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ANALYTICAL REPORT

Eurofins TestAmerica, Pittsburgh
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RIDC Park
Pittsburgh, PA 15238
Tel: (412)963-7058

Laboratory Job ID: 180-93098-1
Client Project/Site: JSF_STR_20190718_3B

For:
Environmental Standards Inc.
1140 Valley Forge Road
PO BOX 810
Valley Forge, Pennsylvania 19482-0810

Attn: Amanda Cover

Authorized for release by:
9/13/2019 4:24:27 PM

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

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

PA Lab ID: 02-00416

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Job ID: 180-93098-1

Laboratory: Eurofins TestAmerica, Pittsburgh

Narrative

Job Narrative
180-93098-1

Receipt
The samples were received on 7/23/2019 9:20 AM; the samples arrived in good condition, properly preserved and on ice. The temperature of the cooler at receipt was 0.6º C.

RAD
Method 903.0: Ra-226 Prep Batch 160-436764
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.
JSF-STR-PB09-CC-SUR-20190718 ~ STR-PB09 (180-93098-1), JSF-STR-PB08-CC-SUR-20190718 ~ STR-PB08 (180-93098-2), JSF-STR-PB07-CC-SUR-20190718 ~ STR-PB07 (180-93098-3), JSF-STR-PB06-CC-SUR-20190718 ~ STR-PB06 (180-93098-4), (LCS 160-436764/1-A), (MB 160-436764/18-A), (180-93047-A-9-A) and (180-93047-C-9-A DU)

Method 904.0: Ra-228 Prep Batch 160-436768
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.
JSF-STR-PB09-CC-SUR-20190718 ~ STR-PB09 (180-93098-1), JSF-STR-PB08-CC-SUR-20190718 ~ STR-PB08 (180-93098-2), JSF-STR-PB07-CC-SUR-20190718 ~ STR-PB07 (180-93098-3), JSF-STR-PB06-CC-SUR-20190718 ~ STR-PB06 (180-93098-4), (LCS 160-436768/1-A), (MB 160-436768/18-A), (180-93047-A-9-B) and (180-93047-C-9-B DU)

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

Definitions/Glossary

Client: Environmental Standards Inc.
Project/Site: JSF_STR_20190718_3B

Job ID: 180-93098-1

Qualifiers

Rad

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

Glossary

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

Accreditation/Certification Summary

Client: Environmental Standards Inc.
Project/Site: JSF_STR_20190718_3B

Job ID: 180-93098-1

Laboratory: Eurofins TestAmerica, Pittsburgh

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Arkansas DEQ	State	19-033-0	06-27-20
Arkansas DEQ	State Program	88-0690	06-27-20
California	State	2891	04-30-20
California	State Program	2891	04-30-20
Connecticut	State	PH-0688	09-30-20
Connecticut	State Program	PH-0688	09-30-20
Florida	NELAP	E871008	06-30-20
Florida	NELAP	E871008	06-30-20
Illinois	NELAP	200005	06-30-20
Illinois	NELAP	004375	06-30-20
Kansas	NELAP	E-10350	01-31-20
Kansas	NELAP	E-10350	03-31-20
Kentucky (UST)	State Program	162013	04-30-20
Kentucky (WW)	State	KY98043	12-31-19
Kentucky (WW)	State Program	KY98043	12-31-19
Louisiana	NELAP	04041	06-30-20
Minnesota	NELAP	042-999-482	12-31-19
Minnesota	NELAP	042-999-482	12-31-19
Nevada	State	PA00164	07-31-20
Nevada	State Program	PA00164	07-31-20
New Hampshire	NELAP	2030	04-04-20
New Jersey	NELAP	PA005	06-30-20
New Jersey	NELAP	PA005	06-30-20
New York	NELAP	11182	03-31-20
New York	NELAP	11182	04-01-20
North Carolina (WW/SW)	State Program	434	12-31-19
North Dakota	State	R-227	04-30-20
North Dakota	State Program	R-227	04-30-20
Oregon	NELAP	PA-2151	02-06-20
Oregon	NELAP	PA-2151	02-06-20
Pennsylvania	NELAP	02-00416	04-30-20
Pennsylvania	NELAP	02-00416	04-30-20
Rhode Island	State	LAO00362	12-30-19
Rhode Island	State Program	LAO00362	12-30-19
South Carolina	State Program	89014	04-30-20
Texas	NELAP	T104704528-15-2	03-31-20
Texas	NELAP	T104704528	03-31-20
US Fish & Wildlife	US Federal Programs	058448	07-31-20
USDA	Federal	P-Soil-01	06-26-22
USDA	US Federal Programs	P330-16-00211	06-26-22
Utah	NELAP	PA001462015-4	05-31-20
Utah	NELAP	PA001462019-8	05-31-20
Virginia	NELAP	460189	09-14-19
Virginia	NELAP	10043	09-14-19
West Virginia DEP	State	142	01-31-20
West Virginia DEP	State Program	142	01-31-20
Wisconsin	State	998027800	08-31-20
Wisconsin	State Program	998027800	08-31-20

Accreditation/Certification Summary

Client: Environmental Standards Inc.
Project/Site: JSF_STR_20190718_3B

Job ID: 180-93098-1

Laboratory: Eurofins TestAmerica, St. Louis

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
ANAB	Dept. of Defense ELAP	L2305	04-06-22
ANAB	Dept. of Energy	L2305.01	04-06-22
ANAB	DoD	L2305	04-06-22
ANAB	DOE	L2305.01	04-06-22
ANAB	ISO/IEC 17025	L2305	04-06-22
Arizona	State	AZ0813	12-08-19
Arizona	State Program	AZ0813	12-08-19
California	State	2886	06-30-20
California	State Program	2886	06-30-20
Connecticut	State	PH-0241	03-31-21
Connecticut	State Program	PH-0241	03-31-21
Florida	NELAP	E87689	06-30-20
Florida	NELAP	E87689	06-30-20
Hawaii	State Program	NA	06-30-20
HI - RadChem Recognition	State	n/a	06-30-20
Illinois	NELAP	200023	11-30-19
Illinois	NELAP	004553	11-30-19
Iowa	State Program	373	12-01-20
Kansas	NELAP	E-10236	10-31-19
Kentucky (DW)	State	KY90125	12-31-19
Kentucky (DW)	State Program	KY90125	12-31-19
Louisiana	NELAP	04080	06-30-20
Louisiana (DW)	NELAP	LA011	12-31-19
Louisiana (DW)	State	LA011	12-31-19
Maryland	State	310	09-30-20
Maryland	State Program	310	09-30-20
MI - RadChem Recognition	State	9005	06-30-20
Michigan	State Program	9005	06-30-20
Missouri	State	780	06-30-22
Missouri	State Program	780	06-30-20
Nevada	State	MO000542020-1	07-31-20
New Jersey	NELAP	MO002	06-30-20
New Jersey	NELAP	MO002	06-30-20
New York	NELAP	11616	03-31-20
New York	NELAP	11616	04-01-20
North Dakota	State	R-207	06-30-20
North Dakota	State Program	R207	06-30-20
NRC	NRC	24-24817-01	12-31-22
Oklahoma	State	9997	08-31-20
Oklahoma	State Program	9997	08-31-20
Pennsylvania	NELAP	68-00540	02-28-20
Pennsylvania	NELAP	68-00540	02-28-20
South Carolina	State Program	85002001	06-30-20
Texas	NELAP	T104704193-19-14	07-31-20
Texas	NELAP	T104704193-19-13	07-31-20
US Fish & Wildlife	Federal	058448	07-31-20
US Fish & Wildlife	US Federal Programs	058448	07-31-20
USDA	Federal	P330-17-0028	02-02-20
USDA	US Federal Programs	P330-17-00028	02-02-20
Utah	NELAP	MO000542019-11	07-31-20

Accreditation/Certification Summary

Client: Environmental Standards Inc.
Project/Site: JSF_STR_20190718_3B

Job ID: 180-93098-1

Laboratory: Eurofins TestAmerica, St. Louis (Continued)

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Virginia	NELAP	460230	06-14-20
Virginia	NELAP	10310	06-14-20
Washington	State Program	C592	08-30-19 *
West Virginia DEP	State Program	381	08-31-19 *

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Sample Summary

Client: Environmental Standards Inc.
Project/Site: JSF_STR_20190718_3B

Job ID: 180-93098-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
180-93098-1	JSF-STR-PB09-CC-SUR-20190718 ~ STR-PB09	Water	07/18/19 13:45	07/23/19 09:20	
180-93098-2	JSF-STR-PB08-CC-SUR-20190718 ~ STR-PB08	Water	07/18/19 14:35	07/23/19 09:20	
180-93098-3	JSF-STR-PB07-CC-SUR-20190718 ~ STR-PB07	Water	07/18/19 15:05	07/23/19 09:20	
180-93098-4	JSF-STR-PB06-CC-SUR-20190718 ~ STR-PB06	Water	07/18/19 15:45	07/23/19 09:20	

Method Summary

Client: Environmental Standards Inc.
Project/Site: JSF_STR_20190718_3B

Job ID: 180-93098-1

Method	Method Description	Protocol	Laboratory
903.0	Radium-226 (GFPC)	EPA	TAL SL
904.0	Radium-228 (GFPC)	EPA	TAL SL
Ra226_Ra228 Pos	Combined Radium-226 and Radium-228	TAL-STL	TAL SL
PrecSep STD	Preparation, Precipitate Separation (Standard In-Growth)	None	TAL SL
PrecSep_0	Preparation, Precipitate Separation	None	TAL SL

Protocol References:

EPA = US Environmental Protection Agency

None = None

TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

Laboratory References:

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

Lab Chronicle

Client: Environmental Standards Inc.
Project/Site: JSF_STR_20190718_3B

Job ID: 180-93098-1

Client Sample ID: JSF-STR-PB09-CC-SUR-20190718 ~ STR-PB09

Lab Sample ID: 180-93098-1

Date Collected: 07/18/19 13:45
Date Received: 07/23/19 09:20

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep STD			1000.02 mL	1.0 g	436764	07/26/19 13:33	ORM	TAL SL
Total/NA	Analysis	903.0		1	1.0 mL	1.0 mL	441511	08/31/19 17:52	KLS	TAL SL
	Instrument ID:	GFPCBLUE								
Total/NA	Prep	PrecSep_0			1000.02 mL	1.0 g	436768	07/26/19 14:09	ORM	TAL SL
Total/NA	Analysis	904.0		1			441352	08/30/19 14:47	KLS	TAL SL
	Instrument ID:	GFPCPURPLE								
Total/NA	Analysis	Ra226_Ra228 Pos		1			442871	09/13/19 14:36	SMP	TAL SL
	Instrument ID:	NOEQUIP								

Client Sample ID: JSF-STR-PB08-CC-SUR-20190718 ~ STR-PB08

Lab Sample ID: 180-93098-2

Date Collected: 07/18/19 14:35
Date Received: 07/23/19 09:20

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep STD			1000.19 mL	1.0 g	436764	07/26/19 13:33	ORM	TAL SL
Total/NA	Analysis	903.0		1			442151	09/08/19 19:00	CDR	TAL SL
	Instrument ID:	GFPCBLUE								
Total/NA	Prep	PrecSep_0			1000.19 mL	1.0 g	436768	07/26/19 14:09	ORM	TAL SL
Total/NA	Analysis	904.0		1			441488	08/30/19 14:44	KLS	TAL SL
	Instrument ID:	GFPCORANGE								
Total/NA	Analysis	Ra226_Ra228 Pos		1			442871	09/13/19 14:36	SMP	TAL SL
	Instrument ID:	NOEQUIP								

Client Sample ID: JSF-STR-PB07-CC-SUR-20190718 ~ STR-PB07

Lab Sample ID: 180-93098-3

Date Collected: 07/18/19 15:05
Date Received: 07/23/19 09:20

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep STD			1000.04 mL	1.0 g	436764	07/26/19 13:33	ORM	TAL SL
Total/NA	Analysis	903.0		1	1.0 mL	1.0 mL	441511	08/31/19 18:55	KLS	TAL SL
	Instrument ID:	GFPCBLUE								
Total/NA	Prep	PrecSep_0			1000.04 mL	1.0 g	436768	07/26/19 14:09	ORM	TAL SL
Total/NA	Analysis	904.0		1			441488	08/30/19 14:44	KLS	TAL SL
	Instrument ID:	GFPCORANGE								
Total/NA	Analysis	Ra226_Ra228 Pos		1			442871	09/13/19 14:36	SMP	TAL SL
	Instrument ID:	NOEQUIP								

Lab Chronicle

Client: Environmental Standards Inc.
Project/Site: JSF_STR_20190718_3B

Job ID: 180-93098-1

Client Sample ID: JSF-STR-PB06-CC-SUR-20190718 ~ STR-PB06

Lab Sample ID: 180-93098-4

Date Collected: 07/18/19 15:45
Date Received: 07/23/19 09:20

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep STD			1000.63 mL	1.0 g	436764	07/26/19 13:33	ORM	TAL SL
Total/NA	Analysis	903.0		1			442151	09/08/19 19:00	CDR	TAL SL
	Instrument ID:	GFPCBLUE								
Total/NA	Prep	PrecSep_0			1000.63 mL	1.0 g	436768	07/26/19 14:09	ORM	TAL SL
Total/NA	Analysis	904.0		1			441488	08/30/19 14:44	KLS	TAL SL
	Instrument ID:	GFPCORANGE								
Total/NA	Analysis	Ra226_Ra228 Pos		1			442871	09/13/19 14:36	SMP	TAL SL
	Instrument ID:	NOEQUIP								

Laboratory References:

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

Analyst References:

Lab: TAL SL

Batch Type: Prep

ORM = Octavia Moore

Batch Type: Analysis

CDR = Conrad Reuscher

KLS = Kody Saulters

SMP = Siobhan Perry

Client Sample Results

Client: Environmental Standards Inc.
Project/Site: JSF_STR_20190718_3B

Job ID: 180-93098-1

Client Sample ID: JSF-STR-PB09-CC-SUR-20190718 ~ STR-PB09

Lab Sample ID: 180-93098-1

Date Collected: 07/18/19 13:45
Date Received: 07/23/19 09:20

Matrix: Water

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.160	U	0.184	0.184	1.00	0.298	pCi/L	07/26/19 13:33	08/31/19 17:52	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*74.3*		*40 - 110*	*07/26/19 13:33*	*08/31/19 17:52*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.217	U	0.327	0.327	1.00	0.548	pCi/L	07/26/19 14:09	08/30/19 14:47	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*74.3*		*40 - 110*	*07/26/19 14:09*	*08/30/19 14:47*	*1*
Y Carrier	*89.7*		*40 - 110*	*07/26/19 14:09*	*08/30/19 14:47*	*1*

Method: Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.376	U	0.375	0.375	5.00		pCi/L		09/13/19 14:36	1

Client Sample Results

Client: Environmental Standards Inc.
Project/Site: JSF_STR_20190718_3B

Job ID: 180-93098-1

Client Sample ID: JSF-STR-PB08-CC-SUR-20190718 ~ STR-PB08

Lab Sample ID: 180-93098-2

Date Collected: 07/18/19 14:35
Date Received: 07/23/19 09:20

Matrix: Water

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.0419	U	0.0563	0.0564	1.00	0.138	pCi/L	07/26/19 13:33	09/08/19 19:00	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*80.8*		*40 - 110*	*07/26/19 13:33*	*09/08/19 19:00*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.310	U	0.272	0.273	1.00	0.434	pCi/L	07/26/19 14:09	08/30/19 14:44	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*80.8*		*40 - 110*	*07/26/19 14:09*	*08/30/19 14:44*	*1*
Y Carrier	*91.6*		*40 - 110*	*07/26/19 14:09*	*08/30/19 14:44*	*1*

Method: Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.310	U	0.278	0.279	5.00		pCi/L		09/13/19 14:36	1

Client Sample Results

Client: Environmental Standards Inc.
Project/Site: JSF_STR_20190718_3B

Job ID: 180-93098-1

Client Sample ID: JSF-STR-PB07-CC-SUR-20190718 ~ STR-PB07

Lab Sample ID: 180-93098-3

Date Collected: 07/18/19 15:05
Date Received: 07/23/19 09:20

Matrix: Water

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.122	U	0.158	0.158	1.00	0.377	pCi/L	07/26/19 13:33	08/31/19 18:55	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*60.2*		*40 - 110*	*07/26/19 13:33*	*08/31/19 18:55*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.224	U	0.382	0.383	1.00	0.646	pCi/L	07/26/19 14:09	08/30/19 14:44	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*60.2*		*40 - 110*	*07/26/19 14:09*	*08/30/19 14:44*	*1*
Y Carrier	*90.1*		*40 - 110*	*07/26/19 14:09*	*08/30/19 14:44*	*1*

Method: Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.224	U	0.413	0.414	5.00		pCi/L		09/13/19 14:36	1

Client Sample Results

Client: Environmental Standards Inc.
Project/Site: JSF_STR_20190718_3B

Job ID: 180-93098-1

Client Sample ID: JSF-STR-PB06-CC-SUR-20190718 ~ STR-PB06

Lab Sample ID: 180-93098-4

Date Collected: 07/18/19 15:45
Date Received: 07/23/19 09:20

Matrix: Water

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.0112	U	0.0652	0.0652	1.00	0.136	pCi/L	07/26/19 13:33	09/08/19 19:00	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*78.8*		*40 - 110*	*07/26/19 13:33*	*09/08/19 19:00*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.0653	U	0.273	0.274	1.00	0.480	pCi/L	07/26/19 14:09	08/30/19 14:44	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*78.8*		*40 - 110*	*07/26/19 14:09*	*08/30/19 14:44*	*1*
Y Carrier	*90.5*		*40 - 110*	*07/26/19 14:09*	*08/30/19 14:44*	*1*

Method: Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.0653	U	0.281	0.282	5.00		pCi/L		09/13/19 14:36	1

QC Sample Results

Client: Environmental Standards Inc.
Project/Site: JSF_STR_20190718_3B

Job ID: 180-93098-1

Method: 903.0 - Radium-226 (GFPC)

Lab Sample ID: MB 160-436764/18-A
Matrix: Water
Analysis Batch: 441511

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 436764

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.03691	U	0.135	0.135	1.00	0.257	pCi/L	07/26/19 13:33	08/31/19 18:55	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*84.5*		*40 - 110*	*07/26/19 13:33*	*08/31/19 18:55*	*1*

Lab Sample ID: LCS 160-436764/1-A
Matrix: Water
Analysis Batch: 442151

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 436764

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-226			11.4	10.21		1.10	1.00	0.169	pCi/L	90	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*71.5*		*40 - 110*

Lab Sample ID: 180-93047-C-9-A DU
Matrix: Water
Analysis Batch: 442471

Client Sample ID: Duplicate
Prep Type: Total/NA
Prep Batch: 436764

Analyte	Sample Result	Sample Qual		DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit			RER	RER Limit
Radium-226	-0.0357	U		0.001595	U	0.0626	1.00	0.126	pCi/L			0.17	1

Carrier	*DU %Yield*	*DU Qualifier*	*Limits*
Ba Carrier	*80.5*		*40 - 110*

Method: 904.0 - Radium-228 (GFPC)

Lab Sample ID: MB 160-436768/18-A
Matrix: Water
Analysis Batch: 441488

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 436768

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.005172	U	0.258	0.258	1.00	0.464	pCi/L	07/26/19 14:09	08/30/19 14:44	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*84.5*		*40 - 110*	*07/26/19 14:09*	*08/30/19 14:44*	*1*
Y Carrier	*89.3*		*40 - 110*	*07/26/19 14:09*	*08/30/19 14:44*	*1*

Method: 904.0 - Radium-228 (GFPC) (Continued)

Lab Sample ID: LCS 160-436768/1-A
Matrix: Water
Analysis Batch: 441488

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 436768

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-228			9.64	9.146		1.18	1.00	0.609	pCi/L	95	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*71.5*		*40 - 110*
Y Carrier	*87.1*		*40 - 110*

Lab Sample ID: 180-93047-C-9-B DU
Matrix: Water
Analysis Batch: 441488

Client Sample ID: Duplicate
Prep Type: Total/NA
Prep Batch: 436768

Analyte	Sample Result	Sample Qual		DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit			RER	RER Limit
Radium-228	0.296	U		0.1213	U	0.338	1.00	0.582	pCi/L			0.23	1

Carrier	*DU %Yield*	*DU Qualifier*	*Limits*
Ba Carrier	*80.5*		*40 - 110*
Y Carrier	*81.9*		*40 - 110*

Method: Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Lab Sample ID: 180-93047-A-9 DU
Matrix: Water
Analysis Batch: 442871

Client Sample ID: Duplicate
Prep Type: Total/NA

Analyte	Sample Result	Sample Qual		DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit			RER	RER Limit
Radium 226 and 228	0.296	U		0.1229	U	0.344	5.00		pCi/L			0.22	

QC Association Summary

Client: Environmental Standards Inc.
Project/Site: JSF_STR_20190718_3B

Job ID: 180-93098-1

Rad

Prep Batch: 436764

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-93098-1	JSF-STR-PB09-CC-SUR-20190718 ~ STR-PB09	Total/NA	Water	PrecSep STD	
180-93098-2	JSF-STR-PB08-CC-SUR-20190718 ~ STR-PB08	Total/NA	Water	PrecSep STD	
180-93098-3	JSF-STR-PB07-CC-SUR-20190718 ~ STR-PB07	Total/NA	Water	PrecSep STD	
180-93098-4	JSF-STR-PB06-CC-SUR-20190718 ~ STR-PB06	Total/NA	Water	PrecSep STD	
MB 160-436764/18-A	Method Blank	Total/NA	Water	PrecSep STD	
LCS 160-436764/1-A	Lab Control Sample	Total/NA	Water	PrecSep STD	
180-93047-C-9-A DU	Duplicate	Total/NA	Water	PrecSep STD	

Prep Batch: 436768

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-93098-1	JSF-STR-PB09-CC-SUR-20190718 ~ STR-PB09	Total/NA	Water	PrecSep_0	
180-93098-2	JSF-STR-PB08-CC-SUR-20190718 ~ STR-PB08	Total/NA	Water	PrecSep_0	
180-93098-3	JSF-STR-PB07-CC-SUR-20190718 ~ STR-PB07	Total/NA	Water	PrecSep_0	
180-93098-4	JSF-STR-PB06-CC-SUR-20190718 ~ STR-PB06	Total/NA	Water	PrecSep_0	
MB 160-436768/18-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-436768/1-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
180-93047-C-9-B DU	Duplicate	Total/NA	Water	PrecSep_0	

TVA Environmental Investigations

Tennessee Valley Authority

COOLER No.:	1	of	1
COC No:	JSF_STR_20190718_3B		
1 of 1 Pages			
Task Desc:	JSF_STR		

Chain-of-Custody / Analytical Request Document

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

Required Ship to Lab:		Required Project Information:		Required Sampler Information	
Lab Name:	TestAmerica Pittsburgh	Site ID #:	JOHN SEVIER FOSSIL PLANT	Sampler: Carina O'Bara	
Lab Address:	301 Alpha Drive	Project #:	0779777	Sampling Company: TVA	
	RIDC Park	Site Address	611 Old Highway 70 S	Address: TVA Chickamauga Power Service Center, 4601 N. Access Road, 37415	
	Pittsburgh, PA 15238	City	Rogersville State, Zip: TN, 37857	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:	3
Phone/Fax:	615-301-5741/615-726-3404	Site PM Email:	jrquinn@tva.gov	Send EDD/Hard Copy to:	tva_deliverables@envstd.com
Lab Email:	Gail.Lage@testamericainc.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	Sample Depth: Meters: End Depth	MATRIX CODE	G= GRAB C=COMP	SAMPLE TYPE	SAMPLE DATE	SAMPLE TIME	# OF CONTAINERS	Comments/ Lab Sample I.D.	MS/MSD	Analysis: SW_RAD	Preserve: HNO3	Filtered: N
1	JSF-STR-PB09-CC-SUR-20190718	STR-PB09	0.03	NA	SW	G	N	7/18/2019	1345	3		☐	X		
2	JSF-STR-PB08-CC-SUR-20190718	STR-PB08	0.05	NA	SW	G	N	7/18/2019	1435	3		☐	X		
3	JSF-STR-PB07-CC-SUR-20190718	STR-PB07	0.10	NA	SW	G	N	7/18/2019	1505	3		☐	X		
4	JSF-STR-PB06-CC-SUR-20190718	STR-PB06	0.10	NA	SW	G	N	7/18/2019	1545	3		☐	X		
5												☐			
6												☐			
7															
8															
9															
10															
11															
12															
13															

Carina O'Bara 7-22-19

180-93098 Chain of Custody

Additional Comments/Special Instructions:

Custody Seal # 683626

RELINQISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
Carina O'Bara TVA-JSG	7-22-19	1325	[illegible] TAPITT	7/23/19	920

SHIPPING METHOD:	SAMPLER NAME AND SIGNATURE
Fedex	Carina O'Bara Carina O'Bara

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?

Form TVA 30067A

180-93098 Waybill

TestAm ca

THE LEADER IN ENV TESTING

RT 97 FZ

1 10:30

ORIGIN ID:MIFA (281) 552-8437
TYLER BAKER
CHICKAMAUGA POWER SERVICE CENTER
4601 NORTH ACCESS ROAD, BUILDING G

CHATTANOOGA, TN 37415
UNITED STATES US

SHIP DATE: 14FEB19
ACTWGT: 10.00 LB MAN
CAD: 592545/CAFE3211

TO

TESTAMERICA PITTSBURGH
301 ALPHA DRIVE
RIDC PARK
PITTSBURGH PA 15238-2907

(412) 963-7058
DEPT: BOTTLES

REF: S180-49805

RMA:

FedEx
TRK# 0221 4759 5527 5894

TUE - 23 JU
PRIORITY OV

XH AGCA

PA-

Uncorrected temp 1.2 °C
Thermometer ID 12
CF -0.6 Initials TS

PT-WI-SR-001 effective 11/8/18

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: Rumble, Jennifer L	Carrier Tracking No(s):	COC No: 180-369435.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: jennifer.rumble@testamericainc.com	State of Origin: Tennessee	Page: Page 1 of 1
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note):		Job #: 180-93098-1
Address: 13715 Rider Trail North, ,	Due Date Requested: 8/22/2019			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: JSF_STR_20190718_3B	Project #: 18019862			
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)	903.0/PrecSep_STD Ra-226	904.0/PrecSep_0 Ra-228	Ra226_228GFPC_P/ Combined Radium-226/228	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
JSF-STR-PB09-CC-SUR-20190718 ~ STR-PB09 (180-93098-1)	7/18/19	13:45 Eastern		Water			X	X	X	3	TVA - Batch alone
JSF-STR-PB08-CC-SUR-20190718 ~ STR-PB08 (180-93098-2)	7/18/19	14:35 Eastern		Water			X	X	X	3	TVA - Batch alone
JSF-STR-PB07-CC-SUR-20190718 ~ STR-PB07 (180-93098-3)	7/18/19	15:05 Eastern		Water			X	X	X	3	TVA - Batch alone
JSF-STR-PB06-CC-SUR-20190718 ~ STR-PB06 (180-93098-4)	7/18/19	15:45 Eastern		Water			X	X	X	3	TVA - Batch alone

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]	7/24/19 1700	MRI	[signature]	7-25-19 0930	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

Login Sample Receipt Checklist

Client: Environmental Standards Inc.

Job Number: 180-93098-1

Login Number: 93098
List Number: 1
Creator: Say, Thomas C

List Source: Eurofins TestAmerica, Pittsburgh

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: 180-93098-1

Login Number: 93098
List Number: 2
Creator: Hellm, Michael

List Source: Eurofins TestAmerica, St. Louis
List Creation: 07/25/19 02:09 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	18.0
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	