

October 31, 2019

Information Technology Unit Los Angeles Regional Water Quality Control Board 320 West 4th Street, Suite 200 Los Angeles, California 90013

Subject: Update to Fourth Quarter 2018 NPDES Discharge Monitoring Report

Compliance File CI-6027 and NPDES No. CA0001309

Santa Susana Field Laboratory Ventura County, California

The Boeing Company (Boeing) hereby submits this update to the Discharge Monitoring Report (DMR) for the Santa Susana Field Laboratory (Santa Susana Site) for the period of October 1 through December 31, 2018 (Fourth Quarter 2018). This DMR Update was prepared in support of the National Pollutant Discharge Elimination System Permit No. CA0001309 (NPDES Permit) issued by the Los Angeles California Regional Water Quality Control Board (Regional Board) in 2015.

Two exceedances of gross alpha were detected in December 2018, correlated to high levels of suspended solids, so Boeing requested additional non-permit-required radionuclide analysis of those samples. However, due to the time required by the analytical laboratory for these additional analyses, results were not available until after the February 15, 2019 submittal of the Fourth Quarter 2018 DMR. These additional data are presented in Table 1.

Hard copies of this Update to the Fourth Quarter 2018 DMR are available to the public at the California State University Northridge Oviatt Library, the Simi Valley Public Library, and the Platt Branch of the Los Angeles Public Library.

An electronic version of this DMR is located at: <a href="http://www.boeing.com/principles/environment/santa-susana/monitoring-reports.page">http://www.boeing.com/principles/environment/santa-susana/monitoring-reports.page</a>

### Gross Alpha for Outfalls 002 and 008

### Outfall 002

On December 7, 2018, a stormwater sample was collected from Outfall 002. Gross alpha was reported at 22.3 +/- 5.45 picocuries per liter [pCi/L], above the Daily Maximum Benchmark Limit of 15 pCi/L. Per the NPDES Permit, if gross alpha is greater than 15 pCi/L, additional calculations and analysis must be made: total uranium analysis must be performed, total uranium results must be less than 20 pCi/L, gross alpha minus total uranium must be compared to the Benchmark of 15 pCi/L, and the average of gross alpha results for the calendar year must also be compared to the Daily Maximum Benchmark of 15 pCi/L. Total uranium analysis was performed, and the result was 1.25 +/- 1.30 pCi/L. Gross alpha minus total uranium was calculated to be 21.05 +/- 5.60 pCi/L which exceeds the Daily Maximum Benchmark Limit of 15 pCi/L. The only other discharge event for Outfall 002 was on March 23, 2018. Averaging the December and March data gives an annual average of

11.70 +/- 2.95 pCi/L, which is below the Daily Maximum Benchmark Limit.

Boeing tested the December 7, 2018 sample from Outfall 002 at an independent, State-certified laboratory for an additional twelve naturally occurring and three man-made alpha emitting radionuclides. That isotopic analysis confirmed that only naturally-occurring radioactive material (NORM) was detected. No anthropogenic (man-made) alpha emitting radionuclides were detected in the sample, demonstrating that residual radiological soil contamination from historic site operations at SSFL did not impact stormwater due to the Woolsey Fire (Table 1).

### Outfall 008

On December 7, 2018, a stormwater sample was collected from Outfall 008. Gross alpha was reported at 14.8 +/- 3.81 pCi/L, which could be slightly above the Benchmark Limit of 15 pCi/L if you take into account the error range provided by the laboratory. As stated above, if gross alpha is greater than 15 pCi/L, additional calculations and analysis must be made: total uranium analysis must be performed, total uranium results must be less than 20 pCi/L, gross alpha minus total uranium must be compared to the Benchmark of 15 pCi/L, and the average of gross alpha results for the calendar year must also be compared to the Daily Maximum Benchmark of 15 pCi/L. Total uranium analysis was performed and the results were 1.33 +/- 0.884 pCi/L. Gross alpha minus total uranium was calculated to be 13.47 +/- 3.91 pCi/L which is indeterminate¹ compared to the Daily Maximum Benchmark Limit of 15 pCi/L. As Outfall 008 only flowed during the Fourth Quarter 2018, the annual average was also indeterminate.

Boeing tested the December 7, 2018 sample from Outfall 008 at an independent, State-certified laboratory for an additional thirteen naturally-occurring and four man-made alpha emitting radionuclides. That isotopic analysis confirmed that only naturally-occurring radioactive material (NORM) was detected. No anthropogenic (man-made) alpha emitting radionuclides were detected in the sample, demonstrating that residual radiological soil contamination from historic site operations at SSFL did not impact stormwater due to the Woolsey Fire (Table 1).

The Stormwater Expert Panel is evaluating the data contained in this report and will include the results of their analysis in the 2019 Annual Report.

### **FACILITY CONTACT**

If there are any questions regarding this report or its enclosures, you may contact Mr. Jeffrey Wokurka of Boeing at (818) 466-8800.

### **CERTIFICATION**

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted.

Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge

<sup>&</sup>lt;sup>1</sup> An indeterminate result is defined by the NPDES Permit when the Daily Maximum Benchmark Limit lies within the  $\pm 1.96\sigma$  error range of the mean analysis result. In this case, 15 pCi/L lies within the range 13.47 - 3.91 = 9.56 pCi/L and 13.47 + 3.91 = 17.38 pCi/L.

### Page 3

and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Executed on the 31st of October 2019 at The Boeing Company, Seal Beach, CA Site.

Sincerety.

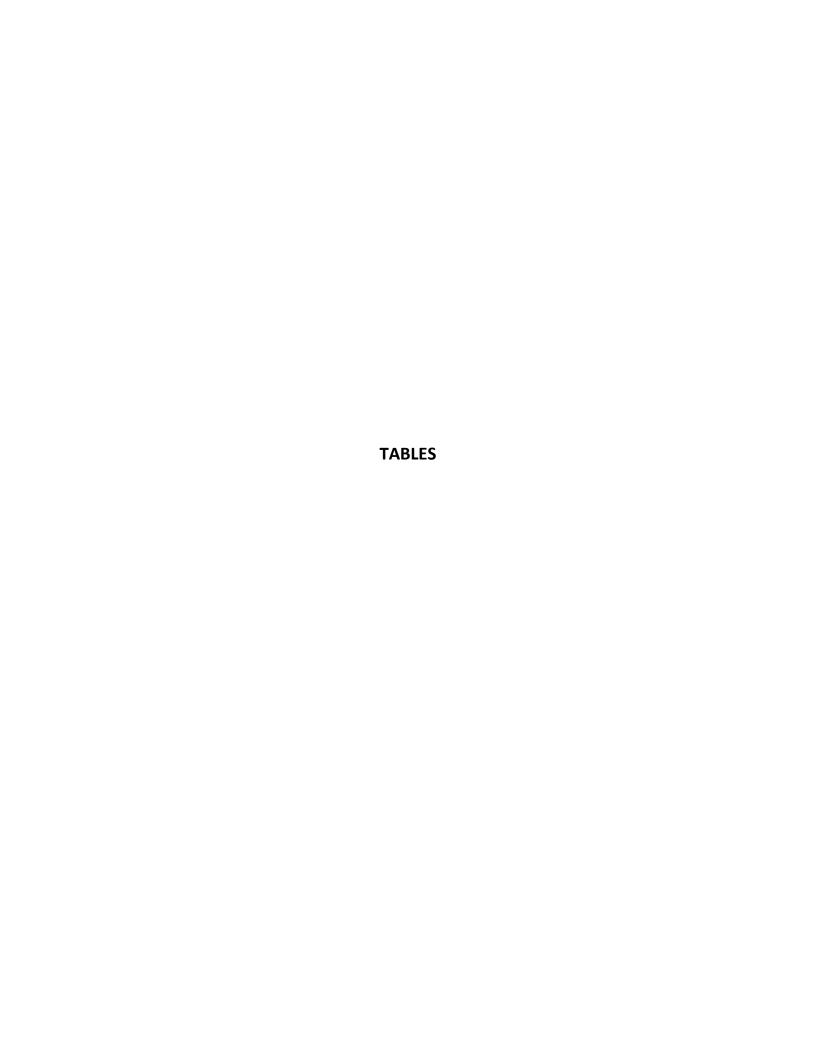
Kim D'Rourke

Remediation Program Manager Environment, Health & Safety

### **Enclosures:**

Table 1 – Extended Radiochemistry, Fourth Quarter 2018 Analytical Report – J226830-5 Analytical Report – J226838-4

c: Los Angeles Regional Water Quality Control Board; Attn: Ms. Cassandra Owens California Department of Toxic Substances Control; Attn: Mr. Mark Malinowski California State University Northridge Oviatt Library Simi Valley Public Library Los Angeles Public Library, Platt Branch



### EXTENDED RADIOCHEMISTRY

# FOURTH QUARTER 2018 THE BOEING COMPANY SANTA SUSANA FIELD LABORATORY NPDES PERMIT CA0001309

October 1 through December 31, 2018

				OUTFALL 002			OUTFALL 008	
			12/0	7/2018 10:05 (Compo	osite)	12/0	7/2018 11:05 (Compo	site)
ANALYTE	UNITS	PERMIT LIMIT DAILY MAX	RESULT	MDA	LABORATORY/ VALIDATION QUALIFIER	RESULT	MDA	LABORATORY/ VALIDATION QUALIFIER
MAN-MADE RADIOCHEMISTRY RESULTS								
Americium-241	pCi/L	-/-	0.275 +/-0.456	0.813	U*	0.109 +/-0.356	0.768	U*
Plutonium-238	pCi/L	-/-	0.207 +/-0.540	1.07	U*	0.156 +/-0.481	0.998	U*
Plutonium-239/240	pCi/L	-/-	0.321 +/-0.398	0.519	U*	0.113 +/-0.227	0.340	U*
NATURALLY OCCURRING RADIOCHEMISTRY RESULTS	BY GAMMA SP	ECTROSCOPY						
Actinium-227	pCi/L	-/-	39.2 +/-79.5	98.6	U*	6.72 +/-67.0	95.1	U*
Bismuth-211	pCi/L	-/-	39.2 +/-79.5	98.6	U*	6.72 +/-67.0	95.1	U*
Bismuth-212	pCi/L	-/-	49.4 +/-85.3	144	U*	16.0 +/-95.6	169	U*
Cesium-137	pCi/L	-/-	-4.04 +/-11.4	19.4	U*	-3.40 +/-12.5	15.6	U*
Polonium-210	pCi/L	-/-	1.27 +/-0.479	0.500	*	2.36 +/-0.789	0.833	*
Protactinium-231	pCi/L	-/-	0.000 +/-46.3	685	U*	79.1 +/-178	403	U*
Radium-223	pCi/L	-/-	39.2 +/-79.5	98.6	U*	6.72 +/-67.0	95.1	U*
Radium-224	pCi/L	-/-	-15.9 +/-14.2	35.5	U*	24.3 +/-13.0	14.8	*
Thorium-227	pCi/L	-/-	39.2 +/-79.5	98.6	U*	6.72 +/-67.0	95.1	U*
NATURALLY OCCURRING RADIOCHEMISTRY RESULTS	BY ALPHA SPE	CTROSCOPY						
Thorium-228	pCi/L	-/-	1.82 +/-1.48	1.79	*	1.17 +/-0.905	1.13	*
Thorium-230	pCi/L	-/-	1.24 +/-1.27	1.63	U*	2.17 +/-1.13	0.930	*
Thorium-232	pCi/L	-/-	0.767 +/-0.916	1.29	U*	1.24 +/-0.806	0.692	*

### NOTES:

-92.9 +/-200 = A negative radiochemical analytical result indicates the count rate of the sample was less than the background condition. Radiological results are presented as activity plus or minus total uncertainty.

-/- = No NPDES permit limit established for daily maximum or monthly

\* = Result not validated

MDA = Minimum Detectable Activity

pCi/L = picoCuries per liter

U = Result not detected



# **ANALYTICAL REPORT**

TestAmerica Laboratories, Inc.

TestAmerica Irvine 17461 Derian Ave Suite 100

Irvine, CA 92614-5817 Tel: (949)261-1022

TestAmerica Job ID: 440-226838-4

Client Project/Site: Quarterly Outfall 002 Comp

For:

Haley & Aldrich, Inc. 400 E Van Buren St. Suite 545 Phoenix, Arizona 85004

Attn: Katherine Miller

Usli fatel

Authorized for release by: 3/26/2019 7:27:16 PM

Urvashi Patel, Manager of Project Management (949)261-1022

urvashi.patel@testamericainc.com

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Review your project results through

Total Access

**Have a Question?** 



Visit us at: www.testamericainc.com

The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

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

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

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TestAmerica Job ID: 440-226838-4

I certify under penalty of perjury that the information contained in this report and all attachments was produced in accordance with the indicated methods and laboratory standard operating procedures, except as noted, and are complete and accurate to the best of my knowledge and belief. Subcontract laboratory reports that are attached have been evaluated for completeness and quality control acceptability.

Ushi fatel

Urvashi Patel Manager of Project Management 3/26/2019 7:27:16 PM 3

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# **Sample Summary**

Client: Haley & Aldrich, Inc. Project/Site: Quarterly Outfall 002 Comp

TestAmerica Job ID: 440-226838-4

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
440-226838-1	Outfall002_20181207_Comp	Water	12/07/18 10:05	12/07/18 21:05

Client: Haley & Aldrich, Inc.

Project/Site: Quarterly Outfall 002 Comp

TestAmerica Job ID: 440-226838-4

Job ID: 440-226838-4

**Laboratory: TestAmerica Irvine** 

**Narrative** 

Job Narrative 440-226838-4

### Comments

No additional comments.

### Receipt

The samples were received on 12/7/2018 9:05 PM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 2 coolers at receipt time were 0.6° C and 2.9° C.

### **RAD**

Method(s) 901.1: Gamma Prep Batch 160-417097

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Outfall002\_20181207\_Comp (440-226838-1), (LCS 160-417097/2-A), (MB 160-417097/1-A), (440-226830-I-1-J) and (440-226830-I-1-K DU)

Method(s) 901.1: Gamma Prep Batch 160-417097

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

Outfall002\_20181207\_Comp (440-226838-1), (LCS 160-417097/2-A), (MB 160-417097/1-A), (440-226830-I-1-J) and (440-226830-I-1-K DU)

Method(s) 901.1: Gamma Prep Batch 160-417097

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

illienea nom	reported to An
Th-234	Pa-234
Th-234	U-238
Pb-210	Po-210
Pb-210	Bi-210
Cs-137	Ba-137m
Po-216	Pb-212
Xe-131m	Xe-131
Sb-125	Te-125m
Ag-108m	Ag-108
Rh-106	Ru-106
Pb-212	Th-228
Pb-212	Ra-224
U-235	Th-231
Ac-228	Th-232
Ac-228	Ra-228
Th-227	Ra-223
Th-227	Ac-227
Th-227	Bi-211
Th-227	Pb-211
Bi-214	Ra-226

Outfall002 20181207 Comp (440-226838-1), (LCS 160-417097/2-A), (MB 160-417097/1-A), (440-226830-I-1-J) and (440-226830-I-1-K)

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Client: Haley & Aldrich, Inc.

Project/Site: Quarterly Outfall 002 Comp

TestAmerica Job ID: 440-226838-4

Job ID: 440-226838-4 (Continued)

Laboratory: TestAmerica Irvine (Continued)

DU)

Method(s) 901.1: Gamma Prep Batch: 160-417097

The cesium-137 MDC (21.2 pCi/L) for the method blank (MB) is above the requested limit of 20 pCi/L. Cesium-137 activity was not observed in the MB above the MDC or RL. The MDC for the associated samples is less than the requested limit. The data have been reported with the MDC achieved. (MB 160-417097/1-A).

Method(s) A-01-R: Americium Prep Batch: 160-417049

Manual Integrations and adjustments to ROIs were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

(LCSD 160-417049/3-A).

Method(s) A-01-R: Americium Prep Batch: 160-417049

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

Outfall002\_20181207\_Comp (440-226838-1), (LCS 160-417049/2-A), (LCSD 160-417049/3-A) and (MB 160-417049/1-A)

Method(s) A-01-R: Americium Prep Batch: 160-417049

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Outfall002 20181207 Comp (440-226838-1), (LCS 160-417049/2-A), (LCSD 160-417049/3-A) and (MB 160-417049/1-A)

Method(s) A-01-R: Polonium Prep Batch: 160-418940

The following samples have a tracer recoveries below the 30% QC limit: MB 160-418940/1-A (29.0%), LCS 160-418940/2-A (24.5%), 440-226830-I-1-N (21.7%), 440-226830-I-1-O DU (21.7%), 440-226838-P-1-O (28.3%), 440-229259-J-1-J (19.7%). In addition, the Po-210 MDC is above the detection goal (0.300 pCi/L) which can be attributed to the lower tracer recovery. The samples were counted for the maximum count time of 960 minutes and achieved >400 tracer counts in the tracer peaks (which leads to 10% count uncertainty at 2 sigma), the resolution of < 100 keV is met for all peaks (there are no indications of spectral interferences), and the activity in the sample is above the MDC. The data have been qualified and reported with this narrative.

Outfall002\_20181207\_Comp (440-226838-1), (LCS 160-418940/2-A), (MB 160-418940/1-A), (440-226830-I-1-N) and (440-226830-I-1-O DU)

Method(s) A-01-R: Polonium Prep Batch: 160-418940

The Po-210 detection goal (0.300 pCi/L) was not met for the following samples due to low tracer recovery and reduced aliquots (see prep non-conformance memo: 160-162593): Outfall002\_20181207\_Comp (440-226838-1), (MB 160-418940/1-A), (440-226830-I-1-N) and (440-226830-I-1-O DU). Analytical results are reported with the detection limit achieved.

Method(s) A-01-R: Polonium Prep Batch: 160-418940

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

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

Outfall002\_20181207\_Comp (440-226838-1), (LCS 160-418940/2-A), (MB 160-418940/1-A), (440-226830-I-1-N) and (440-226830-I-1-O

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Client: Haley & Aldrich, Inc.

Project/Site: Quarterly Outfall 002 Comp

TestAmerica Job ID: 440-226838-4

Job ID: 440-226838-4 (Continued)

Laboratory: TestAmerica Irvine (Continued)

DU)

Method(s) A-01-R: Plutonium Prep Batch: 160-417063

The Pu-238 detection goal (1.00 pCi/L) was not met for the following samples due to the reduced aliquot required from the presence of matrix interferences (see prep non-conformance memo: 160-161634): Outfall002\_20181207\_Comp (440-226838-1) and (MB 160-417063/1-A). Analytical results are reported with the detection limit achieved.

Method(s) A-01-R: Plutonium Prep Batch: 160-417063

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Outfall002\_20181207\_Comp (440-226838-1), (LCS 160-417063/2-A), (LCSD 160-417063/3-A) and (MB 160-417063/1-A)

Method(s) A-01-R: Plutonium Prep Batch: 160-417063

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

Outfall002\_20181207\_Comp (440-226838-1), (LCS 160-417063/2-A), (LCSD 160-417063/3-A) and (MB 160-417063/1-A)

Method(s) A-01-R: Thorium Prep Batch: 160-417064

Manual Integrations and adjustments to ROIs were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

(LCS 160-417064/2-A).

Method(s) A-01-R: Thorium Prep Batch: 160-417064

The detection goals were not met for the following samples due to the reduced aliquot required from the presence of matrix interferences (see prep non-conformance memo: 160-161635): Outfall002\_20181207\_Comp (440-226838-1). Analytical results are reported with the detection limit achieved.

Method(s) A-01-R: Thorium Prep Batch: 160-417064

A blank population correction was applied to account for contributions to the analyte count rate from sources other than the sample itself. Interferences may include, but are not limited to, impurities in reagents, tracers, or glassware, or effects due to the measurement process (such as tailing or crosstalk).

Outfall002\_20181207\_Comp (440-226838-1), (LCS 160-417064/2-A), (LCSD 160-417064/3-A) and (MB 160-417064/1-A)

Method(s) A-01-R: Thorium Prep Batch: 160-417064

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

Outfall002 20181207 Comp (440-226838-1), (LCS 160-417064/2-A), (LCSD 160-417064/3-A) and (MB 160-417064/1-A)

Method(s) A-01-R: Thorium Prep Batch: 160-417064

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Outfall002 20181207 Comp (440-226838-1), (LCS 160-417064/2-A), (LCSD 160-417064/3-A) and (MB 160-417064/1-A)

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Client: Haley & Aldrich, Inc.

Project/Site: Quarterly Outfall 002 Comp

TestAmerica Job ID: 440-226838-4

### 31/AITIETICA 300 ID. 440-220030-4

### Job ID: 440-226838-4 (Continued)

### Laboratory: TestAmerica Irvine (Continued)

Method(s) Digest/Cu Plate: polonium-210 prep 160-417309: The following sample could not be thoroughly homogenized before sub-sampling was performed due to sample matrix: Outfall002\_20181207\_Comp (440-226838-1). The sample was dark-brown, murky, and contained a fair amount of undissolved sediment along the bottom of the container. Although sample was shaken well prior to sub-sampling there is no guarantee that sediments were evenly dispersed.

Method(s) Digest/Cu Plate: polonium-210 prep 160-417309: A deviation from the Standard Operating Procedure (SOP) occurred. Details are as follows: Due to apparent matrix samples underwent atypical separations prior to auto-plating per SOP No. ST-RC-0210.

Outfall002\_20181207\_Comp (440-226838-1)

Method(s) Digest/Cu Plate: Polonium-210 prep batch 160-418940: The following sample could not be thoroughly homogenized before sub-sampling was performed due to sample matrix: Outfall002\_20181207\_Comp (440-226838-1). The samples were dark-brown, murky, and contained a fair amount of undissolved sediment along the bottom of the container. Although sample was shaken well prior to sub-sampling there is no guarantee that sediments were evenly dispersed.

Method(s) Digest/Cu Plate: Polonium-210 prep batch 160-418940: A deviation from the Standard Operating Procedure (SOP) occurred. Details are as follows: Due to apparent matrix samples underwent atypical separations prior to purification via extraction chromatography and preparation for counting by alpha spectroscopy. The samples were also prepared at a reduced aliquot to lower potential matrix interference.

Outfall002\_20181207\_Comp (440-226838-1)

Method(s) ExtChrom: Americium Prep Batch 160-417049:

The following samples were prepared at a reduced aliquot due to brown discoloration and sediment: Outfall002\_20181207\_Comp (440-226838-1). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead of a sample duplicate (DUP) to demonstrate batch precision.

Method(s) ExtChrom: Plutonium Prep Batch 160-417063:

The following samples were prepared at a reduced aliquot due to brown discoloration and sediment: Outfall002\_20181207\_Comp (440-226838-1). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead of a sample duplicate (DUP) to demonstrate batch precision.

Method(s) ExtChrom: Thorium Prep Batch 160-417064:

The following samples were prepared at a reduced aliquot due to brown discoloration and sediment: Outfall002\_20181207\_Comp (440-226838-1). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead of a sample duplicate (DUP) to demonstrate batch precision.

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

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TestAmerica Irvine 3/26/2019

Client: Haley & Aldrich, Inc.

Project/Site: Quarterly Outfall 002 Comp

TestAmerica Job ID: 440-226838-4

Lab Sample ID: 440-226838-1

02/27/19 22:08 03/01/19 17:10

**Matrix: Water** 

Client Sample ID: Outfall002\_20181207\_Comp Date Collected: 12/07/18 10:05

0.000 U

Date Received: 12/07/18 21:05

Protactinium-231

Method: 901.1 -		a outlot o	Count	Total						
			Uncert.	Uncert.						
Analyte	Result	Qualifier	(2σ+/-)	(2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	39.2	U	79.4	79.5		98.6	pCi/L	02/27/19 22:08	03/01/19 17:10	1
Cesium-137	-4.04	U	11.4	11.4	20.0	19.4	pCi/L	02/27/19 22:08	03/01/19 17:10	1
Bismuth-211	39.2	U	79.4	79.5		98.6	pCi/L	02/27/19 22:08	03/01/19 17:10	1
Bismuth-212	49.4	U	85.2	85.3		144	pCi/L	02/27/19 22:08	03/01/19 17:10	1
Thorium-227	39.2	U	79.4	79.5		98.6	pCi/L	02/27/19 22:08	03/01/19 17:10	1
Radium-223	39.2	U	79.4	79.5		98.6	pCi/L	02/27/19 22:08	03/01/19 17:10	1
Radium-224	-15.9	U	14.1	14.2		35.5	pCi/L	02/27/19 22:08	03/01/19 17:10	1

Method: A-01-R -	Isotopic Cu	ırium and	or Americi	um 241 (A	lpha Spe	ctrome	try)			
	•		Count	Total			•			
			Uncert.	Uncert.						
Analyte	Result	Qualifier	(2σ+/-)	(2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Americium-241	0.275	U	0.455	0.456	1.00	0.813	pCi/L	02/27/19 12:01	03/07/19 22:45	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Americium-243	85.1		30 - 110					02/27/19 12:01	03/07/19 22:45	

685 pCi/L

46.3

46.3

Method: A-01-R - I	sotopic Pl	utonium a	nd Neptuni	um (Alpha	<b>Spectro</b>	metry)				
			Count	Total						
			Uncert.	Uncert.						
Analyte	Result	Qualifier	(2σ+/-)	(2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Plutonium-238	0.207	UG	0.539	0.540	1.00	1.07	pCi/L	02/27/19 13:31	03/06/19 21:52	1
Plutonium-239/240	0.321	U	0.398	0.398	1.00	0.519	pCi/L	02/27/19 13:31	03/06/19 21:52	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Pu-242 (T)	79.9		30 - 110					02/27/19 13:31	03/06/19 21:52	1

Method: A-01-R -	Isotopic Po	olonium (A	Ipha Spect	rometry)						
			Count	Total						
			Uncert.	Uncert.						
Analyte	Result	Qualifier	(2σ+/-)	(2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Polonium-210	1.27	G	0.467	0.479	0.300	0.500	pCi/L	03/12/19 12:19	03/15/19 20:28	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Polonium-209	28.3	X	30 - 110					03/12/19 12:19	03/15/19 20:28	1

			Count Uncert.	Total Uncert.						
Analyte	Result	Qualifier	(2σ+/-)	(2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	1.82	G	1.47	1.48	1.00	1.79	pCi/L	02/27/19 13:33	03/07/19 22:42	1
Thorium-230	1.24	UG	1.27	1.27	1.00	1.63	pCi/L	02/27/19 13:33	03/07/19 22:42	1
Thorium-232	0.767	U G	0.914	0.916	1.00	1.29	pCi/L	02/27/19 13:33	03/07/19 22:42	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	45.4		30 - 110					02/27/19 13:33	03/07/19 22:42	1

# **Method Summary**

Client: Haley & Aldrich, Inc.

Project/Site: Quarterly Outfall 002 Comp

TestAmerica Job ID: 440-226838-4

Method	Method Description	Protocol	Laboratory
901.1	Cesium 137 & Other Gamma Emitters (GS)	EPA	TAL SL
A-01-R	Isotopic Curium and/or Americium 241 (Alpha Spectrometry)	DOE	TAL SL
A-01-R	Isotopic Plutonium and Neptunium (Alpha Spectrometry)	DOE	TAL SL
A-01-R	Isotopic Polonium (Alpha Spectrometry)	DOE	TAL SL
A-01-R	Isotopic Thorium (Alpha Spectrometry)	DOE	TAL SL
Digest/Cu Plate	Preparation, Digestion & Copper Plating	TAL-STL	TAL SL
ExtChrom	Preparation, Extraction Chromatography Resin Actinide Separation	None	TAL SL
Fill Geo-0	Fill Geometry, No In-Growth	None	TAL SL

### **Protocol References:**

DOE = U.S. Department of Energy

EPA = US Environmental Protection Agency

None = None

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

### **Laboratory References:**

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

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### **Lab Chronicle**

Client: Haley & Aldrich, Inc.

Project/Site: Quarterly Outfall 002 Comp

TestAmerica Job ID: 440-226838-4

Lab Sample ID: 440-226838-1

Matrix: Water

Client Sample ID: Outfall002\_20181207\_Comp

Date Collected: 12/07/18 10:05 Date Received: 12/07/18 21:05

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Fill_Geo-0			1000 mL	1.0 mL	417097	02/27/19 22:08	MPT	TAL SL
Total/NA	Analysis	901.1		1			417372	03/01/19 17:10	KLS	TAL SL
Total/NA	Prep	ExtChrom			100.08 mL	1.0 mL	417063	02/27/19 13:31	KNF	TAL SL
Total/NA	Analysis	A-01-R		1			418008	03/06/19 21:52	ALS	TAL SL
Total/NA	Prep	ExtChrom			100.08 mL	1.0 mL	417064	02/27/19 13:33	KNF	TAL SL
Total/NA	Analysis	A-01-R		1			418286	03/07/19 22:42	ALS	TAL SL
Total/NA	Prep	ExtChrom			100.08 mL	1.0 mL	417049	02/27/19 12:01	KNF	TAL SL
Total/NA	Analysis	A-01-R		1			418293	03/07/19 22:45	ALS	TAL SL
Total/NA	Prep	Digest/Cu Plate			199.97 mL	1.0 g	418940	03/12/19 12:19	PJM	TAL SL
Total/NA	Analysis	A-01-R		1			419522	03/15/19 20:28	ALS	TAL SL

### **Laboratory References:**

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

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TestAmerica Job ID: 440-226838-4

Client: Haley & Aldrich, Inc.

Project/Site: Quarterly Outfall 002 Comp

### Method: 901.1 - Cesium 137 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-417097/1-A

**Matrix: Water** 

**Analysis Batch: 417503** 

**Client Sample ID: Method Blank** Prep Type: Total/NA

**Prep Batch: 417097** 

			Count	Total						
	MB	MB	Uncert.	Uncert.						
Analyte	Result	Qualifier	(2σ+/-)	(2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	-2.360	U	132	132		145	pCi/L	02/27/19 22:08	03/01/19 17:09	1
Cesium-137	6.536	U G	12.5	12.5	20.0	21.2	pCi/L	02/27/19 22:08	03/01/19 17:09	1
Bismuth-211	-2.360	U	132	132		145	pCi/L	02/27/19 22:08	03/01/19 17:09	1
Bismuth-212	-76.06	U	128	128		274	pCi/L	02/27/19 22:08	03/01/19 17:09	1
Thorium-227	-2.360	U	132	132		145	pCi/L	02/27/19 22:08	03/01/19 17:09	1
Radium-223	-2.360	U	132	132		145	pCi/L	02/27/19 22:08	03/01/19 17:09	1
Radium-224	-11.20	U	20.1	20.2		40.9	pCi/L	02/27/19 22:08	03/01/19 17:09	1
Protactinium-231	0.0000	U	57.8	57.8		1010	pCi/L	02/27/19 22:08	03/01/19 17:09	1

Lab Sample ID: LCS 160-417097/2-A

**Matrix: Water** 

**Analysis Batch: 417372** 

**Client Sample ID: Lab Control Sample** 

Prep Type: Total/NA

**Prep Batch: 417097** 

				Total						
	Spike	LCS	LCS	Uncert.					%Rec.	
Analyte	Added	Result	Qual	(2σ+/-)	RL	MDC	Unit	%Rec	Limits	
Americium-241	136000	124300		14400		399	pCi/L	91	90 - 111	
Cesium-137	44900	44730		4480	20.0	110	pCi/L	100	90 - 111	
Cobalt-60	30400	29420		2910		61.0	pCi/L	97	89 - 110	

Lab Sample ID: 440-226830-I-1-K DU

**Matrix: Water** 

**Analysis Batch: 417504** 

**Client Sample ID: Duplicate** Prep Type: Total/NA

**Prep Batch: 417097** 

					Total				•	
	Sample	Sample	DU	DU	Uncert.					RER
Analyte	Result	Qual	Result	Qual	(2σ+/-)	RL	MDC	Unit	RER	Limit
Actinium-227	6.72	U	25.23	U	28.2		111	pCi/L	0.19	1
Cesium-137	-3.40	U	4.351	U	9.55	20.0	16.4	pCi/L	0.35	1
Bismuth-211	6.72	U	25.23	U	28.2		111	pCi/L	0.19	1
Bismuth-212	16.0	U	2.412	U	95.6		177	pCi/L	0.07	1
Thorium-227	6.72	U	25.23	U	28.2		111	pCi/L	0.19	1
Radium-223	6.72	U	25.23	U	28.2		111	pCi/L	0.19	1
Radium-224	24.3		-2.018	U	17.0		29.4	pCi/L	0.88	1
Protactinium-231	79.1	U	72.45	U	225		521	pCi/L	0.02	1

### Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Lab Sample ID: MB 160-417064/1-A

**Matrix: Water** 

Analysis Batch: 418283

**Client Sample ID: Method Blank Prep Type: Total/NA Prep Batch: 417064** 

			Count	rotai					
	MB	MB	Uncert.	Uncert.					
Analyte	Result	Qualifier	(2σ+/-)	(2σ+/-)	RL	MDC Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.1787	U	0.434	0.434	1.00	0.812 pCi/L	02/27/19 13:33	03/07/19 22:42	1
Thorium-230	0.5403	U	0.666	0.668	1.00	0.916 pCi/L	02/27/19 13:33	03/07/19 22:42	1
Thorium-232	0.04384	U	0.243	0.243	1.00	0.653 pCi/L	02/27/19 13:33	03/07/19 22:42	1

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TestAmerica Job ID: 440-226838-4

Client: Haley & Aldrich, Inc.

Project/Site: Quarterly Outfall 002 Comp

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry) (Continued)

Lab Sample ID: MB 160-417064/1-A

Lab Sample ID: LCS 160-417064/2-A

**Matrix: Water** 

**Matrix: Water** 

Thorium-230

**Analysis Batch: 418283** 

MB MB

Tracer **%Yield Qualifier** Limits Thorium-229 30 - 110 99.9

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

**Prep Batch: 417064** 

Analyzed Dil Fac

Client Sample ID: Lab Control Sample

02/27/19 13:33 03/07/19 22:42

Prepared

Prep Type: Total/NA

81 - 125

Prep Batch: 417064

Analysis Batch: 418284 Total LCS LCS %Rec. **Spike** Uncert. Analyte Added Result Qual  $(2\sigma + / -)$ RL **MDC** Unit %Rec Limits

5.18

1.00

0.779 pCi/L

LCS LCS Tracer %Yield Qualifier Limits Thorium-229 103 30 - 110

Lab Sample ID: LCSD 160-417064/3-A

**Matrix: Water** 

**Analysis Batch: 418285** 

Client Sample ID: Lab Control Sample Dup

**Client Sample ID: Lab Control Sample** 

96

Prep Type: Total/NA Prep Batch: 417064

Total

40.1

38.67

LCSD LCSD **RER** Spike Uncert. %Rec. Analyte Added Result Qual  $(2\sigma + / -)$ RL **MDC** Unit %Rec Limits RER Limit 81 - 125 Thorium-230 40.1 43.40 5.64 1.00 0.788 pCi/L 108 0.44

LCSD LCSD Tracer %Yield Qualifier Limits Thorium-229 104 30 - 110

Method: A-01-R - Isotopic Polonium (Alpha Spectrometry)

Client Sample ID: Method Blank Lab Sample ID: MB 160-418940/1-A **Matrix: Water** Prep Type: Total/NA **Analysis Batch: 419517** Prep Batch: 418940

Count Total MB MB Uncert. Uncert. **Analyte** Result Qualifier  $(2\sigma + / -)$  $(2\sigma + / -)$ RL **MDC** Unit Dil Fac Prepared Analyzed 0.1963 UG Polonium-210 0.207 0.208 0.300 0.313 pCi/L 03/12/19 12:19 03/15/19 20:28

MB MB Tracer **%Yield Qualifier** Limits Prepared Analyzed Dil Fac Polonium-209 29.0 X 30 - 110 03/12/19 12:19 03/15/19 20:28

Lab Sample ID: LCS 160-418940/2-A

**Matrix: Water** 

**Analysis Batch: 419518** 

**Prep Batch: 418940** Total Spike LCS LCS %Rec. Uncert. Analyte Added Result Qual  $(2\sigma + / -)$ RL MDC Unit %Rec Limits Polonium-210 43.1 0.300 0.747 pCi/L 41.20 4.31 79 - 124

Prep Type: Total/NA

Total

RL

1.00

Total

TestAmerica Job ID: 440-226838-4

Project/Site: Quarterly Outfall 002 Comp

Method: A-01-R - Isotopic Polonium (Alpha Spectrometry) (Continued)

Lab Sample ID: LCS 160-418940/2-A **Matrix: Water** 

**Analysis Batch: 419518** 

LCS LCS

Result Qual

Tracer %Yield Qualifier Limits Polonium-209 24.5 X 30 - 110

Lab Sample ID: 440-226830-I-1-O DU

**Matrix: Water** 

Analysis Batch: 419520

Sample Sample

2.36 G Polonium-210 DU DU

%Yield Qualifier Tracer Polonium-209

Limits  $\overline{21.7} \overline{X}$ 30 - 110 **Client Sample ID: Lab Control Sample** 

Prep Type: Total/NA

**Prep Batch: 418940** 

**Client Sample ID: Duplicate** 

**Client Sample ID: Method Blank** 

Analyzed

Analyzed

Prep Type: Total/NA

**Prep Batch: 418940** 

**RER MDC** Unit RER Limit

Uncert.  $(2\sigma + / -)$ RL 0.300 0.955 pCi/L 0.15

Prepared

Prepared

0.828

**MDC** Unit

0.893 pCi/L

Method: A-01-R - Isotopic Curium and/or Americium 241 (Alpha Spectrometry)

DU DU

Result Qual

2.125 G

Lab Sample ID: MB 160-417049/1-A

**Matrix: Water** 

Analyte

Analysis Batch: 418290

Count Total MB MB Uncert. Uncert. Result Qualifier  $(2\sigma + / -)$ 

Analyte  $(2\sigma + / -)$ Americium-241 0.1270 U 0.413 0.413

MB MB Tracer **%Yield Qualifier** Limits

Americium-243 96.2 30 - 110

Lab Sample ID: LCS 160-417049/2-A

**Matrix: Water** 

Analysis Batch: 418291

**Client Sample ID: Lab Control Sample** 

02/27/19 12:01 03/07/19 22:44

02/27/19 12:01 03/07/19 22:44

Prep Type: Total/NA

Prep Type: Total/NA

**Prep Batch: 417049** 

**Prep Batch: 417049** 

Spike LCS LCS Uncert. %Rec. Added RL **MDC** Unit Analyte Result Qual  $(2\sigma + / -)$ %Rec Limits 80 - 116 Americium-241 37.2 37.97 5.76 1.00 0.787 pCi/L 102

LCS LCS Tracer %Yield Qualifier

Limits 30 - 110 90 4 Americium-24

Lab Sample ID: LCSD 160-417049/3-A Client Sample ID: Lab Control Sample Dup Prep Type: Total/NA

**Matrix: Water** 

Analysis Batch: 418292

Total Spike LCSD LCSD Uncert.

Added Analyte Result Qual  $(2\sigma + / -)$ Americium-241 37.2 37.58

5.63

RL 1.00

**MDC** Unit 0.808 pCi/L

%Rec 101 80 - 116

**Prep Batch: 417049** %Rec. **RER** Limits RER Limit

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Dil Fac

Dil Fac

TestAmerica Job ID: 440-226838-4

Client: Haley & Aldrich, Inc.

Project/Site: Quarterly Outfall 002 Comp

# Method: A-01-R - Isotopic Curium and/or Americium 241 (Alpha Spectrometry) (Continued)

Lab Sample ID: LCSD 160-417049/3-A

**Matrix: Water** 

**Analysis Batch: 418292** 

LCSD LCSD

Tracer %Yield Qualifier Limits 30 - 110 Americium-24 948

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

**Prep Batch: 417049** 

Method: A-01-R - Isotopic Plutonium and Neptunium (Alpha Spectrometry)

Lab Sample ID: MB 160-417063/1-A

**Matrix: Water** 

Analysis Batch: 418005

**Client Sample ID: Method Blank** 

Prep Type: Total/NA

**Prep Batch: 417063** 

			Count	ıotai						
	MB	MB	Uncert.	Uncert.						
Analyte	Result	Qualifier	(2σ+/-)	(2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Plutonium-238	0.3914	UG	0.627	0.628	1.00	1.11	pCi/L	02/27/19 13:31	03/06/19 21:52	1
Plutonium-239/240	0.07682	U	0.254	0.254	1.00	0.639	pCi/L	02/27/19 13:31	03/06/19 21:52	1

MB MB Tracer **%Yield Qualifier** Limits Pu-242 (T) 74.3 30 - 110

Prepared Analyzed Dil Fac 02/27/19 13:31 03/06/19 21:52

Lab Sample ID: LCS 160-417063/2-A

**Matrix: Water** 

Analysis Batch: 418006

**Client Sample ID: Lab Control Sample** 

Prep Type: Total/NA

Prep Batch: 417063

				ı otai						
	Spike	LCS	LCS	Uncert.					%Rec.	
Analyte	Added	Result	Qual	(2σ+/-)	RL	MDC U	nit %	Rec	Limits	
Plutonium-238	53.0	52.34		6.37	1.00	0.909 pc	Ci/L	99	79 - 115	
Plutonium-239/2	52.8	52.02		6.33	1.00	0.574 p0	Ci/L	98	85 - 120	
40										

LCS LCS %Yield Qualifier Tracer Limits Pu-242 (T) 89.9 30 - 110

Lab Sample ID: LCSD 160-417063/3-A

**Matrix: Water** 

40

Analysis Batch: 418007

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

**Prep Batch: 417063** 

				Total						
	Spike	LCSD	LCSD	Uncert.				%Rec.		RER
Analyte	Added	Result	Qual	(2σ+/-)	RL	MDC Unit	%Rec	Limits	RER	Limit
Plutonium-238	53.0	47.71		5.88	1.00	0.921 pCi/L	90	79 - 115	0.38	1
Plutonium-239/2	52.8	50.05		6.08	1.00	0.547 pCi/L	95	85 - 120	0.16	1

LCSD LCSD %Yield Qualifier Tracer Limits Pu-242 (T) 93.3 30 - 110

TestAmerica Irvine

# **QC Association Summary**

Client: Haley & Aldrich, Inc.

Project/Site: Quarterly Outfall 002 Comp

TestAmerica Job ID: 440-226838-4

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Prep	Batc	h: 41	17049
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Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-226838-1	Outfall002_20181207_Comp	Total/NA	Water	ExtChrom	
MB 160-417049/1-A	Method Blank	Total/NA	Water	ExtChrom	
LCS 160-417049/2-A	Lab Control Sample	Total/NA	Water	ExtChrom	
LCSD 160-417049/3-A	Lab Control Sample Dup	Total/NA	Water	ExtChrom	

### **Prep Batch: 417063**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-226838-1	Outfall002_20181207_Comp	Total/NA	Water	ExtChrom	
MB 160-417063/1-A	Method Blank	Total/NA	Water	ExtChrom	
LCS 160-417063/2-A	Lab Control Sample	Total/NA	Water	ExtChrom	
LCSD 160-417063/3-A	Lab Control Sample Dup	Total/NA	Water	ExtChrom	

### **Prep Batch: 417064**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-226838-1	Outfall002_20181207_Comp	Total/NA	Water	ExtChrom	
MB 160-417064/1-A	Method Blank	Total/NA	Water	ExtChrom	
LCS 160-417064/2-A	Lab Control Sample	Total/NA	Water	ExtChrom	
LCSD 160-417064/3-A	Lab Control Sample Dup	Total/NA	Water	ExtChrom	

### **Prep Batch: 417097**

Lab Sample ID 440-226838-1	Client Sample ID Outfall002_20181207_Comp	Prep Type Total/NA	Matrix Water	Method Fill_Geo-0	Prep Batch
MB 160-417097/1-A	Method Blank	Total/NA	Water	Fill_Geo-0	
LCS 160-417097/2-A	Lab Control Sample	Total/NA	Water	Fill_Geo-0	
440-226830-I-1-K DU	Duplicate	Total/NA	Water	Fill_Geo-0	

### **Prep Batch: 418940**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-226838-1	Outfall002_20181207_Comp	Total/NA	Water	Digest/Cu Plate	
MB 160-418940/1-A	Method Blank	Total/NA	Water	Digest/Cu Plate	
LCS 160-418940/2-A	Lab Control Sample	Total/NA	Water	Digest/Cu Plate	
440-226830-I-1-O DU	Duplicate	Total/NA	Water	Digest/Cu Plate	

# **Definitions/Glossary**

Client: Haley & Aldrich, Inc.

Project/Site: Quarterly Outfall 002 Comp

TestAmerica Job ID: 440-226838-4

### **Qualifiers**

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.
X	Tracer is outside acceptance limits.
G	The Sample MDC is greater than the requested RL.

# Glossary

TEF

TEQ

Toxicity Equivalent Factor (Dioxin)

Toxicity Equivalent Quotient (Dioxin)

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

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## **Accreditation/Certification Summary**

Client: Haley & Aldrich, Inc.

TestAmerica Job ID: 440-226838-4

Project/Site: Quarterly Outfall 002 Comp

### **Laboratory: TestAmerica Irvine**

The accreditations/certifications listed below are applicable to this report.

Authority	Program	EPA Region	Identification Number	<b>Expiration Date</b>
California	State Program	9	CA ELAP 2706	06-30-19

### Laboratory: TestAmerica St. Louis

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

Authority	Program	EPA Region	Identification Number	Expiration Date
Alaska	State Program	10	MO00054	06-30-19
ANAB	DoD / DOE		L2305	04-06-22
Arizona	State Program	9	AZ0813	12-08-19
California	State Program	9	2886	06-30-19
Connecticut	State Program	1	PH-0241	03-31-19 *
Florida	NELAP	4	E87689	06-30-19
Hawaii	State Program	9	NA	06-30-19
Illinois	NELAP	5	200023	11-30-19
Iowa	State Program	7	373	12-01-20
Kansas	NELAP	7	E-10236	10-31-19
Kentucky (DW)	State Program	4	KY90125	12-31-19
Louisiana	NELAP	6	04080	06-30-19
Louisiana (DW)	NELAP	6	LA011	12-31-19
Maryland	State Program	3	310	09-30-19
Michigan	State Program	5	9005	06-30-19
Missouri	State Program	7	780	06-30-19
Nevada	State Program	9	MO000542018-1	07-31-19
New Jersey	NELAP	2	MO002	06-30-19
New York	NELAP	2	11616	03-31-19 *
North Dakota	State Program	8	R207	06-30-19
NRC	NRC		24-24817-01	12-31-22
Oklahoma	State Program	6	9997	08-31-19
Pennsylvania	NELAP	3	68-00540	02-28-19 *
South Carolina	State Program	4	85002001	06-30-19
Texas	NELAP	6	T104704193-18-13	07-31-19
US Fish & Wildlife	Federal		058448	07-31-19
USDA	Federal		P330-17-0028	02-02-20
Utah	NELAP	8	MO000542018-10	07-31-19
Virginia	NELAP	3	460230	06-14-19
Washington	State Program	10	C592	08-30-19
West Virginia DEP	State Program	3	381	08-31-19

TestAmerica Irvine

<sup>\*</sup> Accreditation/Certification renewal pending - accreditation/certification considered valid.

# CHAIN OF CUSTODY FORM

Client Name/Add Haley & Aldrich 5333 Mission Cer San Diego, CA 9:	Client Name/Address Haley & Aldrich 5333 Mission Center Rd Suite 300 San Diego, CA 92108			B. Quarterly	Property Perm Perm Outfall	Project. Boeing-SSFL NPDES Permit 2018 Quarterly Outli [001, 002, 011, 018]	S 111, 018]		ac	œ	œ.	œ	~	œ	« —			ANAL	ANALYSIS REQUIRED	RED
Test America Cont 17461 Derian Ave Irvine CA 92614 Tel 949-260-3269 Cell 949-333-9055	Test America Contact: Urvashi Patel 17461 Derian Ave Suite #100 Irvine CA 92614 Tel 949-260-3269 Cell 949-333-9055	And the state of t			5	Comp				06.1 (E1613B)	540C/E425.1)	'N-SON+6ON 'N-	(1 0813)		ene, Bis(2-	Mercury (E245 1				Comments
TestAmerica s : Service Agreen affiliates, and T.	Test/mercia s services under this CoC3 shall be performed in accordance with the T&Ce within Blanket Service Agreements 2015-15-Test/mercia by and between Haley & Adrich, Inc., its subsidiarles and affiliates, and Test/mercia Laboratories inc.	moe with the T&Cs within Bland Aldnch, Inc., its subsidiaries an	ī šē	Project Manag 520,289,8606,	Managi ,8606,	Project Manager: Katherine Miller 520.289.8606, 520.904 6944 (cell)	ne Miller 44 (cell)	le Metals:	Cq, Se	95 C) (E4		(00	S240D)) SWS240C	(2)	nitrotolue		e Metals			
Sampler Den-Smith	Jen-Smith			Field Manag 978,234 5033		Field Manager: Mark Dominick 78.234 5033, 818.599.0702 (cell)	minick 02 (cell)	denavoo	Zn Cu, Pb	engeb O		OC3) ete		19E) N-E	P, 2,4 D		coverab			
Sample Description	Sample I D	Sampling Date/Time	Sample Matrix	Container Type	# 8 2 E	Preservative	Bottle M	MS/MS0 DS/MS0 PS/IstoT	(E 200 S)	s) sqoa	Surfactar	Perchlori	Vhibidity 381) 28T	ы∩оттА	9pha-Bl	·····				
			WW	500 mL Poty	-	HNO3	66	2	×								×		Outfalls Outfalls Fe ontv	Outfall 001 analyze for Fe and Mn Outfalls 002 and 011 analyze for Fe only
		······	WW	1 L Glass Amber	~	None	110	2		×					-					
·aç		·······	WW	1t. Poly	۳.	None	115	92		×										
je.			WW	500 mt. Poly	2	None	120	No			×		H			_				
19			WW	500 mL Poly	. 2	None	85	ş				×							48 hot NO2	48 hours Holding Time NO3 & NO2
of	Outfall002_20181207_Comp	12/1/2018	W.W.	500 mL Poly	-	None	150	2					×						48 hor.	48 hours Holding Time for Tubidity
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)		500%	WW	1 L Glass Amber	2	None	170	No							×					
Southern Co.		•	WW	1 L Glass Amber	2 .	None	180	No No						<b></b>	×					
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			Ž.	COLOSIIICELE VIERE	1	HNO	315	کر اگ	3	3						× 			Sampl BAG   Mercu	Sample receiving DO NOT OPEN BAG Bag to be opened in Mercury Prep using clean
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		,	N/M	600 ml. Poly	4	None	8	1	7		Ι		-						면	
	Outfall002_20181207_Comp_Extra	12/1/2018	WW	500 mt-Poly	ļ.	None	130	1	1			I				-			Hotq	
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			WW	11 Glass Ambac	2	Mone	180	Ski A							Ξ	_			Hold	
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		(1.16)	<b>1</b>	10161	1	- 11	7	+	#	_						; T		\ \ \ \		

1894 Ali Level IV X Infact
Store samples for 6 months
Data Requirements (Check)
No Level IV
All 5012 81/4h

On Ice

Sample Integrity (Check)

1000

81.1.21

Test America

440-226838 Chain of Custody

Client Nar	Clent Name/Address:				D.	Project:			æ	œ	æ	۳.		ORSWE	ORSWE ORSW ORSW	ORSW	ٳڿ	-	
Hafey & Aldrich	Mdrich			لي	Soeing-	Boeing-SSFL NPDES	တ			wn	- 1			74					*
5333 Miss	5333 Mission Center Rd Suite 300				e .	Permit 2018	676				ber			0 Y					
San Diego	San Diego, CA 92108			Quarter		Quarterly Outfall (001, 002, 011, 018) Outfall 002	711, U18J			T .(0	ndmo	······································	(1	(80 (80				*	
Test America Cont 17461 Derian Ave Irvine CA 92614 Tel 949-260-3269 Cell 949-333-9055	Test America Contact. Urvashi Patel 17461 Derian Ave Suite #100 Irvine CA 92614 Tel 949-260-3269 Cell 949-333-9055				-	Согир			9	( ) E335 2)	6 0), K-40, CS-1 (6 0), K-40, CS-1	mutse	Wercury (E245	ddes+PCBs (E6	ı e. 	£003#0		······································	Comments
TestAmence's Agreement# 21	s services under this CoC shall be performed an accordance 1015.5 Esthanance by and between Haley & Aldrich, Inc.	e with the T&Cs within Blanket Se , its subsidience and efficience, an	annoe id	Project 520.28	t Mana 9.8606	Project Manager: Katherine Miller 520.289.8606, 520.904,6944 (cell)	ne Miller 144 (cell)	Metals	p' Cq' 2		51-90 (5 903 0 or 10 (590			useq-etr	seM eld	şisteM ss ssen			
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Sample Description	Sample 1 D	Sampling Date/Time	Sample Matrix	Container Type	Cont Cont	Preservative	Sottle MS.	MS/MSD G isto?	(E200.7		(H-3) (E-H) Radium (E904 (E			Priority Ch/J	A listoT	Total D			
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	27- ROB-W. 5/24-(24)	61-7-19	WW	500 ml. Poty	-	HNO <sub>3</sub>	8	oN.							×				at OF601,002,011, or 018.
			WW	1L Poly	-	Nane	902	2	×	-		<u> </u>							Fifter and preserve win 24hrs of receipt at lab at OF001,002,011, or 018
age 2	Outfall002_20181207_Comp_F	1202018	WA	1 L Glass Amber	2	None	750	2						×		***************************************			Chiordane, DDO, DDE, DDT dieldan, PCBs,toxaphene at OF041,002,011, or 018.
		5001/	VANA	borosilicate wais	-	Nane	320	2	<b></b>				×						Sample recewing DO NOT OPEN BAG. Bag to be opened in Mercury Prep using clean procedures.
,			WM	500 mL Poly	-	NaOH	Ц	Ş		×		igg		Ī				+	Participant of the Participant o
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Refrontished	od By Date/Timo	Compan, Compan, 7.7.18 9	-		lavů	, Year	Received By		A B	Date/Tim	Date/Time		sh ha		Store samp Data Requir No Level IV	Store samples for 6 months Data Requirements, (Check) No Eavel IV		All Level IV	**************************************
726/20							JU	De la company				(V)	210	h		Available page and the state of			
19																			

# **Login Sample Receipt Checklist**

Client: Haley & Aldrich, Inc.

Job Number: 440-226838-4

Login Number: 226838 List Source: TestAmerica Irvine

List Number: 1

Creator: Soderblom, Tim

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

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Client: Haley & Aldrich, Inc.

Job Number: 440-226838-4

List Source: TestAmerica St. Louis
List Number: 3
List Source: TestAmerica St. Louis
List Creation: 12/20/18 12:36 PM

Creator: Hellm, Michael

Creator: Heilm, Michael		
Question	Answer	Comment
Radioactivity wasn't checked or is = background as measured by a survey meter.</td <td>True</td> <td></td>	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.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	19.0
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	N/A	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Client: Haley & Aldrich, Inc.

Project/Site: Quarterly Outfall 002 Comp

TestAmerica Job ID: 440-226838-4

Method: A-01-R - Isotopic Curium and/or Americium 241 (Alpha Spectrometry)

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

			Percent Yield (Acceptance Limits)
		nericium-2	
ab Sample ID	Client Sample ID	(30-110)	
40-226838-1	Outfall002_20181207_Comp	85.1	
.CS 160-417049/2-A	Lab Control Sample	90.4	
.CSD 160-417049/3-A	Lab Control Sample Dup	94.8	
/IB 160-417049/1-A	Method Blank	96.2	
Tracer/Carrier Legenc	I		

Method: A-01-R - Isotopic Plutonium and Neptunium (Alpha Spectrometry)

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

			Percent Yield (Acceptance Limits)
		Pu-242 (T)	
Lab Sample ID	Client Sample ID	(30-110)	
440-226838-1	Outfall002_20181207_Comp	79.9	
LCS 160-417063/2-A	Lab Control Sample	89.9	
LCSD 160-417063/3-A	Lab Control Sample Dup	93.3	
MB 160-417063/1-A	Method Blank	74.3	
Tracer/Carrier Legenc	I		
Pu-242 (T) = Pu-242 (T			

Method: A-01-R - Isotopic Polonium (Alpha Spectrometry)

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

			Percent Yield (Acceptance Limits)
		olonium-2	
Lab Sample ID	Client Sample ID	(30-110)	
440-226830-I-1-O DU	Duplicate	21.7 X	
440-226838-1	Outfall002_20181207_Comp	28.3 X	
LCS 160-418940/2-A	Lab Control Sample	24.5 X	
MB 160-418940/1-A	Method Blank	29.0 X	

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

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

		Percent Yield (Acceptance Limits)		
		horium-22		
Lab Sample ID	Client Sample ID	(30-110)		
440-226838-1	Outfall002_20181207_Comp	45.4		
LCS 160-417064/2-A	Lab Control Sample	103		
LCSD 160-417064/3-A	Lab Control Sample Dup	104		
MB 160-417064/1-A	Method Blank	99.9		
Tracer/Carrier Legend				

TestAmerica Irvine

Page 23 of 29

### Patel, Urvashi

From: Miller, Katherine <KMiller@haleyaldrich.com>

**Sent:** Monday, February 18, 2019 12:53 PM

To:Patel, UrvashiSubject:RE: Gross alpha

Follow Up Flag: Follow up Flag Status: Flagged

**Categories:** Red Category

### -External Email-

We need these test for OF002 and OF008 from Dec.

OF002 - Qtrly	440-226838
OF008 - Annual	440-226830

Man-made radionuclides to be analyzed by alpha spectroscopy

Pu-239/240

Pu-238

Am-241

Naturally occurring radionuclides to be analyzed by alpha spectroscopy

Th-232

Th-230

Th-228

Naturally occurring radionuclides to be analyzed by gamma spectroscopy

Po-210

Po-214

Po-218

Pa-231

Ac-227

Th-227

Ra-223

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3/26/2019

Po-215 Bi-211 Ra-224 Po-216

Bi-212 Po-212

Katherine Miller HALEY & ALDRICH Tel: 520.289.8606

From: Miller, Katherine

Sent: Thursday, January 24, 2019 11:41 AM

**To:** 'Patel, Urvashi' < Urvashi.Patel@testamericainc.com>

Subject: RE: Gross alpha

No rad tests needed.

Katherine Miller HALEY & ALDRICH Tel: 520.289.8606

From: Patel, Urvashi < <a href="mailto:Urvashi.Patel@testamericainc.com">Urvashi.Patel@testamericainc.com</a>>

**Sent:** Wednesday, January 23, 2019 11:07 AM **To:** Miller, Katherine < <a href="mailto:KMiller@haleyaldrich.com">KMiller@haleyaldrich.com</a>>

Subject: RE: Gross alpha

Katherine- please let me know if you'd like to add the analysis and I'll add them to both jobs.

Thanks, Urvashi

### **URVASHI PATEL**

Manager of Project Management

### Test America

THE LEADER IN ENVIRONMENTAL TESTING

17461 Derian Ave, Suite #100 Irvine, CA 92614 TEL 949-261-1022 | FAX 949-260-3297 DIRECT 949-260-3269 CELL 949-333-9055

www.testamericainc.com

From: Franks, Mike

Sent: Wednesday, January 23, 2019 9:50 AM

**To:** 'Miller, Katherine' **Cc:** Patel, Urvashi

Subject: RE: Gross alpha

The recount can be done in a few days. Just scheduling the analysis time.

The isotopic thorium can be done in 10 business days.

**From:** Miller, Katherine [mailto:KMiller@haleyaldrich.com]

Sent: Wednesday, January 23, 2019 11:44 AM

**To:** Franks, Mike **Cc:** Patel, Urvashi

**Subject:** RE: Gross alpha

### -External Email-

How long would recount and isotopic thorium take?

Katherine Miller HALEY & ALDRICH Tel: 520.289.8606

**From:** Franks, Mike < <u>Mike.Franks@testamericainc.com</u>>

Sent: Wednesday, January 23, 2019 10:28 AM
To: Miller, Katherine < <a href="Miller@haleyaldrich.com">KMiller@haleyaldrich.com</a>>
Cc: Patel, Urvashi < <a href="Miller@haleyaldrich.com">Urvashi.Patel@testamericainc.com</a>>

Subject: FW: Gross alpha

Importance: High

Hi Katherine,

Our technical director review the gamma spec 901.1 data for jobs 440-226838 & 440-226830. The Np-237 result we discussed is most likely caused by interference from x-ray junk around that energy line.

He concurs that isotopic thorium is the logical additional analysis. We can also recount the Gross Alpha/Beta planchete

Thanks.

Mike

### **MIKE FRANKS**

Client Relations Manager

### **TestAmerica**

THE LEADER IN ENVIRONMENTAL TESTING

13715 Rider Trail North Earth City, MO 63045 Tel 314.298.8566 I Fax 314.298.8757 www.testamericainc.com

From: Miller, Katherine [mailto:KMiller@haleyaldrich.com]

Sent: Wednesday, January 23, 2019 8:51 AM

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**To:** Patel, Urvashi

Subject: RE: Gross alpha

### -External Email-

I need the lab to call me asap

Katherine Miller **HALEY & ALDRICH** Tel: 520.289.8606

From: Patel, Urvashi < <a href="mailto:Urvashi.Patel@testamericainc.com">Urvashi.Patel@testamericainc.com</a>>

Sent: Tuesday, January 22, 2019 6:00 PM

**To:** Miller, Katherine < <a href="mailto:KMiller@haleyaldrich.com">KMiller@haleyaldrich.com</a>>

Subject: RE: Gross alpha

### Mike got back to me today but will give you a call tomorrow to discuss:

We can perform additional analysis. Uranium, thorium, and radium are the predominant naturally occurring alpha emitters. I can contact the client tomorrow.

Mike Franks is his full name.

Thanks, Urvashi

### **URVASHI PATEL**

Manager of Project Management

### Test America

THE LEADER IN ENVIRONMENTAL TESTING

17461 Derian Ave, Suite #100 Irvine, CA 92614 TEL 949-261-1022 | FAX 949-260-3297 DIRECT 949-260-3269 CELL 949-333-9055

www.testamericainc.com

**From:** Miller, Katherine [mailto:KMiller@haleyaldrich.com]

Sent: Tuesday, January 22, 2019 4:38 PM

To: Patel, Urvashi

Subject: RE: Gross alpha

### -External Email-

We are hoping for a super fast TAT on the answer and if possible, the results.

# Katherine Miller **HALEY & ALDRICH**

Tel: 520.289.8606

From: Patel, Urvashi < Urvashi.Patel@testamericainc.com>

Sent: Tuesday, January 22, 2019 5:36 PM

To: Miller, Katherine < <a href="mailto:KMiller@haleyaldrich.com">KMiller@haleyaldrich.com</a>>

Subject: RE: Gross alpha

Ok- checking with our Rad experts to see if this is possible.

Thanks, Urvashi

### **URVASHI PATEL**

Manager of Project Management

### Test America

THE LEADER IN ENVIRONMENTAL TESTING

17461 Derian Ave, Suite #100 Irvine, CA 92614 TEL 949-261-1022 | FAX 949-260-3297 DIRECT 949-260-3269 CELL 949-333-9055

www.testamericainc.com

**From:** Miller, Katherine [mailto:KMiller@haleyaldrich.com]

Sent: Tuesday, January 22, 2019 4:30 PM

To: Patel, Urvashi Subject: Re: Gross alpha

### -External Email-

Determining if it is naturally occurring

Sent from my iPhone

On Jan 22, 2019, at 5:25 PM, Patel, Urvashi < <u>Urvashi.Patel@testamericainc.com</u>> wrote:

Hi Katherine

Is there something specific you're looking for in the water? I've not heard of speciating water from Gross Alpha but I'll ask the team and get back to you.

Thanks, Urvashi

**URVASHI PATEL** 

### Manager of Project Management

Test America THE LEADER IN ENVIRONMENTAL TESTING

17461 Derian Ave, Suite #100 Irvine, CA 92614 TEL 949-261-1022 | FAX 949-260-3297 DIRECT 949-260-3269 CELL 949-333-9055

www.testamericainc.com

----Original Message-----

From: Miller, Katherine [mailto:KMiller@haleyaldrich.com]

Sent: Tuesday, January 22, 2019 4:22 PM

To: Patel, Urvashi Subject: Gross alpha

-External Email-

Urvashi,

Can we speciate water for the gross alpha?

Sent from my iPhone



# **ANALYTICAL REPORT**

TestAmerica Laboratories, Inc.

TestAmerica Irvine 17461 Derian Ave Suite 100

Irvine, CA 92614-5817 Tel: (949)261-1022

TestAmerica Job ID: 440-226830-5

Client Project/Site: Annual Outfall 008 Comp

For:

Haley & Aldrich, Inc. 400 E Van Buren St. Suite 545 Phoenix, Arizona 85004

Attn: Katherine Miller

Usli Patel

Authorized for release by: 3/26/2019 6:25:35 PM

Urvashi Patel, Manager of Project Management (949)261-1022

urvashi.patel@testamericainc.com

·····LINKS ······

Review your project results through

Total Access

**Have a Question?** 



Visit us at: www.testamericainc.com

The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

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

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

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I certify under penalty of perjury that the information contained in this report and all attachments was produced in accordance with the indicated methods and laboratory standard operating procedures, except as noted, and are complete and accurate to the best of my knowledge and belief. Subcontract laboratory reports that are attached have been evaluated for completeness and quality control acceptability.

Usli Patel

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Urvashi Patel Manager of Project Management 3/26/2019 6:25:35 PM

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# **Sample Summary**

Client: Haley & Aldrich, Inc. Project/Site: Annual Outfall 008 Comp

TestAmerica Job ID: 440-226830-5

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
440-226830-1	Outfall008_20181207_Comp	Water	12/07/18 11:05	12/07/18 21:05

Client: Haley & Aldrich, Inc.

Project/Site: Annual Outfall 008 Comp

TestAmerica Job ID: 440-226830-5

Job ID: 440-226830-5

**Laboratory: TestAmerica Irvine** 

Narrative

Job Narrative 440-226830-5

#### Comments

No additional comments.

#### Receipt

The samples were received on 12/7/2018 9:05 PM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 2 coolers at receipt time were 2.3° C and 3.5° C.

#### **Receipt Exceptions**

The reference method requires samples to be preserved to a pH <2. The following samples was received with insufficient preservation at a pH of 7: Outfall008\_20181207\_Comp (440-226830-1). The samples were preserved with 10mL of nitric acid reagent #1598157, at 16:00 on 12/11/18, to reach the appropriate pH of 2 in the laboratory.

#### **RAD**

Method(s) 901.1: Gamma Prep Batch 160-417097

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Outfall008\_20181207\_Comp (440-226830-1), (LCS 160-417097/2-A), (MB 160-417097/1-A) and (440-226830-I-1-K DU)

Method(s) 901.1: Gamma Prep Batch 160-417097

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

Outfall008 20181207 Comp (440-226830-1), (LCS 160-417097/2-A), (MB 160-417097/1-A) and (440-226830-1-1-K DU)

Method(s) 901.1: Gamma Prep Batch 160-417097

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

Th-234	Pa-234
Th-234	U-238
Pb-210	Po-210
Pb-210	Bi-210
Cs-137	Ba-137m
Po-216	Pb-212
Xe-131m	Xe-131
Sb-125	Te-125m
Ag-108m	Ag-108
Rh-106	Ru-106
Pb-212	Th-228
Pb-212	Ra-224
U-235	Th-231
Ac-228	Th-232
Ac-228	Ra-228
Th-227	Ra-223
Th-227	Ac-227
Th-227	Bi-211

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Client: Haley & Aldrich, Inc.

Project/Site: Annual Outfall 008 Comp

TestAmerica Job ID: 440-226830-5

#### Job ID: 440-226830-5 (Continued)

#### Laboratory: TestAmerica Irvine (Continued)

Th-227 Pb-211 Bi-214 Ra-226

Outfall008\_20181207\_Comp (440-226830-1), (LCS 160-417097/2-A), (MB 160-417097/1-A) and (440-226830-I-1-K DU)

Method(s) 901.1: Gamma Prep Batch: 160-417097

The cesium-137 MDC (21.2 pCi/L) for the method blank (MB) is above the requested limit of 20 pCi/L. Cesium-137 activity was not observed in the MB above the MDC or RL. The MDC for the associated samples is less than the requested limit. The data have been reported with the MDC achieved. (MB 160-417097/1-A).

Method(s) A-01-R: Americium Prep Batch: 160-417049

Manual Integrations and adjustments to ROIs were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

(LCSD 160-417049/3-A).

Method(s) A-01-R: Americium Prep Batch: 160-417049

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

Outfall008\_20181207\_Comp (440-226830-1), (LCS 160-417049/2-A), (LCSD 160-417049/3-A) and (MB 160-417049/1-A)

Method(s) A-01-R: Americium Prep Batch: 160-417049

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Outfall008\_20181207\_Comp (440-226830-1), (LCS 160-417049/2-A), (LCSD 160-417049/3-A) and (MB 160-417049/1-A)

Method(s) A-01-R: Polonium Prep Batch: 160-418940

The following samples have a tracer recoveries below the 30% QC limit: MB 160-418940/1-A (29.0%), LCS 160-418940/2-A (24.5%), 440-226830-I-1-N (21.7%), 440-226830-I-1-O DU (21.7%), 440-226838-P-1-O (28.3%), 440-229259-J-1-J (19.7%). In addition, the Po-210 MDC is above the detection goal (0.300 pCi/L) which can be attributed to the lower tracer recovery. The samples were counted for the maximum count time of 960 minutes and achieved >400 tracer counts in the tracer peaks (which leads to 10% count uncertainty at 2 sigma), the resolution of < 100 keV is met for all peaks (there are no indications of spectral interferences), and the activity in the sample is above the MDC. The data have been qualified and reported with this narrative.

Outfall008\_20181207\_Comp (440-226830-1), (LCS 160-418940/2-A), (MB 160-418940/1-A) and (440-226830-I-1-O DU)

Method(s) A-01-R: Polonium Prep Batch: 160-418940

The Po-210 detection goal (0.300 pCi/L) was not met for the following samples due to low tracer recovery and reduced aliquots (see prep non-conformance memo: 160-162593): Outfall008\_20181207\_Comp (440-226830-1), (MB 160-418940/1-A) and (440-226830-I-1-O DU). Analytical results are reported with the detection limit achieved.

Method(s) A-01-R: Polonium Prep Batch: 160-418940

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

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

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Client: Haley & Aldrich, Inc.

Project/Site: Annual Outfall 008 Comp

TestAmerica Job ID: 440-226830-5

#### Job ID: 440-226830-5 (Continued)

#### Laboratory: TestAmerica Irvine (Continued)

Outfall008 20181207 Comp (440-226830-1), (LCS 160-418940/2-A), (MB 160-418940/1-A) and (440-226830-I-1-O DU)

Method(s) A-01-R: Plutonium Prep Batch: 160-417063

The Pu-238 detection goal (1.00 pCi/L) was not met for the following samples due to the reduced aliquot required from the presence of matrix interferences (see prep non-conformance memo: 160-161634): (MB 160-417063/1-A). Analytical results are reported with the detection limit achieved.

Method(s) A-01-R: Plutonium Prep Batch: 160-417063

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Outfall008\_20181207\_Comp (440-226830-1), (LCS 160-417063/2-A), (LCSD 160-417063/3-A) and (MB 160-417063/1-A)

Method(s) A-01-R: Plutonium Prep Batch: 160-417063

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

Outfall008\_20181207\_Comp (440-226830-1), (LCS 160-417063/2-A), (LCSD 160-417063/3-A) and (MB 160-417063/1-A)

Method(s) A-01-R: Thorium Prep Batch: 160-417064

Manual Integrations and adjustments to ROIs were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

(LCS 160-417064/2-A).

Method(s) A-01-R: Thorium Prep Batch: 160-417064

The detection goals were not met for the following samples due to the reduced aliquot required from the presence of matrix interferences (see prep non-conformance memo: 160-161635): Outfall008 20181207 Comp (440-226830-1). Analytical results are reported with the detection limit achieved.

Method(s) A-01-R: Thorium Prep Batch: 160-417064

A blank population correction was applied to account for contributions to the analyte count rate from sources other than the sample itself. Interferences may include, but are not limited to, impurities in reagents, tracers, or glassware, or effects due to the measurement process (such as tailing or crosstalk).

Outfall008 20181207 Comp (440-226830-1), (LCS 160-417064/2-A), (LCSD 160-417064/3-A) and (MB 160-417064/1-A)

Method(s) A-01-R: Thorium Prep Batch: 160-417064

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

Outfall008 20181207 Comp (440-226830-1), (LCS 160-417064/2-A), (LCSD 160-417064/3-A) and (MB 160-417064/1-A)

Method(s) A-01-R: Thorium Prep Batch: 160-417064

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Outfall008 20181207 Comp (440-226830-1), (LCS 160-417064/2-A), (LCSD 160-417064/3-A) and (MB 160-417064/1-A)

Client: Haley & Aldrich, Inc.

Project/Site: Annual Outfall 008 Comp

TestAmerica Job ID: 440-226830-5

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#### Job ID: 440-226830-5 (Continued)

#### Laboratory: TestAmerica Irvine (Continued)

Method(s) Digest/Cu Plate: polonium-210 prep 160-417309: The following samples could not be thoroughly homogenized before sub-sampling was performed due to sample matrix: Outfall008\_20181207\_Comp (440-226830-1) and (440-226830-I-1 DU). The sample was dark-brown, murky, and contained a fair amount of undissolved sediment along the bottom of the container. Although samples were shaken well prior to sub-sampling there is no guarantee that sediments were evenly dispersed.

Method(s) Digest/Cu Plate: polonium-210 prep 160-417309: A deviation from the Standard Operating Procedure (SOP) occurred. Details are as follows: Due to apparent matrix samples underwent atypical separations prior to auto-plating per SOP No. ST-RC-0210.

Outfall008\_20181207\_Comp (440-226830-1) and (440-226830-I-1 DU)

Method(s) Digest/Cu Plate: Polonium-210 prep batch 160-418940: The following samples could not be thoroughly homogenized before sub-sampling was performed due to sample matrix: Outfall008\_20181207\_Comp (440-226830-1) and (440-226830-I-1 DU). The samples were dark-brown, murky, and contained a fair amount of undissolved sediment along the bottom of the container. Although sample was shaken well prior to sub-sampling there is no guarantee that sediments were evenly dispersed.

Method(s) Digest/Cu Plate: Polonium-210 prep batch 160-418940: A deviation from the Standard Operating Procedure (SOP) occurred. Details are as follows: Due to apparent matrix samples underwent atypical separations prior to purification via extraction chromatography and preparation for counting by alpha spectroscopy. The samples were also prepared at a reduced aliquot to lower potential matrix interference.

Outfall008\_20181207\_Comp (440-226830-1) and (440-226830-I-1 DU)

Method(s) ExtChrom: Americium Prep Batch 160-417049:

The following samples were prepared at a reduced aliquot due to brown discoloration and sediment: Outfall008\_20181207\_Comp (440-226830-1). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead of a sample duplicate (DUP) to demonstrate batch precision.

Method(s) ExtChrom: Plutonium Prep Batch 160-417063:

The following samples were prepared at a reduced aliquot due to brown discoloration and sediment: Outfall008\_20181207\_Comp (440-226830-1). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead of a sample duplicate (DUP) to demonstrate batch precision.

Method(s) ExtChrom: Thorium Prep Batch 160-417064:

The following samples were prepared at a reduced aliquot due to brown discoloration and sediment: Outfall008\_20181207\_Comp (440-226830-1). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead of a sample duplicate (DUP) to demonstrate batch precision.

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

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Project/Site: Annual Outfall 008 Comp

Client Sample ID: Outfall008 20181207 Comp Lab Sample ID: 440-226830-1

Date Collected: 12/07/18 11:05 Date Received: 12/07/18 21:05

			Count Uncert.	Total Uncert.						
Analyte	Result	Qualifier	(2σ+/-)	(2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	6.72	U	67.0	67.0		95.1	pCi/L	02/27/19 22:08	03/04/19 15:04	1
Cesium-137	-3.40	U	12.4	12.5	20.0	15.6	pCi/L	02/27/19 22:08	03/04/19 15:04	1
Bismuth-211	6.72	U	67.0	67.0		95.1	pCi/L	02/27/19 22:08	03/04/19 15:04	1
Bismuth-212	16.0	U	95.6	95.6		169	pCi/L	02/27/19 22:08	03/04/19 15:04	1
Thorium-227	6.72	U	67.0	67.0		95.1	pCi/L	02/27/19 22:08	03/04/19 15:04	1
Radium-223	6.72	U	67.0	67.0		95.1	pCi/L	02/27/19 22:08	03/04/19 15:04	1
Radium-224	24.3		12.7	13.0		14.8	pCi/L	02/27/19 22:08	03/04/19 15:04	1
Protactinium-231	79.1	U	178	178		403	pCi/L	02/27/19 22:08	03/04/19 15:04	1

#### Method: A-01-R - Isotopic Curium and/or Americium 241 (Alpha Spectrometry)

			Count Uncert.	Total Uncert.						
Analyte	Result	Qualifier	(2σ+/-)	(2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Americium-241	0.109	U	0.355	0.356	1.00	0.768	pCi/L	02/27/19 12:01	03/07/19 22:45	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Americium-243	97.2		30 - 110					02/27/19 12:01	03/07/19 22:45	

#### Method: A-01-R - Isotopic Plutonium and Neptunium (Alpha Spectrometry)

	-		Count	Total						
			Uncert.	Uncert.						
Analyte	Result	Qualifier	(2σ+/-)	(2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Plutonium-238	0.156	U	0.480	0.481	1.00	0.998	pCi/L	02/27/19 13:31	03/06/19 21:52	1
Plutonium-239/240	0.113	U	0.227	0.227	1.00	0.340	pCi/L	02/27/19 13:31	03/06/19 21:52	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Pu-242 (T)	88.5		30 - 110					02/27/19 13:31	03/06/19 21:52	1

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			Count	Total						
			Uncert.	Uncert.						
Analyte	Result	Qualifier	(2σ+/-)	(2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Polonium-210	2.36	G	0.763	0.789	0.300	0.833	pCi/L	03/12/19 12:19	03/15/19 20:28	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Polonium-209	21.7	X	30 - 110					03/12/19 12:19	03/15/19 20:28	

			Count	Total						
			Uncert.	Uncert.						
Analyte	Result	Qualifier	(2σ+/-)	(2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	1.17	G	0.899	0.905	1.00	1.13	pCi/L	02/27/19 13:33	03/07/19 22:42	1
Thorium-230	2.17		1.12	1.13	1.00	0.930	pCi/L	02/27/19 13:33	03/07/19 22:42	1
Thorium-232	1.24		0.800	0.806	1.00	0.692	pCi/L	02/27/19 13:33	03/07/19 22:42	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	93.9		30 - 110					02/27/19 13:33	03/07/19 22:42	1

TestAmerica Irvine

3/26/2019

**Matrix: Water** 

# **Method Summary**

Client: Haley & Aldrich, Inc.

Project/Site: Annual Outfall 008 Comp

TestAmerica Job ID: 440-226830-5

Method	Method Description	Protocol	Laboratory
901.1	Cesium 137 & Other Gamma Emitters (GS)	EPA	TAL SL
A-01-R	Isotopic Curium and/or Americium 241 (Alpha Spectrometry)	DOE	TAL SL
A-01-R	Isotopic Plutonium and Neptunium (Alpha Spectrometry)	DOE	TAL SL
A-01-R	Isotopic Polonium (Alpha Spectrometry)	DOE	TAL SL
4-01-R	Isotopic Thorium (Alpha Spectrometry)	DOE	TAL SL
Digest/Cu Plate	Preparation, Digestion & Copper Plating	TAL-STL	TAL SL
ExtChrom	Preparation, Extraction Chromatography Resin Actinide Separation	None	TAL SL
Fill_Geo-0	Fill Geometry, No In-Growth	None	TAL SL

#### **Protocol References:**

DOE = U.S. Department of Energy

EPA = US Environmental Protection Agency

None = None

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

#### Laboratory References:

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

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#### **Lab Chronicle**

Client: Haley & Aldrich, Inc.

Project/Site: Annual Outfall 008 Comp

TestAmerica Job ID: 440-226830-5

Lab Sample ID: 440-226830-1

**Matrix: Water** 

Client Sample ID: Outfall008\_20181207\_Comp Date Collected: 12/07/18 11:05

Date Received: 12/07/18 21:05

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	Fill_Geo-0			1000 mL	1.0 mL	417097	02/27/19 22:08	MPT	TAL SL
Total/NA	Analysis	901.1		1			417532	03/04/19 15:04	CDR	TAL SL
Total/NA	Prep	ExtChrom			100.04 mL	1.0 mL	417063	02/27/19 13:31	KNF	TAL SL
Total/NA	Analysis	A-01-R		1			418009	03/06/19 21:52	ALS	TAL SL
Total/NA	Prep	ExtChrom			100.04 mL	1.0 mL	417064	02/27/19 13:33	KNF	TAL SL
Total/NA	Analysis	A-01-R		1			418287	03/07/19 22:42	ALS	TAL SL
Total/NA	Prep	ExtChrom			100.04 mL	1.0 mL	417049	02/27/19 12:01	KNF	TAL SL
Total/NA	Analysis	A-01-R		1			418294	03/07/19 22:45	ALS	TAL SL
Total/NA	Prep	Digest/Cu Plate			199.97 mL	1.0 g	418940	03/12/19 12:19	PJM	TAL SL
Total/NA	Analysis	A-01-R		1			419530	03/15/19 20:28	ALS	TAL SL

#### **Laboratory References:**

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

Client: Haley & Aldrich, Inc.

Project/Site: Annual Outfall 008 Comp

## Method: 901.1 - Cesium 137 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-417097/1-A

**Matrix: Water** 

**Analysis Batch: 417503** 

**Client Sample ID: Method Blank Prep Type: Total/NA** 

**Prep Batch: 417097** 

			Count	Total						
	MB	MB	Uncert.	Uncert.						
Analyte	Result	Qualifier	(2σ+/-)	(2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	-2.360	U	132	132		145	pCi/L	02/27/19 22:08	03/01/19 17:09	1
Cesium-137	6.536	UG	12.5	12.5	20.0	21.2	pCi/L	02/27/19 22:08	03/01/19 17:09	1
Bismuth-211	-2.360	U	132	132		145	pCi/L	02/27/19 22:08	03/01/19 17:09	1
Bismuth-212	-76.06	U	128	128		274	pCi/L	02/27/19 22:08	03/01/19 17:09	1
Thorium-227	-2.360	U	132	132		145	pCi/L	02/27/19 22:08	03/01/19 17:09	1
Radium-223	-2.360	U	132	132		145	pCi/L	02/27/19 22:08	03/01/19 17:09	1
Radium-224	-11.20	U	20.1	20.2		40.9	pCi/L	02/27/19 22:08	03/01/19 17:09	1
Protactinium-231	0.0000	U	57.8	57.8		1010	pCi/L	02/27/19 22:08	03/01/19 17:09	1

Lab Sample ID: LCS 160-417097/2-A

**Matrix: Water** 

**Analysis Batch: 417372** 

**Client Sample ID: Lab Control Sample** 

Prep Type: Total/NA **Prep Batch: 417097** 

Total LCS LCS %Rec. Spike Uncert. Analyte Added Result Qual  $(2\sigma + / -)$ **MDC** Unit %Rec Limits RL Americium-241 136000 124300 14400 399 pCi/L 91 90 - 111 Cesium-137 44900 44730 4480 20.0 110 pCi/L 100 90 - 111 Cobalt-60 30400 29420 2910 61.0 pCi/L 97 89 - 110

Lab Sample ID: 440-226830-1 DU

**Matrix: Water** 

Analysis Batch: 417504

Client Sample ID: Outfall008\_20181207\_Comp Prep Type: Total/NA

**Prep Batch: 417097** 

					Total					
	Sample	Sample	DU	DU	Uncert.					RER
Analyte	Result	Qual	Result	Qual	(2σ+/-)	RL	MDC	Unit	RER	Limit
Actinium-227	6.72	U	25.23	U	28.2		111	pCi/L	0.19	1
Cesium-137	-3.40	U	4.351	U	9.55	20.0	16.4	pCi/L	0.35	1
Bismuth-211	6.72	U	25.23	U	28.2		111	pCi/L	0.19	1
Bismuth-212	16.0	U	2.412	Ü	95.6		177	pCi/L	0.07	1
Thorium-227	6.72	U	25.23	U	28.2		111	pCi/L	0.19	1
Radium-223	6.72	U	25.23	U	28.2		111	pCi/L	0.19	1
Radium-224	24.3		-2.018	U	17.0		29.4	pCi/L	0.88	1
Protactinium-231	79.1	U	72.45	U	225		521	pCi/L	0.02	1

#### Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Lab Sample ID: MB 160-417064/1-A **Client Sample ID: Method Blank Matrix: Water Prep Type: Total/NA** 

**Analysis Batch: 418283** 

			Count	Total						
	MB	MB	Uncert.	Uncert.						
Analyte	Result	Qualifier	(2σ+/-)	(2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.1787	U	0.434	0.434	1.00	0.812	pCi/L	02/27/19 13:33	03/07/19 22:42	1
Thorium-230	0.5403	U	0.666	0.668	1.00	0.916	pCi/L	02/27/19 13:33	03/07/19 22:42	1
Thorium-232	0.04384	U	0.243	0.243	1.00	0.653	pCi/L	02/27/19 13:33	03/07/19 22:42	1

TestAmerica Irvine

**Prep Batch: 417064** 

Client: Haley & Aldrich, Inc.

Project/Site: Annual Outfall 008 Comp

# Method: A-01-R - Isotopic Thorium (Alpha Spectrometry) (Continued)

Lab Sample ID: MB 160-417064/1-A

**Matrix: Water** 

**Analysis Batch: 418283** 

**Client Sample ID: Method Blank** Prep Type: Total/NA

**Prep Batch: 417064** 

Prep Type: Total/NA

Tracer **%Yield Qualifier** Limits Prepared Analyzed Dil Fac Thorium-229 30 - 110 02/27/19 13:33 03/07/19 22:42 99.9

Client Sample ID: Lab Control Sample

Lab Sample ID: LCS 160-417064/2-A **Matrix: Water** 

Prep Type: Total/NA Analysis Batch: 418284 Prep Batch: 417064

Total LCS LCS %Rec. **Spike** Uncert. Analyte Added Result Qual  $(2\sigma + / -)$ RL **MDC** Unit %Rec Limits Thorium-230 40.1 38.67 5.18 1.00 0.779 pCi/L 96 81 - 125

LCS LCS Tracer %Yield Qualifier Limits Thorium-229 103 30 - 110

Client Sample ID: Lab Control Sample Dup Lab Sample ID: LCSD 160-417064/3-A

**Matrix: Water Analysis Batch: 418285** 

MB MB

Prep Batch: 417064 Total

LCSD LCSD **RER** Spike Uncert. %Rec. Analyte Added Result Qual  $(2\sigma + / -)$ RL **MDC** Unit %Rec Limits RER Limit 81 - 125 Thorium-230 40.1 43.40 5.64 1.00 0.788 pCi/L 108 0.44

LCSD LCSD Tracer %Yield Qualifier Limits Thorium-229 104 30 - 110

#### Method: A-01-R - Isotopic Polonium (Alpha Spectrometry)

Lab Sample ID: MB 160-418940/1-A Client Sample ID: Method Blank **Matrix: Water** Prep Type: Total/NA **Analysis Batch: 419517** Prep Batch: 418940

Count Total MB MB Uncert. Uncert. **Analyte** Result Qualifier  $(2\sigma + / -)$  $(2\sigma + / -)$ RL **MDC** Unit Dil Fac Prepared Analyzed 0.1963 UG Polonium-210 0.207 0.208 0.300 0.313 pCi/L 03/12/19 12:19 03/15/19 20:28

MB MB Tracer **%Yield Qualifier** Limits Prepared Analyzed Dil Fac Polonium-209 29.0 X 30 - 110 03/12/19 12:19 03/15/19 20:28

Lab Sample ID: LCS 160-418940/2-A **Client Sample ID: Lab Control Sample Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 419518 Prep Batch: 418940** 

Total Spike LCS LCS %Rec. Uncert. Analyte Added Result Qual  $(2\sigma + / -)$ RL MDC Unit %Rec Limits Polonium-210 43.1 0.300 0.747 pCi/L 41.20 4.31 79 - 124

TestAmerica Irvine

Client: Haley & Aldrich, Inc.

Project/Site: Annual Outfall 008 Comp

Method: A-01-R - Isotopic Polonium (Alpha Spectrometry) (Continued)

Lab Sample ID: LCS 160-418940/2-A

**Matrix: Water** 

**Analysis Batch: 419518** 

LCS LCS

Tracer %Yield Qualifier Limits Polonium-209 24.5 X 30 - 110

Lab Sample ID: 440-226830-1 DU

**Matrix: Water** 

Analysis Batch: 419520

Analyte Result Qual 2.36 G Polonium-210

%Yield Qualifier Tracer  $\overline{21.7} \overline{X}$ 

Polonium-209 30 - 110 **Client Sample ID: Lab Control Sample** 

Prep Type: Total/NA

**Prep Batch: 418940** 

Client Sample ID: Outfall008\_20181207\_Comp

Prep Type: Total/NA

**Client Sample ID: Method Blank** 

02/27/19 12:01 03/07/19 22:44

02/27/19 12:01 03/07/19 22:44

**Client Sample ID: Lab Control Sample** 

%Rec.

Limits

80 - 116

Analyzed

Analyzed

Prep Type: Total/NA

**Prep Batch: 417049** 

Prep Type: Total/NA

**Prep Batch: 417049** 

**Prep Batch: 418940** 

Total Uncert. **RER**  $(2\sigma + / -)$ RL **MDC** Unit RER Limit 0.828 0.300 0.955 pCi/L 0.15

Prepared

Prepared

%Rec

102

Client Sample ID: Lab Control Sample Dup

DU DU

Sample Sample

Limits

Method: A-01-R - Isotopic Curium and/or Americium 241 (Alpha Spectrometry)

DU DU

Result Qual

2.125 G

Lab Sample ID: MB 160-417049/1-A

**Matrix: Water** 

Analysis Batch: 418290

Count Total MB MB Uncert. Uncert.

Analyte Result Qualifier  $(2\sigma + / -)$  $(2\sigma + / -)$ Americium-241 0.1270 U 0.413 0.413

MB MB

Tracer **%Yield Qualifier** Limits Americium-243 96.2

30 - 110

LCS LCS

Result Qual

37.97

Total

Uncert.

 $(2\sigma + / -)$ 

5.76

RL

1.00

**MDC** Unit

0.893 pCi/L

Lab Sample ID: LCS 160-417049/2-A

**Matrix: Water** 

Analysis Batch: 418291

Analyte Added Americium-241 37.2

LCS LCS Tracer %Yield Qualifier

Americium-24

90 4

Limits 30 - 110

Spike

Lab Sample ID: LCSD 160-417049/3-A

**Matrix: Water** 

Analysis Batch: 418292

Spike LCSD LCSD Uncert. Added Analyte Result Qual Americium-241 37.2 37.58

 $(2\sigma + / -)$ 5.63

Total

RL 1.00

RL

1.00

**MDC** Unit 0.808 pCi/L

**MDC** Unit

0.787 pCi/L

%Rec 101

%Rec. Limits 80 - 116

**RER** RER Limit 0.03

Prep Type: Total/NA

**Prep Batch: 417049** 

TestAmerica Irvine

Dil Fac

Dil Fac

Client Sample ID: Lab Control Sample Dup

Client: Haley & Aldrich, Inc.

Project/Site: Annual Outfall 008 Comp

# Method: A-01-R - Isotopic Curium and/or Americium 241 (Alpha Spectrometry) (Continued)

Lab Sample ID: LCSD 160-417049/3-A

**Matrix: Water** 

**Analysis Batch: 418292** 

LCSD LCSD

Tracer %Yield Qualifier Limits 30 - 110 Americium-24 948

Method: A-01-R - Isotopic Plutonium and Neptunium (Alpha Spectrometry)

**Matrix: Water** 

**Analysis Batch: 418005** 

Lab Sample ID: MB 160-417063/1-A

**Client Sample ID: Method Blank** Prep Type: Total/NA

**Prep Batch: 417063** 

Prep Type: Total/NA

**Prep Batch: 417049** 

Count Total MB MB Uncert. Uncert. Result Qualifier RLMDC Unit Prepared Analyte  $(2\sigma + / -)$  $(2\sigma + / -)$ Analyzed Dil Fac Plutonium-238 0.3914 U G 0.627 0.628 1.00 1.11 pCi/L 02/27/19 13:31 03/06/19 21:52 Plutonium-239/240 0.07682 U 0.254 0.254 1.00 0.639 pCi/L 02/27/19 13:31 03/06/19 21:52

MB MB

Tracer %Yield Qualifier Limits Prepared Analyzed Dil Fac Pu-242 (T) 74.3 30 - 110 02/27/19 13:31 03/06/19 21:52

Lab Sample ID: LCS 160-417063/2-A

**Matrix: Water** 

**Analysis Batch: 418006** 

**Client Sample ID: Lab Control Sample** 

Prep Type: Total/NA

**Prep Batch: 417063** 

Total LCS LCS Spike Uncert. %Rec. Analyte Added **MDC** Unit Limits Result Qual  $(2\sigma + / -)$ RL %Rec 1.00 Plutonium-238 53.0 52.34 6.37 0.909 pCi/L 99 79 <sub>-</sub> 115 52.8 52.02 6.33 1.00 0.574 pCi/L 98 85 - 120 Plutonium-239/2

LCS LCS Tracer %Yield Qualifier Limits Pu-242 (T) 89.9 30 - 110

Lab Sample ID: LCSD 160-417063/3-A

**Matrix: Water** 

40

**Analysis Batch: 418007** 

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

**Prep Batch: 417063** 

Total LCSD LCSD %Rec. **RER** Spike Uncert. Analyte Added Result Qual  $(2\sigma + / -)$ RL **MDC** Unit %Rec Limits RER Limit Plutonium-238 53.0 47.71 5.88 1.00 0.921 pCi/L 90 79 - 115 0.38 52.8 50.05 6.08 1.00 0.547 pCi/L 95 85 - 120 0.16 Plutonium-239/2 40

LCSD LCSD %Yield Qualifier Tracer Limits Pu-242 (T) 93.3 30 - 110

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# **QC Association Summary**

Client: Haley & Aldrich, Inc.

Project/Site: Annual Outfall 008 Comp

TestAmerica Job ID: 440-226830-5

# Rad

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method Prep Batch
440-226830-1	Outfall008_20181207_Comp	Total/NA	Water	ExtChrom
MB 160-417049/1-A	Method Blank	Total/NA	Water	ExtChrom
LCS 160-417049/2-A	Lab Control Sample	Total/NA	Water	ExtChrom
LCSD 160-417049/3-A	Lab Control Sample Dup	Total/NA	Water	ExtChrom

#### **Prep Batch: 417063**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-226830-1	Outfall008_20181207_Comp	Total/NA	Water	ExtChrom	
MB 160-417063/1-A	Method Blank	Total/NA	Water	ExtChrom	
LCS 160-417063/2-A	Lab Control Sample	Total/NA	Water	ExtChrom	
LCSD 160-417063/3-A	Lab Control Sample Dup	Total/NA	Water	ExtChrom	

#### **Prep Batch: 417064**

Lab Sample ID 440-226830-1	Client Sample ID Outfall008_20181207_Comp	Prep Type Total/NA	Matrix Water	Method ExtChrom	Prep Batch
MB 160-417064/1-A	Method Blank	Total/NA	Water	ExtChrom	
LCS 160-417064/2-A	Lab Control Sample	Total/NA	Water	ExtChrom	
LCSD 160-417064/3-A	Lab Control Sample Dup	Total/NA	Water	ExtChrom	

#### **Prep Batch: 417097**

Lab Sample ID 440-226830-1	Client Sample ID Outfall008_20181207_Comp	Prep Type Total/NA	Matrix Water	Method Fill_Geo-0	Prep Batch
MB 160-417097/1-A	Method Blank	Total/NA	Water	Fill_Geo-0	
LCS 160-417097/2-A	Lab Control Sample	Total/NA	Water	Fill_Geo-0	
440-226830-1 DU	Outfall008_20181207_Comp	Total/NA	Water	Fill_Geo-0	

#### **Prep Batch: 418940**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-226830-1	Outfall008_20181207_Comp	Total/NA	Water	Digest/Cu Plate	
MB 160-418940/1-A	Method Blank	Total/NA	Water	Digest/Cu Plate	
LCS 160-418940/2-A	Lab Control Sample	Total/NA	Water	Digest/Cu Plate	
440-226830-1 DU	Outfall008_20181207_Comp	Total/NA	Water	Digest/Cu Plate	

# **Definitions/Glossary**

Client: Haley & Aldrich, Inc.

Project/Site: Annual Outfall 008 Comp

TestAmerica Job ID: 440-226830-5

#### **Qualifiers**

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TEQ

Toxicity Equivalent Quotient (Dioxin)

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.
G	The Sample MDC is greater than the requested RL.
X	Tracer is outside acceptance limits.

# Glossary

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

# **Accreditation/Certification Summary**

Client: Haley & Aldrich, Inc.

TestAmerica Job ID: 440-226830-5

Project/Site: Annual Outfall 008 Comp

#### **Laboratory: TestAmerica Irvine**

The accreditations/certifications listed below are applicable to this report.

Authority	Program	<b>EPA</b> Region	Identification Number	<b>Expiration Date</b>
California	State Program	9	CA ELAP 2706	06-30-19

# Laboratory: TestAmerica St. Louis

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

Authority	Program	EPA Region	EPA Region Identification Number	
Alaska	State Program	10 MO00054		06-30-19
ANAB	DoD / DOE			04-06-22
Arizona	State Program	9 AZ0813		12-08-19
California	State Program	9	2886	06-30-19
Connecticut	State Program	1	PH-0241	03-31-19 *
Florida	NELAP	4	E87689	06-30-19
Hawaii	State Program	9	NA	06-30-19
Illinois	NELAP	5	200023	11-30-19
lowa	State Program	7	373	12-01-20
Kansas	NELAP	7	E-10236	10-31-19
Kentucky (DW)	State Program	4	KY90125	12-31-19
Louisiana	NELAP	6	04080	06-30-19
Louisiana (DW)	NELAP	6	LA011	12-31-19
Maryland	State Program	3	310	09-30-19
Michigan	State Program	5	9005	06-30-19
Missouri	State Program	7	780	06-30-19
Nevada	State Program	9	MO000542018-1	07-31-19
New Jersey	NELAP	2	MO002	06-30-19
New York	NELAP	2	11616	03-31-19 *
North Dakota	State Program	8	R207	06-30-19
NRC	NRC		24-24817-01	12-31-22
Oklahoma	State Program	6	9997	08-31-19
Pennsylvania	NELAP	3	68-00540	02-28-19 *
South Carolina	State Program	4	85002001	06-30-19
Texas	NELAP	6	T104704193-18-13	07-31-19
US Fish & Wildlife	Federal		058448	07-31-19
USDA	Federal		P330-17-0028	02-02-20
Utah	NELAP	8	MO000542018-10	07-31-19
Virginia	NELAP	3	460230	06-14-19
Washington	State Program	10	C592	08-30-19
West Virginia DEP	State Program	3	381	08-31-19

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<sup>\*</sup> Accreditation/Certification renewal pending - accreditation/certification considered valid.

TestAmerica Irvine

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CHAIN OF CUSTODY FOR	R R/A		2-N,	ON+	(8	:191	ners) (E V, Witnit	egnoo itrate-	e  	pu#) (	тсо: Э,40		×	×				_							
USTO	R/A			ʻuz			stats. 18, Cr, F , Pb, Sb	<b>8CO3</b>	ii V	A (7 i	(E200	×											300	3	
OF C											MS/MSD	٩N	Š	N.	Νο	£	ž	ž	ρŽ	S.	ž	oN	i e		ş
NA								Miller	(100)	2 (cell)	Bottle #	98	110	125	155	160	185	220	225	230	235	250	êle S		195
ਹ		Project	Boeing-SSFL NPDES Permit 2018	Annual Outfall [008]	Comp			Project Manager Katherine Miller	250,304,03	Field Manager Mark Dominick 978 234 5033, 818 599 0702 (cell)	Preservative	HNO3	None	None	Norre	H2SO4	None	NaOH	None	None	None	None	EQUIII		None
		٠. ۲	Boeing-v Per	Annual	3			X Manag	2000	3 Manag 34 5033,	Conf.	-	2	2	-	1	1	+	-	-	A	2	1		-
								Projec	2020	Field 978.2	Container Type	500 ml. Poly	11. Glass Amber	500 mi. Poly	500 mL Poly	500 mL Poly	11. Poly	500 mL Poly	2.5 Gal Cube	1 L Glass Amber	1 Gal Cube	1 L Glass Amber	-bornsilicate vials		% Poly
						<del>,</del>		estAmerica	1		Sample	MA	WM	MM	WM	MM	MM	MM	WW	WM	Š	WM	MM		N.N
440-226830 Chain of Custody								with the T&Cs within Blanket Service to subsidences and ifficience, and if	V-10-11-11-11-11-11-11-11-11-11-11-11-11-		Sampling Date/Time							•	12712018	SOI /					
1		a/Address'	drich	5333 Mission Center Rd Suite 300 San Diego, CA 92108	fest America Contact Urvashi Patel	17461 Derian Ave Suite #100	3-8055 3-8055	estAmenca's services under this CoC shall be performed in accordance with the TGCs within Blankes Service greenments 2015-16-TestAmerica by and between Habry & Adelch, Inc., in subsidiances and alfestes, and TestAmerica		an Smith	Sample I.D.								Outfat008_20181207_Comp						
Test America		Client Name/Address	Haley & Aldrich	5333 Mission Center San Diego CA 92108	Test Americ	17461 Derian Av	Tel 949-260-3269 Cell 949-333-9055	TestAmenca's se Agreemental 2015	Laboratories Inc	Sampler. Dan Smith	Sample					F	²a	g€	<del>-</del> 1	9.0	f. 2	9_			

Sample receiving DC NOT OPEN
BAG Bag to be opened in Mercury
Prep jushig clean procedures
Hold
Held
Held
Hold 9 Ś Y ā All Level IV 10 Day Pag 50 Ġ Data Requirements (Check) 72 Hour. Store samples for 6 months Turn-around time (Check) 5 Day Sample Integrity: (Check) Intact. No Level IV: 24 Hour 48 Hour. 1894 C012 811751 12.718 14.35 059/ 81-7-81 Z Legend: R = Routine, A = Annual TA 10V 2 2 2 125 25 None None 25:91 500 ml. Poly 1 L Glass Amber 3.05 WW WW 1272018/105 12.419 Outfall008\_20181207\_Comp\_Extra

Sample receiving DO NOT OPEN BAG Bug to be opened in Mercury Prep using plean procedures Filter and preserve with 24hrs of recept at lab

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None

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Outfail008\_20181207\_Comp\_F

11. Glass Amber boroesicate viais

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Unifiered and unpreserved analyses. Separate RAD onto separate RAD onto separate review of separate reverse of opticals in not MSIMSID. Only test if first or second rain events of the year.

48 hours Holding Time NO3 & NO2

Comments

otel Dissolved Metals, Merchiy (E245.1)

Lotal Recoverable Metals Mercury (E245 1)

nouty Pollutants-Pesticides+PCBs (E608)

Combined Radium 226 (E903 0 or E903 1) & Radium 228 (E904 0), Uranium (E908 0), K-40,

Gross Alpha(E900 0), Gross Beta(E900 0), Tritium (H-3) (E906 0), Sr-90 (E905 0), Total (ES00 8) V8' Cq' Cn' bp' 2p' 2e' 11 (E200.7), Al, As, B, Be, Cr, Fe, Ni, V, Zn, Hardness as CaCO3

Cyanide (9M4500-CN-E / E335.2)

Chronic Toxicity - Selenastrum

CS-137 (E901 0 or E901 1)

(S.035) M-sinommA

(EPA-821-R-02-013)

Total Dissolved Metals

122 (180 S (SWS240D))

TDS (SMZS40C/E160 1)

ANALYSIS REGUIRED

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3/26/2019

Pengle SSET INPES   Pengle SSET INPES   Pengle SSET INPES	Project Name of Table   Period Manager Nath Period   Project Name of Table   Period Name of Table   Period Name of Table   Project Name of Table   Period   Period Name of Table   Period Name of Table   Period Name of Table   Period   Period Name of Table   Period   P	Secretary   Company   Co	ent Name	Client Name/Address					Project.			L					¥	MLYSIS	ANALYSIS REQUIRED	S			1
Project Manager   Katherine Miller   Comp   E625	Physical Manager   Katherine Miller   Exoze Book   Stock Medial Continue   Third Manager   Katherine Miller   Exoze Book   Stock Medial Continue   Third Manager   Mark Dominical New   Third Mark Dominical New   Third Manager   Mark Dominical New   Third Mark Notice   Third Manager   Mark Dominical New   Third Mark Notice   Third Mark	Project Nameger: Katherine Miller	iley & A 33 Missic n Diego.	ildrich n Center Rd Suite 300 CA 92108		<del></del>		Boei	ng-SSFL NF Permit 2018 ual Outfall [	DES XO8]													
Project Manager: Katherine Miller   S20.289.8606, 520.904.6944 (cell)   Project Manager: Mark Dominick   S20.289.8606, 520.904.6944 (cell)   Project Manager: Mark Dominick   S10.289.8702 (cell)   Project Manager: Mark Dominick   S10.294.6034 (cell)   Project Manager: Mark Dominick   Project Mark   S10.294.6034 (cell)   Project Mark   Project Mark	Project Manager, Katherine Miller   S20,289,8666, 50.094,8944 (cili)   Fred Manager, Katherine Miller   S20,289,8666, 50.094,8944 (cili)   Fred Manager, Katherine Miller   S20,289,8666, 50.094,8944 (cili)   Fred Manager, Katherine Bottler & Nove   175	Project Manager: Katherine Miller   S20,289,684 (cell)   S20,289,6800 (32,094 (cell)   S20,289,6800 (32,094 (cell)   S20,289,6900 (32,094 (cell)   S20,944 (cell)   S20,944 (cell)   S20,944 (cell)   S20,944 (cell)   S20,944 (cell)   S20,944 (cell)   S20,289,600 (32,044 (cell)   S20,944 (cell)	st Americ 161 Derig ne CA 92 1949-260 II 949-33	a Contact. Urvashi Patel an Ave Sute #100 2614 -3269 5-9055					Comp			)C\$ (E625)		(E626.2)								Commenta	
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Deletitine   Deletitine   Company   Legend: R = Routine, A = Annual   Deletitine   Turn-around time (Check)	Deletime Deletime Company Received By Deletime Check)  Company Received By Deletime Check Sample Integrity (Check)  Company Received By Deletime Sample Integrity (Check)  Deletime Company Received By Deletime Sample Integrity (Check)  Deletime Company Received By Receiv	Detertine											Н		H	Ш				H			
Desertine Desertine Company Received By Received By Tun-around time (Check)  [2 7-18/1435 H/W 4/6/14 (MWW) Veggy 12-7-18 14:35 24 Hour 5 Day	Detertine Detertine Company Received By Detertine Turn-sround time (Check)  Detertine Datertine Company Company Received By Detertine Sample integrity (Check) Infact.  Detertine Detertine Company Company Received By Detertine Sample integrity (Check) Infact.  Detertine Detertine Company Company Received By Macrowed By Macrowel B	Detertine Detertine Company Received By Batertine Check)    2 7-18/435							-														
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	Company Compan	Company Compan			35%	Kingda J.	بداله	1/2	477	3	3	70	A.	2)	1.7	181	7. ii	<del></del>	n-around t Hour:	72 Hc 6 Da	ori.	10 Day X	
		2/05	Squished B	Date/Tim		ompany	7	/ <b>W</b> /	<b>2</b>	Receiv	ed By	3)	Date	Time.	>	12	1/2	Sto.	sct. re samples a Requiren Level ?V*	s for 6 mon nents (Che	All L		

# **Login Sample Receipt Checklist**

Client: Haley & Aldrich, Inc.

Job Number: 440-226830-5

Login Number: 226830 List Source: TestAmerica Irvine

List Number: 1

Creator: Soderblom, Tim

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

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# **Login Sample Receipt Checklist**

Client: Haley & Aldrich, Inc. Job Number: 440-226830-5

List Source: TestAmerica St. Louis
List Number: 2
List Creation: 12/11/18 03:46 PM

Creator: Dupart, Lacee S

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

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Client: Haley & Aldrich, Inc.

Project/Site: Annual Outfall 008 Comp

TestAmerica Job ID: 440-226830-5

Method: A-01-R - Isotopic Curium and/or Americium 241 (Alpha Spectrometry)

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

			Percent Yield (Acceptance Limits)
		nericium-2	
Lab Sample ID	Client Sample ID	(30-110)	
440-226830-1	Outfall008_20181207_Comp	97.2	
LCS 160-417049/2-A	Lab Control Sample	90.4	
LCSD 160-417049/3-A	Lab Control Sample Dup	94.8	
MB 160-417049/1-A	Method Blank	96.2	
Tracer/Carrier Legenc	I		
Americium-243 = Amer	icium-243		

Method: A-01-R - Isotopic Plutonium and Neptunium (Alpha Spectrometry)

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

			Percent Yield (Acceptance Limits)
		Pu-242 (T)	
Lab Sample ID	Client Sample ID	(30-110)	
440-226830-1	Outfall008_20181207_Comp	88.5	
LCS 160-417063/2-A	Lab Control Sample	89.9	
LCSD 160-417063/3-A	Lab Control Sample Dup	93.3	
MB 160-417063/1-A	Method Blank	74.3	
Tracer/Carrier Legenc	I		
Pu-242 (T) = Pu-242 (T	·)		

Method: A-01-R - Isotopic Polonium (Alpha Spectrometry)

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

			Percent Yield (Acceptance Limits)
		olonium-2	
Lab Sample ID	Client Sample ID	(30-110)	
440-226830-1	Outfall008_20181207_Comp	21.7 X	
440-226830-1 DU	Outfall008_20181207_Comp	21.7 X	
LCS 160-418940/2-A	Lab Control Sample	24.5 X	
MB 160-418940/1-A	Method Blank	29.0 X	
Tracer/Carrier Legen	d		

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

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

			Percent Yield (Acceptance Limits)
		horium-22	
Lab Sample ID	Client Sample ID	(30-110)	
440-226830-1	Outfall008_20181207_Comp	93.9	
LCS 160-417064/2-A	Lab Control Sample	103	
LCSD 160-417064/3-A	Lab Control Sample Dup	104	
MB 160-417064/1-A	Method Blank	99.9	
Tracer/Carrier Legenc	I		

TestAmerica Irvine

Page 23 of 29

#### Patel, Urvashi

From: Miller, Katherine <KMiller@haleyaldrich.com>

**Sent:** Monday, February 18, 2019 12:53 PM

To:Patel, UrvashiSubject:RE: Gross alpha

Follow Up Flag: Follow up Flag Status: Flagged

**Categories:** Red Category

## -External Email-

We need these test for OF002 and OF008 from Dec.

OF002 - Qtrly	440-226838
OF008 - Annual	440-226830

Man-made radionuclides to be analyzed by alpha spectroscopy

Pu-239/240

Pu-238

Am-241

Naturally occurring radionuclides to be analyzed by alpha spectroscopy

Th-232

Th-230

Th-228

Naturally occurring radionuclides to be analyzed by gamma spectroscopy

Po-210

Po-214

Po-218

Pa-231

Ac-227

Th-227

Ra-223

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Po-215 Bi-211 Ra-224 Po-216

Bi-212 Po-212

Katherine Miller HALEY & ALDRICH Tel: 520.289.8606

From: Miller, Katherine

Sent: Thursday, January 24, 2019 11:41 AM

**To:** 'Patel, Urvashi' < Urvashi.Patel@testamericainc.com>

Subject: RE: Gross alpha

No rad tests needed.

Katherine Miller HALEY & ALDRICH Tel: 520.289.8606

From: Patel, Urvashi < <a href="mailto:Urvashi.Patel@testamericainc.com">Urvashi.Patel@testamericainc.com</a>>

**Sent:** Wednesday, January 23, 2019 11:07 AM **To:** Miller, Katherine < <a href="mailto:KMiller@haleyaldrich.com">KMiller@haleyaldrich.com</a>>

Subject: RE: Gross alpha

Katherine- please let me know if you'd like to add the analysis and I'll add them to both jobs.

Thanks, Urvashi

#### **URVASHI PATEL**

Manager of Project Management

#### Test America

THE LEADER IN ENVIRONMENTAL TESTING

17461 Derian Ave, Suite #100 Irvine, CA 92614 TEL 949-261-1022 | FAX 949-260-3297 DIRECT 949-260-3269 CELL 949-333-9055

www.testamericainc.com

From: Franks, Mike

Sent: Wednesday, January 23, 2019 9:50 AM

**To:** 'Miller, Katherine' **Cc:** Patel, Urvashi

Subject: RE: Gross alpha

The recount can be done in a few days. Just scheduling the analysis time.

The isotopic thorium can be done in 10 business days.

**From:** Miller, Katherine [mailto:KMiller@haleyaldrich.com]

Sent: Wednesday, January 23, 2019 11:44 AM

**To:** Franks, Mike **Cc:** Patel, Urvashi

Subject: RE: Gross alpha

#### -External Email-

How long would recount and isotopic thorium take?

Katherine Miller **HALEY & ALDRICH** Tel: 520.289.8606

**From:** Franks, Mike < <u>Mike.Franks@testamericainc.com</u>>

Sent: Wednesday, January 23, 2019 10:28 AM
To: Miller, Katherine < <a href="Miller@haleyaldrich.com">KMiller@haleyaldrich.com</a>
Cc: Patel, Urvashi < <a href="Miller@haleyaldrich.com">Urvashi.Patel@testamericainc.com</a>>

Subject: FW: Gross alpha

Importance: High

Hi Katherine,

Our technical director review the gamma spec 901.1 data for jobs 440-226838 & 440-226830. The Np-237 result we discussed is most likely caused by interference from x-ray junk around that energy line.

He concurs that isotopic thorium is the logical additional analysis. We can also recount the Gross Alpha/Beta planchete

Thanks.

Mike

#### **MIKE FRANKS**

Client Relations Manager

#### **TestAmerica**

THE LEADER IN ENVIRONMENTAL TESTING

13715 Rider Trail North Earth City, MO 63045 Tel 314.298.8566 I Fax 314.298.8757 www.testamericainc.com

From: Miller, Katherine [mailto:KMiller@haleyaldrich.com]

Sent: Wednesday, January 23, 2019 8:51 AM

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To: Patel, Urvashi

Subject: RE: Gross alpha

#### -External Email-

I need the lab to call me asap

Katherine Miller HALEY & ALDRICH Tel: 520.289.8606

From: Patel, Urvashi < <a href="mailto:Urvashi.Patel@testamericainc.com">Urvashi.Patel@testamericainc.com</a>>

Sent: Tuesday, January 22, 2019 6:00 PM

**To:** Miller, Katherine < <a href="mailto:KMiller@haleyaldrich.com">KMiller@haleyaldrich.com</a>>

Subject: RE: Gross alpha

#### Mike got back to me today but will give you a call tomorrow to discuss:

We can perform additional analysis. Uranium, thorium, and radium are the predominant naturally occurring alpha emitters. I can contact the client tomorrow.

Mike Franks is his full name.

Thanks, Urvashi

#### **URVASHI PATEL**

Manager of Project Management

#### Test America

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www.testamericainc.com

**From:** Miller, Katherine [mailto:KMiller@haleyaldrich.com]

Sent: Tuesday, January 22, 2019 4:38 PM

To: Patel, Urvashi

Subject: RE: Gross alpha

#### -External Email-

We are hoping for a super fast TAT on the answer and if possible, the results.

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# Katherine Miller **HALEY & ALDRICH**

Tel: 520.289.8606

From: Patel, Urvashi < Urvashi.Patel@testamericainc.com>

Sent: Tuesday, January 22, 2019 5:36 PM

To: Miller, Katherine < <a href="mailto:KMiller@haleyaldrich.com">KMiller@haleyaldrich.com</a>>

Subject: RE: Gross alpha

Ok- checking with our Rad experts to see if this is possible.

Thanks, Urvashi

#### **URVASHI PATEL**

Manager of Project Management

#### Test America

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**From:** Miller, Katherine [mailto:KMiller@haleyaldrich.com]

Sent: Tuesday, January 22, 2019 4:30 PM

To: Patel, Urvashi Subject: Re: Gross alpha

#### -External Email-

Determining if it is naturally occurring

Sent from my iPhone

On Jan 22, 2019, at 5:25 PM, Patel, Urvashi < <u>Urvashi.Patel@testamericainc.com</u>> wrote:

Hi Katherine

Is there something specific you're looking for in the water? I've not heard of speciating water from Gross Alpha but I'll ask the team and get back to you.

Thanks, Urvashi

**URVASHI PATEL** 

#### Manager of Project Management

Test America
THE LEADER IN ENVIRONMENTAL TESTING

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www.testamericainc.com

----Original Message----

From: Miller, Katherine [mailto:KMiller@haleyaldrich.com]

Sent: Tuesday, January 22, 2019 4:22 PM

To: Patel, Urvashi Subject: Gross alpha

-External Email-

Urvashi,

Can we speciate water for the gross alpha?

Sent from my iPhone

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