TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

TestAmerica Job ID: 160-18521-2
TestAmerica Sample Delivery Group: Headworks/9720-8
Client Project/Site: ORNL Y-12 Outfall 200 Characterization

For:
Alliant Corporation
320 N Cedar Bluff Road
Suite 200
Knoxville, Tennessee 37923

Attn: Doug Milloway

Authorized for release by:
9/16/2016 3:42:13 PM

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

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

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Job ID: 160-18521-2

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Alliant Corporation

Project: ORNL Y-12 Outfall 200 Characterization

Report Number: 160-18521-2

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

RECEIPT

The samples were received on 8/6/2016 8:30 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 0.7º C.

TCLP MERCURY

Samples YMTFA74SE001 (160-18521-1) and YMTFA75SE001 (160-18521-2) were analyzed for TCLP mercury in accordance with EPA SW-846 Methods 1311/7470A. The samples were leached on 08/30/2016, and prepared and analyzed on 08/31/2016.

Mercury was detected in method blank LB 160-267256/1-B at a level that was above the method detection limit but below the reporting limit. The value should be considered an estimate, and has been flagged.

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

RADIUM-226 BY ALPHA SPECTROMETRY

Samples YMTFA74SE001 (160-18521-1) and YMTFA75SE001 (160-18521-2) were analyzed for Radium-226 by Alpha Spectrometry in

Job ID: 160-18521-2 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

accordance with ST-RC-0301. The samples were dried on 08/08/2016, prepared on 08/22/2016 and analyzed on 09/15/2016.

The At-217 tracer recovery for the following sample was low outside the QC limits of 30%: LCS 160-266021/2-A: 28.2%. The DOE/DOD Quality Systems Manual for Environmental Laboratories (QSM Rev. 5.0) allows for reporting results as quantitative when tracer recoveries are below 30% if a) the relative uncertainty associated with the tracer recovery is less than 10% (2 sigma), b) spectral resolution requirements are met and there are no indications of spectral interferences, and c) detection limit requirements are met. All three of these criteria are met for these samples: a) a minimum of 400 counts (which leads to 10% count uncertainty at 2 sigma) in the tracer peak, b) resolution of < 100 keV is met for all peaks, and c) the activity in the sample is well above the MDC. The data have been qualified and reported.

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

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Phone (314) 298-8566 Fax (314) 298-8757

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information	Sampler: R. Stout	Lab PM: Gish, Erika K	Carrier Tracking No(s): 8100 3192 5927 FedEx	COC No: 160-4416-2171.4
Client Contact: Matt Frost	Phone: 865·255·5540	E-Mail: erika.gish@testamericainc.com		Page: Page 4 of 4
Company: Alliant Corporation				Job #:
Address: 320 N Cedar Bluff Road Suite 200	Due Date Requested:			
City: Knoxville	TAT Requested (days): by contract			
State, Zip: TN, 37923				
Phone: 865-255-5540	PO #: 16-PO-001581			
Email: mfrost@alliantcorp.com	WO #: 4326			
Project Name: ORNL Y-12 Outfall 200 Characterization	Project #: 16005502			
Site: Y-12 Headworks/9720-8	SSOW#:			

Analysis Requested

Sample Identification	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)	A_01_R_Am_Cm, A01R_Np, A01R_Pu, A01R_Th, A01R_U, SR_03_RC_Tot_Sr, TC_02_RC	C_01_1, DOE_H3_04_RC	8260C - TCLP VOC	8151A - TCLP Herbicides	GA_01_R_Ra - Gamma - Radium-226/228	8082A - PCB	8270D - TCLP BNAs	6010C, 7470A	8082A - PCBs	Radionuclides	TCLP Metals	TCLP SVOCs	Total Number of containers	Special Instructions/Note:
			Preservation Code:				N	N	N	N	N	N	N	N	N					
YMTFA74SE001	8-5-16	0750	C	Solid					X	X		X				X	X	X		
YMTFA75SE001	8-5-16	0925	C	Solid					X	X		X				X	X	X		

160-18521 Chain of Custody

Preservation Codes:

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

Other:

Possible Hazard Identification
☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

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)

Special Instructions/QC Requirements:

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

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
[signature]	8-5-2016/1400		[signature]	080616 0850	
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:

9/16/2016

Login Sample Receipt Checklist

Client: Alliant Corporation

Job Number: 160-18521-2
SDG Number: Headworks/9720-8

Login Number: 18521
List Number: 1
Creator: McKinney, Gerrod E

List Source: TestAmerica St. Louis

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	
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").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Alliant Corporation
Project/Site: ORNL Y-12 Outfall 200 Characterization

TestAmerica Job ID: 160-18521-2
SDG: Headworks/9720-8

Qualifiers

Metals

Qualifier	Qualifier Description
B	Compound was found in the blank and sample.
U	Undetected at the Limit of Detection.
J	Estimated: The analyte was positively identified; the quantitation is an estimation

Rad

Qualifier	Qualifier Description
S	Tracer is outside acceptance limits.

Glossary

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

Method Summary

Client: Alliant Corporation
Project/Site: ORNL Y-12 Outfall 200 Characterization

TestAmerica Job ID: 160-18521-2
SDG: Headworks/9720-8

Method	Method Description	Protocol	Laboratory
7470A	Mercury (CVAA)	SW846	TAL SL
ST-RC-0301	Radium-226 (Alpha Spectrometry)	TAL-STL	TAL SL

Protocol References:

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

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

Laboratory References:

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

Sample Summary

Client: Alliant Corporation
Project/Site: ORNL Y-12 Outfall 200 Characterization

TestAmerica Job ID: 160-18521-2
SDG: Headworks/9720-8

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-18521-1	YMTFA74SE001	Solid	08/05/16 07:50	08/06/16 08:30
160-18521-2	YMTFA75SE001	Solid	08/05/16 09:25	08/06/16 08:30

Client Sample Results

Client: Alliant Corporation
Project/Site: ORNL Y-12 Outfall 200 Characterization

TestAmerica Job ID: 160-18521-2
SDG: Headworks/9720-8

Client Sample ID: YMTFA74SE001

Lab Sample ID: 160-18521-1
Date Collected: 08/05/16 07:50
Matrix: Solid
Date Received: 08/06/16 08:30

Method: 7470A - Mercury (CVAA) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.0022	B	0.0010	0.000079	mg/L		08/31/16 08:31	08/31/16 18:06	1

Method: ST-RC-0301 - Radium-226 (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.712		0.187	0.196	1.00	0.190	pCi/g	08/22/16 18:53	09/15/16 10:19	1

Tracer	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
At-217	*42.6*		*30 - 110*	*08/22/16 18:53*	*09/15/16 10:19*	*1*

Client Sample ID: YMTFA75SE001

Lab Sample ID: 160-18521-2
Date Collected: 08/05/16 09:25
Matrix: Solid
Date Received: 08/06/16 08:30

Method: 7470A - Mercury (CVAA) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.000079	U	0.0010	0.000079	mg/L		08/31/16 08:31	08/31/16 18:14	1

Method: ST-RC-0301 - Radium-226 (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	84.4		1.87	7.33	1.00	0.0791	pCi/g	08/22/16 18:53	09/15/16 10:19	1

Tracer	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
At-217	*34.2*		*30 - 110*	*08/22/16 18:53*	*09/15/16 10:19*	*1*

Method: 7470A - Mercury (CVAA)

Lab Sample ID: LCS 160-267442/2-A
Matrix: Solid
Analysis Batch: 267626

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 267442

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Mercury			0.0250	0.0240		mg/L		96	80 - 120		

Lab Sample ID: LB 160-267256/1-B
Matrix: Solid
Analysis Batch: 267626

Client Sample ID: Method Blank
Prep Type: TCLP
Prep Batch: 267442

Analyte	LB Result	LB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.000110	J	0.0010	0.000079	mg/L		08/31/16 08:31	08/31/16 17:57	1

Lab Sample ID: 160-18521-1 MS
Matrix: Solid
Analysis Batch: 267626

Client Sample ID: YMTFA74SE001
Prep Type: TCLP
Prep Batch: 267442

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Mercury	0.0022	B	0.0250	0.0261		mg/L		95	70 - 130		

Lab Sample ID: 160-18521-1 MSD
Matrix: Solid
Analysis Batch: 267626

Client Sample ID: YMTFA74SE001
Prep Type: TCLP
Prep Batch: 267442

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Mercury	0.0022	B	0.0250	0.0263		mg/L		96	70 - 130	1	20

Method: ST-RC-0301 - Radium-226 (Alpha Spectrometry)

Lab Sample ID: MB 160-266021/1-A
Matrix: Solid
Analysis Batch: 270177

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 266021

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.1953		0.0942	0.0956	1.00	0.0787	pCi/g	08/22/16 18:53	09/15/16 10:20	1

Tracer	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
At-217	*36.5*		*30 - 110*	*08/22/16 18:53*	*09/15/16 10:20*	*1*

Lab Sample ID: LCS 160-266021/2-A
Matrix: Solid
Analysis Batch: 270178

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 266021

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-226			12.1	14.07		1.47	1.00	0.103	pCi/g	117	70 - 130		

Tracer	*LCS %Yield*	*LCS Qualifier*	*Limits*
At-217	*28.2*	*S*	*30 - 110*

Method: ST-RC-0301 - Radium-226 (Alpha Spectrometry) (Continued)

Lab Sample ID: 160-18504-F-1-Q DU
Matrix: Solid
Analysis Batch: 270180

Client Sample ID: Duplicate
Prep Type: Total/NA
Prep Batch: 266021

Analyte	Sample Result	Sample Qual		DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit			RER	RER Limit
Radium-226	0.772			0.6592		0.171	1.00	0.152	pCi/g			0.31	1

Tracer	*DU %Yield*	*DU Qualifier*	*Limits*
At-217	*50.0*		*30 - 110*

QC Association Summary

Client: Alliant Corporation
Project/Site: ORNL Y-12 Outfall 200 Characterization

TestAmerica Job ID: 160-18521-2
SDG: Headworks/9720-8

Metals

Leach Batch: 267256

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-18521-1	YMTFA74SE001	TCLP	Solid	1311	
160-18521-2	YMTFA75SE001	TCLP	Solid	1311	
LB 160-267256/1-B	Method Blank	TCLP	Solid	1311	
160-18521-1 MS	YMTFA74SE001	TCLP	Solid	1311	
160-18521-1 MSD	YMTFA74SE001	TCLP	Solid	1311	

Prep Batch: 267442

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-18521-1	YMTFA74SE001	TCLP	Solid	7470A	267256
160-18521-2	YMTFA75SE001	TCLP	Solid	7470A	267256
LB 160-267256/1-B	Method Blank	TCLP	Solid	7470A	267256
LCS 160-267442/2-A	Lab Control Sample	Total/NA	Solid	7470A	
160-18521-1 MS	YMTFA74SE001	TCLP	Solid	7470A	267256
160-18521-1 MSD	YMTFA74SE001	TCLP	Solid	7470A	267256

Analysis Batch: 267626

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-18521-1	YMTFA74SE001	TCLP	Solid	7470A	267442
160-18521-2	YMTFA75SE001	TCLP	Solid	7470A	267442
LB 160-267256/1-B	Method Blank	TCLP	Solid	7470A	267442
LCS 160-267442/2-A	Lab Control Sample	Total/NA	Solid	7470A	267442
160-18521-1 MS	YMTFA74SE001	TCLP	Solid	7470A	267442
160-18521-1 MSD	YMTFA74SE001	TCLP	Solid	7470A	267442

Rad

Leach Batch: 263822

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-18521-1	YMTFA74SE001	Total/NA	Solid	Dry and Grind	
160-18521-2	YMTFA75SE001	Total/NA	Solid	Dry and Grind	

Leach Batch: 263919

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-18504-F-1-Q DU	Duplicate	Total/NA	Solid	Dry and Grind	

Prep Batch: 266021

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-18521-1	YMTFA74SE001	Total/NA	Solid	DPS-0	263822
160-18521-2	YMTFA75SE001	Total/NA	Solid	DPS-0	263822
MB 160-266021/1-A	Method Blank	Total/NA	Solid	DPS-0	
LCS 160-266021/2-A	Lab Control Sample	Total/NA	Solid	DPS-0	
160-18504-F-1-Q DU	Duplicate	Total/NA	Solid	DPS-0	263919

Tracer/Carrier Summary

Client: Alliant Corporation
Project/Site: ORNL Y-12 Outfall 200 Characterization

TestAmerica Job ID: 160-18521-2
SDG: Headworks/9720-8

Method: ST-RC-0301 - Radium-226 (Alpha Spectrometry)

Matrix: Solid **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)							
Lab Sample ID	Client Sample ID	At-217 (30-110)							
160-18504-F-1-Q DU	Duplicate	50.0							
160-18521-1	YMTFA74SE001	42.6							
160-18521-2	YMTFA75SE001	34.2							
LCS 160-266021/2-A	Lab Control Sample	28.2 S							
MB 160-266021/1-A	Method Blank	36.5							

Tracer/Carrier Legend

At-217 = At-217