-CORLB-0.0/0.5-20190124 (180-86185-51), JOF-SED-BH02-CORLB-0.5/3.0-20190124 (180-86185-52), JOF-SED-BH02-CORLB-3.0/4.7-20190124 (180-86185-53), JOF-SED-BH02-CORLB-4.7/5.7-20190124 (180-86185-54), JOF-SED-BH02-CORCC-0.0/0.5-20190124 (180-86185-56), JOF-SED-BH02-CORCC-0.5/1.7-20190124 (180-86185-57), JOF-SED-BH02-CORCC-1.7/3.0-20190124 (180-86185-58), JOF-SED-BH02-CORCC-3.0/3.7-20190124 (180-86185-59), JOF-SED-BH02-CORRB-0.0/0.5-20190124 (180-86185-60), JOF-SED-IC01-CORRB-0.0/0.5-20190124 (180-86185-61), JOF-SED-IC01-CORCC-0.0/0.5-20190124 (180-86185-62), JOF-SED-IC01-CORLB-0.0/0.5-20190124 (180-86185-63), JOF-SED-BH02-DUP01-20190124 (180-86185-64), (LCS 160-429544/2-A) and (MB 160-429544/1-A)

Method(s) Fill_Geo-21: Insufficient sample was provided for the following samples to fit the preferred geometry (i.e. tuna can):
Samples 37 and 40 were reduced to 100mL d = 1 geometry.
Sample 41 was reduced to 100mL Solid geometry.JOF-SED-CV03-CORLB-0.0/0.5-20190123 (180-86185-37), JOF-SED-CV03-CORCC-0.0/0.5-20190123 (180-86185-40) and JOF-SED-CV03-CORRB-0.0/0.5-20190123 (180-86185-41).

Method(s) Fill_Geo-21: Gamma Prep Batch 429544
Insufficient sample was provided for the following samples to fit the preferred geometry (i.e. tuna can).
Samples 44, 49, 56, 60, 64 were reduced to 100mL d = 1 geometry
Sample 61 was reduced to 100mL Solid geometry
Sample46 was reduced to 25mL Solid geometry

JOF-SED-CV02-CORLB-0.0/0.5-20190123 (180-86185-44), JOF-SED-CV02-CORCC-0.0/0.5-20190123 (180-86185-46), JOF-SED-BH02-CORLB-0.0/0.5-20190124 (180-86185-51), JOF-SED-BH02-CORCC-0.0/0.5-20190124 (180-86185-56), JOF-SED-BH02-CORRB-0.0/0.5-20190124 (180-86185-60), JOF-SED-IC01-CORRB-0.0/0.5-20190124 (180-86185-61) and JOF-SED-BH02-DUP01-20190124 (180-86185-64).

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

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

TVA Environmental Investigations

Tennessee Valley Authority

Chain-of-Custody / Analytical Request Document

Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed and accurate

COOLER No.:	1 of 4
COC No:	JOF_SED_20190122_1B
1 of 5 Pages	[redacted]
Task Desc:	JOF_SED

Rev-1 DC 2/8/19 Rev-2 TFB 4-7-21

180-86185 Chain of Custody

Required Ship to Lab:		Required Project Information:				Required Sampler Information	
Lab Name:	TestAmerica Pittsburgh	Site ID #:	JOHNSONVILLE FOSSIL PLANT			Sampler: Tyler Baker	
Lab Address:	301 Alpha Drive	Project #:	0779777			Sampling Company: TVA	
	RIDC Park	Site Address	535 Steam Plant Road			Address: TVA Chickamauga Power Service Center, 4601 N Access Road	
	Pittsburgh, PA 15238	City	New Johnsonville	State, Zip:	37134	City/State: Chattanooga, TN	Phone: 423-876-6733
Lab Manager Contact Information		Site PM Name:	Roy Quinn				
Lab PM:	Gail Lage	Phone/Fax:	423-751-3753			Sampling Team Number:	1
Phone/Fax:	615-301-5741/615-726-3404	Site PM Email:	rquinn@tva.gov			Send EDD/Hard Copy to:	tva-ei@emvalt.com
Lab Email:	Gail.Lage@testamericainc.com						

Analysis Turnaround Time: ☐ CALENDAR DAYS ☑ WORKING DAYS

TAT if different from Below _____

☐ 24 Hours
☐ 4 Business Days
☐ 5 Business Days
☑ 10 Business Days (Standard)

ITEMS #	SAMPLE ID Samples IDs MUST BE UNIQUE	SAMPLE LOCATION	Sample Depth: Depth Unit	Sample Depth: Feet Start Depth	Sample Depth: Feet End Depth	MATRIX CODE	G= GRAB C=COMP	SAMPLE TYPE	SAMPLE DATE	SAMPLE TIME	# OF CONTAINERS	Comments/ Lab Sample I.D.	MS/MSD	Analysis: JOF_SEDIMENT_RAD	Analysis: JOF_SEDIMENT_BLANKS_RAD	Preserve: see comments	Preserve: see comments
1	JOF-SED-CV01-EB01-20190122	CV01		NA	NA	AQ	G	EB	1/22/2019	0700	3		☐		X		
2	JOF-SED-CV01-FB01-20190122	CV01		NA	NA	AQ	G	FB	1/22/2019	0710	3		☐		X		
3	JOF-SED-CV01-CORRB-0 0/0.5-20190122	CV01		0.0	0.5	SED	G	N	1/22/2019	0830	1		☐	X			
4	JOF-SED-CV01-CORCC-0 0/0.5-20190122	CV01		0.0	0.5	SED	G	N	1/22/2019	0900	1		☐	X			
5	JOF-SED-CV01-CORLB-0 0/0.5-20190122	CV01		0.0	0.5	SED	G	N	1/22/2019	0920	1		☐	X			
6	JOF-SED-CV01-CORLB-0 5/2.0-20190122	CV01		0.5	2.0	SED	G	N	1/22/2019	0920	1	Hold	☐	X			
7	JOF-SED-CV01-CORLB-2.0/3.8-20190122	CV01		2.0	3.8	SED	G	N	1/22/2019	0920	1	Hold	☐	X			
8	JOF-SED-IC01-CORRB-0 0/0.5-20190122	IC01		0.0	0.5	SED	G	N	1/22/2019	1015	1		☐	X			
9	JOF-SED-IC01-CORRB-0 5/1.5-20190122	IC01		0.5	1.5	SED	G	N	1/22/2019	1015	1	Hold	☐	X			
10	JOF-SED-IC01-CORCC-0 0/0 5-20190122	IC01		0.0	0.5	SED	G	N	1/22/2019	1035	1		☐	X			
11	JOF-SED-IC01-CORCC-0 5/1 6-20190122	IC01		0.5	1.6	SED	G	N	1/22/2019	1035	1	Hold	☐	X			
12	JOF-SED-IC01-CORLB-0 0/0.5-20190122	IC01		0.0	0.5	SED	G	N	1/22/2019	1100	2	Lab Dup	☐	X			
13	JOF-SED-IC02-CORLB-0 0/0.5-20190122	IC02		0.0	0.5	SED	G	N	1/22/2019	1140	1		☐	X			

Additional Comments/Special Instructions:

Additional volume can be used for Laboratory Duplicate.

Samples designated "Hold" should not be analyzed until directed otherwise.

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
Tyler Baker / TVA	1-23-19	1600	[illegible]	[illegible]	[illegible]

SHIPPING METHOD	SAMPLER NAME AND SIGNATURE
FedEx	Tyler Baker Tyler Baker

Sample Receipt Conditions

Temperature in °C	Sample on Ice?	Sample Intact?	Trip Blank?
☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No

Form TVA 30067A

TVA Environmental Investigations

Tennessee Valley Authority

Chain-of-Custody / Analytical Request Document

Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed and accurate

COOLER No.:	1 of 4
COC No:	JOF_SED_20190122_1B
2 of 5 Pages	
Task Desc:	JOF_SED

Rev 1 DC 2/8/19 Rev 2 TFB 4-7-21

Required Ship to Lab:

Lab Name:	TestAmerica Pittsburgh
Lab Address	301 Alpha Drive RIDC Park Pittsburgh, PA 15238
Lab Manager Contact Information	
Lab PM:	Gail Lage
Phone/Fax:	615-301-5741/615-726-3404
Lab Email	Gail.Lage@testamericainc.com

Required Project Information:

Site ID #:	JOHNSONVILLE FOSSIL PLANT		
Project #:	0779777		
Site Address	535 Steam Plant Road		
City	New Johnsonville	State, Zip:	37134
Site PM Name:	Roy Quinn		
Phone/Fax:	423-751-3753		
Site PM Email:	rquinn@tva.gov		

Required Sampler Information

Sampler:	Tyler Baker		
Sampling Company:	TVA		
Address:	TVA Chickamauga Power Service Center, 4601 N Access Road		
City/State:	Chattanooga, TN	Phone:	423-876-6733
Sampling Team Number:	1		
Send EDD/Hard Copy to:	tva-ei@envyld.com		

Analysis Turnaround Time

☐ CALENDAR DAYS ☑ WORKING DAYS

TAT if different from Below _____

☐ 24 Hours
☐ 3 Business Days
☐ 5 Business Days
☑ 10 Business Days (Standard)

ITEMS #	SAMPLE ID Samples IDs MUST BE UNIQUE	SAMPLE LOCATION	Sample Depth: Depth Unit	Sample Depth: Feet Start Depth	Sample Depth: Feet End Depth	MATRIX CODE	G= GRAB C=COMP	SAMPLE TYPE	SAMPLE DATE	SAMPLE TIME	# OF CONTAINERS	Comments/ Lab Sample I.D.	MS/MSD	Filtered	Preserve: see comments	Preserve: see comments	Analysis: JOF_SEDIMENT_RAD	Analysis: JOF_SEDIMENT_BLANKS_RAD
1	JOF-SED-IC02-CORLB-0 5/2.0-20190122	IC02		0.5	2.0	SED	G	N	1/22/2019	1140	1	Hold	☐	N			X	
2	JOF-SED-IC02-CORLB-2 0/3 0-20190122	IC02		2.0	3.0	SED	G	N	1/22/2019	1140	1	Hold	☐	N			X	
3	JOF-SED-IC02-CORLB-3.0/3 7-20190122	IC02		3.0	3.7	SED	G	N	1/22/2019	1140	1	Hold	☐				X	
4	JOF-SED-IC02-CORCC-0.0/0.5-20190122	IC02		0.0	0.5	SED	G	N	1/22/2019	1220	1		☐				X	
5	JOF-SED-IC02-CORCC-0 5/3 0-20190122	IC02		0.5	3.0	SED	G	N	1/22/2019	1220	1	Hold	☐				X	
6	JOF-SED-IC02-CORCC-3 0/5 4-20190122	IC02		3.0	5.4	SED	G	N	1/22/2019	1220	1	Hold	☐				X	
7	JOF-SED-IC02-CORRB-0 0/0.5-20190122	IC02		0.0	0.5	SED	G	N	1/22/2019	1250	1		☐				X	
8	JOF-SED-BH01-CORLB-0 0/0 5-20190122	BH01		0.0	0.5	SED	G	N	1/22/2019	1335	1		☐				X	
9	JOF-SED-BH01-CORLB-0 5/1 5-20190122	BH01		0.5	1.5	SED	G	N	1/22/2019	1335	1	Hold	☐				X	
10	JOF-SED-BH01-CORCC-0.0/0.5-20190122	BH01		0.0	0.5	SED	G	N	1/22/2019	1400	1		☐				X	
11	JOF-SED-BH01-CORCC-0.5/1 6-20190122	BH01		0.5	1.6	SED	G	N	1/22/2019	1400	1	Hold	☐				X	
12	JOF-SED-BH01-CORRB-0 0/0.5-20190122	BH01		0.0	0.5	SED	G	N	1/22/2019	1425	1		☐				X	
13	JOF-SED-BH03-CORRB-0 0/0 5-20190122	BH03		0.0	0.5	SED	G	N	1/22/2019	1445	1		☐				X	

Additional Comments/Special Instructions:

Additional volume can be used for Laboratory Duplicate.

Samples designated "Hold" should not be analyzed until directed otherwise.

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
Tyler Baker / TVA	1-25-19	1600	[illegible]	1/24/19	[illegible]

SHIPPING METHOD	SAMPLER NAME AND SIGNATURE
FedEx	Tyler Baker Tyler Baker

Sample Receipt Conditions

Temperature in °C	Sample on Ice?	Sample Intact?	Trip Blank?
☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No

Form TVA 30067A

0.0/0.7 TFB 4-7-21

TVA Environmental Investigations

Tennessee Valley Authority

Chain-of-Custody / Analytical Request Document

Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed and accurate

COOLER No.:	1 of 1
COC No:	JOF_SED_20190122_1B
3 of 5 Pages	[redacted]
Task Desc:	JOF_SED

Rev-1
Dc 2/8/19
Rev-2
TFB 4-7-21

Required Ship to Lab:

Lab Name	TestAmerica Pittsburgh
Lab Address:	301 Alpha Drive RIDC Park Pittsburgh, PA 15238

Lab Manager Contact Information

Lab PM	Gail Lage
Phone/Fax	615-301-5741/615-728-3404
Lab Email	Gail.Lage@testamericainc.com

Required Project Information:

Site ID #:	JOHNSONVILLE FOSSIL PLANT
Project #:	0779777
Site Address	535 Steam Plant Road
City	New Johnsonville; State, Zip: 37134
Site PM Name:	Roy Quinn
Phone/Fax:	423-751-3753
Site PM Email:	rg.quinn@tva.gov

Required Sampler Information

Sampler:	Tyler Baker
Sampling Company:	TVA
Address:	TVA Chickamauga Power Service Center, 4601 N Access Road
City/State:	Chattanooga, TN; Phone: 423-876-6733
Sampling Team Number:	1
Send EDD/Hard Copy to:	tva-ei@anwald.com

Analysis Turnaround Time

☐ CALENDAR DAYS ☑ WORKING DAYS

TAT if different from Below _____

☐ 24 Hours
☐ 3 Business Days
☐ 5 Business Days
☑ 10 Business Days (Standard)

ITEMS #	SAMPLE ID Samples IDs MUST BE UNIQUE	SAMPLE LOCATION	Sample Depth Start Depth (Depth Unit: Feet)	Sample Depth End Depth (Depth Unit: Feet)	MATRIX CODE	G= GRAB C=COMP	SAMPLE TYPE	SAMPLE DATE	SAMPLE TIME	# OF CONTAINERS	Comments/ Lab Sample I.D.	MS/MSD	Analysis: JOF_SEDIMENT_RAD (Filtered: N)	Analysis: JOF_SEDIMENT_BLANKS_RAD (Filtered: N)
1	JOF-SED-BH03-CORRB-0.5/3.0-20190122	BH03	0.5	3.0	SED	G	N	1/22/2019	1445	1	Hold	☐	X	
2	JOF-SED-BH03-CORRB-3.0/5.5-20190122	BH03	3.0	5.5	SED	G	N	1/22/2019	1445	1	Hold	☐	X	
3	JOF-SED-BH03-CORCC-0.0/0.5-20190122	BH03	0.0	0.5	SED	G	N	1/22/2019	1520	1		☐	X	
4	JOF-SED-BH03-CORCC-0 5/2.5-20190122	BH03	0.5	2.5	SED	G	N	1/22/2019	1520	1	Hold	☐	X	
5	JOF-SED-BH03-CORLB-0 0/0.5-20190122	BH03	0.0	0.5	SED	G	N	1/22/2019	1545	1		☐	X	
6	JOF-SED-BH03-CORLB-0.5/2 5-20190122	BH03	0.5	2.5	SED	G	N	1/22/2019	1545	1	Hold	☐	X	
7	JOF-SED-BH03-CORLB-2.5/4.1-20190122	BH03	2.5	4.1	SED	G	N	1/22/2019	1545	1	Hold	☐	X	
8	JOF-SED-IC01-DUP01-20190122	IC01	NA	NA	SED	G	FD	1/22/2019	NA	1	Duplicate	☐	X	
9	JOF-SED-CV03-EB01-20190123	CV03	NA	NA	AQ	G	EB	1/23/2019	0945	3		☐		X
10	JOF-SED-CV03-FB01-20190123	CV03	NA	NA	AQ	G	FB	1/23/2019	0955	3		☐		X
11	JOF-SED-CV03-CORLB-0 0/0.5-20190123	CV03	0.0	0.5	SED	G	N	1/23/2019	1000	1		☐	X	
12	JOF-SED-CV03-CORLB-0 5/2 5-20190123	CV03	0.5	2.5	SED	G	N	1/23/2019	1000	1	Hold	☐	X	
13	JOF-SED-CV03-CORLB-2 5/5 3-20190123	CV03	2.5	5.3	SED	G	N	1/23/2019	1000	1	Hold	☐	X	

Additional Comments/Special Instructions:

Additional volume can be used for Laboratory Duplicate.

Samples designated "Hold" should not be analyzed until directed otherwise.

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
Tyler Baker / TVA	1-25-19	1600	[illegible]	[illegible]	[illegible]

SHIPPING METHOD	SAMPLER NAME AND SIGNATURE
FedEx	Tyler Baker, Tyler Baker

Sample Receipt Conditions

Temperature in °C	Sample on Ice?	Sample Intact?	Trip Blank?
☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No

Form TVA 30067A

TVA Environmental Investigations

Tennessee Valley Authority

Chain-of-Custody / Analytical Request Document

Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed and accurate

COOLER No:	1 of 4
COC No:	JOF_SED_20190122_1B
4 of 5 Pages	[redacted]
Task Desc:	JOF_SED

Rev-1
Dc 2/8/19
Rev-2
TFB 4-7-21

Required Ship to Lab:

Lab Name	TestAmerica Pittsburgh
Lab Address	301 Alpha Drive RIDC Park Pittsburgh, PA 15238
Lab Manager Contact Information	
Lab PM:	Gail Lage
Phone/Fax:	615-301-5741/615-726-3404
Lab Email:	Gail.Lage@testamericainc.com

Required Project Information:

Site ID #:	JOHNSONVILLE FOSSIL PLANT		
Project #:	0779777		
Site Address	535 Steam Plant Road		
City	New Johnsonville	State, Zip:	37134
Site PM Name:	Roy Quinn		
Phone/Fax:	423-751-3753		
Site PM Email:	rjquinn@tva.gov		

Required Sampler Information

Sampler: Tyler Baker	
Sampling Company: TVA	
Address: TVA Chickamauga Power Service Center, 4601 N Access Road	
City/State: Chattanooga, TN	Phone: 423-876-6733
Sampling Team Number:	1
Send EDD/Hard Copy to:	tva-ei@envsid.com

Analysis Turnaround Time

☐ CALENDAR DAYS ☑ WORKING DAYS

TAT if different from Below _____

☐ 24 Hours
☐ 3 Business Days
☐ 5 Business Days
☑ 10 Business Days (Standard)

ITEMS #	SAMPLE ID Samples IDs MUST BE UNIQUE	SAMPLE LOCATION	Sample Depth Depth Unit	Start Depth (Feet)	End Depth (Feet)	MATRIX CODE	G= GRAB C=COMP	SAMPLE TYPE	SAMPLE DATE	SAMPLE TIME	# OF CONTAINERS	Comments/ Lab Sample I.D.	MS/MSD	Analysis JOF_SEDIMENT_RAD	Analysis JOF_SEDIMENT_BLANKS_RAD	Filtered N	Filtered N	Preserve (see comments)	Preserve (see comments)
1	JOF-SED-CV03-CORCC-0 0/0 5-20190123	CV03		0.0	0.5	SED	G	N	1/23/2019	1053	1		☐	X					
2	JOF-SED-CV03-CORRB-0.0/0 5-20190123	CV03		0.0	0.5	SED	G	N	1/23/2019	1110	1		☐	X					
3	JOF-SED-CV03-CORRB-0 5/1.5-20190123	CV03		0.5	1.5	SED	G	N	1/23/2019	1110	1	Hold	☐	X					
4	JOF-SED-CV03-CORRB-1.5/2 7-20190123	CV03		1.5	2.7	SED	G	N	1/23/2019	1110	1	Hold	☐	X					
5	JOF-SED-CV02-CORLB-0 0/0.5-20190123	CV02		0.0	0.5	SED	G	N	1/23/2019	1225	1		☐	X					
6	JOF-SED-CV02-CORLB-0 5/2 5-20190123	CV02		0.5	2.5	SED	G	N	1/23/2019	1225	1	Hold	☐	X					
7	JOF-SED-CV02-CORCC-0 0/0.5-20190123	CV02		0.0	0.5	SED	G	N	1/23/2019	1245	1		☐	X					
8	JOF-SED-CV02-CORCC-0.5/1 6-20190123	CV02		0.5	1.6	SED	G	N	1/23/2019	1245	1	Hold	☐	X					
9	JOF-SED-CV02-CORRB-0 0/0 5-20190123	CV02		0.0	0.5	SED	G	N	1/23/2019	1305	2	Lab Dup	☐	X					
10	JOF-SED-CV02-DUP01-20190123	CV02		NA	NA	SED	G	FD	1/23/2019	NA	1	Duplicate	☐	X					
11	JOF-SED-BH02-FB01-20190124	BH02		NA	NA	AQ	G	FB	1/24/2019	0735	3		☐		X				
12	JOF-SED-BH02-CORLB-0 0/0 5-20190124	BH02		0.0	0.5	SED	G	N	1/24/2019	0855	1		☐	X					
13	JOF-SED-BH02-CORLB-0 5/3 0-20190124	BH02		0.5	3.0	SED	G	N	1/24/2019	0855	1	Hold	☐	X					

Additional Comments/Special Instructions:

Additional volume can be used for Laboratory Duplicate.

Samples designated "Hold" should not be analyzed until directed otherwise.

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
Tyler Baker / TVA	1-25-19	1600	[illegible]	[illegible]	[illegible]

SHIPPING METHOD:	SAMPLER NAME AND SIGNATURE
FedEx	Tyler Baker Tyler Baker

Sample Receipt Conditions

Temperature in °C	Sample on Ice?	Sample Intact?	Trip Blank?
☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No

Form TVA 30067A

TVA Environmental Investigations

Tennessee Valley Authority

Chain-of-Custody / Analytical Request Document

Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed and accurate

COOLER No:	1 of 4
COC No:	JOF_SED_20190122_1B
5 of 5 Pages	
Task Desc:	JOF_SED

Rev. 1 DC 2/8/19
Rev-2 TFB 4-7-21

Required Ship to Lab:

Lab Name	TestAmerica Pittsburgh
Lab Address	301 Alpha Drive RIDC Park Pittsburgh, PA 15238
Lab Manager Contact Information	
Lab PM	Gail Lage
Phone/Fax	615-301-5741/615-726-3404
Lab Email	Gail.Lage@testamericainc.com

Required Project Information:

Site ID #:	JOHNSONVILLE FOSSIL PLANT		
Project #:	0779777		
Site Address	535 Steam Plant Road		
City	New Johnsonville	State, Zip:	37134
Site PM Name:	Roy Quinn		
Phone/Fax:	423-751-3753		
Site PM Email:	[illegible]		

Required Sampler Information

Sampler: Tyler Baker	
Sampling Company: TVA	
Address: TVA Chickamauga Power Service Center 4601 N Access Road	
City/State: Chattanooga TN	Phone: 423-878-6733
Sampling Team Number:	1
Send EDD/Hard Copy to:	[illegible]

Analysis Turnaround Time

☐ CALENDAR DAYS ☐ WORKING DAYS

TAT if different from below _____

☐ 24 Hours
☐ 3 Business Days
☐ 5 Business Days
☒ 10 Business Days (Standard)

ITEMS #	SAMPLE ID Samples IDs MUST BE UNIQUE	SAMPLE LOCATION	Sample Depth: Depth Unit	Sample Depth: Feet	MATRIX CODE	G= GRAB C=COMP	SAMPLE TYPE	SAMPLE DATE	SAMPLE TIME	# OF CONTAINERS	Comments/ Lab Sample I.D.	MS/MSD	Analysis: JOF_SEDIMENT_RAD	Analysis: JOF_STORMWT_BLANKS_RAD	Filtered	Preservative
1	JOF-SED-BH02-CORLB-3 0/4 7-20190124	BH02	3 0	4.7	SED	G	N	1/24/2019	0855	1	Hold	☐	X		N	
2	JOF-SED-BH02-CORLB-4 7/5 7-20190124	BH02	4.7	5.7	SED	G	N	1/24/2019	0855	1	Hold	☐	X			
3	JOF-SED-BH02-EB01-20190124	BH02	NA	NA	AQ	G	EB	1/24/2019	0935	3		☐		X		
4	JOF-SED-BH02-CORCC-0 0/0 5-20190124	BH02	0 0	0.5	SED	G	N	1/24/2019	0945	1		☐	X			
5	JOF-SED-BH02-CORCC 0 5/1 7-20190124	BH02	0.5	1.7	SED	G	N	1/24/2019	0945	1	Hold	☐	X			
6	JOF-SED-BH02-CORCC-1 7/3 0-20190124	BH02	1 7	3.0	SED	G	N	1/24/2019	0945	1	Hold	☐	X			
7	JOF-SED-BH02-CORCC-3 0/3 7-20190124	BH02	3.0	3.7	SED	G	N	1/24/2019	0945	1	Hold	☐	X			
8	JOF-SED-BH02-CORRB-0 0/0 5-20190124	BH02	0 0	0.5	SED	G	N	1/24/2019	1100	1		☐	X			
9	JOF-SED-IC01-CORRB-0 0/0 5-20190124	~~BH02~~	0.0	0.5	SED	G	N	1/24/2019	1205	1		☐	X			
10	JOF-SED-IC01-CORCC-0 0/0 5-20190124	~~BH02~~	0.0	0.5	SED	G	N	1/24/2019	1225	1		☐	X			
11	JOF-SED-IC01-CORLB-0 0/0 5-20190124	~~BH02~~	0.0	0 5	SED	G	N	1/24/2019	1235	1		☐	X			
12	JOF-SED-BH02-DUP01-20190124	BH02	NA	NA	SED	G	FD	1/24/2019	NA	1	Duplicate	☐	X			
13												☐				

Additional Comments/Special Instructions:

Additional volume can be used for Laboratory Duplicate.

Samples designated "Hold" should not be analyzed until directed otherwise.

IC01 DC 2/8/19

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
Tyler Baker / TVA	1-24-19	1400	[illegible]	[illegible]	[illegible]

Sample Receipt Conditions

☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Temperature in °C	Sample on Ice?	Sample Intact?	Trip Blank?

SHIPPING METHOD	SAMPLER NAME AND SIGNATURE
FedEx	Tyler Baker [signature]

Form TVA 30067A

Eurofins TestAmerica, Pittsburgh
301 Alpha Drive RIDC Park
Pittsburgh, PA 15238
Phone (412) 963-7058 Fax (412) 963-2468

Chain of Custody Record

eurofins | Environment Testing TestAmerica

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Lage, Gail	Carrier Tracking No(s):	COC No: 180-360542.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: gail.lage@testamericainc.com	State of Origin: Tennessee	Page: Page 1 of 7
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note):		Job #: 180-86185-2
Address: 13715 Rider Trail North, ,	Due Date Requested: 5/16/2019			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: JOF_SED_20190122_1B	Project #: 18020000			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:

A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify)

Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	901.1_Ra/Dry_Grind Positive Combined Radium-226/228	Total Number of containers	Special Instructions/Note:
			Preservation Code:						
JOF-SED-CV01-CORRB-0.0/0.5-20190122 (180-86185-3)	1/22/19	08:30 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-CV01-CORCC-0.0/0.5-20190122 (180-86185-4)	1/22/19	09:00 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-CV01-CORLB-0.0/0.5-20190122 (180-86185-5)	1/22/19	09:20 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-CV01-CORLB-0.5/2.0-20190122 (180-86185-6)	1/22/19	09:20 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-CV01-CORLB-2.0/3.8-20190122 (180-86185-7)	1/22/19	09:20 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-IC01-CORRB-0.0/0.5-20190122 (180-86185-8)	1/22/19	10:15 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-IC01-CORRB-0.5/1.5-20190122 (180-86185-9)	1/22/19	10:15 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-IC01-CORCC-0.0/0.5-20190122 (180-86185-10)	1/22/19	10:35 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-IC01-CORCC-0.5/1.6-20190122 (180-86185-11)	1/22/19	10:35 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc. attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to TestAmerica Laboratories, Inc.

Possible Hazard Identification
Unconfirmed

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*

Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
[signature]	4/18/19 1700	TAPGH	Michael Stein	4-19-19 08:45	TA STL
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Ver: 01/16/2019

Eurofins TestAmerica, Pittsburgh
301 Alpha Drive RIDC Park
Pittsburgh, PA 15238
Phone (412) 963-7058 Fax (412) 963-2468

Chain of Custody Record

eurofins | Environment Testing TestAmerica

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Lage, Gail	Carrier Tracking No(s):	COC No: 180-360542.2
Client Contact: Shipping/Receiving	Phone:	E-Mail: gail.lage@testamericainc.com	State of Origin: Tennessee	Page: Page 2 of 7
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note):		Job #: 180-86185-2
Address: 13715 Rider Trail North, ,	Due Date Requested: 5/16/2019			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: JOF_SED_20190122_1B	Project #: 18020000			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA
M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify)
Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	901.1_Ra/Dry_Grind Positive Combined Radium-226/228	Total Number of containers	Special Instructions/Note:
			Preservation Code:						
JOF-SED-IC01-CORLB-0.0/0.5-20190122 (180-86185-12)	1/22/19	11:00 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-IC01-CORLB-0.0/0.5-20190122 (180-86185-12DU)	1/22/19	11:00 Central	DU	Solid			X	4	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-IC02-CORLB-0.0/0.5-20190122 (180-86185-13)	1/22/19	11:40 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-IC02-CORLB-0.5/2.0-20190122 (180-86185-14)	1/22/19	11:40 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-IC02-CORLB-2.0/3.0-20190122 (180-86185-15)	1/22/19	11:40 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-IC02-CORLB-3.0/3.7-20190122 (180-86185-16)	1/22/19	11:40 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-IC02-CORCC-0.0/0.5-20190122 (180-86185-17)	1/22/19	12:20 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-IC02-CORCC-0.5/3.0-20190122 (180-86185-18)	1/22/19	12:20 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-IC02-CORCC-3.0/5.4-20190122 (180-86185-19)	1/22/19	12:20 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna

180-86185-01 Chain of Custody

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc. attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to TestAmerica Laboratories, Inc.

Possible Hazard Identification
Unconfirmed

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*

Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:		
Relinquished by:	Date/Time: 4/18/19 1700	Company: Aegis	Received by:	Date/Time: 4-19-19 0830 MH 08:45	Company: TA STL
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Ver: 01/16/2019

Eurofins TestAmerica, Pittsburgh
301 Alpha Drive RIDC Park
Pittsburgh, PA 15238
Phone (412) 963-7058 Fax (412) 963-2468

Chain of Custody Record

eurofins Environment Testing TestAmerica

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Lage, Gail	Carrier Tracking No(s):	COC No: 180-360542.3
Client Contact: Shipping/Receiving	Phone:	E-Mail: gail.lage@testamericainc.com	State of Origin: Tennessee	Page: Page 3 of 7
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note):		Job #: 180-86185-2
Address: 13715 Rider Trail North, ,	Due Date Requested: 5/16/2019			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: JOF_SED_20190122_1B	Project #: 18020000			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:

A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify)

Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	901.1_Ra/Dry_Grind Positive Combined Radium-226/228	Total Number of containers	Special Instructions/Note:
			Preservation Code:						
JOF-SED-IC02-CORRB-0.0/0.5-20190122 (180-86185-20)	1/22/19	12:50 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-BH01-CORLB-0.0/0.5-20190122 (180-86185-21)	1/22/19	13:35 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-BH01-CORLB-0.5/1.5-20190122 (180-86185-22)	1/22/19	13:35 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-BH01-CORCC-0.0/0.5-20190122 (180-86185-23)	1/22/19	14:00 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-BH01-CORCC-0.5/1.6-20190122 (180-86185-24)	1/22/19	14:00 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-BH01-CORRB-0.0/0.5-20190122 (180-86185-25)	1/22/19	14:25 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-BH03-CORRB-0.0/0.5-20190122 (180-86185-26)	1/22/19	14:45 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-BH03-CORRB-0.5/3.0-20190122 (180-86185-27)	1/22/19	14:45 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-BH03-CORRB-3.0/5.5-20190122 (180-86185-28)	1/22/19	14:45 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna

180-86185-02 Chain of Custody

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc. attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to TestAmerica Laboratories, Inc.

Possible Hazard Identification *Unconfirmed*	***Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)*** ☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:		Method of Shipment:	
Relinquished by:	Date/Time: 4/18/19 1700	Company: TAAL	Received by:	Date/Time: 4-19-19 08:45	Company: TA SR
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:		Cooler Temperature(s) °C and Other Remarks:		

Ver: 01/16/2019

Eurofins TestAmerica, Pittsburgh
301 Alpha Drive RIDC Park
Pittsburgh, PA 15238
Phone (412) 963-7058 Fax (412) 963-2468

Chain of Custody Record

eurofins | Environment Testing TestAmerica

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Lage, Gail	Carrier Tracking No(s):	COC No: 180-360542.4
Client Contact: Shipping/Receiving	Phone:	E-Mail: gail.lage@testamericainc.com	State of Origin: Tennessee	Page: Page 4 of 7
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note):		Job #: 180-86185-2
Address: 13715 Rider Trail North, ,	Due Date Requested: 5/16/2019			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: JOF_SED_20190122_1B	Project #: 18020000			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA
M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify)
Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	901.1_Ra/Dry_Grind Positive Combined Radium-226/228	Total Number of containers	Special Instructions/Note:
			Preservation Code:						
JOF-SED-BH03-CORCC-0.0/0.5-20190122 (180-86185-29)	1/22/19	15:20 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-BH03-CORCC-0.5/2.5-20190122 (180-86185-30)	1/22/19	15:20 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-BH03-CORLB-0.0/0.5-20190122 (180-86185-31)	1/22/19	15:45 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-BH03-CORLB-0.5/2.5-20190122 (180-86185-32)	1/22/19	15:45 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-BH03-CORLB-2.5/4.1-20190122 (180-86185-33)	1/22/19	15:45 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-IC01-DUP01-20190122 (180-86185-34)	1/22/19	Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-CV03-CORLB-0.0/0.5-20190123 (180-86185-37)	1/23/19	10:00 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-CV03-CORLB-0.5/2.5-20190123 (180-86185-38)	1/23/19	10:00 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-CV03-CORLB-2.5/5.3-20190123 (180-86185-39)	1/23/19	10:00 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna

180-86185-03 Chain of Custody

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc. attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to TestAmerica Laboratories, Inc.

Possible Hazard Identification *Unconfirmed*	***Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)*** ☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:		Time:	Method of Shipment:	
Relinquished by:	Date/Time: 4/18/19 1700	Company	Received by:	Date/Time: 4-19-19 08:45	Company TASTL
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:		Cooler Temperature(s) °C and Other Remarks:		

Ver: 01/16/2019

Eurofins TestAmerica, Pittsburgh
301 Alpha Drive RIDC Park
Pittsburgh, PA 15238
Phone (412) 963-7058 Fax (412) 963-2468

Chain of Custody Record

eurofins Environment Testing TestAmerica

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Lage, Gail	Carrier Tracking No(s):	COC No: 180-360542.5
Client Contact: Shipping/Receiving	Phone:	E-Mail: gail.lage@testamericainc.com	State of Origin: Tennessee	Page: Page 5 of 7
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note):		Job #: 180-86185-2
Address: 13715 Rider Trail North, ,	Due Date Requested: 5/16/2019			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: JOF_SED_20190122_1B	Project #: 18020000			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:

A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify)

Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	901.1_Ra/Dry_Grind Positive Combined Radium-226/228	Total Number of containers	Special Instructions/Note:
			Preservation Code:						
JOF-SED-CV03-CORCC-0.0/0.5-20190123 (180-86185-40)	1/23/19	10:53 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-CV03-CORRB-0.0/0.5-20190123 (180-86185-41)	1/23/19	11:10 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-CV03-CORRB-0.5/1.5-20190123 (180-86185-42)	1/23/19	11:10 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-CV03-CORRB-1.5/2.7-20190123 (180-86185-43)	1/23/19	11:10 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-CV02-CORLB-0.0/0.5-20190123 (180-86185-44)	1/23/19	12:25 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-CV02-CORLB-0.5/2.5-20190123 (180-86185-45)	1/23/19	12:25 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-CV02-CORCC-0.0/0.5-20190123 (180-86185-46)	1/23/19	12:45 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-CV02-CORCC-0.5/1.6-20190123 (180-86185-47)	1/23/19	12:45 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-CV02-CORRB-0.0/0.5-20190123 (180-86185-48)	1/23/19	13:05 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna

180-86185-04 Chain of Custody

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc. attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to TestAmerica Laboratories, Inc.

Possible Hazard Identification *Unconfirmed*	***Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)*** ☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:		Method of Shipment:		
Relinquished by:	Date/Time: 4/18/19 7:00	Company TAS	Received by:	Date/Time: 4-19-19 08:45	Company TASL	
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company	
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company	
Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:		Cooler Temperature(s) °C and Other Remarks:			

Ver: 01/16/2019

Eurofins TestAmerica, Pittsburgh
301 Alpha Drive RIDC Park
Pittsburgh, PA 15238
Phone (412) 963-7058 Fax (412) 963-2468

Chain of Custody Record

eurofins Environment Testing TestAmerica

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Lage, Gail	Carrier Tracking No(s):	COC No: 180-360542.6
Client Contact: Shipping/Receiving	Phone:	E-Mail: gail.lage@testamericainc.com	State of Origin: Tennessee	Page: Page 6 of 7
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note):		Job #: 180-86185-2
Address: 13715 Rider Trail North, ,	Due Date Requested: 5/16/2019			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: JOF_SED_20190122_1B	Project #: 18020000			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:

A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify)

Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	901.1_Ra/Dry_Grind Positive Combined Radium-226/228	Total Number of containers	Special Instructions/Note:
			Preservation Code:						
JOF-SED-CV02-CORRB-0.0/0.5-20190123 (180-86185-48DU)	1/23/19	13:05 Central	DU	Solid			X	4	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-CV02-DUP01-20190123 (180-86185-49)	1/23/19	Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-BH02-CORLB-0.0/0.5-20190124 (180-86185-51)	1/24/19	08:55 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-BH02-CORLB-0.5/3.0-20190124 (180-86185-52)	1/24/19	08:55 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-BH02-CORLB-3.0/4.7-20190124 (180-86185-53)	1/24/19	08:55 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-BH02-CORLB-4.7/5.7-20190124 (180-86185-54)	1/24/19	08:55 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-BH02-CORCC-0.0/0.5-20190124 (180-86185-56)	1/24/19	09:45 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-BH02-CORCC-0.5/1.7-20190124 (180-86185-57)	1/24/19	09:45 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-BH02-CORCC-1.7/3.0-20190124 (180-86185-58)	1/24/19	09:45 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna

180-86185-05 Chain of Custody

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc. attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to TestAmerica Laboratories, Inc.

Possible Hazard Identification
Unconfirmed

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*

Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:		Time:	Method of Shipment:	
Relinquished by:	Date/Time: 2/18/18 1700	Company: TAL	Received by:	Date/Time: 4-19-19 08:45	Company: TA STL
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No | Custody Seal No.:

Cooler Temperature(s) °C and Other Remarks:

Ver: 01/16/2019

Eurofins TestAmerica, Pittsburgh
301 Alpha Drive RIDC Park
Pittsburgh, PA 15238
Phone (412) 963-7058 Fax (412) 963-2468

Chain of Custody Record

eurofins Environment Testing TestAmerica

Client Information (Sub Contract Lab)

Client Contact: Shipping/Receiving
Company: TestAmerica Laboratories, Inc.
Address: 13715 Rider Trail North,
City: Earth City
State, Zip: MO, 63045
Phone: 314-298-8566(Tel) 314-298-8757(Fax)
Email:
Project Name: JOF_SED_20190122_1B
Site:

Sampler:
Phone:
Due Date Requested: 5/16/2019
TAT Requested (days):
PO #:
WO #:
Project #: 18020000
SSOW#:

Lab PM: Lage, Gail
E-Mail: gail.lage@testamericainc.com
Carrier Tracking No(s):
State of Origin: Tennessee
Accreditations Required (See note):

COC No: 180-360542.7
Page: Page 7 of 7
Job #: 180-86185-2

Analysis Requested

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	901.1_Ra/Dry_Grind Positive Combined Radium-226/228	Total Number of containers	Special Instructions/Note:
			Preservation Code:						
JOF-SED-BH02-CORCC-3.0/3.7-20190124 (180-86185-59)	1/24/19	09:45 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-BH02-CORRB-0.0/0.5-20190124 (180-86185-60)	1/24/19	11:00 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-IC01-CORRB-0.0/0.5-20190124 (180-86185-61)	1/24/19	12:05 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-IC01-CORCC-0.0/0.5-20190124 (180-86185-62)	1/24/19	12:25 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-IC01-CORLB-0.0/0.5-20190124 (180-86185-63)	1/24/19	12:35 Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna
JOF-SED-BH02-DUP01-20190124 (180-86185-64)	1/24/19	Central		Solid			X	2	TVA - Batch alone. Quarantine zone soil. Contact PM if insufficient volume for Tuna

180-86185-06 Chain of Custody

Preservation Codes:

A - HCL
B - NaOH
C - Zn Acetate
D - Nitric Acid
E - NaHSO4
F - MeOH
G - Amchlor
H - Ascorbic Acid
I - Ice
J - DI Water
K - EDTA
L - EDA
M - Hexane
N - None
O - AsNaO2
P - Na2O4S
Q - Na2SO3
R - Na2S2O3
S - H2SO4
T - TSP Dodecahydrate
U - Acetone
V - MCAA
W - pH 4-5
Z - other (specify)
Other:

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc. attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to TestAmerica Laboratories, Inc.

Possible Hazard Identification
Unconfirmed

Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*

Special Instructions/QC Requirements:

Empty Kit Relinquished by: Date: Time: Method of Shipment:

Relinquished by	Date/Time	Company	Received by	Date/Time	Company
[signature]	4/18/19 1700	[illegible]	[signature]	4-19-19 08:45	TAS

Custody Seals Intact: Δ Yes Δ No
Custody Seal No.:
Cooler Temperature(s) °C and Other Remarks:

Ver: 01/16/2019

Login Sample Receipt Checklist

Client: Environmental Standards Inc. Job Number: 180-86185-2

Login Number: 86185 **List Source: Eurofins TestAmerica, Pittsburgh**
List Number: 1
Creator: Say, Thomas C

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: Environmental Standards Inc.

Job Number: 180-86185-2

Login Number: 86185
List Number: 2
Creator: Hellm, Michael

List Source: Eurofins TestAmerica, St. Louis
List Creation: 01/31/19 12:03 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	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?	N/A	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	N/A	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: Environmental Standards Inc.

Job Number: 180-86185-2

Login Number: 86185
List Number: 3
Creator: Hellm, Michael

List Source: Eurofins TestAmerica, St. Louis
List Creation: 01/31/19 12:20 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	19.0
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?	N/A	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	N/A	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: Environmental Standards Inc.

Job Number: 180-86185-2

Login Number: 86185
List Number: 4
Creator: Hellm, Michael

List Source: Eurofins TestAmerica, St. Louis
List Creation: 04/22/19 01:36 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	0.1
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?	N/A	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	N/A	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

SECTION 5

PROJECT CORRESPONDENCE

Danielle Coles

From: Lage, Gail <Gail.Lage@testamericainc.com>
Sent: Tuesday, April 2, 2019 4:23 PM
To: Jennifer Gable; CSO – TVA Projects
Cc: Quinn, James Roy III; Rock J. Vitale; TVA_Deliverables; Amanda Cover; Romanko, Terry
Subject: RE: radium in sediment
Attachments: image001.png.html

Jen – we should have volume for all samples, but we won't really know how much volume we have until after we do the dry grind. We need about 325 grams of dry sample to fill the tuna can and based on the moisture content of these samples that may not be possible. We will pull all the volume from the non-RAD to maximize the volume.

Just to confirm, we should proceed with re-analysis with the dry grind on the same samples that were originally run, correct? Is there any site that is higher priority then any other?

Thanks

Gail Lage

Phone: 615-301-5741

E-mail: Gail.Lage@testamericainc.com

From: Jennifer Gable [mailto:jgable@envstd.com]
Sent: Monday, April 01, 2019 3:58 PM
To: Lage, Gail; CSO – TVA Projects
Cc: Quinn, James Roy III; Rock J. Vitale; TVA_Deliverables; Amanda Cover; Romanko, Terry
Subject: radium in sediment
Importance: High

External Email

Good afternoon:

Please provide a listing of **sediment** samples for which TestAmerica has retained sample volume sufficient to perform radium reanalyses on **dried** material.

We'd appreciate if you can provide this information by COB tomorrow. Please let me know if this deadline will not be achievable. Please advise if we need a call.

Thank you
Jen

Jennifer N. Gable
Associate Principal Chemist
Environmental Standards, Inc.
1140 Valley Forge Road • PO Box 810 • Valley Forge, PA 19482
610.935.5577 ext. 414 • www.envstd.com • jgable@envstd.com

Danielle Coles

From: Lage, Gail <Gail.Lage@testamericainc.com>
Sent: Thursday, July 11, 2019 2:19 PM
To: Andrew Piasecki; Jennifer Gable; CSO – TVA Projects
Cc: Amanda Cover; DeAnna Aungst; TVA_Deliverables; Danielle Coles
Subject: RE: radium in sediment

Yes -

Gail Lage
Senior Project Manager

Eurofins TestAmerica
2960 Foster Creighton Drive
Nashville, TN 37204
USA

Phone: 615-301-5741

From: Andrew Piasecki [mailto:apiasecki@envstd.com]
Sent: Thursday, July 11, 2019 1:15 PM
To: Lage, Gail; Jennifer Gable; CSO – TVA Projects
Cc: Amanda Cover; DeAnna Aungst; TVA_Deliverables; Danielle Coles
Subject: RE: radium in sediment

[redacted]

Hi Gail,

Just for clarification purposes, please also provide revisions to include the equipment and field blanks in these SDGs:

180-85727-2
490-161170-3
490-161630-3
180-86185-2
180-85168-2

Thanks,
Andrew

From: Lage, Gail <Gail.Lage@testamericainc.com>
Sent: Tuesday, July 9, 2019 1:23 PM
To: Jennifer Gable <jgable@envstd.com>; CSO – TVA Projects <TVAProjects@testamericainc.com>
Cc: Amanda Cover <ACover@envstd.com>; Andrew Piasecki <apiasecki@envstd.com>; DeAnna Aungst <DAungst@envstd.com>; TVA_Deliverables <tva_deliverables@envstd.com>
Subject: RE: radium in sediment

It looks like my mistake – the hold didn't get carryover when I added the re-analysis with the dry grind. I can remove them from the revision since they were not requested.

Gail Lage
Senior Project Manager

Eurofins TestAmerica
2960 Foster Creighton Drive
Nashville, TN 37204
USA

Phone: 615-301-5741

From: Jennifer Gable [mailto:jgable@envstd.com]
Sent: Tuesday, July 09, 2019 12:09 PM
To: Lage, Gail; CSO – TVA Projects
Cc: Amanda Cover; Andrew Piasecki; DeAnna Aungst; TVA_Deliverables
Subject: FW: radium in sediment

External Email

Hi Gail,

Please see below. According to our records, the samples in 180-86185-2 (originally 180-86185-1) were not taken off hold. Can you find out why these were analyzed for radium?

Thanks
Jen

Jennifer N. Gable
Associate Principal Chemist
Environmental Standards, Inc.
(610) 935.5577 x 414

From: DeAnna Aungst
Sent: Friday, July 5, 2019 2:34 PM
To: Jennifer Gable <jgable@envstd.com>; Amanda Cover <ACover@envstd.com>; Danielle Coles <dcoles@envstd.com>; Andrew Piasecki <apiasecki@envstd.com>
Cc: TVA_Deliverables <tva_deliverables@envstd.com>
Subject: FW: radium in sediment

For 180-86185-2 (originally 180-86185-1), it appears that the samples that were previously on hold were analyzed/reported with the Dry Grind/Tuna Can adjustment. Can someone confirm whether the HOLD samples were supposed to be reported/analyzed?

For all of the Sediment revisions, it appears that any Aqueous samples (EB/FBs) originally reported in the -1 SDGs were NOT re-reported in the -2 SDGs. I am going to reach out to TA to ask that they include the blanks in the reports/EDDs. I would like to be sure that the HOLD samples should indeed have been reported, as well, prior to requesting the revisions.

From: Lage, Gail <Gail.Lage@testamericainc.com>
Sent: Tuesday, April 2, 2019 4:23 PM

To: Jennifer Gable <jgable@envstd.com>; CSO – TVA Projects <TVAProjects@testamericainc.com>
Cc: Quinn, James Roy III <jrquinn@tva.gov>; Rock J. Vitale <rvitale@envstd.com>; TVA_Deliverables <tva_deliverables@envstd.com>; Amanda Cover <ACover@envstd.com>; Romanko, Terry <Terry.Romanko@testamericainc.com>
Subject: RE: radium in sediment

Jen – we should have volume for all samples, but we won't really know how much volume we have until after we do the dry grind. We need about 325 grams of dry sample to fill the tuna can and based on the moisture content of these samples that may not be possible. We will pull all the volume from the non-RAD to maximize the volume.

Just to confirm, we should proceed with re-analysis with the dry grind on the same samples that were originally run, correct? Is there any site that is higher priority then any other?

Thanks

Gail Lage

Phone: 615-301-5741

E-mail: Gail.Lage@testamericainc.com

From: Jennifer Gable [mailto:jgable@envstd.com]
Sent: Monday, April 01, 2019 3:58 PM
To: Lage, Gail; CSO – TVA Projects
Cc: Quinn, James Roy III; Rock J. Vitale; TVA_Deliverables; Amanda Cover; Romanko, Terry
Subject: radium in sediment
Importance: High

External Email

Good afternoon:

Please provide a listing of **sediment** samples for which TestAmerica has retained sample volume sufficient to perform radium reanalyses on **dried** material.

We'd appreciate if you can provide this information by COB tomorrow. Please let me know if this deadline will not be achievable. Please advise if we need a call.

Thank you
Jen

Jennifer N. Gable
Associate Principal Chemist
Environmental Standards, Inc.
1140 Valley Forge Road • PO Box 810 • Valley Forge, PA 19482
610.935.5577 ext. 414 • www.envstd.com • jgable@envstd.com

Emergency Response Quality Assurance Hotline: 855.374.7272

Amanda Cover

From: Lage, Gail <Gail.Lage@testamericainc.com>
Sent: Tuesday, July 30, 2019 1:09 PM
To: Jennifer Gable; Andrew Piasecki; CSO – TVA Projects
Cc: TVA_Deliverables; Amanda Cover; Danielle Coles; Ammie Martin; Rock J. Vitale; Vicinie, Rusty; Carnes, Jodie
Subject: RE: TVA TDEC - Method 901.1 Combined Rad Uncertainty Calc
Attachments: CAR 901.1 Ra-226 + Ra-228 Uncertainty.pdf; 901.1_uncertainties_072619.pdf

Jen – I apologize for the delay. Attached is the letter and updated table. Please let me know if you need anything else.

Thanks

Gail Lage
Senior Project Manager

Eurofins TestAmerica
2960 Foster Creighton Drive
Nashville, TN 37204
USA

Phone: 615-301-5741

From: Jennifer Gable [mailto:jgable@envstd.com]
Sent: Friday, July 26, 2019 11:34 AM
To: Andrew Piasecki; Lage, Gail; CSO – TVA Projects
Cc: TVA_Deliverables; Amanda Cover; Danielle Coles; Ammie Martin; Rock J. Vitale; Vicinie, Rusty; Carnes, Jodie
Subject: RE: TVA TDEC - Method 901.1 Combined Rad Uncertainty Calc
Importance: High

Eurofins Email

Can we please get an update on this issue? We are holding data finalization pending resolution.

Thanks
Jen

Jennifer N. Gable
Associate Principal Chemist
Environmental Standards, Inc.
(610) 935.5577 x 414

From: Andrew Piasecki <apiasecki@envstd.com>
Sent: Monday, July 22, 2019 5:02 PM
To: Lage, Gail <Gail.Lage@testamericainc.com>; Jennifer Gable <jgable@envstd.com>; CSO – TVA Projects <TVAProjects@testamericainc.com>
Cc: TVA_Deliverables <tva_deliverables@envstd.com>; Amanda Cover <ACover@envstd.com>; Danielle Coles <dcoles@envstd.com>; Ammie Martin <amartin@envstd.com>; Rock J. Vitale <rvitale@envstd.com>
Subject: RE: TVA TDEC - Method 901.1 Combined Rad Uncertainty Calc

Hi Gail,

Attached are outstanding email requests for the "older" radium samples. We need to have these radium data requests resolved by the end of this week (or sooner). This includes the combined radium uncertainty calcuation issues. Do you have any updates?

Thanks,
Andrew

From: Andrew Piasecki
Sent: Wednesday, July 17, 2019 4:45 PM
To: 'Lage, Gail' <Gail.Lage@testamericainc.com>; Jennifer Gable <jgable@envstd.com>; CSO – TVA Projects <TVAProjects@testamericainc.com>
Cc: TVA_Deliverables <tva_deliverables@envstd.com>; Amanda Cover <ACover@envstd.com>; Danielle Coles <dcoles@envstd.com>; Ammie Martin <amartin@envstd.com>; Rock J. Vitale <rvitale@envstd.com>
Subject: RE: TVA TDEC - Method 901.1 Combined Rad Uncertainty Calc

Hi Gail,

These samples were not included in the spreadsheet that I sent on July 5th. Please include them in your review:

Sample Name	analytic_method	lab_sdg	lab_sample_id	Reported Uncertainty for Radium-226+228
JOF-SED-BH02-CORRB-0.0/0.5-20190124	EPA 901.1	180861851	180-86185-60	0.200
JSF-CCR-FB16-20190423	EPA 901.1	180894481	180-89448-5	19.1
JSF-CCR-EB03-20190409	EPA 901.1	180888511	180-88851-4	15.2
JSF-CCR-EB05-20190501	EPA 901.1	180896681	180-89668-1	12.2
JSF-CCR-FB19-20190501	EPA 901.1	180896681	180-89668-5	0.00000
JSF-CCR-FB20-20190513	EPA 901.1	180901011	180-90101-1	19.7
JSF-CCR-FB21-20190514	EPA 901.1	180901041	180-90104-1	0.00000

Thanks,
Andrew

From: Lage, Gail <Gail.Lage@testamericainc.com>
Sent: Wednesday, July 10, 2019 6:39 PM
To: Jennifer Gable <jgable@envstd.com>; Andrew Piasecki <apiasecki@envstd.com>; CSO – TVA Projects <TVAProjects@testamericainc.com>
Cc: TVA_Deliverables <tva_deliverables@envstd.com>; Amanda Cover <ACover@envstd.com>; Danielle Coles <dcoles@envstd.com>; Ammie Martin <amartin@envstd.com>; Rock J. Vitale <rvitale@envstd.com>
Subject: RE: TVA TDEC - Method 901.1 Combined Rad Uncertainty Calc

Jen – understood.

Thanks

Gail Lage

Senior Project Manager

Eurofins TestAmerica
2960 Foster Creighton Drive
Nashville, TN 37204
USA

Phone: 615-301-5741

From: Jennifer Gable [mailto:jgable@envstd.com]
Sent: Wednesday, July 10, 2019 5:25 PM
To: Andrew Piasecki; Lage, Gail; CSO – TVA Projects
Cc: TVA_Deliverables; Amanda Cover; Danielle Coles; Ammie Martin; Rock J. Vitale
Subject: RE: TVA TDEC - Method 901.1 Combined Rad Uncertainty Calc

External Email

Hi Gail,

To proceed with our proposed plan below, we need Eurofins TestAmerica to provide confirmation, on your letterhead, of the corrected uncertainties for the samples impacted by this issue. You're welcome to use our calculation spreadsheet or perform your own calculations, but we won't be able to perform any updates until this information is provided formally by Eurofins TestAmerica.

Please let me know if you have any questions.

Thanks
Jen

Jennifer N. Gable
Associate Principal Chemist
Environmental Standards, Inc.
(610) 935.5577 x 414

From: Andrew Piasecki
Sent: Friday, July 5, 2019 1:31 PM
To: Lage, Gail <Gail.Lage@testamericainc.com>; CSO – TVA Projects <TVAProjects@testamericainc.com>
Cc: TVA_Deliverables <tva_deliverables@envstd.com>; Jennifer Gable <jgable@envstd.com>; Amanda Cover <ACover@envstd.com>; Danielle Coles <dcoles@envstd.com>; Ammie Martin <amartin@envstd.com>; Rock J. Vitale <rvitale@envstd.com>
Subject: RE: TVA TDEC - Method 901.1 Combined Rad Uncertainty Calc

Hi Gail,

The uncertainties associated the negative results should be used to calculate the total uncertainty for combined radium 226+228 similar to the way it is being reported for methods 903.0 and 904.0. The reported uncertainty for combined radium-226+228 should be calculated as the combined uncertainty of the individual isotope results, calculated as the square root of the sum of the squared individual uncertainties (see the equation below).

Our plan is to write a memo and manually update the database with the correct uncertainties for combined radium 226+228. I've attached a spreadsheet comparing the currently reported uncertainties to the uncertainties calculated using the equation listed below. Please review the calculated uncertainties (column AG of the attachment), and confirm

that they are correct. Upon your confirmation, we will manually update the database. Also, please ensure that the uncertainties for combined rad 226+228 are calculated and reported correctly for all data going forward.

$$\text{Total uncertainty for combined Rad 226 and 228} = \sqrt{(\text{rad 226 uncertainty})^2 + (\text{rad 228 uncertainty})^2}$$

Thank you,

Andrew L. Piasecki
Quality Assurance Chemist
Environmental Standards, Inc.
1140 Valley Forge Road • PO Box 810 • Valley Forge, PA 19482
610.935.5577 ext. 433 • www.envstd.com • apiasecki@envstd.com

Emergency Response Quality Assurance Hotline: 855.374.7272

ENVIRONMENTAL® STANDARDS

From: Lage, Gail [mailto:Gail.Lage@testamericainc.com]
Sent: Wednesday, June 26, 2019 6:25 PM
To: Jennifer Gable <jgable@envstd.com>; Andrew Piasecki <apiasecki@envstd.com>; CSO – TVA Projects <TVAProjects@testamericainc.com>
Cc: TVA_Deliverables <tva_deliverables@envstd.com>; Amanda Cover <ACover@envstd.com>; Danielle Coles <dcoles@envstd.com>; Ammie Martin <amartin@envstd.com>; Rock J. Vitale <rvitale@envstd.com>
Subject: RE: TVA TDEC - Method 901.1 Combined Rad Uncertainty Calc

I know why it is doing what it is doing. For the results, only the positive numbers are used to calculate the total for TVA. Therefore it is not using the uncertainty from the negative result to calculate the total uncertainty.

Gail Lage
Senior Project Manager

Eurofins TestAmerica
2960 Foster Creighton Drive
Nashville, TN 37204
USA

Phone: 615-301-5741

From: Jennifer Gable [mailto:jgable@envstd.com]
Sent: Wednesday, June 26, 2019 1:22 PM
To: Andrew Piasecki; CSO – TVA Projects
Cc: TVA_Deliverables; Amanda Cover; Danielle Coles; Ammie Martin; Rock J. Vitale
Subject: RE: TVA TDEC - Method 901.1 Combined Rad Uncertainty Calc
Importance: High

External Email

Gail - please hold on this request for now, we have some thoughts on resolution that I'd like to discuss internally. We'll get back to you shortly.

Jennifer N. Gable
Associate Principal Chemist
Environmental Standards, Inc.
(610) 935.5577 x 414

From: Andrew Piasecki
Sent: Wednesday, June 26, 2019 1:40 PM
To: CSO – TVA Projects <TVAProjects@testamericainc.com>
Cc: TVA_Deliverables <tva_deliverables@envstd.com>; Amanda Cover <ACover@envstd.com>; Jennifer Gable <jgable@envstd.com>; Danielle Coles <dcoles@envstd.com>; Ammie Martin <amartin@envstd.com>; Rock J. Vitale <rvitale@envstd.com>
Subject: TVA TDEC - Method 901.1 Combined Rad Uncertainty Calc

Hi Gail,

For the Method 901.1 rad data, it appears that the total uncertainties for combined radium 226+228 were not reported correctly when a negative value was reported for one (or both) of the isotopes. In these instances, it appears that the uncertainty for the isotope was treated as zero instead of being calculated as part of the root sum square. For example, in SDG 180-87481-1, the results for sample 180-87481-2 were reported as:

Method 901.1	Result (pCI/g)	Uncertainty
Rad-226	0.391	0.173
Rad-228	-0.221	0.528
Combined Rad 226+228	0.391	0.173

According to the reporting protocols, the combined rad 226+228 uncertainty should have been reported as ~0.556 in this example.

I've attached a list of samples where this issue has been identified. Please review the total uncertainty calculations and revise the data as appropriate.

Thank you,

Andrew L. Piasecki
Quality Assurance Chemist
Environmental Standards, Inc.
1140 Valley Forge Road • PO Box 810 • Valley Forge, PA 19482
610.935.5577 ext. 433 • www.envstd.com • apiasecki@envstd.com

Emergency Response Quality Assurance Hotline: 855.374.7272

ENVIRONMENTAL® STANDARDS

From: Ammie Martin
Sent: Friday, June 21, 2019 2:10 PM
To: Andrew Piasecki <apiasecki@envstd.com>
Subject: Total Uncertainty Calculation Discrepancy

During review of report 180-87481-1, it was noted that the total uncertainty (2σ) for combined radium-226/-228 in the US EPA Method 901.1 portion of sample 180-87481-2 did not take into account the result from the radium-228 analysis. The total uncertainty (2σ) reported was equal to that of radium-226. This is not consistent with the calculation of the total uncertainty (2σ) for combined radium-226/-228 in the other methods or samples reported. It appears that the system used zero for the radium-228 total uncertainty (2σ) in the calculation in the same manner it used zero for the negative radium-228 activity when calculating the combined radium-226/-228 activity. For all US EPA Method 901.1 samples where both components were positive (whether > MDC or < MDC) and for all GFPC samples, the total uncertainty was correctly calculated as the root sum square (RSS; the square root of the sum of the squared individual uncertainties).

Ammie Martin
Corporate Quality Assurance and Training Specialist/
Senior Quality Assurance Chemist
Environmental Standards, Inc.
1140 Valley Forge Road • PO Box 810 • Valley Forge, PA 19482
610.935.5577 x429 • www.envstd.com • amartin@envstd.com

Emergency Response Quality Assurance Hotline: 855.374.7272
<image001.gif>

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July 30, 2019

Environmental Standards, Inc.
1140 Valley Forge Road
Valley Forge, PA 19482

RE: EPA 901.1 Radium-226 + Radium-228, Incorrect Uncertainty Calculation

Dear Ms. Gable

It was recently discovered that sample uncertainty was being incorrectly calculated for the summation analyte Radium-226 + Radium-228 by EPA method 901.1. When either of the analyte results was negative, the uncertainty for that analyte was being set to zero.

Environmental Standards provided Eurofins TestAmerica with a spreadsheet of affected data that included the corrected uncertainty. This spreadsheet was then validated by the Quality Assurance Manager on July 26th, 2019. One error was found (sample JOF-SED-BH02-CORRB-0.0/0.5-20190124, lab ID 180-86185-60). This was corrected, and a PDF of the spreadsheet has been included (see attachment "901.1_uncertainties_072619").

The uncertainty calculation for Ra-226 + Ra-228 has been corrected by the Eurofins TestAmerica IT department, and has been verified by Terry Romanko, the Technical Director at the St. Louis facility.

Eurofins TestAmerica St. Louis prides itself on supplying its clients with reliable quality data. We deeply apologize for the calculation error and any difficulties this may have caused.

Regards,

Kristen Ely
Quality Assurance Manager
Kristen.Ely@testamericainc.com