Lockheed Martin Corporation
6801 Rockledge Drive MP: CCT-246
Bethesda, Maryland 20817
Telephone 301-548-2209

April 25, 2017

VIA PRIVATE CARRIER

Mr. James R. Carroll
Program Administrator
Land Restoration Program
Land Management Administration
Maryland Department of the Environment
1800 Washington Boulevard, Suite 625
Baltimore, Maryland 21230

Subject: Sediment Removal Action for Outfall 005 (2014-2015)
Uranium and Thorium Radionuclide Sampling Results from Dredged Sediment
Lockheed Martin Middle River Complex
2323 Eastern Boulevard
Middle River, Maryland

Dear Mr. Carroll:

The purpose of this letter is to submit to MDE the results of radionuclide sampling from the 2014-2015 Outfall 005 Sediment Removal Action. You may remember that the sediment removal action (SRA) was performed in the approximately 1.5 acre Outfall 005 footprint. The objective of the SRA was to remove sediment contaminated with polychlorinated biphenyls (PCBs). SRA in-water work operations were carried out from December 8, 2014 to February 11, 2015. Mechanical dredging involved using a 30-ton Whirley crane-barge in the Outfall 005 project footprint. The dredging was done at a rate of 250 cubic yards per day. Approximately 5,500 *in situ* cubic yards of material were dredged and approximately 8,500 tons of material and debris were shipped off-site for disposal. Dredged sediment was placed in a scow positioned adjacent to the Whirley crane-barge. A tug was used to position the dredging equipment within the project footprint. For sediment off-loading, the tug was used to position the scow at the Block F bulkhead wall to facilitate the transfer of dredged sediment into articulating off-road trucks staged on the upland. The Whirley crane-barge was deployed for off-loading for approximately half of each workday. A spill apron was used to capture incidental spillage during sediment off-loading. The off-road trucks

transported the sediment across the Block F tarmac to two specially constructed sediment bins for processing. The geometry of these bins was 150 feet long and 60 feet wide by 40 inches tall.

Amendment was mixed into the sediment to facilitate dewatering and to help ensure that the matrix would pass the paint filter test for the landfill. The amended sediment was shipped off-site to the Waste Management, Inc. landfill in possession of a dual Resource Conservation and Recovery Act/Toxic Substances Control Act (RCRA/TSCA) permit in Model City, New York. Twenty-five cubic yard aluminum intermodal end-dumping containers with sealed tailgates were lined with plastic bed liners before the amended sediment was loaded, using a tracked hydraulic excavator. Trucks were staged on plastic sheeting and incidental spillage was cleaned immediately during load-out. Trucks were properly placarded, manifested, covered, and inspected before leaving the Lockheed Martin Middle River project site.

Sediment had previously been extensively sampled in the areas around Outfalls 5, 6, and 8. The sediment samples had been sent to an off-site laboratory (TestAmerica) and analyzed for isotopic uranium and thorium. Radionuclide concentrations in the sediment were determined to be consistent with background concentrations.

In planning for the SRA, the project team decided to adopt a conservative approach by collecting periodic grab samples of dredged sediment and analyzing them for uranium-235 (U-235), uranium-238 (U-238), and thorium-232 (Th-232) by the gamma spectroscopy method (Method GA_01-R). Forty sediment samples were collected, and all 40 samples were analyzed for gamma emitters. A subset of four of these samples was also analyzed for isotopic uranium by inductively coupled plasma-mass-spectrometry (ICP-MS) (Method 6020A). One wipe sample was collected from equipment surfaces and analyzed for PCBs using EPA SW-846 Method 8082A. Sampling results for the radionuclides of concern are in Table 1.

All sampling results for U-235 are reported as non-detects (ND). All sampling results for U-238 and Th-232 are consistent with previous sampling results, although four samples slightly exceed the Th-232 range of previous sampling results. Previous sampling-result ranges were as follows:

- Th-232: 0.354–1.07 picocuries per gram (pCi/g)
- U-235: ND–0.63 pCi/g
- U-238: ND–1.37 pCi/g
- U-234: 0.028–7.53 pCi/g
- U-236: ND

The wipe sample was ND for all PCB analytes. Full sampling reports from the laboratory are in Appendix A. Lockheed Martin is submitting this data now because we realized this radionuclide sample data was not included in the 2015 report documenting the Construction Completion results of the Outfall 005 Sediment Removal Action.

Please let me know if you have any questions regarding this data submittal.

Sincerely,

Thomas D. Blackman
Project Lead, Environmental Remediation

cc: (via e-mail)
Gary Schold, MDE
Mark Mank, MDE
Tom Blackman, Lockheed Martin
Christine Kline, Lockheed Martin
Norman Varney, Lockheed Martin
Dave Brown, MRAS
Michael Martin, Tetra Tech
Cannon Silver, CDM Smith

cc: (via U.S. mail, with CD enclosure)
Jann Richardson, Lockheed Martin
Justin Tetlow, MRAS

cc: (via U.S. mail)
Alan Jacobson, MDE
Ruth Prince, USEPA
Tom Green, LMCPI
Mike Musheno, LMCPI
Doug Mettee, Lockheed Martin MST
John Morgan, LMCPI

cc: Scott Heinlein (send RMFT)

Table 1—Sampling Results
Page 1 of 2

	Gamma spectroscopy (pCi/g)			ICP-MS (pCi/g)			
Sample ID	**Th-232**	**U-235**	**U-238**	**U-234**	**U-235**	**U-236**	**U-238**
BIN1-001-121614	0.402	−0.0182*U*	0.414*U*	N/A	N/A	N/A	N/A
BIN1-002-121614	0.476	0.0530*U*	0.857	N/A	N/A	N/A	N/A
BIN1-003-121614	0.0410	0.0301*U*	0.337*U*	N/A	N/A	N/A	N/A
BIN1-004-121614	0.387	0.0316*U*	0.362*U*	N/A	N/A	N/A	N/A
BIN1-005-121614	0.438	0.0370*U*	0.252*U*	N/A	N/A	N/A	N/A
BIN1-006-121614	0.432	0.0424*U*	0.407*U*	N/A	N/A	N/A	N/A
BIN1-007-121614	0.411	0.0647*U*	0.337*U*	N/A	N/A	N/A	N/A
BIN1-008-121614	0.558	0.0324*U*	0.495*U*	N/A	N/A	N/A	N/A
BIN1-009-121614	0.358	0.0732*U*	0.638	1.17*U*	0.0422*U*	−0.00314*U*	0.706
BIN1-010-121614	0.422	0.0220*U*	0.765	1.29*U*	0.0339*U*	0.00395*U*	0.703
BATCH2-001-121814	0.459	−0.00792*U*	0.542	N/A	N/A	N/A	N/A
BATCH2-002-121814	0.483	0.0855*U*	0.251*U*	N/A	N/A	N/A	N/A
BATCH2-003-121814	0.560	0.0675*U*	0.411*U*	N/A	N/A	N/A	N/A
BATCH2-004-121814	0.379	0.0479*U*	0.961	0.823*U*	0.0334*U*	0.00645*U*	0.678
BATCH2-005-121814	0.484	0.0680*U*	0.212	N/A	N/A	N/A	N/A
BATCH2-006-121814	0.432	0.00525*U*	0.0581*U*	N/A	N/A	N/A	N/A
BATCH2-007-121814	0.410	0.0748*U*	0.371*U*	N/A	N/A	N/A	N/A
BATCH2-008-121814	0.485	0.00618*U*	0.604	N/A	N/A	N/A	N/A
BATCH2-009-121814	0.373	0.00458*U*	0.0713*U*	N/A	N/A	N/A	N/A

N/A—not analyzed

U—Result is less than the sample detection limit (ND)

Table 1—Sampling Results
Page 2 of 2

	Gamma spectroscopy (pCi/g)			ICP-MS (pCi/g)			
Sample ID	**Th-232**	**U-235**	**U-238**	**U-234**	**U-235**	**U-236**	**U-238**
BATCH2-010-121814	0.459	0.0494*U*	0.613	1.23*U*	0.0341*U*	0.00375*U*	0.668
BATCH3-001-011915	0.196*U*	0.142*U*	0.519*U*	N/A	N/A	N/A	N/A
BATCH3-002-011915	0.607	−0.0439*U*	1.26*U*	N/A	N/A	N/A	N/A
BATCH3-003-011915	1.10	0.147*U*	1.35*U*	N/A	N/A	N/A	N/A
BATCH3-004-011915	0.493	0.0561*U*	1.24*U*	N/A	N/A	N/A	N/A
BATCH3-005-011915	0.907	0.0456*U*	−0.00768*U*	N/A	N/A	N/A	N/A
BATCH3-006-011915	0.376*U*	0.000*U*	0.690*U*	N/A	N/A	N/A	N/A
BATCH3-007-011915	0.424*U*	0.182*U*	0.479*U*	N/A	N/A	N/A	N/A
BATCH3-008-011915	0.850	0.207*U*	1.30*U*	N/A	N/A	N/A	N/A
BATCH3-009-011915	0.429	0.139*U*	0.592*U*	N/A	N/A	N/A	N/A
BATCH3-010-011915	0.362	0.0559*U*	1.66*U*	N/A	N/A	N/A	N/A
BATCH4-001-011915	0.430*U*	0.729*U*	9.78*U*	N/A	N/A	N/A	N/A
BATCH4-002-011915	1.88	0.224*U*	−0.418*U*	N/A	N/A	N/A	N/A
BATCH4-003-011915	1.18	0.0682*U*	2.61*U*	N/A	N/A	N/A	N/A
BATCH4-004-011915	0.668	0.223*U*	0.898*U*	N/A	N/A	N/A	N/A
BATCH4-005-011915	0.723	0.351*U*	2.29*U*	N/A	N/A	N/A	N/A
BATCH4-006-011915	1.25	0.444*U*	0.848*U*	N/A	N/A	N/A	N/A
BATCH4-007-011915	0.614	0.185*U*	2.18*U*	N/A	N/A	N/A	N/A
BATCH4-008-011915	0.525*U*	0.457*U*	2.08*U*	N/A	N/A	N/A	N/A
BATCH4-009-011915	0.901	0.260*U*	1.04*U*	N/A	N/A	N/A	N/A
BATCH4-010-011915	0.820	−0.108*U*	2.65*U*	N/A	N/A	N/A	N/A

N/A—not analyzed

U—Result is less than the sample detection limit (ND)

APPENDIX A—LABORATORY SAMPLE REPORTS

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: 160-9881-1

Client Project/Site: Middle River Project: Off-Site Rush Gamm

For:

Tetra Tech EC, Inc.
3200 George Washington Way
Suite G
Richland, Washington 99354

Attn: Steve McGee

Authorized for release by:
12/18/2014 2:31:39 PM

Jayna Awalt, Project Manager II
(314)298-8566
jayna.awalt@testamericainc.com

Table of Contents

Job ID: 160-9881-1

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Tetra Tech EC, Inc.

Project: Middle River Project: Off-Site Rush Gamma

Report Number: 160-9881-1

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 12/17/2014 10:00 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 2 coolers at receipt time were 1.8° C and 2.4° C.

CESIUM-137 & OTHER GAMMA EMITTERS (GS)

Samples BIN1-001-121614 (160-9881-1), BIN1-002-121614 (160-9881-2), BIN1-003-121614 (160-9881-3), BIN1-004-121614 (160-9881-4), BIN1-005-121614 (160-9881-5), BIN1-006-121614 (160-9881-6), BIN1-007-121614 (160-9881-7), BIN1-008-121614 (160-9881-8), BIN1-009-121614 (160-9881-9) and BIN1-010-121614 (160-9881-10) were analyzed for Cesium-137 & Other Gamma Emitters (GS) in accordance with DOE. The samples were prepared and analyzed on 12/17/2014.

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

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Phone (314) 298-8566 Fax (314) 298-8757

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information	Sampler: Heather Phelan	Lab PM: Awalt, Jayna K	Carrier Tracking No(s):	COC No: 160-2142-1050.1
Client Contact: Heather Phelan	Phone: 920 8578422	E-Mail: jayna.awalt@testamericainc.com		Page: Page 1 of 11
Company: Tetra Tech EC, Inc.				Job #:

Address: 3200 George Washington Way Suite G	Due Date Requested:
City: Richland	TAT Requested (days):
State, Zip: WA, 99354	
Phone:	PO #: Purchase Order Requested
Email:	WO #:
Project Name: Middle River Project: Off-Site Rush Gamm	Project #: 16003877
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 - Na2S2SO3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - ph 4-5, Z - other (specify)
Other:

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)	GA_01_R_Cs - Gamma Spectrometry (Uranium & Thorium Is	Total Number of containers	Special Instructions/Note:
			Preservation Code:				N		
BIN1-0001-121614	12/16/14	1205	G	Solid	N	N	X		
BIN1-0002-121614			G	Solid			X		
BIN1-0003-121614			G	Solid			X		
BIN1-0004-121614			G	Solid			X		
BIN1-0005-121614			G	Solid			X		
BIN1-0006-121614			G	Solid			X		
BIN1-0007-121614			G	Solid			X		
BIN1-0008-121614			G	Solid			X		
BIN1-0009-121614			G	Solid			X		
BIN1-0010-121614			G	Solid			X		
			G	Solid			X		

160-9881 Chain of Custody

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: Heather Phelan	Date/Time: 12/16/14 1440	Company: Tetra Tech	Received by:	Date/Time: 12/16/14 1440	Company: TestAmerica
Relinquished by:	Date/Time: 12/16/14 1630	Company: TestAmerica	Received by:	Date/Time: 12/17/14 1000	Company: TA STL
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

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

Login Sample Receipt Checklist

Client: Tetra Tech EC, Inc.

Job Number: 160-9881-1

Login Number: 9881

List Number: 1

Creator: Daniels, Brian J

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.	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	

Client: Tetra Tech EC, Inc.
Project/Site: Middle River Project: Off-Site Rush Gamm

TestAmerica Job ID: 160-9881-1

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, 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: Tetra Tech EC, Inc.
Project/Site: Middle River Project: Off-Site Rush Gamm

TestAmerica Job ID: 160-9881-1

Method	Method Description	Protocol	Laboratory
GA-01-R	Cesium-137 & Other Gamma Emitters (GS)	DOE	TAL SL

Protocol References:

DOE = U.S. Department of Energy

Laboratory References:

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

Sample Summary

Client: Tetra Tech EC, Inc.
Project/Site: Middle River Project: Off-Site Rush Gamm

TestAmerica Job ID: 160-9881-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-9881-1	BIN1-001-121614	Solid	12/16/14 12:05	12/17/14 10:00
160-9881-2	BIN1-002-121614	Solid	12/16/14 12:05	12/17/14 10:00
160-9881-3	BIN1-003-121614	Solid	12/16/14 12:05	12/17/14 10:00
160-9881-4	BIN1-004-121614	Solid	12/16/14 12:05	12/17/14 10:00
160-9881-5	BIN1-005-121614	Solid	12/16/14 12:05	12/17/14 10:00
160-9881-6	BIN1-006-121614	Solid	12/16/14 12:05	12/17/14 10:00
160-9881-7	BIN1-007-121614	Solid	12/16/14 12:05	12/17/14 10:00
160-9881-8	BIN1-008-121614	Solid	12/16/14 12:05	12/17/14 10:00
160-9881-9	BIN1-009-121614	Solid	12/16/14 12:05	12/17/14 10:00
160-9881-10	BIN1-010-121614	Solid	12/16/14 12:05	12/17/14 10:00

Client Sample ID: BIN1-001-121614 — Lab Sample ID: 160-9881-1

Date Collected: 12/16/14 12:05 — **Matrix: Solid**
Date Received: 12/17/14 10:00

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	**0.159**		0.0260	0.0308	0.200	0.0138	pCi/g	12/17/14 10:40	12/17/14 11:32	1
Cobalt-60	0.00851	U	0.0103	0.0104		0.0243	pCi/g	12/17/14 10:40	12/17/14 11:32	1
Uranium-235	-0.0182	U	0.0494	0.0494		0.141	pCi/g	12/17/14 10:40	12/17/14 11:32	1
Uranium-238	0.414	U	0.196	0.201		0.538	pCi/g	12/17/14 10:40	12/17/14 11:32	1
Thorium-232	**0.402**		0.0796	0.0895		0.0710	pCi/g	12/17/14 10:40	12/17/14 11:32	1

Client Sample ID: BIN1-002-121614 — Lab Sample ID: 160-9881-2

Date Collected: 12/16/14 12:05 — **Matrix: Solid**
Date Received: 12/17/14 10:00

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	**0.155**		0.0359	0.0394	0.200	0.0238	pCi/g	12/17/14 10:40	12/17/14 11:33	1
Cobalt-60	0.000624	U	0.00842	0.00842		0.0465	pCi/g	12/17/14 10:40	12/17/14 11:33	1
Uranium-235	0.0530	U	0.0884	0.0886		0.169	pCi/g	12/17/14 10:40	12/17/14 11:33	1
Uranium-238	**0.857**		0.551	0.558		0.667	pCi/g	12/17/14 10:40	12/17/14 11:33	1
Thorium-232	**0.476**		0.0935	0.105		0.0637	pCi/g	12/17/14 10:40	12/17/14 11:33	1

Client Sample ID: BIN1-003-121614 — Lab Sample ID: 160-9881-3

Date Collected: 12/16/14 12:05 — **Matrix: Solid**
Date Received: 12/17/14 10:00

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	**0.169**		0.0376	0.0415	0.200	0.0278	pCi/g	12/17/14 10:40	12/17/14 11:34	1
Cobalt-60	-0.00367	U	0.0172	0.0172		0.0317	pCi/g	12/17/14 10:40	12/17/14 11:34	1
Uranium-235	0.0301	U	0.0860	0.0861		0.147	pCi/g	12/17/14 10:40	12/17/14 11:34	1
Uranium-238	0.337	U	0.191	0.194		0.494	pCi/g	12/17/14 10:40	12/17/14 11:34	1
Thorium-232	**0.410**		0.0903	0.0995		0.0638	pCi/g	12/17/14 10:40	12/17/14 11:34	1

Client Sample ID: BIN1-004-121614 — Lab Sample ID: 160-9881-4

Date Collected: 12/16/14 12:05 — **Matrix: Solid**
Date Received: 12/17/14 10:00

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	**0.159**		0.0242	0.0294	0.200	0.0120	pCi/g	12/17/14 10:40	12/17/14 11:36	1
Cobalt-60	-0.000331	U	0.000973	0.000973		0.0275	pCi/g	12/17/14 10:40	12/17/14 11:36	1
Uranium-235	0.0316	U	0.0829	0.0829		0.140	pCi/g	12/17/14 10:40	12/17/14 11:36	1
Uranium-238	0.362	U	0.198	0.201		0.528	pCi/g	12/17/14 10:40	12/17/14 11:36	1
Thorium-232	**0.387**		0.0785	0.0879		0.0707	pCi/g	12/17/14 10:40	12/17/14 11:36	1

Client Sample ID: BIN1-005-121614 — Lab Sample ID: 160-9881-5

Date Collected: 12/16/14 12:05 — **Matrix: Solid**
Date Received: 12/17/14 10:00

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	**0.207**		0.0336	0.0400	0.200	0.0101	pCi/g	12/17/14 10:40	12/17/14 11:38	1
Cobalt-60	-0.00747	U	0.0246	0.0246		0.0442	pCi/g	12/17/14 10:40	12/17/14 11:38	1
Uranium-235	0.0370	U	0.0933	0.0934		0.168	pCi/g	12/17/14 10:40	12/17/14 11:38	1
Uranium-238	0.252	U	0.168	0.170		0.768	pCi/g	12/17/14 10:40	12/17/14 11:38	1
Thorium-232	**0.438**		0.0906	0.101		0.0623	pCi/g	12/17/14 10:40	12/17/14 11:38	1

Client Sample ID: BIN1-006-121614 — Lab Sample ID: 160-9881-6

Date Collected: 12/16/14 12:05 — **Matrix: Solid**
Date Received: 12/17/14 10:00

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	**0.159**		0.0318	0.0358	0.200	0.0245	pCi/g	12/17/14 10:40	12/17/14 12:16	1
Cobalt-60	-0.00546	U	0.0185	0.0185		0.0329	pCi/g	12/17/14 10:40	12/17/14 12:16	1
Uranium-235	0.0424	U	0.0789	0.0790		0.134	pCi/g	12/17/14 10:40	12/17/14 12:16	1
Uranium-238	0.407	U	0.207	0.212		0.542	pCi/g	12/17/14 10:40	12/17/14 12:16	1
Thorium-232	**0.432**		0.0747	0.0867		0.0428	pCi/g	12/17/14 10:40	12/17/14 12:16	1

Client Sample ID: BIN1-007-121614 — Lab Sample ID: 160-9881-7

Date Collected: 12/16/14 12:05 — **Matrix: Solid**
Date Received: 12/17/14 10:00

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	**0.173**		0.0359	0.0402	0.200	0.0224	pCi/g	12/17/14 10:40	12/17/14 12:15	1
Cobalt-60	0.00801	U	0.0154	0.0154		0.0403	pCi/g	12/17/14 10:40	12/17/14 12:15	1
Uranium-235	0.0647	U	0.104	0.104		0.188	pCi/g	12/17/14 10:40	12/17/14 12:15	1
Uranium-238	0.337	U	0.242	0.245		0.671	pCi/g	12/17/14 10:40	12/17/14 12:15	1
Thorium-232	**0.411**		0.0977	0.106		0.0798	pCi/g	12/17/14 10:40	12/17/14 12:15	1

Client Sample ID: BIN1-008-121614 — Lab Sample ID: 160-9881-8

Date Collected: 12/16/14 12:05 — **Matrix: Solid**
Date Received: 12/17/14 10:00

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	**0.172**		0.0362	0.0403	0.200	0.0279	pCi/g	12/17/14 10:40	12/17/14 12:14	1
Cobalt-60	-0.00495	U	0.0170	0.0170		0.0311	pCi/g	12/17/14 10:40	12/17/14 12:14	1
Uranium-235	0.0324	U	0.0966	0.0967		0.165	pCi/g	12/17/14 10:40	12/17/14 12:14	1
Uranium-238	0.495	U	0.200	0.207		0.575	pCi/g	12/17/14 10:40	12/17/14 12:14	1
Thorium-232	**0.558**		0.0934	0.109		0.0572	pCi/g	12/17/14 10:40	12/17/14 12:14	1

Client Sample ID: BIN1-009-121614 — Lab Sample ID: 160-9881-9

Date Collected: 12/16/14 12:05 — **Matrix: Solid**
Date Received: 12/17/14 10:00

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	**0.158**		0.0301	0.0343	0.200	0.0233	pCi/g	12/17/14 10:40	12/17/14 12:17	1
Cobalt-60	0.00147	U	0.00718	0.00718		0.0270	pCi/g	12/17/14 10:40	12/17/14 12:17	1
Uranium-235	0.0732	U	0.0926	0.0929		0.137	pCi/g	12/17/14 10:40	12/17/14 12:17	1
Uranium-238	**0.638**		0.236	0.245		0.528	pCi/g	12/17/14 10:40	12/17/14 12:17	1
Thorium-232	**0.358**		0.0694	0.0785		0.0734	pCi/g	12/17/14 10:40	12/17/14 12:17	1

Client Sample ID: BIN1-010-121614 — Lab Sample ID: 160-9881-10

Date Collected: 12/16/14 12:05 — **Matrix: Solid**
Date Received: 12/17/14 10:00

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	**0.154**		0.0261	0.0306	0.200	0.0167	pCi/g	12/17/14 10:40	12/17/14 13:43	1
Cobalt-60	-0.00278	U	0.0131	0.0131		0.0241	pCi/g	12/17/14 10:40	12/17/14 13:43	1
Uranium-235	0.0220	U	0.0847	0.0848		0.136	pCi/g	12/17/14 10:40	12/17/14 13:43	1
Uranium-238	**0.765**		0.362	0.371		0.473	pCi/g	12/17/14 10:40	12/17/14 13:43	1
Thorium-232	**0.422**		0.0579	0.0722		0.0577	pCi/g	12/17/14 10:40	12/17/14 13:43	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-163954/1-A
Matrix: Solid
Analysis Batch: 163995

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 163954

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	0.003181	U	0.00727	0.00728	0.200	0.0135	pCi/g	12/17/14 10:40	12/17/14 13:43	1
Cobalt-60	0.0000	U	0.00422	0.00422		0.0436	pCi/g	12/17/14 10:40	12/17/14 13:43	1
Uranium-235	0.009533	U	0.0449	0.0449		0.0826	pCi/g	12/17/14 10:40	12/17/14 13:43	1
Uranium-238	-0.09984	U	0.599	0.599		0.308	pCi/g	12/17/14 10:40	12/17/14 13:43	1
Thorium-232	0.0000	U	0.0145	0.0145		0.0379	pCi/g	12/17/14 10:40	12/17/14 13:43	1

Lab Sample ID: LCS 160-163954/2-A
Matrix: Solid
Analysis Batch: 163994

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 163954

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Americium-241	101	100.7		10.5		0.514	pCi/g	100	87 - 116
Cesium-137	35.1	34.70		3.64	0.200	0.190	pCi/g	99	87 - 120
Cobalt-60	37.6	36.97		3.73		0.107	pCi/g	98	87 - 115

Lab Sample ID: 160-9881-1 DU
Matrix: Solid
Analysis Batch: 163989

Client Sample ID: BIN1-001-121614
Prep Type: Total/NA
Prep Batch: 163954

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Cesium-137	0.159		0.1916		0.0400	0.200	0.0160	pCi/g	0.46	1
Cobalt-60	0.00851	U	0.0000	U	0.00908		0.0404	pCi/g	0.44	1
Uranium-235	-0.0182	U	0.05345	U	0.0941		0.151	pCi/g	0.50	1
Uranium-238	0.414	U	0.1952	U	0.225		0.714	pCi/g	0.51	1
Thorium-232	0.402		0.5066		0.118		0.0406	pCi/g	0.50	1

QC Association Summary

Client: Tetra Tech EC, Inc.
Project/Site: Middle River Project: Off-Site Rush Gamm

TestAmerica Job ID: 160-9881-1

Rad

Prep Batch: 163954

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-9881-1	BIN1-001-121614	Total/NA	Solid	Fill_Geo-0	
160-9881-1 DU	BIN1-001-121614	Total/NA	Solid	Fill_Geo-0	
160-9881-2	BIN1-002-121614	Total/NA	Solid	Fill_Geo-0	
160-9881-3	BIN1-003-121614	Total/NA	Solid	Fill_Geo-0	
160-9881-4	BIN1-004-121614	Total/NA	Solid	Fill_Geo-0	
160-9881-5	BIN1-005-121614	Total/NA	Solid	Fill_Geo-0	
160-9881-6	BIN1-006-121614	Total/NA	Solid	Fill_Geo-0	
160-9881-7	BIN1-007-121614	Total/NA	Solid	Fill_Geo-0	
160-9881-8	BIN1-008-121614	Total/NA	Solid	Fill_Geo-0	
160-9881-9	BIN1-009-121614	Total/NA	Solid	Fill_Geo-0	
160-9881-10	BIN1-010-121614	Total/NA	Solid	Fill_Geo-0	
LCS 160-163954/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-0	
MB 160-163954/1-A	Method Blank	Total/NA	Solid	Fill_Geo-0	

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: 160-9881-2
TestAmerica Sample Delivery Group: 160-9881-2
Client Project/Site: Middle River Project: Off-Site Rush Gamm

For:
Tetra Tech EC, Inc.
3200 George Washington Way
Suite G
Richland, Washington 99354

Attn: Steve McGee

Authorized for release by:
2/3/2015 11:49:15 AM

Jayna Awalt, Project Manager II
(314)298-8566
jayna.awalt@testamericainc.com

Table of Contents

Job ID: 160-9881-2

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Tetra Tech EC, Inc.

Project: Middle River Project

Report Number: 160-9881-2

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 12/17/2014 10:00 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 2 coolers at receipt time were 1.8° C and 2.4° C.

ICP-MS (ISOTOPIC URANIUM

Samples BIN1-009-121614 (160-9881-9) and BIN1-010-121614 (160-9881-10) were analyzed for ICP-MS in accordance with EPA SW-846 Method 6020A-Iso Uranium. The samples were prepared on 01/13/2015 and analyzed on 01/26/2015 and 01/29/2015.

Analytical Batch: 170503

The following sample(s) were diluted due to the nature of the sample matrix. Sample digestates were yellow in color indicating a potential matrix interference as well as a potential for high salts which can cause internal standard and instrument QC failure.: (160-9881-9 SD), (CCB 160-170503/12), (CCB 160-170503/24), (CCV 160-170503/11), (CCV 160-170503/23), (CRI 160-170503/8), (ICB 160-170503/7), (ICSA 160-170503/9), (ICSAB 160-170503/10), (MB 160-168222/1-A), BIN1-009-121614 (160-9881-9), BIN1-010-121614 (160-9881-10). Elevated reporting limits (RLs) are provided.

Job ID: 160-9881-2 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

Analytical Batch: 171226

The LLC was outside QC limits for uranium 238. The concentration of this analyte(s) in the sample was at such a high level as to make the LLC unnecessary. (CRI 160-171226/11)

The serial dilution was outside control limits for uranium 238 indicating potential matrix interference: (160-9881-9 SD).

The following sample(s) were diluted due to the nature of the sample matrix. Sample digestates were yellow in color indicating potential matrix interference and for being high in salts: (160-9881-9 MS), (160-9881-9 MSD), (160-9881-9 SD), BIN1-009-121614 (160-9881-9), BIN1-010-121614 (160-9881-10). Elevated reporting limits (RLs) are provided.

Analytical Batch: 170504

The following sample(s) were diluted due to the nature of the sample matrix. Sample digestates were yellow in color indicating potential matrix interference as well as being high in salts: (160-9881-9 SD), BIN1-009-121614 (160-9881-9), BIN1-010-121614 (160-9881-10). Elevated reporting limits (RLs) are provided.

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

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Phone (314) 298-8566 Fax (314) 298-8757

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information	Sampler: Heather Phelan	Lab PM: Awalt, Jayna K	Carrier Tracking No(s):	COC No: 160-2142-1050.1
Client Contact: Heather Phelan	Phone: 9209578422	E-Mail: jayna.awalt@testamericainc.com		Page: Page 1 of 11
Company: Tetra Tech EC, Inc.				Job #:
Address: 3200 George Washington Way Suite G	Due Date Requested:			
City: Richland	TAT Requested (days):			
State, Zip: WA, 99354				
Phone:	PO #: Purchase Order Requested			
Email:	WO #:			
Project Name: Middle River Project: Off-Site Rush Gamm	Project #: 16003877			
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 - Na2S2SO3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - ph 4-5, Z - other (specify)

Other:

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)	GA_01_R_Cs - Gamma Spectrometry (Uranium & Thorium Is	Total Number of containers	Special Instructions/Note:
			Preservation Code:				N		
BIN1-0001-121614	12/16/14	1205	G	Solid	N	N	X		
BIN1-0002-121614			G	Solid			X		
BIN1-0003-121614			G	Solid			X		
BIN1-0004-121614			G	Solid			X		
BIN1-0005-121614			G	Solid			X		
BIN1-0006-121614			G	Solid			X		
BIN1-0007-121614			G	Solid			X		
BIN1-0008-121614			G	Solid			X		
BIN1-0009-121614			G	Solid			X		
BIN1-0010-121614			G	Solid			X		
			G	Solid			X		

160-9881 Chain of Custody

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:

	Date/Time	Company		Date/Time	Company
Relinquished by: Heather Phelan Heather Phelan	12/16/14 1440	Tetra Tech	Received by:	12/16/14 1440	TestAmerica
Relinquished by:	12/16/14 1630	TestAmerica	Received by:	12/17/14 1000	TA STL
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

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

Cooler Temperature(s) °C and Other Remarks:

Login Sample Receipt Checklist

Client: Tetra Tech EC, Inc.

Job Number: 160-9881-2
SDG Number: 160-9881-2

Login Number: 9881
List Number: 1
Creator: Daniels, Brian J

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.	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	

Qualifiers

Metals

Qualifier	Qualifier Description
^	ICV,CCV,ICB,CCB, ISA, ISB, CRI, CRA, DLCK or MRL standard: Instrument related QC exceeds the control limits.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Rad

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

Glossary

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

Method Summary

Client: Tetra Tech EC, Inc.
Project/Site: Middle River Project: Off-Site Rush Gamm

TestAmerica Job ID: 160-9881-2
SDG: 160-9881-2

Method	Method Description	Protocol	Laboratory
6020A	Metals (ICP/MS), Isotopic Uranium	SW846	TAL SL
Moisture	Percent Moisture	EPA	TAL SL
6020A Activity	Metals (ICP/MS), Isotopic Uranium (Activity)	SW846	TAL SL

Protocol References:

EPA = US Environmental Protection Agency

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

Laboratory References:

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

Sample Summary

Client: Tetra Tech EC, Inc.
Project/Site: Middle River Project: Off-Site Rush Gamm

TestAmerica Job ID: 160-9881-2
SDG: 160-9881-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-9881-9	BIN1-009-121614	Solid	12/16/14 12:05	12/17/14 10:00
160-9881-10	BIN1-010-121614	Solid	12/16/14 12:05	12/17/14 10:00

Client Sample ID: BIN1-009-121614

Lab Sample ID: 160-9881-9

Date Collected: 12/16/14 12:05
Matrix: Solid
Date Received: 12/17/14 10:00
Percent Solids: 37.6

Method: 6020A - Metals (ICP/MS), Isotopic Uranium

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
U-234	ND		0.058	0.0035	mg/Kg	☼	01/13/15 16:20	01/29/15 16:45	10
U-235	ND		0.058	0.023	mg/Kg	☼	01/13/15 16:20	01/29/15 16:45	10
U-236	ND		0.058	0.0046	mg/Kg	☼	01/13/15 16:20	01/26/15 18:00	10
U-238	**2.1**	^	0.058	0.0035	mg/Kg	☼	01/13/15 16:20	01/29/15 16:45	10

Method: 6020A Activity - Metals (ICP/MS), Isotopic Uranium (Activity)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
U-234	1.17	U	1.72	1.72	360	21.6	pCi/g	01/13/15 16:20	01/29/15 16:45	10
U-235	0.0422	U	0.00241	0.00457	0.125	0.0509	pCi/g	01/13/15 16:20	01/29/15 16:45	10
U-236	-0.00314	U	0.0128	0.0128	3.74	0.299	pCi/g	01/13/15 16:20	01/26/15 18:00	10
U-238	**0.706**		0.0298	0.0715	0.0194	0.00117	pCi/g	01/13/15 16:20	01/29/15 16:45	10

Client Sample ID: BIN1-010-121614

Lab Sample ID: 160-9881-10

Date Collected: 12/16/14 12:05
Matrix: Solid
Date Received: 12/17/14 10:00
Percent Solids: 44.5

Method: 6020A - Metals (ICP/MS), Isotopic Uranium

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
U-234	ND		0.051	0.0031	mg/Kg	☼	01/13/15 16:20	01/29/15 17:02	10
U-235	ND		0.051	0.021	mg/Kg	☼	01/13/15 16:20	01/29/15 17:02	10
U-236	ND		0.051	0.0041	mg/Kg	☼	01/13/15 16:20	01/26/15 18:08	10
U-238	**2.1**	^	0.051	0.0031	mg/Kg	☼	01/13/15 16:20	01/29/15 17:02	10

Method: 6020A Activity - Metals (ICP/MS), Isotopic Uranium (Activity)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
U-234	1.29	U	1.99	1.99	316	19.0	pCi/g	01/13/15 16:20	01/29/15 17:02	10
U-235	0.0339	U	0.00153	0.00347	0.110	0.0448	pCi/g	01/13/15 16:20	01/29/15 17:02	10
U-236	0.00395	U	0.00704	0.00705	3.29	0.263	pCi/g	01/13/15 16:20	01/26/15 18:08	10
U-238	**0.703**		0.0400	0.0761	0.0171	0.00103	pCi/g	01/13/15 16:20	01/29/15 17:02	10

Method: 6020A - Metals (ICP/MS), Isotopic Uranium

Lab Sample ID: MB 160-168222/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 170503 — **Prep Batch: 168222**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
U-236	ND		0.0049	0.00039	mg/Kg		01/13/15 16:20	01/26/15 17:57	2

Lab Sample ID: MB 160-168222/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 171226 — **Prep Batch: 168222**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
U-234	ND		0.0049	0.00029	mg/Kg		01/13/15 16:20	01/29/15 16:36	2
U-235	ND		0.0049	0.0020	mg/Kg		01/13/15 16:20	01/29/15 16:36	2
U-238	ND	^	0.0049	0.00029	mg/Kg		01/13/15 16:20	01/29/15 16:36	2

Lab Sample ID: LCS 160-168222/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 171226 — **Prep Batch: 168222**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
U-234	0.00799	0.00828		mg/Kg		104	80 - 120
U-235	0.469	0.493		mg/Kg		105	80 - 120
U-238	0.486	0.510	^	mg/Kg		105	80 - 120

Lab Sample ID: 160-9881-9 MS — **Client Sample ID: BIN1-009-121614**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 171226 — **Prep Batch: 168222**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
U-234	ND		0.0216	0.0222	J	mg/Kg	☼	103	75 - 125
U-235	ND		1.27	1.36		mg/Kg	☼	107	75 - 125
U-238	2.1	^	1.32	3.51	^	mg/Kg	☼	107	75 - 125

Lab Sample ID: 160-9881-9 MSD — **Client Sample ID: BIN1-009-121614**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 171226 — **Prep Batch: 168222**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
U-234	ND		0.0203	0.0216	J	mg/Kg	☼	106	75 - 125	3	20
U-235	ND		1.19	1.29		mg/Kg	☼	108	75 - 125	6	20
U-238	2.1	^	1.23	3.46	^	mg/Kg	☼	110	75 - 125	1	20

Method: 6020A Activity - Metals (ICP/MS), Isotopic Uranium (Activity)

Lab Sample ID: MB 160-168222/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 170504 — **Prep Batch: 168222**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
U-236	-0.0001882	U	0.00115	0.00115	0.314	0.0251	pCi/g	01/13/15 16:20	01/26/15 17:57	2

Method: 6020A Activity - Metals (ICP/MS), Isotopic Uranium (Activity) (Continued)

Lab Sample ID: MB 160-168222/1-A
Matrix: Solid
Analysis Batch: 171227

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 168222

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
U-234	-0.01690	U	0.0756	0.0756	30.2	1.81	pCi/g	01/13/15 16:20	01/29/15 16:36	2
U-235	0.00001887	U	0.000117	0.000117	0.0105	0.00427	pCi/g	01/13/15 16:20	01/29/15 16:36	2
U-238	-0.001113	U	0.000255	0.000275	0.00163	0.0000980	pCi/g	01/13/15 16:20	01/29/15 16:36	2

Lab Sample ID: LCS 160-168222/2-A
Matrix: Solid
Analysis Batch: 171227

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 168222

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
U-234			49.7	51.55		5.49	30.1	1.81	pCi/g	104	80 - 120		
U-235			1.01	1.065		0.106	0.0104	0.00425	pCi/g	105	80 - 120		
U-238			0.163	0.1714		0.0178	0.00162	0.0000977	pCi/g	105	80 - 120		

Lab Sample ID: 160-9881-9 MS
Matrix: Solid
Analysis Batch: 171227

Client Sample ID: BIN1-009-121614
Prep Type: Total/NA
Prep Batch: 168222

Analyte	Sample Result	Sample Qual	Spike Added	MS Result	MS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
U-234	1.17	U	135	138.3		20.3	407	24.4	pCi/g	103	75 - 125		
U-235	0.0422	U	2.74	2.947		0.280	0.141	0.0576	pCi/g	107	75 - 125		
U-238	0.706		0.442	1.178		0.121	0.0220	0.00132	pCi/g	107	75 - 125		

Lab Sample ID: 160-9881-9 MSD
Matrix: Solid
Analysis Batch: 171227

Client Sample ID: BIN1-009-121614
Prep Type: Total/NA
Prep Batch: 168222

Analyte	Sample Result	Sample Qual	Spike Added	MSD Result	MSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
U-234	1.17	U	126	134.1		12.4	382	22.9	pCi/g	106	75 - 125	0.13	1
U-235	0.0422	U	2.57	2.782		0.299	0.133	0.0540	pCi/g	108	75 - 125	0.28	1
U-238	0.706		0.415	1.164		0.126	0.0206	0.00124	pCi/g	110	75 - 125	0.06	1

QC Association Summary

Client: Tetra Tech EC, Inc.
Project/Site: Middle River Project: Off-Site Rush Gamm

TestAmerica Job ID: 160-9881-2
SDG: 160-9881-2

Metals

Prep Batch: 168222

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-9881-9	BIN1-009-121614	Total/NA	Solid	3050B	
160-9881-9 MS	BIN1-009-121614	Total/NA	Solid	3050B	
160-9881-9 MSD	BIN1-009-121614	Total/NA	Solid	3050B	
160-9881-10	BIN1-010-121614	Total/NA	Solid	3050B	
LCS 160-168222/2-A	Lab Control Sample	Total/NA	Solid	3050B	
MB 160-168222/1-A	Method Blank	Total/NA	Solid	3050B	

Analysis Batch: 170503

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-9881-9	BIN1-009-121614	Total/NA	Solid	6020A	168222
160-9881-10	BIN1-010-121614	Total/NA	Solid	6020A	168222
MB 160-168222/1-A	Method Blank	Total/NA	Solid	6020A	168222

Analysis Batch: 171226

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-9881-9	BIN1-009-121614	Total/NA	Solid	6020A	168222
160-9881-9 MS	BIN1-009-121614	Total/NA	Solid	6020A	168222
160-9881-9 MSD	BIN1-009-121614	Total/NA	Solid	6020A	168222
160-9881-10	BIN1-010-121614	Total/NA	Solid	6020A	168222
LCS 160-168222/2-A	Lab Control Sample	Total/NA	Solid	6020A	168222
MB 160-168222/1-A	Method Blank	Total/NA	Solid	6020A	168222

General Chemistry

Analysis Batch: 165864

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-9881-9	BIN1-009-121614	Total/NA	Solid	Moisture	
160-9881-9 DU	BIN1-009-121614	Total/NA	Solid	Moisture	
160-9881-10	BIN1-010-121614	Total/NA	Solid	Moisture	

Rad

Prep Batch: 168222

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-9881-9	BIN1-009-121614	Total/NA	Solid	3050B	
160-9881-9 MS	BIN1-009-121614	Total/NA	Solid	3050B	
160-9881-9 MSD	BIN1-009-121614	Total/NA	Solid	3050B	
160-9881-10	BIN1-010-121614	Total/NA	Solid	3050B	
LCS 160-168222/2-A	Lab Control Sample	Total/NA	Solid	3050B	
MB 160-168222/1-A	Method Blank	Total/NA	Solid	3050B	

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: 160-9928-1
TestAmerica Sample Delivery Group: 160-9928
Client Project/Site: Middle River Project: Off-Site Rush Gamm

For:
Tetra Tech EC, Inc.
3200 George Washington Way
Suite G
Richland, Washington 99354

Attn: Steve McGee

Authorized for release by:
12/22/2014 10:01:34 AM

Jayna Awalt, Project Manager II
(314)298-8566
jayna.awalt@testamericainc.com

Table of Contents

Job ID: 160-9928-1

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Tetra Tech EC, Inc.

Project: Middle River Project: Off-Site Rush Gamma

Report Number: 160-9928-1

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 12/19/2014 9:40 AM; the samples arrived in good condition, properly preserved. The temperatures of the 2 coolers at receipt time were 20.0º C and 20.0º C.

CESIUM-137 & OTHER GAMMA EMITTERS (GS)

Samples BATCH2-001-121814 (160-9928-1), BATCH2-002-121814 (160-9928-2), BATCH2-003-121814 (160-9928-3), BATCH2-004-121814 (160-9928-4), BATCH2-005-121814 (160-9928-5), BATCH2-006-121814 (160-9928-6), BATCH2-007-121814 (160-9928-7), BATCH2-008-121814 (160-9928-8), BATCH2-009-121814 (160-9928-9) and BATCH2-010-121814 (160-9928-10) were analyzed for Cesium-137 & Other Gamma Emitters (GS) in accordance with DOE. The samples were prepared and analyzed on 12/19/2014.

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

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Phone (314) 298-8566 Fax (314) 298-8757

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information	Sampler: Heather Phelan	Lab PM: Awalt, Jayna K	Carrier Tracking No(s):	COC No: 160-2142-1050.3
Client Contact: Heather Phelan	Phone: 9208578422	E-Mail: jayna.awalt@testamericainc.com		Page: Page 3 of 11
Company: Tetra Tech EC, Inc.				Job #:

Address: 3200 George Washington Way Suite G	Due Date Requested:	Analysis Requested
City: Richland	TAT Requested (days): 12 hour	
State, Zip: WA, 99354	PO #: Purchase Order Requested	
Phone:	WO #:	
Email:		
Project Name: Middle River Project: Off-Site Rush Gamm	Project #: 16003877	
Site:	SSOW#:	

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 - Na2S2SO3
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:

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)	GA_01_R_Cs - Gamma Spectrometry (Uranium & Thorium Is	Total Number of containers	Special Instructions/Note:
			Preservation Code:				N		
Batch2-001-121814	12/18/14	1030	G	Solid	N	N	X		
Batch2-002-121814				Solid			X		
Batch2-003-121814				Solid			X		
Batch2-004-121814				Solid			X		
Batch2-005-121814				Solid			X		
Batch2-006-121814				Solid			X		
Batch2-007-121814				Solid			X		
Batch2-008-121814				Solid			X		
Batch2-009-121814				Solid			X		
Batch2-010-121814				Solid			X		
				Solid					

160-9928 Chain of Custody

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
1	Heather Phelan	12/18/2014 1530	TetraTech		12/18/14 1530	TestAmerica
2		12/19/14 1630	TestAmerica		12/19/14 0940	TA STL
3		Date/Time:	Company		Date/Time:	Company

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

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12/22/2014

Login Sample Receipt Checklist

Client: Tetra Tech EC, Inc.

Job Number: 160-9928-1
SDG Number: 160-9928

Login Number: 9928
List Number: 1
Creator: Daniels, Brian J

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.	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?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Client: Tetra Tech EC, Inc.
Project/Site: Middle River Project: Off-Site Rush Gamm

TestAmerica Job ID: 160-9928-1
SDG: 160-9928

Qualifiers

Rad

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

Glossary

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

Method Summary

Client: Tetra Tech EC, Inc.
Project/Site: Middle River Project: Off-Site Rush Gamm

TestAmerica Job ID: 160-9928-1
SDG: 160-9928

Method	Method Description	Protocol	Laboratory
GA-01-R	Cesium-137 & Other Gamma Emitters (GS)	DOE	TAL SL

Protocol References:

DOE = U.S. Department of Energy

Laboratory References:

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

Sample Summary

Client: Tetra Tech EC, Inc.
Project/Site: Middle River Project: Off-Site Rush Gamm

TestAmerica Job ID: 160-9928-1
SDG: 160-9928

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-9928-1	BATCH2-001-121814	Solid	12/18/14 10:30	12/19/14 09:40
160-9928-2	BATCH2-002-121814	Solid	12/18/14 10:30	12/19/14 09:40
160-9928-3	BATCH2-003-121814	Solid	12/18/14 10:30	12/19/14 09:40
160-9928-4	BATCH2-004-121814	Solid	12/18/14 10:30	12/19/14 09:40
160-9928-5	BATCH2-005-121814	Solid	12/18/14 10:30	12/19/14 09:40
160-9928-6	BATCH2-006-121814	Solid	12/18/14 10:30	12/19/14 09:40
160-9928-7	BATCH2-007-121814	Solid	12/18/14 10:30	12/19/14 09:40
160-9928-8	BATCH2-008-121814	Solid	12/18/14 10:30	12/19/14 09:40
160-9928-9	BATCH2-009-121814	Solid	12/18/14 10:30	12/19/14 09:40
160-9928-10	BATCH2-010-121814	Solid	12/18/14 10:30	12/19/14 09:40

Client Sample ID: BATCH2-001-121814

Lab Sample ID: 160-9928-1

Date Collected: 12/18/14 10:30
Matrix: Solid
Date Received: 12/19/14 09:40

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	**0.150**		0.0277	0.0318	0.200	0.0185	pCi/g	12/19/14 10:36	12/19/14 12:45	1
Cobalt-60	0.000	U	0.0101	0.0101		0.0108	pCi/g	12/19/14 10:36	12/19/14 12:45	1
Uranium-235	-0.00792	U	0.0165	0.0166		0.147	pCi/g	12/19/14 10:36	12/19/14 12:45	1
Uranium-238	**0.542**		0.185	0.194		0.501	pCi/g	12/19/14 10:36	12/19/14 12:45	1
Thorium-232	**0.459**		0.0867	0.0985		0.0420	pCi/g	12/19/14 10:36	12/19/14 12:45	1

Client Sample ID: BATCH2-002-121814

Lab Sample ID: 160-9928-2

Date Collected: 12/18/14 10:30
Matrix: Solid
Date Received: 12/19/14 09:40

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	**0.152**		0.0335	0.0371	0.200	0.0217	pCi/g	12/19/14 10:36	12/19/14 12:46	1
Cobalt-60	0.000	U	0.00588	0.00588		0.0585	pCi/g	12/19/14 10:36	12/19/14 12:46	1
Uranium-235	0.0855	U	0.0845	0.0849		0.128	pCi/g	12/19/14 10:36	12/19/14 12:46	1
Uranium-238	0.251	U	0.187	0.189		0.728	pCi/g	12/19/14 10:36	12/19/14 12:46	1
Thorium-232	**0.483**		0.0727	0.0878		0.0700	pCi/g	12/19/14 10:36	12/19/14 12:46	1

Client Sample ID: BATCH2-003-121814

Lab Sample ID: 160-9928-3

Date Collected: 12/18/14 10:30
Matrix: Solid
Date Received: 12/19/14 09:40

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	**0.141**		0.0276	0.0312	0.200	0.0164	pCi/g	12/19/14 10:36	12/19/14 12:47	1
Cobalt-60	0.000784	U	0.0146	0.0146		0.0283	pCi/g	12/19/14 10:36	12/19/14 12:47	1
Uranium-235	0.0675	U	0.0861	0.0864		0.143	pCi/g	12/19/14 10:36	12/19/14 12:47	1
Uranium-238	0.411	U	0.175	0.180		0.441	pCi/g	12/19/14 10:36	12/19/14 12:47	1
Thorium-232	**0.560**		0.0896	0.106		0.0302	pCi/g	12/19/14 10:36	12/19/14 12:47	1

Client Sample ID: BATCH2-004-121814

Lab Sample ID: 160-9928-4

Date Collected: 12/18/14 10:30
Matrix: Solid
Date Received: 12/19/14 09:40

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	**0.155**		0.0282	0.0325	0.200	0.0196	pCi/g	12/19/14 10:36	12/19/14 12:48	1
Cobalt-60	0.00152	U	0.00839	0.00839		0.0189	pCi/g	12/19/14 10:36	12/19/14 12:48	1
Uranium-235	0.0479	U	0.0859	0.0861		0.135	pCi/g	12/19/14 10:36	12/19/14 12:48	1
Uranium-238	**0.961**		0.413	0.425		0.499	pCi/g	12/19/14 10:36	12/19/14 12:48	1
Thorium-232	**0.379**		0.0633	0.0741		0.0601	pCi/g	12/19/14 10:36	12/19/14 12:48	1

Client Sample ID: BATCH2-005-121814 Lab Sample ID: 160-9928-5

Date Collected: 12/18/14 10:30 **Matrix: Solid**
Date Received: 12/19/14 09:40

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	**0.145**		0.0363	0.0393	0.200	0.0284	pCi/g	12/19/14 10:36	12/19/14 12:53	1
Cobalt-60	0.00878	U	0.0223	0.0223		0.0398	pCi/g	12/19/14 10:36	12/19/14 12:53	1
Uranium-235	0.0680	U	0.0860	0.0863		0.156	pCi/g	12/19/14 10:36	12/19/14 12:53	1
Uranium-238	0.212	U	0.247	0.248		0.765	pCi/g	12/19/14 10:36	12/19/14 12:53	1
Thorium-232	**0.484**		0.0828	0.0964		0.0407	pCi/g	12/19/14 10:36	12/19/14 12:53	1

Client Sample ID: BATCH2-006-121814 Lab Sample ID: 160-9928-6

Date Collected: 12/18/14 10:30 **Matrix: Solid**
Date Received: 12/19/14 09:40

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	**0.165**		0.0304	0.0349	0.200	0.0204	pCi/g	12/19/14 10:36	12/19/14 14:02	1
Cobalt-60	0.00525	U	0.0167	0.0167		0.0299	pCi/g	12/19/14 10:36	12/19/14 14:02	1
Uranium-235	0.0581	U	0.0748	0.0750		0.137	pCi/g	12/19/14 10:36	12/19/14 14:02	1
Uranium-238	**0.664**		0.339	0.346		0.484	pCi/g	12/19/14 10:36	12/19/14 14:02	1
Thorium-232	**0.432**		0.0755	0.0874		0.0265	pCi/g	12/19/14 10:36	12/19/14 14:02	1

Client Sample ID: BATCH2-007-121814 Lab Sample ID: 160-9928-7

Date Collected: 12/18/14 10:30 **Matrix: Solid**
Date Received: 12/19/14 09:40

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	**0.155**		0.0363	0.0397	0.200	0.0242	pCi/g	12/19/14 10:36	12/19/14 14:03	1
Cobalt-60	0.000619	U	0.0220	0.0220		0.0425	pCi/g	12/19/14 10:36	12/19/14 14:03	1
Uranium-235	0.0748	U	0.106	0.106		0.175	pCi/g	12/19/14 10:36	12/19/14 14:03	1
Uranium-238	0.371	U	0.254	0.257		0.771	pCi/g	12/19/14 10:36	12/19/14 14:03	1
Thorium-232	**0.410**		0.114	0.121		0.0734	pCi/g	12/19/14 10:36	12/19/14 14:03	1

Client Sample ID: BATCH2-008-121814 Lab Sample ID: 160-9928-8

Date Collected: 12/18/14 10:30 **Matrix: Solid**
Date Received: 12/19/14 09:40

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	**0.190**		0.0359	0.0409	0.200	0.0230	pCi/g	12/19/14 10:36	12/19/14 14:04	1
Cobalt-60	0.00279	U	0.0204	0.0204		0.0376	pCi/g	12/19/14 10:36	12/19/14 14:04	1
Uranium-235	0.00618	U	0.0192	0.0192		0.167	pCi/g	12/19/14 10:36	12/19/14 14:04	1
Uranium-238	**0.604**		0.341	0.347		0.497	pCi/g	12/19/14 10:36	12/19/14 14:04	1
Thorium-232	**0.485**		0.0768	0.0914		0.0502	pCi/g	12/19/14 10:36	12/19/14 14:04	1

Client Sample ID: BATCH2-009-121814

Lab Sample ID: 160-9928-9

Date Collected: 12/18/14 10:30
Matrix: Solid
Date Received: 12/19/14 09:40

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	**0.147**		0.0271	0.0311	0.200	0.0190	pCi/g	12/19/14 10:36	12/19/14 14:05	1
Cobalt-60	0.00458	U	0.0115	0.0115		0.0206	pCi/g	12/19/14 10:36	12/19/14 14:05	1
Uranium-235	0.0713	U	0.0843	0.0846		0.135	pCi/g	12/19/14 10:36	12/19/14 14:05	1
Uranium-238	**0.597**		0.370	0.376		0.481	pCi/g	12/19/14 10:36	12/19/14 14:05	1
Thorium-232	**0.373**		0.0631	0.0736		0.0624	pCi/g	12/19/14 10:36	12/19/14 14:05	1

Client Sample ID: BATCH2-010-121814

Lab Sample ID: 160-9928-10

Date Collected: 12/18/14 10:30
Matrix: Solid
Date Received: 12/19/14 09:40

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	**0.179**		0.0293	0.0347	0.200	0.0184	pCi/g	12/19/14 10:36	12/19/14 14:43	1
Cobalt-60	0.000	U	0.00283	0.00283		0.0104	pCi/g	12/19/14 10:36	12/19/14 14:43	1
Uranium-235	0.0494	U	0.0813	0.0815		0.140	pCi/g	12/19/14 10:36	12/19/14 14:43	1
Uranium-238	**0.613**		0.346	0.352		0.473	pCi/g	12/19/14 10:36	12/19/14 14:43	1
Thorium-232	**0.459**		0.0685	0.0830		0.0470	pCi/g	12/19/14 10:36	12/19/14 14:43	1

Client: Tetra Tech EC, Inc.
Project/Site: Middle River Project: Off-Site Rush Gamm

TestAmerica Job ID: 160-9928-1
SDG: 160-9928

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-164447/1-A
Matrix: Solid
Analysis Batch: 164546

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 164447

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	0.004535	U	0.0108	0.0108	0.200	0.0195	pCi/g	12/19/14 10:36	12/19/14 14:41	1
Cobalt-60	0.0000	U	0.00422	0.00422		0.0155	pCi/g	12/19/14 10:36	12/19/14 14:41	1
Uranium-235	-0.001337	U	0.0480	0.0480		0.0871	pCi/g	12/19/14 10:36	12/19/14 14:41	1
Uranium-238	-0.02102	U	0.187	0.187		0.297	pCi/g	12/19/14 10:36	12/19/14 14:41	1
Thorium-232	-0.001553	U	0.0452	0.0452		0.0878	pCi/g	12/19/14 10:36	12/19/14 14:41	1

Lab Sample ID: LCS 160-164447/2-A
Matrix: Solid
Analysis Batch: 164545

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 164447

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Americium-241			101	100.6		10.5		0.491	pCi/g	100	87 - 116		
Cesium-137			35.1	34.63		3.63	0.200	0.183	pCi/g	99	87 - 120		
Cobalt-60			37.5	36.41		3.67		0.110	pCi/g	97	87 - 115		

Lab Sample ID: 160-9928-1 DU
Matrix: Solid
Analysis Batch: 164505

Client Sample ID: BATCH2-001-121814
Prep Type: Total/NA
Prep Batch: 164447

Analyte	Sample Result	Sample Qual		DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit			RER	RER Limit
Cesium-137	0.150			0.1450		0.0381	0.200	0.0238	pCi/g			0.07	1
Cobalt-60	0.000	U		0.006280	U	0.0141		0.0178	pCi/g			0.26	1
Uranium-235	-0.00792	U		0.06846	U	0.0959		0.159	pCi/g			0.68	1
Uranium-238	0.542			0.2727	U	0.203		0.759	pCi/g			0.68	1
Thorium-232	0.459			0.4450		0.104		0.0432	pCi/g			0.07	1

QC Association Summary

Client: Tetra Tech EC, Inc.
Project/Site: Middle River Project: Off-Site Rush Gamm

TestAmerica Job ID: 160-9928-1
SDG: 160-9928

Rad

Prep Batch: 164447

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-9928-1	BATCH2-001-121814	Total/NA	Solid	Fill_Geo-0	
160-9928-1 DU	BATCH2-001-121814	Total/NA	Solid	Fill_Geo-0	
160-9928-2	BATCH2-002-121814	Total/NA	Solid	Fill_Geo-0	
160-9928-3	BATCH2-003-121814	Total/NA	Solid	Fill_Geo-0	
160-9928-4	BATCH2-004-121814	Total/NA	Solid	Fill_Geo-0	
160-9928-5	BATCH2-005-121814	Total/NA	Solid	Fill_Geo-0	
160-9928-6	BATCH2-006-121814	Total/NA	Solid	Fill_Geo-0	
160-9928-7	BATCH2-007-121814	Total/NA	Solid	Fill_Geo-0	
160-9928-8	BATCH2-008-121814	Total/NA	Solid	Fill_Geo-0	
160-9928-9	BATCH2-009-121814	Total/NA	Solid	Fill_Geo-0	
160-9928-10	BATCH2-010-121814	Total/NA	Solid	Fill_Geo-0	
LCS 160-164447/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-0	
MB 160-164447/1-A	Method Blank	Total/NA	Solid	Fill_Geo-0	

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: 160-9928-2
TestAmerica Sample Delivery Group: 160-9928-2
Client Project/Site: Middle River Project: Off-Site Rush Gamm

For:
Tetra Tech EC, Inc.
3200 George Washington Way
Suite G
Richland, Washington 99354

Attn: Steve McGee

Authorized for release by:
2/3/2015 2:20:58 PM

Jayna Awalt, Project Manager II
(314)298-8566
jayna.awalt@testamericainc.com

Table of Contents

Job ID: 160-9928-2

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Tetra Tech EC, Inc.

Project: Middle River Project

Report Number: 160-9928-2

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 12/19/2014 9:40 AM; the samples arrived in good condition, properly preserved. The temperatures of the 2 coolers at receipt time were 20.0º C and 20.0º C.

ICP-MS (ISOTOPIC URANIUM)

Samples BATCH2-004-121814 (160-9928-4) and BATCH2-010-121814 (160-9928-10) were analyzed for ICP-MS in accordance with EPA SW-846 Method 6020A-Iso Uranium. The samples were prepared on 01/13/2015 and analyzed on 01/26/2015 and 01/29/2015.

Analytical Batch: 170503

The following sample(s) were diluted due to the nature of the sample matrix. Sample digestates were yellow in color indicating potential matrix interference as well as a potential for high salts which can cause internal standard and instrument QC failure: BATCH2-004-121814 (160-9928-4), BATCH2-010-121814 (160-9928-10). Elevated reporting limits (RLs) are provided.

Analytical Batch: 171226

The LLC was outside QC limits for uranium 238. The concentration of this analyte(s) in the sample was at such a high level as to make

Job ID: 160-9928-2 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

the LLC unnecessary. (CRI 160-171226/11)

The serial dilution was outside control limits for uranium 238 indicating potential matrix interference. : (160-9881-9 SD)

The following sample(s) were diluted due to the nature of the sample matrix. Sample digestates were yellow in color indicating potential matrix interference and for being high in salts: (160-9881-9 MS), (160-9881-9 MSD), (160-9881-9 SD), BATCH2-004-121814 (160-9928-4), BATCH2-010-121814 (160-9928-10). Elevated reporting limits (RLs) are provided.

Analytical Batch: 170504
The following sample(s) were diluted due to the nature of the sample matrix. Sample digestates were yellow in color indicating potential matrix interference as well as being high in salts: BATCH2-004-121814 (160-9928-4), BATCH2-010-121814 (160-9928-10). Elevated reporting limits (RLs) are provided.

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

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Phone (314) 298-8566 Fax (314) 298-8757

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information	Sampler: Heather Phelan	Lab PM: Awalt, Jayna K	Carrier Tracking No(s):	COC No: 160-2142-1050.3
Client Contact: Heather Phelan	Phone: 9208578422	E-Mail: jayna.awalt@testamericainc.com		Page: Page 3 of 11
Company: Tetra Tech EC, Inc.				Job #:

Address: 3200 George Washington Way Suite G	Due Date Requested:	Analysis Requested	Preservation Codes:
City: Richland	TAT Requested (days): 12 hour		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 - Na2S2SO3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - ph 4-5, Z - other (specify)
State, Zip: WA, 99354			
Phone:	PO #: Purchase Order Requested		Other:
Email:	WO #:		
Project Name: Middle River Project: Off-Site Rush Gamm	Project #: 16003877		
Site:	SSOW#:		

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)	GA_01_R_Cs - Gamma Spectrometry (Uranium & Thorium Is	Total Number of containers	Special Instructions/Note:
			Preservation Code:				N		
Batch2-001-121814	12/18/14	1030	G	Solid	N	N	X		
Batch2-002-121814				Solid			X		
Batch2-003-121814				Solid			X		
Batch2-004-121814				Solid			X		
Batch2-005-121814				Solid			X		
Batch2-006-121814				Solid			X		
Batch2-007-121814				Solid			X		
Batch2-008-121814				Solid			X		
Batch2-009-121814				Solid			X		
Batch2-010-121814				Solid			X		
				Solid					

160-9928 Chain of Custody

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
1	Heather Phelan	12/18/2014 1530	TetraTech		12/18/14 1530	TestAmerica
2		12/19/14 1130	TestAmerica		12/19/14 0940	TA STL
3		Date/Time:	Company		Date/Time:	Company

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

Cooler Temperature(s) °C and Other Remarks:

Login Sample Receipt Checklist

Client: Tetra Tech EC, Inc.

Job Number: 160-9928-2
SDG Number: 160-9928-2

Login Number: 9928
List Number: 1
Creator: Daniels, Brian J

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.	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?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Client: Tetra Tech EC, Inc.
Project/Site: Middle River Project: Off-Site Rush Gamm

TestAmerica Job ID: 160-9928-2
SDG: 160-9928-2

Qualifiers

Metals

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
^	ICV,CCV,ICB,CCB, ISA, ISB, CRI, CRA, DLCK or MRL standard: Instrument related QC exceeds the control limits.

Rad

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

Glossary

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

Method Summary

Client: Tetra Tech EC, Inc.
Project/Site: Middle River Project: Off-Site Rush Gamm

TestAmerica Job ID: 160-9928-2
SDG: 160-9928-2

Method	Method Description	Protocol	Laboratory
6020A	Metals (ICP/MS), Isotopic Uranium	SW846	TAL SL
Moisture	Percent Moisture	EPA	TAL SL
6020A Activity	Metals (ICP/MS), Isotopic Uranium (Activity)	SW846	TAL SL

Protocol References:

EPA = US Environmental Protection Agency

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

Laboratory References:

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

Sample Summary

Client: Tetra Tech EC, Inc.
Project/Site: Middle River Project: Off-Site Rush Gamm

TestAmerica Job ID: 160-9928-2
SDG: 160-9928-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-9928-4	BATCH2-004-121814	Solid	12/18/14 10:30	12/19/14 09:40
160-9928-10	BATCH2-010-121814	Solid	12/18/14 10:30	12/19/14 09:40

Client Sample ID: BATCH2-004-121814

Lab Sample ID: 160-9928-4

Date Collected: 12/18/14 10:30
Matrix: Solid
Date Received: 12/19/14 09:40
Percent Solids: 39.8

Method: 6020A - Metals (ICP/MS), Isotopic Uranium

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
U-234	ND		0.062	0.0037	mg/Kg	☼	01/13/15 16:20	01/29/15 17:15	10
U-235	ND		0.062	0.025	mg/Kg	☼	01/13/15 16:20	01/29/15 17:15	10
U-236	ND		0.062	0.0050	mg/Kg	☼	01/13/15 16:20	01/26/15 18:11	10
U-238	**2.0**	^	0.062	0.0037	mg/Kg	☼	01/13/15 16:20	01/29/15 17:15	10

Method: 6020A Activity - Metals (ICP/MS), Isotopic Uranium (Activity)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
U-234	0.823	U	2.19	2.19	388	23.3	pCi/g	01/13/15 16:20	01/29/15 17:15	10
U-235	0.0334	U	0.00553	0.00632	0.135	0.0549	pCi/g	01/13/15 16:20	01/29/15 17:15	10
U-236	0.00645	U	0.00296	0.00301	4.03	0.323	pCi/g	01/13/15 16:20	01/26/15 18:11	10
U-238	**0.678**		0.0664	0.0911	0.0210	0.00126	pCi/g	01/13/15 16:20	01/29/15 17:15	10

Client Sample ID: BATCH2-010-121814

Lab Sample ID: 160-9928-10

Date Collected: 12/18/14 10:30
Matrix: Solid
Date Received: 12/19/14 09:40
Percent Solids: 37.9

Method: 6020A - Metals (ICP/MS), Isotopic Uranium

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
U-234	ND		0.060	0.0036	mg/Kg	☼	01/13/15 16:20	01/29/15 17:20	10
U-235	ND		0.060	0.025	mg/Kg	☼	01/13/15 16:20	01/29/15 17:20	10
U-236	ND		0.060	0.0048	mg/Kg	☼	01/13/15 16:20	01/26/15 18:22	10
U-238	**2.0**	^	0.060	0.0036	mg/Kg	☼	01/13/15 16:20	01/29/15 17:20	10

Method: 6020A Activity - Metals (ICP/MS), Isotopic Uranium (Activity)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
U-234	1.23	U	2.18	2.18	375	22.5	pCi/g	01/13/15 16:20	01/29/15 17:20	10
U-235	0.0341	U	0.00204	0.00375	0.130	0.0531	pCi/g	01/13/15 16:20	01/29/15 17:20	10
U-236	0.00375	U	0.00103	0.00108	3.90	0.313	pCi/g	01/13/15 16:20	01/26/15 18:22	10
U-238	**0.668**		0.0332	0.0698	0.0203	0.00122	pCi/g	01/13/15 16:20	01/29/15 17:20	10

Method: 6020A - Metals (ICP/MS), Isotopic Uranium

Lab Sample ID: MB 160-168222/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 170503 — **Prep Batch: 168222**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
U-236	ND		0.0049	0.00039	mg/Kg		01/13/15 16:20	01/26/15 17:57	2

Lab Sample ID: MB 160-168222/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 171226 — **Prep Batch: 168222**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
U-234	ND		0.0049	0.00029	mg/Kg		01/13/15 16:20	01/29/15 16:36	2
U-235	ND		0.0049	0.0020	mg/Kg		01/13/15 16:20	01/29/15 16:36	2
U-238	ND	^	0.0049	0.00029	mg/Kg		01/13/15 16:20	01/29/15 16:36	2

Lab Sample ID: LCS 160-168222/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 171226 — **Prep Batch: 168222**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
U-234	0.00799	0.00828		mg/Kg		104	80 - 120
U-235	0.469	0.493		mg/Kg		105	80 - 120
U-238	0.486	0.510	^	mg/Kg		105	80 - 120

Lab Sample ID: 160-9881-A-9-C MS — **Client Sample ID: Matrix Spike**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 171226 — **Prep Batch: 168222**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
U-234	ND		0.0216	0.0222	J	mg/Kg	☼	103	75 - 125
U-235	ND		1.27	1.36		mg/Kg	☼	107	75 - 125
U-238	2.1	^	1.32	3.51	^	mg/Kg	☼	107	75 - 125

Lab Sample ID: 160-9881-A-9-D MSD — **Client Sample ID: Matrix Spike Duplicate**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 171226 — **Prep Batch: 168222**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
U-234	ND		0.0203	0.0216	J	mg/Kg	☼	106	75 - 125	3	20
U-235	ND		1.19	1.29		mg/Kg	☼	108	75 - 125	6	20
U-238	2.1	^	1.23	3.46	^	mg/Kg	☼	110	75 - 125	1	20

Method: 6020A Activity - Metals (ICP/MS), Isotopic Uranium (Activity)

Lab Sample ID: MB 160-168222/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 170504 — **Prep Batch: 168222**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
U-236	-0.0001882	U	0.00115	0.00115	0.314	0.0251	pCi/g	01/13/15 16:20	01/26/15 17:57	2

Method: 6020A Activity - Metals (ICP/MS), Isotopic Uranium (Activity) (Continued)

Lab Sample ID: MB 160-168222/1-A
Matrix: Solid
Analysis Batch: 171227

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 168222

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
U-234	-0.01690	U	0.0756	0.0756	30.2	1.81	pCi/g	01/13/15 16:20	01/29/15 16:36	2
U-235	0.00001887	U	0.000117	0.000117	0.0105	0.00427	pCi/g	01/13/15 16:20	01/29/15 16:36	2
U-238	-0.001113	U	0.000255	0.000275	0.00163	0.0000980	pCi/g	01/13/15 16:20	01/29/15 16:36	2

Lab Sample ID: LCS 160-168222/2-A
Matrix: Solid
Analysis Batch: 171227

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 168222

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
U-234	49.7	51.55		5.49	30.1	1.81	pCi/g	104	80 - 120
U-235	1.01	1.065		0.106	0.0104	0.00425	pCi/g	105	80 - 120
U-238	0.163	0.1714		0.0178	0.00162	0.0000977	pCi/g	105	80 - 120

Lab Sample ID: 160-9881-A-9-C MS
Matrix: Solid
Analysis Batch: 171227

Client Sample ID: Matrix Spike
Prep Type: Total/NA
Prep Batch: 168222

Analyte	Sample Result	Sample Qual	Spike Added	MS Result	MS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
U-234	1.17	U	135	138.3		20.3	407	24.4	pCi/g	103	75 - 125
U-235	0.0422	U	2.74	2.947		0.280	0.141	0.0576	pCi/g	107	75 - 125
U-238	0.706		0.442	1.178		0.121	0.0220	0.00132	pCi/g	107	75 - 125

Lab Sample ID: 160-9881-A-9-D MSD
Matrix: Solid
Analysis Batch: 171227

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total/NA
Prep Batch: 168222

Analyte	Sample Result	Sample Qual	Spike Added	MSD Result	MSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
U-234	1.17	U	126	134.1		12.4	382	22.9	pCi/g	106	75 - 125	0.13	1
U-235	0.0422	U	2.57	2.782		0.299	0.133	0.0540	pCi/g	108	75 - 125	0.28	1
U-238	0.706		0.415	1.164		0.126	0.0206	0.00124	pCi/g	110	75 - 125	0.06	1

QC Association Summary

Client: Tetra Tech EC, Inc.
Project/Site: Middle River Project: Off-Site Rush Gamm

TestAmerica Job ID: 160-9928-2
SDG: 160-9928-2

Metals

Prep Batch: 168222

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-9881-A-9-C MS	Matrix Spike	Total/NA	Solid	3050B	
160-9881-A-9-D MSD	Matrix Spike Duplicate	Total/NA	Solid	3050B	
160-9928-4	BATCH2-004-121814	Total/NA	Solid	3050B	
160-9928-10	BATCH2-010-121814	Total/NA	Solid	3050B	
LCS 160-168222/2-A	Lab Control Sample	Total/NA	Solid	3050B	
MB 160-168222/1-A	Method Blank	Total/NA	Solid	3050B	

Analysis Batch: 170503

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-9928-4	BATCH2-004-121814	Total/NA	Solid	6020A	168222
160-9928-10	BATCH2-010-121814	Total/NA	Solid	6020A	168222
MB 160-168222/1-A	Method Blank	Total/NA	Solid	6020A	168222

Analysis Batch: 171226

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-9881-A-9-C MS	Matrix Spike	Total/NA	Solid	6020A	168222
160-9881-A-9-D MSD	Matrix Spike Duplicate	Total/NA	Solid	6020A	168222
160-9928-4	BATCH2-004-121814	Total/NA	Solid	6020A	168222
160-9928-10	BATCH2-010-121814	Total/NA	Solid	6020A	168222
LCS 160-168222/2-A	Lab Control Sample	Total/NA	Solid	6020A	168222
MB 160-168222/1-A	Method Blank	Total/NA	Solid	6020A	168222

General Chemistry

Analysis Batch: 165864

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-9881-A-9 DU	Duplicate	Total/NA	Solid	Moisture	
160-9928-4	BATCH2-004-121814	Total/NA	Solid	Moisture	
160-9928-10	BATCH2-010-121814	Total/NA	Solid	Moisture	

Rad

Prep Batch: 168222

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-9881-A-9-C MS	Matrix Spike	Total/NA	Solid	3050B	
160-9881-A-9-D MSD	Matrix Spike Duplicate	Total/NA	Solid	3050B	
160-9928-4	BATCH2-004-121814	Total/NA	Solid	3050B	
160-9928-10	BATCH2-010-121814	Total/NA	Solid	3050B	
LCS 160-168222/2-A	Lab Control Sample	Total/NA	Solid	3050B	
MB 160-168222/1-A	Method Blank	Total/NA	Solid	3050B	

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: 160-10190-1
Client Project/Site: Middle River Project

For:
Tetra Tech EC, Inc.
3200 George Washington Way
Suite G
Richland, Washington 99354

Attn: Steve McGee

Authorized for release by:
1/27/2015 1:27:40 PM

Jayna Awalt, Project Manager II
(314)298-8566
jayna.awalt@testamericainc.com

Table of Contents

Job ID: 160-10190-1

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Tetra Tech EC, Inc.

Project: Middle River Project

Report Number: 160-10190-1

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 1/20/2015 9:10 AM; the samples arrived in good condition, properly preserved. The temperatures of the 2 coolers at receipt time were 20.0º C and 20.0º C.

CESIUM-137 & OTHER GAMMA EMITTERS (GS)

Samples BATCH3-001-011915 (160-10190-1), BATCH3-002-011915 (160-10190-2), BATCH3-003-011915 (160-10190-3), BATCH3-004-011915 (160-10190-4), BATCH3-005-011915 (160-10190-5), BATCH3-006-011915 (160-10190-6), BATCH3-007-011915 (160-10190-7), BATCH3-008-011915 (160-10190-8), BATCH3-009-011915 (160-10190-9), BATCH3-010-011915 (160-10190-10), BATCH4-001-011915 (160-10190-11), BATCH4-002-011915 (160-10190-12), BATCH4-003-011915 (160-10190-13), BATCH4-004-011915 (160-10190-14), BATCH4-005-011915 (160-10190-15), BATCH4-006-011915 (160-10190-16), BATCH4-007-011915 (160-10190-17), BATCH4-008-011915 (160-10190-18), BATCH4-009-011915 (160-10190-19) and BATCH4-010-011915 (160-10190-20) were analyzed for Cesium-137 & Other Gamma Emitters (GS) in accordance with DOE GA-01-R. The samples were leached on 01/20/2015, prepared on 01/22/2015 and analyzed on 01/22/2015 and 01/23/2015.

Preparation Batch: 169743

Job ID: 160-10190-1 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

The RER was outside of the acceptance limits of 1 for uranium-238. Both the sample and duplicate activity were less than the MDC. (160-10190-10 DU), (LCS 160-169743/2-A), (MB 160-169743/1-A), BATCH3-001-011915 (160-10190-1), BATCH3-002-011915 (160-10190-2), BATCH3-003-011915 (160-10190-3), BATCH3-004-011915 (160-10190-4), BATCH3-005-011915 (160-10190-5), BATCH3-006-011915 (160-10190-6), BATCH3-007-011915 (160-10190-7), BATCH3-008-011915 (160-10190-8), BATCH3-009-011915 (160-10190-9), BATCH3-010-011915 (160-10190-10), BATCH4-001-011915 (160-10190-11), BATCH4-002-011915 (160-10190-12), BATCH4-003-011915 (160-10190-13), BATCH4-004-011915 (160-10190-14), BATCH4-005-011915 (160-10190-15), BATCH4-006-011915 (160-10190-16), BATCH4-007-011915 (160-10190-17), BATCH4-008-011915 (160-10190-18), BATCH4-009-011915 (160-10190-19), BATCH4-010-011915 (160-10190-20)

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

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Phone (314) 298-8566 Fax (314) 298-8757

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information	Sampler: Heather Phelan	Lab PM: Awalt, Jayna K	Carrier Tracking No(s):	COC No: 160-2142-1050.5
Client Contact: Heather Phelan	Phone: 920-857-8422	E-Mail: jayna.awalt@testamericainc.com		Page: ~~Page 5 of 11~~ 1 of 2
Company: Tetra Tech EC, Inc.				Job #:

Address: 3200 George Washington Way Suite G	Due Date Requested:	Analysis Requested	Preservation Codes:
City: Richland	TAT Requested (days): 14 days		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 - Na2S2SO3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - ph 4-5, Z - other (specify)
State, Zip: WA, 99354			
Phone:	PO #: Purchase Order Requested		Other:
Email:	WO #:		
Project Name: Middle River Project: Off-Site Rush Gamm	Project #: 16003877		
Site:	SSOW#:		

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)	GA_01_R_Cs - Gamma Spectrometry (Uranium & Thorium Is	Total Number of containers	Special Instructions/Note:
			Preservation Code:			N			
Batch3-001-011915	1/19/15	1200	G	Solid	X	N	1		
Batch3-002-011915				Solid	X	N	1		
Batch3-003-011915				Solid	X	N	1		
Batch3-004-011915				Solid	X	N	1		
Batch3-005-011915				Solid	X	N	1		
Batch3-006-011915				Solid	X	N	1		
Batch3-007-011915				Solid	X	N	1		
Batch3-008-011915				Solid	X	N	1		
Batch3-009-011915				Solid	X	N	1		
Batch3-010-011915				Solid	X	N	1		
				Solid					

160-10190 Chain of Custody

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: Heather Phelan	Date/Time: 1/19/15 1522	Company TT	Received by:	Date/Time: 1/19/15 1522	Company TestAmerica
Relinquished by:	Date/Time: 1/19/15 1630	Company TT	Received by:	Date/Time: 1/20/15 0900	Company TA
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

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

Cooler Temperature(s) °C and Other Remarks:

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Phone (314) 298-8566 Fax (314) 298-8757

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information	Sampler: Heather Phelan	Lab PM: Awalt, Jayna K	Carrier Tracking No(s):	COC No: 160-2142-1050.6
Client Contact: Heather Phelan	Phone: 9208578422	E-Mail: jayna.awalt@testamericainc.com		Page: ~~Page 6 of 11~~ 2of2
Company: Tetra Tech EC, Inc.				Job #:
Address: 3200 George Washington Way Suite G	Due Date Requested:			
City: Richland	TAT Requested (days): 14 days			
State, Zip: WA, 99354				
Phone:	PO #: Purchase Order Requested			
Email:	WO #:			
Project Name: Middle River Project: Off-Site Rush Gamm	Project #: 16003877			
Site:	SSOW#:			

Analysis Requested

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 - Na2S2SO3
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:

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)	GA_01_R_Cs - Gamma Spectrometry (Uranium & Thorium Is	Total Number of containers	Special Instructions/Note:
			Preservation Code:				N		
Batch4-001-011915	1/19/15	1230	G	Solid	X	N	1		
Batch4-002-011915				Solid	X	N	1		
Batch4-003-011915				Solid	X	N	1		
Batch4-004-011915				Solid	X	N	1		
Batch4-005-011915				Solid	X	N	1		
Batch4-006-011915				Solid	X	N	1		
Batch4-007-011915				Solid	X	N	1		
Batch4-008-011915				Solid	X	N	1		
Batch4-009-011915				Solid	X	N	1		
Batch4-010-011915				Solid	X	N	1		
				Solid					

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
1	Heather Phelan	1/19/15 1522		Paul Lund	1/19/15 1522	TA
2	Paul Lund	1/19/15 1630	TT		1/20/15 0910	TA
3						

Custody Seals Intact: ☐ Yes ☐ No
Custody Seal No.:

Cooler Temperature(s) °C and Other Remarks:

1/27/2015

Login Sample Receipt Checklist

Client: Tetra Tech EC, Inc.

Job Number: 160-10190-1

Login Number: 10190

List Source: TestAmerica St. Louis

List Number: 1

Creator: Daniels, Brian J

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.	False	Thermal preservation not required.
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.	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	

Qualifiers

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.
F	Duplicate RPD exceeds the control limit

Glossary

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

Method Summary

Client: Tetra Tech EC, Inc.
Project/Site: Middle River Project

TestAmerica Job ID: 160-10190-1

Method	Method Description	Protocol	Laboratory
GA-01-R	Cesium-137 & Other Gamma Emitters (GS)	DOE	TAL SL

Protocol References:

DOE = U.S. Department of Energy

Laboratory References:

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

Sample Summary

Client: Tetra Tech EC, Inc.
Project/Site: Middle River Project

TestAmerica Job ID: 160-10190-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-10190-1	BATCH3-001-011915	Solid	01/19/15 12:00	01/20/15 09:10
160-10190-2	BATCH3-002-011915	Solid	01/19/15 12:00	01/20/15 09:10
160-10190-3	BATCH3-003-011915	Solid	01/19/15 12:00	01/20/15 09:10
160-10190-4	BATCH3-004-011915	Solid	01/19/15 12:00	01/20/15 09:10
160-10190-5	BATCH3-005-011915	Solid	01/19/15 12:00	01/20/15 09:10
160-10190-6	BATCH3-006-011915	Solid	01/19/15 12:00	01/20/15 09:10
160-10190-7	BATCH3-007-011915	Solid	01/19/15 12:00	01/20/15 09:10
160-10190-8	BATCH3-008-011915	Solid	01/19/15 12:00	01/20/15 09:10
160-10190-9	BATCH3-009-011915	Solid	01/19/15 12:00	01/20/15 09:10
160-10190-10	BATCH3-010-011915	Solid	01/19/15 12:00	01/20/15 09:10
160-10190-11	BATCH4-001-011915	Solid	01/19/15 12:30	01/20/15 09:10
160-10190-12	BATCH4-002-011915	Solid	01/19/15 12:30	01/20/15 09:10
160-10190-13	BATCH4-003-011915	Solid	01/19/15 12:30	01/20/15 09:10
160-10190-14	BATCH4-004-011915	Solid	01/19/15 12:30	01/20/15 09:10
160-10190-15	BATCH4-005-011915	Solid	01/19/15 12:30	01/20/15 09:10
160-10190-16	BATCH4-006-011915	Solid	01/19/15 12:30	01/20/15 09:10
160-10190-17	BATCH4-007-011915	Solid	01/19/15 12:30	01/20/15 09:10
160-10190-18	BATCH4-008-011915	Solid	01/19/15 12:30	01/20/15 09:10
160-10190-19	BATCH4-009-011915	Solid	01/19/15 12:30	01/20/15 09:10
160-10190-20	BATCH4-010-011915	Solid	01/19/15 12:30	01/20/15 09:10

Client Sample ID: BATCH3-001-011915

Lab Sample ID: 160-10190-1

Date Collected: 01/19/15 12:00

Matrix: Solid

Date Received: 01/20/15 09:10

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	0.0339	U	0.0699	0.0700	0.200	0.122	pCi/g	01/22/15 11:08	01/22/15 21:03	1
Cobalt-60	0.000	U	0.0316	0.0316		0.0822	pCi/g	01/22/15 11:08	01/22/15 21:03	1
Uranium-235	0.142	U	0.249	0.249		0.404	pCi/g	01/22/15 11:08	01/22/15 21:03	1
Uranium-238	0.519	U	0.726	0.728		2.35	pCi/g	01/22/15 11:08	01/22/15 21:03	1
Thorium-232	0.196	U	0.229	0.230		0.462	pCi/g	01/22/15 11:08	01/22/15 21:03	1

Client Sample ID: BATCH3-002-011915

Lab Sample ID: 160-10190-2

Date Collected: 01/19/15 12:00

Matrix: Solid

Date Received: 01/20/15 09:10

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	**0.156**		0.0666	0.0685	0.200	0.0549	pCi/g	01/22/15 11:08	01/22/15 20:58	1
Cobalt-60	0.0141	U	0.0247	0.0247		0.0861	pCi/g	01/22/15 11:08	01/22/15 20:58	1
Uranium-235	-0.0439	U	0.271	0.271		0.478	pCi/g	01/22/15 11:08	01/22/15 20:58	1
Uranium-238	1.26	U	1.19	1.20		1.91	pCi/g	01/22/15 11:08	01/22/15 20:58	1
Thorium-232	**0.607**		0.225	0.233		0.377	pCi/g	01/22/15 11:08	01/22/15 20:58	1

Client Sample ID: BATCH3-003-011915

Lab Sample ID: 160-10190-3

Date Collected: 01/19/15 12:00

Matrix: Solid

Date Received: 01/20/15 09:10

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	**0.274**		0.0889	0.0934	0.200	0.0532	pCi/g	01/22/15 11:08	01/22/15 20:59	1
Cobalt-60	0.000	U	0.0209	0.0209		0.0771	pCi/g	01/22/15 11:08	01/22/15 20:59	1
Uranium-235	0.147	U	0.325	0.325		0.583	pCi/g	01/22/15 11:08	01/22/15 20:59	1
Uranium-238	1.35	U	2.24	2.25		3.44	pCi/g	01/22/15 11:08	01/22/15 20:59	1
Thorium-232	**1.10**		0.345	0.363		0.198	pCi/g	01/22/15 11:08	01/22/15 20:59	1

Client Sample ID: BATCH3-004-011915

Lab Sample ID: 160-10190-4

Date Collected: 01/19/15 12:00

Matrix: Solid

Date Received: 01/20/15 09:10

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	0.0512	U	0.0730	0.0732	0.200	0.122	pCi/g	01/22/15 11:08	01/22/15 21:00	1
Cobalt-60	0.0156	U	0.0388	0.0389		0.186	pCi/g	01/22/15 11:08	01/22/15 21:00	1
Uranium-235	0.0561	U	0.329	0.329		0.604	pCi/g	01/22/15 11:08	01/22/15 21:00	1
Uranium-238	1.24	U	1.73	1.73		3.01	pCi/g	01/22/15 11:08	01/22/15 21:00	1
Thorium-232	**0.493**		0.217	0.222		0.439	pCi/g	01/22/15 11:08	01/22/15 21:00	1

Client Sample ID: BATCH3-005-011915

Lab Sample ID: 160-10190-5

Date Collected: 01/19/15 12:00
Matrix: Solid
Date Received: 01/20/15 09:10

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	0.0498	U	0.0827	0.0829	0.200	0.141	pCi/g	01/22/15 11:08	01/22/15 20:58	1
Cobalt-60	0.00520	U	0.0906	0.0906		0.175	pCi/g	01/22/15 11:08	01/22/15 20:58	1
Uranium-235	0.0456	U	0.349	0.350		0.579	pCi/g	01/22/15 11:08	01/22/15 20:58	1
Uranium-238	-0.00768	U	1.37	1.37		2.56	pCi/g	01/22/15 11:08	01/22/15 20:58	1
Thorium-232	**0.907**		0.236	0.254		0.193	pCi/g	01/22/15 11:08	01/22/15 20:58	1

Client Sample ID: BATCH3-006-011915

Lab Sample ID: 160-10190-6

Date Collected: 01/19/15 12:00
Matrix: Solid
Date Received: 01/20/15 09:10

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	0.0828	U	0.0913	0.0917	0.200	0.146	pCi/g	01/22/15 11:08	01/22/15 21:00	1
Cobalt-60	0.00639	U	0.0736	0.0736		0.153	pCi/g	01/22/15 11:08	01/22/15 21:00	1
Uranium-235	0.000	U	0.413	0.413		0.749	pCi/g	01/22/15 11:08	01/22/15 21:00	1
Uranium-238	0.690	U	1.02	1.02		3.26	pCi/g	01/22/15 11:08	01/22/15 21:00	1
Thorium-232	0.376	U	0.254	0.256		0.492	pCi/g	01/22/15 11:08	01/22/15 21:00	1

Client Sample ID: BATCH3-007-011915

Lab Sample ID: 160-10190-7

Date Collected: 01/19/15 12:00
Matrix: Solid
Date Received: 01/20/15 09:10

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	0.0310	U	0.0880	0.0881	0.200	0.154	pCi/g	01/22/15 11:08	01/22/15 21:01	1
Cobalt-60	0.000	U	0.0181	0.0181		0.0666	pCi/g	01/22/15 11:08	01/22/15 21:01	1
Uranium-235	0.182	U	0.280	0.280		0.448	pCi/g	01/22/15 11:08	01/22/15 21:01	1
Uranium-238	0.479	U	0.659	0.661		2.48	pCi/g	01/22/15 11:08	01/22/15 21:01	1
Thorium-232	0.424	U	0.247	0.251		0.448	pCi/g	01/22/15 11:08	01/22/15 21:01	1

Client Sample ID: BATCH3-008-011915

Lab Sample ID: 160-10190-8

Date Collected: 01/19/15 12:00
Matrix: Solid
Date Received: 01/20/15 09:10

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	0.0460	U	0.0803	0.0804	0.200	0.136	pCi/g	01/22/15 11:08	01/23/15 01:22	1
Cobalt-60	0.0139	U	0.0619	0.0619		0.117	pCi/g	01/22/15 11:08	01/23/15 01:22	1
Uranium-235	0.207	U	0.254	0.255		0.488	pCi/g	01/22/15 11:08	01/23/15 01:22	1
Uranium-238	1.30	U	1.23	1.24		1.98	pCi/g	01/22/15 11:08	01/23/15 01:22	1
Thorium-232	**0.850**		0.271	0.285		0.250	pCi/g	01/22/15 11:08	01/23/15 01:22	1

Client Sample ID: BATCH3-009-011915

Lab Sample ID: 160-10190-9

Date Collected: 01/19/15 12:00

Matrix: Solid

Date Received: 01/20/15 09:10

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	0.0411	U	0.0674	0.0675	0.200	0.115	pCi/g	01/22/15 11:08	01/22/15 21:37	1
Cobalt-60	0.00998	U	0.0355	0.0355		0.0770	pCi/g	01/22/15 11:08	01/22/15 21:37	1
Uranium-235	0.139	U	0.224	0.224		0.333	pCi/g	01/22/15 11:08	01/22/15 21:37	1
Uranium-238	0.592	U	4.89	4.89		8.22	pCi/g	01/22/15 11:08	01/22/15 21:37	1
Thorium-232	**0.429**		0.199	0.204		0.311	pCi/g	01/22/15 11:08	01/22/15 21:37	1

Client Sample ID: BATCH3-010-011915

Lab Sample ID: 160-10190-10

Date Collected: 01/19/15 12:00

Matrix: Solid

Date Received: 01/20/15 09:10

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	0.105	U	0.0784	0.0792	0.200	0.117	pCi/g	01/22/15 11:08	01/22/15 21:33	1
Cobalt-60	-0.00626	U	0.0766	0.0766		0.147	pCi/g	01/22/15 11:08	01/22/15 21:33	1
Uranium-235	0.0559	U	0.186	0.186		0.559	pCi/g	01/22/15 11:08	01/22/15 21:33	1
Uranium-238	1.66	U	1.17	1.18		1.78	pCi/g	01/22/15 11:08	01/22/15 21:33	1
Thorium-232	**0.362**		0.199	0.203		0.270	pCi/g	01/22/15 11:08	01/22/15 21:33	1

Client Sample ID: BATCH4-001-011915

Lab Sample ID: 160-10190-11

Date Collected: 01/19/15 12:30

Matrix: Solid

Date Received: 01/20/15 09:10

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	0.0352	U	0.0894	0.0895	0.200	0.177	pCi/g	01/22/15 11:08	01/22/15 21:37	1
Cobalt-60	0.00354	U	0.0892	0.0892		0.202	pCi/g	01/22/15 11:08	01/22/15 21:37	1
Uranium-235	0.729	U	5.31	5.31		8.79	pCi/g	01/22/15 11:08	01/22/15 21:37	1
Uranium-238	9.78	U	20.4	20.4		33.7	pCi/g	01/22/15 11:08	01/22/15 21:37	1
Thorium-232	0.430	U	0.372	0.375		0.614	pCi/g	01/22/15 11:08	01/22/15 21:37	1

Client Sample ID: BATCH4-002-011915

Lab Sample ID: 160-10190-12

Date Collected: 01/19/15 12:30

Matrix: Solid

Date Received: 01/20/15 09:10

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	**0.483**		0.154	0.162	0.200	0.107	pCi/g	01/22/15 11:08	01/22/15 21:33	1
Cobalt-60	0.00469	U	0.0533	0.0533		0.388	pCi/g	01/22/15 11:08	01/22/15 21:33	1
Uranium-235	0.224	U	0.541	0.541		1.13	pCi/g	01/22/15 11:08	01/22/15 21:33	1
Uranium-238	-0.418	U	0.802	0.803		8.37	pCi/g	01/22/15 11:08	01/22/15 21:33	1
Thorium-232	**1.88**		0.522	0.556		0.267	pCi/g	01/22/15 11:08	01/22/15 21:33	1

Client Sample ID: BATCH4-003-011915

Lab Sample ID: 160-10190-13

Date Collected: 01/19/15 12:30

Matrix: Solid

Date Received: 01/20/15 09:10

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	**0.291**		0.124	0.127	0.200	0.101	pCi/g	01/22/15 11:08	01/22/15 21:34	1
Cobalt-60	0.00697	U	0.121	0.121		0.230	pCi/g	01/22/15 11:08	01/22/15 21:34	1
Uranium-235	0.0682	U	0.426	0.426		0.777	pCi/g	01/22/15 11:08	01/22/15 21:34	1
Uranium-238	2.61	U	3.04	3.05		3.93	pCi/g	01/22/15 11:08	01/22/15 21:34	1
Thorium-232	**1.18**		0.387	0.405		0.234	pCi/g	01/22/15 11:08	01/22/15 21:34	1

Client Sample ID: BATCH4-004-011915

Lab Sample ID: 160-10190-14

Date Collected: 01/19/15 12:30

Matrix: Solid

Date Received: 01/20/15 09:10

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	**0.260**		0.0822	0.0866	0.200	0.0479	pCi/g	01/22/15 11:08	01/22/15 21:33	1
Cobalt-60	0.000	U	0.0196	0.0196		0.0722	pCi/g	01/22/15 11:08	01/22/15 21:33	1
Uranium-235	0.223	U	0.300	0.301		0.450	pCi/g	01/22/15 11:08	01/22/15 21:33	1
Uranium-238	0.898	U	0.701	0.707		2.30	pCi/g	01/22/15 11:08	01/22/15 21:33	1
Thorium-232	**0.668**		0.229	0.239		0.182	pCi/g	01/22/15 11:08	01/22/15 21:33	1

Client Sample ID: BATCH4-005-011915

Lab Sample ID: 160-10190-15

Date Collected: 01/19/15 12:30

Matrix: Solid

Date Received: 01/20/15 09:10

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	0.146	U	0.120	0.121	0.200	0.177	pCi/g	01/22/15 11:08	01/22/15 21:34	1
Cobalt-60	0.0498	U	0.0947	0.0948		0.246	pCi/g	01/22/15 11:08	01/22/15 21:34	1
Uranium-235	0.351	U	0.482	0.483		0.800	pCi/g	01/22/15 11:08	01/22/15 21:34	1
Uranium-238	2.29	U	1.44	1.46		3.70	pCi/g	01/22/15 11:08	01/22/15 21:34	1
Thorium-232	**0.723**		0.374	0.381		0.634	pCi/g	01/22/15 11:08	01/22/15 21:34	1

Client Sample ID: BATCH4-006-011915

Lab Sample ID: 160-10190-16

Date Collected: 01/19/15 12:30

Matrix: Solid

Date Received: 01/20/15 09:10

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	**0.236**		0.110	0.112	0.200	0.0952	pCi/g	01/22/15 11:08	01/22/15 21:35	1
Cobalt-60	0.000	U	0.0262	0.0262		0.0964	pCi/g	01/22/15 11:08	01/22/15 21:35	1
Uranium-235	0.444	U	0.477	0.479		0.679	pCi/g	01/22/15 11:08	01/22/15 21:35	1
Uranium-238	0.848	U	1.30	1.30		4.16	pCi/g	01/22/15 11:08	01/22/15 21:35	1
Thorium-232	**1.25**		0.408	0.428		0.248	pCi/g	01/22/15 11:08	01/22/15 21:35	1

Client Sample ID: BATCH4-007-011915

Lab Sample ID: 160-10190-17

Date Collected: 01/19/15 12:30

Matrix: Solid

Date Received: 01/20/15 09:10

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	**0.320**		0.123	0.127	0.200	0.0955	pCi/g	01/22/15 11:08	01/22/15 22:08	1
Cobalt-60	-0.0216	U	0.0947	0.0947		0.180	pCi/g	01/22/15 11:08	01/22/15 22:08	1
Uranium-235	0.185	U	0.442	0.443		0.759	pCi/g	01/22/15 11:08	01/22/15 22:08	1
Uranium-238	2.18	U	1.39	1.41		3.97	pCi/g	01/22/15 11:08	01/22/15 22:08	1
Thorium-232	**0.614**		0.360	0.365		0.547	pCi/g	01/22/15 11:08	01/22/15 22:08	1

Client Sample ID: BATCH4-008-011915

Lab Sample ID: 160-10190-18

Date Collected: 01/19/15 12:30

Matrix: Solid

Date Received: 01/20/15 09:10

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	0.124	U	0.112	0.113	0.200	0.173	pCi/g	01/22/15 11:08	01/22/15 22:39	1
Cobalt-60	0.00452	U	0.114	0.114		0.221	pCi/g	01/22/15 11:08	01/22/15 22:39	1
Uranium-235	0.457	U	0.406	0.408		0.689	pCi/g	01/22/15 11:08	01/22/15 22:39	1
Uranium-238	2.08	U	1.19	1.21		3.49	pCi/g	01/22/15 11:08	01/22/15 22:39	1
Thorium-232	0.525	U	0.375	0.379		0.550	pCi/g	01/22/15 11:08	01/22/15 22:39	1

Client Sample ID: BATCH4-009-011915

Lab Sample ID: 160-10190-19

Date Collected: 01/19/15 12:30

Matrix: Solid

Date Received: 01/20/15 09:10

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	**0.242**		0.127	0.130	0.200	0.166	pCi/g	01/22/15 11:08	01/22/15 22:43	1
Cobalt-60	0.00611	U	0.0191	0.0191		0.178	pCi/g	01/22/15 11:08	01/22/15 22:43	1
Uranium-235	0.260	U	0.331	0.332		1.16	pCi/g	01/22/15 11:08	01/22/15 22:43	1
Uranium-238	1.04	U	0.817	0.824		4.37	pCi/g	01/22/15 11:08	01/22/15 22:43	1
Thorium-232	**0.901**		0.348	0.360		0.589	pCi/g	01/22/15 11:08	01/22/15 22:43	1

Client Sample ID: BATCH4-010-011915

Lab Sample ID: 160-10190-20

Date Collected: 01/19/15 12:30

Matrix: Solid

Date Received: 01/20/15 09:10

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	**0.262**		0.0956	0.0994	0.200	0.0643	pCi/g	01/22/15 11:08	01/22/15 23:17	1
Cobalt-60	0.0124	U	0.0555	0.0555		0.345	pCi/g	01/22/15 11:08	01/22/15 23:17	1
Uranium-235	-0.108	U	0.457	0.457		0.798	pCi/g	01/22/15 11:08	01/22/15 23:17	1
Uranium-238	2.65	U	2.66	2.68		3.98	pCi/g	01/22/15 11:08	01/22/15 23:17	1
Thorium-232	**0.820**		0.343	0.353		0.617	pCi/g	01/22/15 11:08	01/22/15 23:17	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-169743/1-A
Matrix: Solid
Analysis Batch: 169802

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 169743

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	-0.02734	U	1.79	1.79	0.200	0.130	pCi/g	01/22/15 11:08	01/22/15 21:02	1
Cobalt-60	-0.01668	U	0.667	0.667		0.0836	pCi/g	01/22/15 11:08	01/22/15 21:02	1
Uranium-235	0.04031	U	0.0924	0.0925		0.332	pCi/g	01/22/15 11:08	01/22/15 21:02	1
Uranium-238	-0.1926	U	0.872	0.872		1.26	pCi/g	01/22/15 11:08	01/22/15 21:02	1
Thorium-232	0.01593	U	0.0545	0.0545		0.385	pCi/g	01/22/15 11:08	01/22/15 21:02	1

Lab Sample ID: LCS 160-169743/2-A
Matrix: Solid
Analysis Batch: 169804

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 169743

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Americium-241	97.3	106.5		11.2		1.30	pCi/g	109	87 - 116
Cesium-137	30.6	30.39		3.26	0.200	0.326	pCi/g	99	87 - 120
Cobalt-60	20.5	20.48		2.12		0.160	pCi/g	100	87 - 115

Lab Sample ID: 160-10190-10 DU
Matrix: Solid
Analysis Batch: 169810

Client Sample ID: BATCH3-010-011915
Prep Type: Total/NA
Prep Batch: 169743

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Cesium-137	0.105	U	0.1320		0.0929	0.200	0.132	pCi/g	0.16	1
Cobalt-60	-0.00626	U	0.0000	U	0.0207		0.208	pCi/g	0.06	1
Uranium-235	0.0559	U	0.2409	U	0.404		0.600	pCi/g	0.31	1
Uranium-238	1.66	U	0.01526	U F	0.0415		3.47	pCi/g	1.35	1
Thorium-232	0.362		0.7632		0.250		0.197	pCi/g	0.88	1

QC Association Summary

Client: Tetra Tech EC, Inc.
Project/Site: Middle River Project

TestAmerica Job ID: 160-10190-1

Rad

Leach Batch: 169358

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10190-1	BATCH3-001-011915	Total/NA	Solid	Dry and Grind	
160-10190-2	BATCH3-002-011915	Total/NA	Solid	Dry and Grind	
160-10190-3	BATCH3-003-011915	Total/NA	Solid	Dry and Grind	
160-10190-4	BATCH3-004-011915	Total/NA	Solid	Dry and Grind	
160-10190-5	BATCH3-005-011915	Total/NA	Solid	Dry and Grind	
160-10190-6	BATCH3-006-011915	Total/NA	Solid	Dry and Grind	
160-10190-7	BATCH3-007-011915	Total/NA	Solid	Dry and Grind	
160-10190-8	BATCH3-008-011915	Total/NA	Solid	Dry and Grind	
160-10190-9	BATCH3-009-011915	Total/NA	Solid	Dry and Grind	
160-10190-10	BATCH3-010-011915	Total/NA	Solid	Dry and Grind	
160-10190-10 DU	BATCH3-010-011915	Total/NA	Solid	Dry and Grind	
160-10190-11	BATCH4-001-011915	Total/NA	Solid	Dry and Grind	
160-10190-12	BATCH4-002-011915	Total/NA	Solid	Dry and Grind	
160-10190-13	BATCH4-003-011915	Total/NA	Solid	Dry and Grind	
160-10190-14	BATCH4-004-011915	Total/NA	Solid	Dry and Grind	
160-10190-15	BATCH4-005-011915	Total/NA	Solid	Dry and Grind	
160-10190-16	BATCH4-006-011915	Total/NA	Solid	Dry and Grind	
160-10190-17	BATCH4-007-011915	Total/NA	Solid	Dry and Grind	
160-10190-18	BATCH4-008-011915	Total/NA	Solid	Dry and Grind	
160-10190-19	BATCH4-009-011915	Total/NA	Solid	Dry and Grind	
160-10190-20	BATCH4-010-011915	Total/NA	Solid	Dry and Grind	

Prep Batch: 169743

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10190-1	BATCH3-001-011915	Total/NA	Solid	Fill_Geo-0	169358
160-10190-2	BATCH3-002-011915	Total/NA	Solid	Fill_Geo-0	169358
160-10190-3	BATCH3-003-011915	Total/NA	Solid	Fill_Geo-0	169358
160-10190-4	BATCH3-004-011915	Total/NA	Solid	Fill_Geo-0	169358
160-10190-5	BATCH3-005-011915	Total/NA	Solid	Fill_Geo-0	169358
160-10190-6	BATCH3-006-011915	Total/NA	Solid	Fill_Geo-0	169358
160-10190-7	BATCH3-007-011915	Total/NA	Solid	Fill_Geo-0	169358
160-10190-8	BATCH3-008-011915	Total/NA	Solid	Fill_Geo-0	169358
160-10190-9	BATCH3-009-011915	Total/NA	Solid	Fill_Geo-0	169358
160-10190-10	BATCH3-010-011915	Total/NA	Solid	Fill_Geo-0	169358
160-10190-10 DU	BATCH3-010-011915	Total/NA	Solid	Fill_Geo-0	169358
160-10190-11	BATCH4-001-011915	Total/NA	Solid	Fill_Geo-0	169358
160-10190-12	BATCH4-002-011915	Total/NA	Solid	Fill_Geo-0	169358
160-10190-13	BATCH4-003-011915	Total/NA	Solid	Fill_Geo-0	169358
160-10190-14	BATCH4-004-011915	Total/NA	Solid	Fill_Geo-0	169358
160-10190-15	BATCH4-005-011915	Total/NA	Solid	Fill_Geo-0	169358
160-10190-16	BATCH4-006-011915	Total/NA	Solid	Fill_Geo-0	169358
160-10190-17	BATCH4-007-011915	Total/NA	Solid	Fill_Geo-0	169358
160-10190-18	BATCH4-008-011915	Total/NA	Solid	Fill_Geo-0	169358
160-10190-19	BATCH4-009-011915	Total/NA	Solid	Fill_Geo-0	169358
160-10190-20	BATCH4-010-011915	Total/NA	Solid	Fill_Geo-0	169358
LCS 160-169743/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-0	
MB 160-169743/1-A	Method Blank	Total/NA	Solid	Fill_Geo-0	

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: 160-10090-1
Client Project/Site: Middle River Project

For:
Tetra Tech EC, Inc.
3200 George Washington Way
Suite G
Richland, Washington 99354

Attn: Steve McGee

Authorized for release by:
1/15/2015 10:17:46 AM

Jayna Awalt, Project Manager II
(314)298-8566
jayna.awalt@testamericainc.com

Table of Contents

Job ID: 160-10090-1

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Tetra Tech EC, Inc.

Project: Middle River Project

Report Number: 160-10090-1

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 01/13/2015; the samples arrived in good condition, properly preserved and on ice. The temperature of the coolers at receipt was 1.1 C.

POLYCHLORINATED BIPHENYLS (PCBS)

Sample WS-01-011215 (160-10090-1) was analyzed for polychlorinated biphenyls (PCBs) in accordance with EPA SW-846 Method 8082A. The samples were prepared and analyzed on 01/13/2015.

Analytical Batch: 168074

Insufficient sample volume was available to perform a matrix spike/matrix spike duplicate (MS/MSD), an LCS/LCSD was performed to demonstrate precision in prep batch 168189: WS-01-011215 (160-10090-1). Sample is a filter.

The closing CCV recovery is outside the QC limits of greater than 20%D. The CCV excursion is likely the result of matrix interference from the sample, and has been confirmed by re-analysis. The associated sample is ND for target analytes with acceptable surrogate recovery; therefore the sample data has been reported with this narrative: (CCV 160-168074/47), WS-01-011215 (160-10090-1).

Job ID: 160-10090-1 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

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

Chain of Custody Record

015950

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
TestAmerica Laboratories, Inc.
TAL-8210 (0713)

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Client Contact	Project Manager: Steve McGee	Site Contact: Heather Phelan	Date: 1/12/2015	COC No: 1 of 1 COCs
Company Name: TetraTech	Tel/Fax: 440 522 6936	Lab Contact: John McFadden	Carrier:	Sampler: HPhelan
Address: 602 Chesapeake Park Plaza	Analysis Turnaround Time			For Lab Use Only:
City/State/Zip: Middle River, MD	☒ CALENDAR DAYS ☐ WORKING DAYS			Walk-in Client:
Phone: 9208578422	TAT if different from Below _____			Lab Sampling:
Fax:	☐ 2 weeks			Job / SDG No.:
Project Name: Middle River SRA	☐ 1 week			
Site: Middle River	☒ 2 days			
P O #	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	PCB - EPA SW846 8082	SW846 8082	Sample Specific Notes:
WS-01-011215	01/12/15	1200	G	Wipe	1	N	N	X		

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other Hexane

160-10090 Chain of Custody

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

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 & Comments:

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd:_____ Corr'd:_____ Therm ID No.:_____

	Company	Date/Time		Company	Date/Time
Relinquished by: HPhelan	TetraTech	1/13/15 1440	Received by:	TestAmerica	1/12/15 1440
Relinquished by:	TestAmerica	1/12/15 1615	Received by:	TA STL	1.13.15 1000
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

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1/15/2015

Login Sample Receipt Checklist

Client: Tetra Tech EC, Inc.

Job Number: 160-10090-1

Login Number: 10090

List Number: 1

Creator: Clarke, Jill C

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.	N/A	
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	1.10
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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: Tetra Tech EC, Inc.
Project/Site: Middle River Project

TestAmerica Job ID: 160-10090-1

Method	Method Description	Protocol	Laboratory
8082A	Polychlorinated Biphenyls (PCBs) by Gas Chromatography	SW846	TAL SL

Protocol References:

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

Laboratory References:

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

Sample Summary

Client: Tetra Tech EC, Inc.
Project/Site: Middle River Project

TestAmerica Job ID: 160-10090-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-10090-1	WS-01-011215	Wipe	01/12/15 12:00	01/13/15 10:00

Client: Tetra Tech EC, Inc.
Project/Site: Middle River Project

TestAmerica Job ID: 160-10090-1

Client Sample ID: WS-01-011215
Date Collected: 01/12/15 12:00
Date Received: 01/13/15 10:00

Lab Sample ID: 160-10090-1
Matrix: Wipe

Method: 8082A - Polychlorinated Biphenyls (PCBs) by Gas Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
PCB-1016	ND		1.0	0.32	ug/Wipe		01/13/15 12:54	01/13/15 21:12	1
PCB-1221	ND		1.0	0.32	ug/Wipe		01/13/15 12:54	01/13/15 21:12	1
PCB-1232	ND		1.0	0.32	ug/Wipe		01/13/15 12:54	01/13/15 21:12	1
PCB-1242	ND		1.0	0.32	ug/Wipe		01/13/15 12:54	01/13/15 21:12	1
PCB-1248	ND		1.0	0.32	ug/Wipe		01/13/15 12:54	01/13/15 21:12	1
PCB-1254	ND		1.0	0.31	ug/Wipe		01/13/15 12:54	01/13/15 21:12	1
PCB-1260	ND		1.0	0.31	ug/Wipe		01/13/15 12:54	01/13/15 21:12	1
Polychlorinated biphenyls, Total	ND		1.0	0.32	ug/Wipe		01/13/15 12:54	01/13/15 21:12	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCB Decachlorobiphenyl (Surr)	*88*		*50 - 150*	*01/13/15 12:54*	*01/13/15 21:12*	*1*

Method: 8082A - Polychlorinated Biphenyls (PCBs) by Gas Chromatography

Lab Sample ID: MB 160-168189/1-A
Matrix: Wipe
Analysis Batch: 168074

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 168189

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
PCB-1016	ND		1.0	0.32	ug/Wipe		01/13/15 12:54	01/13/15 19:52	1
PCB-1221	ND		1.0	0.32	ug/Wipe		01/13/15 12:54	01/13/15 19:52	1
PCB-1232	ND		1.0	0.32	ug/Wipe		01/13/15 12:54	01/13/15 19:52	1
PCB-1242	ND		1.0	0.32	ug/Wipe		01/13/15 12:54	01/13/15 19:52	1
PCB-1248	ND		1.0	0.32	ug/Wipe		01/13/15 12:54	01/13/15 19:52	1
PCB-1254	ND		1.0	0.31	ug/Wipe		01/13/15 12:54	01/13/15 19:52	1
PCB-1260	ND		1.0	0.31	ug/Wipe		01/13/15 12:54	01/13/15 19:52	1
Polychlorinated biphenyls, Total	ND		1.0	0.32	ug/Wipe		01/13/15 12:54	01/13/15 19:52	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCB Decachlorobiphenyl (Surr)	*88*		*50 - 150*	*01/13/15 12:54*	*01/13/15 19:52*	*1*

Lab Sample ID: LCS 160-168189/2-A
Matrix: Wipe
Analysis Batch: 168074

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 168189

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
PCB-1016			5.00	4.41		ug/Wipe		88	78 - 125		
PCB-1260			5.00	4.54		ug/Wipe		91	72 - 128		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
DCB Decachlorobiphenyl (Surr)	*89*		*50 - 150*

Lab Sample ID: LCSD 160-168189/3-A
Matrix: Wipe
Analysis Batch: 168074

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 168189

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
PCB-1016			5.00	4.76		ug/Wipe		95	78 - 125	8	20
PCB-1260			5.00	4.70		ug/Wipe		94	72 - 128	3	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
DCB Decachlorobiphenyl (Surr)	*91*		*50 - 150*

QC Association Summary

Client: Tetra Tech EC, Inc.
Project/Site: Middle River Project

TestAmerica Job ID: 160-10090-1

GC Semi VOA

Analysis Batch: 168074

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10090-1	WS-01-011215	Total/NA	Wipe	8082A	168189
LCS 160-168189/2-A	Lab Control Sample	Total/NA	Wipe	8082A	168189
LCSD 160-168189/3-A	Lab Control Sample Dup	Total/NA	Wipe	8082A	168189
MB 160-168189/1-A	Method Blank	Total/NA	Wipe	8082A	168189

Prep Batch: 168189

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10090-1	WS-01-011215	Total/NA	Wipe	3550C	
LCS 160-168189/2-A	Lab Control Sample	Total/NA	Wipe	3550C	
LCSD 160-168189/3-A	Lab Control Sample Dup	Total/NA	Wipe	3550C	
MB 160-168189/1-A	Method Blank	Total/NA	Wipe	3550C	

Surrogate Summary

Client: Tetra Tech EC, Inc.
Project/Site: Middle River Project

TestAmerica Job ID: 160-10090-1

Method: 8082A - Polychlorinated Biphenyls (PCBs) by Gas Chromatography

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

		Percent Surrogate Recovery (Acceptance Limits)								
		DCB1								
Lab Sample ID	Client Sample ID	(50-150)								
160-10090-1	WS-01-011215	88								
LCS 160-168189/2-A	Lab Control Sample	89								
LCSD 160-168189/3-A	Lab Control Sample Dup	91								
MB 160-168189/1-A	Method Blank	88								

Surrogate Legend

DCB = DCB Decachlorobiphenyl (Surr)