

The order of this data package is as follows:

1. Chain-of-Custody/Lab Request
2. Copies of field COCs
3. Validation Report
4. Laboratory analysis

Comments:



## SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

EVENT ID: 11096

EVENT NAME: Pajarito (TA-54) MY2017 Q2

SAMPLE ID: CAPA-17-129178

WORK ORDER: NA

	AS PLANNED	AS COLLECTED		AS PLANNED	AS COLLECTED
Date Collected (MM/DD/YYYY):	01/10/2017	ck	FIELD MATRIX:	WG	ck
TIME COLLECTED (HH:MM):	1308	ck	MEDIA:	UA	↓
PRS ID:	NA		SAMPLE TECH CODE:		G-SP
LOCATION ID:	R-21		FIELD PREP:	UF	ck
LOCATION TYPE:	NA		FIELD QC TYPE:	REG	↓
TOP DEPTH:	↓		SAMPLE USAGE:	INV	↓
BOTTOM DEPTH:	↓	↓	EXCAVATED:		YES / NO / <del>NA</del>

PRIORITY	ORDER	CONTAINER	#	PRESERVATIVE	COLLECTED Y/N	SPECIAL INSTRUCTIONS
NA	WSP-8260B-VOA	40 ML SEPTUM AMBER GLASS	2	HCL	Y	NA
↓	WSP-LL-H-3	1 LITER POLY	1	NONE	↓	↓

SAMPLE COMMENTS: none

LOCATION COMMENTS: Sampled 50 ft from running diesel generator

## FIELD PARAMETERS:

Dissolved Oxygen	<u>6.37</u>	mg/L	Flow (in gpm)	<u>3.13</u>	GPM	Oxidation-Reduction Potential	<u>192.2</u>	mV
pH	<u>7.48</u>	SU	Specific Conductance	<u>124.8</u>	uS/cm	Temperature	<u>20.2</u>	deg C
Turbidity	<u>0.50</u>	NTU						

COLLECTED BY (PRINT): A. Vigil

RELINQUISHED BY (Printed Name) Daniel Jaramila (Signature) <i>[Signature]</i>	Date/Time 1/10/17 1420	RECEIVED BY <i>[Signature]</i> (Printed Name) S. Sherwood (Signature) <i>[Signature]</i>	Date/Time 1/10/17 1420
RELINQUISHED BY (Printed Name) (Signature)	Date/Time	RECEIVED BY (Printed Name) (Signature)	Date/Time

Report Date: 12/29/2016



## SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

EVENT ID: 11096

EVENT NAME: Pajarito (TA-54) MY2017 Q2

SAMPLE ID: CAPA-17-129183

WORK ORDER: NA

	AS PLANNED	AS COLLECTED		AS PLANNED	AS COLLECTED
Date Collected (MM/DD/YYYY):	01/10/2017	ok	FIELD MATRIX:	WG	ok
TIME COLLECTED (HH:MM):	1138		MEDIA:	UA	
PRS ID:	ok		SAMPLE TECH CODE:	GSP	
LOCATION ID:	R-38		FIELD PREP:	UF	
LOCATION TYPE:	mon		FIELD QC TYPE:	REG	
TOP DEPTH:	NA		SAMPLE USAGE:	INV	
BOTTOM DEPTH:	NA		EXCAVATED:		YES / NO / (NA)

PRIORITY	ORDER	CONTAINER	#	PRESERVATIVE	COLLECTED Y/N	SPECIAL INSTRUCTIONS
NA ↓	WSP-8260B-VOA	40 ML SEPTUM AMBER GLASS	2	HCL	Y ↓	NA ↓
	WSP-LL-H-3	1 LITER POLY	1	NONE		

SAMPLE COMMENTS: generator running at about 50' away

LOCATION COMMENTS: none

## FIELD PARAMETERS:

Dissolved Oxygen	<u>6.32</u>	mg/L	Flow (in gpm)	<u>3.54</u>	GPM	Oxidation-Reduction Potential	<u>139.6</u>	mV
pH	<u>7.24</u>	SU	Specific Conductance	<u>138.8</u>	uS/cm	Temperature	<u>18.3</u>	deg C
Turbidity	<u>0.52</u>	NTU						

COLLECTED BY (PRINT): A. Tosh &amp; W. Sanchez

RELINQUISHED BY (Printed Name) <u>Maurice Siendo</u> (Signature) <u>[Signature]</u>	Date/Time <u>11/10/17</u> <u>1245</u>	RECEIVED BY (Printed Name) <u>[Signature]</u> (Signature) <u>[Signature]</u>	Date/Time <u>11/10/17</u> <u>1245</u>
RELINQUISHED BY (Printed Name) (Signature)	Date/Time	RECEIVED BY (Printed Name) (Signature)	Date/Time

Report Date: 12/29/2016

## SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

EVENT ID: 11096

EVENT NAME: Pajarito (TA-54) MY2017 Q2

SAMPLE ID: CAPA-17-129187

WORK ORDER: NA

	AS PLANNED	AS COLLECTED		AS PLANNED	AS COLLECTED
Date Collected (MM/DD/YYYY):	01/11/2017	ok	FIELD MATRIX:	WG	ok
TIME COLLECTED (HH:MM):	11:34		MEDIA:	UA	
PRS ID:	ok		SAMPLE TECH CODE:	GSP	
LOCATION ID:	R-51 S1		FIELD PREP:	UF	
LOCATION TYPE:	WON		FIELD QC TYPE:	REG	
TOP DEPTH:	NA		SAMPLE USAGE:	INV	
BOTTOM DEPTH:	NA		EXCAVATED:		YES / NO / <u>NA</u>

PRIORITY	ORDER	CONTAINER	#	PRESERVATIVE	COLLECTED Y/N	SPECIAL INSTRUCTIONS
NA ↓	WSP-8260B-VOA	40 ML SEPTUM AMBER GLASS	2	HCL	Y ↓	NA ↓
	WSP-LL-H-3	1 LITER POLY	1	NONE	↓	↓

SAMPLE COMMENTS: generator Running at about 60' away.

LOCATION COMMENTS: none

## FIELD PARAMETERS:

Dissolved Oxygen	<u>7.94</u>	mg/L	Flow (in gpm)	<u>3.84</u>	GPM	Oxidation-Reduction Potential	<u>146.7</u>	mV
pH	<u>7.90</u>	SU	Specific Conductance	<u>120.2</u>	uS/cm	Temperature		deg C
Turbidity	<u>4.6</u>	NTU						

COLLECTED BY (PRINT): A. Visil, A. Stanfield

RELINQUISHED BY (Printed Name) Maurice Shundo (Signature) <i>Maurice Shundo</i>	Date/Time 11/11/17 1250	RECEIVED BY (Printed Name) M. Martyn (Signature) <i>M. Martyn</i>	Date/Time 11/11/17 1250
RELINQUISHED BY (Printed Name) (Signature)	Date/Time	RECEIVED BY (Printed Name) (Signature)	Date/Time

Report Date: 12/29/2016



## SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

EVENT ID: 11096

EVENT NAME: Pajarito (TA-54) MY2017 Q2

SAMPLE ID: CAPA-17-129188

WORK ORDER: NA

	AS PLANNED	AS COLLECTED		AS PLANNED	AS COLLECTED
Date Collected (MM/DD/YYYY):	01/11/2017	OK	FIELD MATRIX:	WG	OK
TIME COLLECTED (HH:MM):	1159		MEDIA:	UA	
PRS ID:	NA		SAMPLE TECH CODE:	GSP	
LOCATION ID:	R-52 S1		FIELD PREP:	UF	
LOCATION TYPE:	NA		FIELD QC TYPE:	REG	
TOP DEPTH:	↓	↓	SAMPLE USAGE:	INV	↓
BOTTOM DEPTH:			EXCAVATED:		YES / NO / <del>NA</del>

PRIORITY	ORDER	CONTAINER	#	PRESERVATIVE	COLLECTED Y/N	SPECIAL INSTRUCTIONS
NA	WSP-8260B- VOA	40 ML SEPTUM AMBER GLASS	2	HCL	Y	NA
↓	WSP-LL-H-3	1 LITER POLY	1	NONE	↓	↓

SAMPLE COMMENTS: Sampled 40 Ft From running diesel generator; Windy conditions

LOCATION COMMENTS: None

## FIELD PARAMETERS:

Dissolved Oxygen	6.88	mg/L	Flow (in gpm)	3.26	GPM	Oxidation-Reduction Potential	152.6	mV
pH	8.29	SU	Specific Conductance	143.0	uS/cm	Temperature	20.5	deg C
Turbidity	0.40	NTU						

COLLECTED BY (PRINT): D. Jaramillo

RELINQUISHED BY (Printed Name) Austin Tash (Signature) <i>Austin Tash</i>	Date/Time 1/11/17 1255	RECEIVED BY (Printed Name) <i>M. Montoya</i> (Signature) <i>M. Montoya</i>	Date/Time 1/11/17 1255
RELINQUISHED BY (Printed Name) (Signature)	Date/Time	RECEIVED BY (Printed Name) (Signature)	Date/Time

Report Date: 12/29/2016

## SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

EVENT ID: 11096

EVENT NAME: Pajarito (TA-54) MY2017 Q2

SAMPLE ID: CAPA-17-129190

WORK ORDER: NA

	AS PLANNED	AS COLLECTED		AS PLANNED	AS COLLECTED
Date Collected (MM/DD/YYYY):	1/9/2017	OK	FIELD MATRIX:	WG	OK
TIME COLLECTED (HH:MM):	1520		MEDIA:	UA	↓
PRS ID:	OK		SAMPLE TECH CODE:	OK	1/9/17 DG GSP
LOCATION ID:	R-55 S1		FIELD PREP:	UF	OK
LOCATION TYPE:	NA		FIELD QC TYPE:	REG	↓
TOP DEPTH:	↓		SAMPLE USAGE:	INV	↓
BOTTOM DEPTH:	↓	↓	EXCAVATED:		YES / NO / <u>NA</u>

PRIORITY	ORDER	CONTAINER	#	PRESERVATIVE	COLLECTED Y/N	SPECIAL INSTRUCTIONS
NA	WSP-8260B-VOA	40 ML SEPTUM AMBER GLASS	2	HCL	Y	NA
↓	WSP-LL-H-3	1 LITER POLY	1	NONE	↓	↓

SAMPLE COMMENTS: 30 ft from running diesel generator

LOCATION COMMENTS: None

## FIELD PARAMETERS:

Dissolved Oxygen	6.24	mg/L	Flow (in gpm)	2.94	GPM	Oxidation-Reduction Potential	221.6	mV
pH	8.29	<del>8.29</del> 1/9/17 SU	Specific Conductance	174.9	uS/cm	Temperature	20.3	deg C
Turbidity	0.27	NTU						

COLLECTED BY (PRINT): A. Tosh

RELINQUISHED BY (Printed Name) (Signature)	Katrina Tow <i>[Signature]</i>	Date/Time 1/9/2017 1610	RECEIVED BY (Printed Name) (Signature)	S. Sherwood <i>[Signature]</i>	Date/Time 1/9/17 1610
RELINQUISHED BY (Printed Name) (Signature)		Date/Time	RECEIVED BY (Printed Name) (Signature)		Date/Time

Report Date: 12/29/2016



## SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

EVENT ID: 11096

EVENT NAME: Pajarito (TA-54) MY2017 Q2

SAMPLE ID: CAPA-17-129192

WORK ORDER: NA

	AS PLANNED	AS COLLECTED		AS PLANNED	AS COLLECTED
Date Collected (MM/DD/YYYY):	01/09/2017	ok	FIELD MATRIX:	WG	ok
TIME COLLECTED (HH:MM):	1305		MEDIA:	UA	
PRS ID:	ok		SAMPLE TECH CODE:	GSP	
LOCATION ID:	R-57 S1		FIELD PREP:	UF	
LOCATION TYPE:	Mon		FIELD QC TYPE:	REG	
TOP DEPTH:	NA		SAMPLE USAGE:	INV	
BOTTOM DEPTH:	NA		EXCAVATED:		YES / NO / NA

PRIORITY	ORDER	CONTAINER	#	PRESERVATIVE	COLLECTED Y/N	SPECIAL INSTRUCTIONS
NA	WSP-8260B- VOA	40 ML SEPTUM AMBER GLASS	2	HCL	y	WS 1417 y NA
↓	WSP-LL-H-3	1 LITER POLY	1	NONE	↓	↓

SAMPLE COMMENTS: generator Running at about 50' away.

LOCATION COMMENTS: none

## FIELD PARAMETERS:

Dissolved Oxygen	5.77	mg/L	Flow (in gpm)	3.61	GPM	Oxidation-Reduction Potential	146.8	mV
pH	6.00	SU	Specific Conductance	138.5	uS/cm	Temperature	21.0	deg C
Turbidity	0.39	NTU						

COLLECTED BY (PRINT): W. Sanchez, A. Stanfield

RELINQUISHED BY (Printed Name) <i>Maurice Sando</i> (Signature) <i>Maurice Sando</i>	Date/Time 11/9/17 1406	RECEIVED BY (Printed Name) <i>M. Mark</i> (Signature) <i>M. Mark</i>	Date/Time 11/9/17 1406
RELINQUISHED BY (Printed Name) (Signature)	Date/Time	RECEIVED BY (Printed Name) (Signature)	Date/Time

Report Date: 12/29/2016



## DATA VALIDATION REPORT

Chain Of Custody No. 2017-840

### 1. Distribution Of Samples In EDD.

SDG	Analytical Method	Regular Samples	Field Duplicates	Trip Blanks	Field Blanks	Equipment Blanks
ARS1-17-00129	Generic:Low_Level_Tritium	2				
ARS1-17-00129	Generic:Low_Level_Tritium	2				
ARS1-17-00129	Generic:Low_Level_Tritium	2				

SDG	Analytical Method	Analysis Lot ID	Prep Lot ID	Regular Samples	Field Duplicates	Trip Blanks	Field Blanks	Equipment Blanks	Method Blanks	Matrix Spikes	Matrix Spike Dups	Analytical Spikes	Post-Digestion Spikes	Lab Control Samples	Lab Control Sample Dups	Blank Spike	Blank Spike Dups	Lab Duplicates	Storage Blanks	Preparation Blanks	Reagent Blanks
ARS1-17-00129	Generic:Low_Level_Tritium	ARS1-B17-	ARS1-B17-	6					1					1	1						

### 2. Distribution Of Analytes In EDD.

Analytical Method	Analytical Method Category	Field Sample ID	Lab Sample ID	Sample Purpose	Target Analytes	Surrogates	Spiked Compounds	TICS
Generic:Low_Level_Tritium	RAD	CAPA-17-129178	ARS1-B17-00275-04	REG	1	0	0	0
Generic:Low_Level_Tritium	RAD	CAPA-17-129183	ARS1-B17-00275-05	REG	1	0	0	0
Generic:Low_Level_Tritium	RAD	CAPA-17-129187	ARS1-B17-00275-06	REG	1	0	0	0
Generic:Low_Level_Tritium	RAD	CAPA-17-129188	ARS1-B17-00275-07	REG	1	0	0	0
Generic:Low_Level_Tritium	RAD	CAPA-17-129190	ARS1-B17-00275-08	REG	1	0	0	0
Generic:Low_Level_Tritium	RAD	CAPA-17-129192	ARS1-B17-00275-09	REG	1	0	0	0
Generic:Low_Level_Tritium	RAD	LCS	ARS1-B17-00275-01	LCS	0	0	1	0
Generic:Low_Level_Tritium	RAD	LCSD	ARS1-B17-00275-02	LCSD	0	0	1	0
Generic:Low_Level_Tritium	RAD	MB	ARS1-B17-00275-03	MB	1	0	0	0

### 3. Are any analytes missing?

No.

### 4. Were any holding times exceeded?

No.

## DATA VALIDATION REPORT

5. Any contaminants in blanks?

No.

6. Any surrogate recoveries outside the control limits?

No.

7. Any MS/MSD recoveries or RPDs outside the control limits?

No.

8. Any LCS/LCSD or BS/BSD recoveries or RPDs outside the control limits?

LCS Lab Sample	LCSD Lab	Analytical Method	Parameter Name	Lab Lot ID	Analysis	Sample Matrix	LCS Spike Recovery	LCSD Spike Recovery	Upper Limit	Lower Limit	Upper Rejection Limit	Lower Rejection Limit	RPD	RPD Limit
ARS1-B17-00275-01	ARS1-B17-00275-02	Generic:Low_Level_Tritium	Tritium	ARS1-B17-00275	03-30-2017	W	61.000	82.000	120.00	80.000		10	29.760	

9. Any Field Duplicate RPDs outside the desired limits?

No.

10. Any Lab Duplicate RPDs outside the desired limits?

No.

11. Any required reporting limits exceeded?

## DATA VALIDATION REPORT

No.

12. Additional Validator's Comments.

13. Display Flagged Data.

Location ID	COC Number	Field Sample ID	Sample Purpose	Analysis Type Code	Analytical Suite	Analytical Method	Parameter Name	Lab Qualifier	Validation Qualifier	Validation Reason Codes	Detect Flag	Lab Result	Lab Units	Report Result	Report Units	Report MDA	Report Uncertainty	Lab Matrix	Sample Date	Percent	Analysis Lot ID	Validation Status Code	Use Flag
R-21	2017-840	CAPA-17-129178	REG	INIT	RAD	Generic:Low_Level_Tritium	Tritium	U	U	R5	N	-0.778	pCi/L	-0.778	pCi/L	1.794	0.523	W	01/10/2017		ARS1-B17-00275	VAL	Y
R-38	2017-840	CAPA-17-129183	REG	INIT	RAD	Generic:Low_Level_Tritium	Tritium	U	U	R5	N	0.061	pCi/L	0.061	pCi/L	1.852	0.545	W	01/10/2017		ARS1-B17-00275	VAL	Y
R-51 S1	2017-840	CAPA-17-129187	REG	INIT	RAD	Generic:Low_Level_Tritium	Tritium	U	U	R5	N	-0.005	pCi/L	-0.005	pCi/L	1.644	0.483	W	01/11/2017		ARS1-B17-00275	VAL	Y
R-52 S1	2017-840	CAPA-17-129188	REG	INIT	RAD	Generic:Low_Level_Tritium	Tritium	U	U	R5	N	-0.546	pCi/L	-0.546	pCi/L	2.085	0.606	W	01/11/2017		ARS1-B17-00275	VAL	Y
R-55 S1	2017-840	CAPA-17-129190	REG	INIT	RAD	Generic:Low_Level_Tritium	Tritium	U	U	R5	N	-1.435	pCi/L	-1.435	pCi/L	1.833	0.550	W	01/09/2017		ARS1-B17-00275	VAL	Y
R-57 S1	2017-840	CAPA-17-129192	REG	INIT	RAD	Generic:Low_Level_Tritium	Tritium	U	U	R5	N	0.203	pCi/L	0.203	pCi/L	1.601	0.475	W	01/09/2017		ARS1-B17-00275	VAL	Y

### Reason Code

### Description

R5

Analyte is not detected because the amount reported is less than the MDC.

14. Usable Result Count.

Field Sample ID	Location ID	Sample Purpose	Analytical Method	No. Unuseable Records	Total Records
CAPA-17-129178	R-21	REG	Generic:Low_Level_Tritium	0	1
CAPA-17-129183	R-38	REG	Generic:Low_Level_Tritium	0	1
CAPA-17-129187	R-51 S1	REG	Generic:Low_Level_Tritium	0	1
CAPA-17-129188	R-52 S1	REG	Generic:Low_Level_Tritium	0	1
CAPA-17-129190	R-55 S1	REG	Generic:Low_Level_Tritium	0	1
CAPA-17-129192	R-57 S1	REG	Generic:Low_Level_Tritium	0	1





2609 North River Road • Port Allen, Louisiana 70767

1 (800) 401-4277 • Fax (225) 381-2996

# **American Radiation Services Analytical Reports**

**for**

## **Los Alamos National Laboratory**

### **Request Number: 2017-840**



2609 North River Road • Port Allen, Louisiana 70767

1 (800) 401-4277 • Fax (225) 381-2996

# **American Radiation Services Analytical Reports**

**for**

**Los Alamos National Laboratory  
Request: 2017-840**

# **Original COC**

[illegible]





2609 North River Road • Port Allen, Louisiana 70767

1 (800) 401-4277 • Fax (225) 381-2996

# **American Radiation Services Analytical Reports**

for

**Los Alamos National Laboratory  
Request: 2017-840**

# **Case Narrative**



## ARS International, LLC

### Laboratory Analysis Report

**ARS1-17-00129**

*Prepared for:*

### Los Alamos National Laboratory

Keith Greene  
PO Box 1663  
MS M992  
Los Alamos, NM 87545

kgreene@lanl.gov

Phone: 505-665-9966  
Fax: 505-665-9972

A handwritten signature in cursive script, appearing to read 'Susan Greene', written over a horizontal line.

**Project Manager Review**

A handwritten signature in cursive script, appearing to read 'Keith Greene', written over a horizontal line.

**Management Review**

Notes: ARS International, LLC assumes no liability for the use or the interpretation of any analytical results provided other than the cost of the analysis itself. Reproduction of this report in less than full requires the written consent of the client.

**Contact Person: Questions regarding this analytical report should be addressed to:**

**Project Manager**  
**ProjectManagers@amrad.com**

Phone: 225.381.2991  
Fax: 225.381.2996





2609 North River Road • Port Allen, Louisiana 70767

1 (800) 401-4277 • Fax (225) 381-2996

April 5, 2017

LANL  
Keith Greene  
PO Box 1663 MS M992  
Los Alamos, NM 87545

LANL Request Number: **2017-840**  
ARS SDG: **ARS1-17-00129**  
Project : **ADEP**

Dear Mr. Greene;

On January 13, 2017, ARS International received six (6) water samples to be analyzed for Low Level Tritium.

Samples were counted using the appropriate counting equipment and QA/QC for this type of analysis. Results of the analysis and QA/QC are attached in the data package.

If you have any questions please do not hesitate to call at 225.381.2991 or email [LANL@amrad.com](mailto:LANL@amrad.com).

Sincerely,

Susan Leese  
Project Manager  
**ARS International**





**PROJECT SAMPLE IDENTIFICATION  
CROSS-REFERENCE  
TO ARS SAMPLE LABORATORY IDs**  
Subcontract (LANL Agreement Number) 250953

<b>Request Number</b>	<b>LANL PROJECT SAMPLE ID NUMBER</b>	<b>American Radiation Services SAMPLE ID NUMBER(S)</b>
2017-840	CAPA-17-129178	ARS1-17-00129-001
2017-840	CAPA-17-129183	ARS1-17-00129-002
2017-840	CAPA-17-129187	ARS1-17-00129-003
2017-840	CAPA-17-129188	ARS1-17-00129-004
2017-840	CAPA-17-129190	ARS1-17-00129-005
2017-840	CAPA-17-129192	ARS1-17-00129-006

**SAMPLE RECEIPT**

The sample was received in good condition and was screened for radioactive contamination as per procedure ARS-062 "Sample Receiving". Sample was checked in with a 40-day turnaround, per latest contract modification.

**ANALYTICAL METHODS**

Tritium analyses were performed using ARS-040, "Tritium Assay in Water Samples Using Electrolytic Enrichment".

**ANALYTICAL RESULTS**

Percent RPD for the LCS/LCSD exceeds internal limit of 25. All other QC criteria were met.

**American Radiation Services Project Manager/Laboratory Director's Comments:**

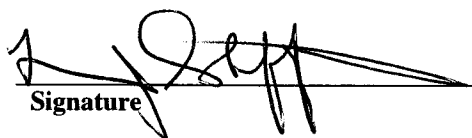
*"I certify that this sample data package is in compliance with SOW requirements, both technically and for completeness, other than the conditions detailed above. Release of the data contained in this sample data package and the computer-readable EDD, as applicable, submitted on diskette or by modem, has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature."*



2609 North River Road • Port Allen, Louisiana 70767

1 (800) 401-4277 • Fax (225) 381-2996

*"I certify that this electronic image and all hardcopies produced from this image accurately represent the data and are in compliance with the LANL specific requirements, both technically and for completeness, other than the conditions detailed above or in the sample data package narrative. Release, by submission through email, the data contained in this electronic image and the computer-readable EDD (as applicable), has been authorized by the laboratory Manager/Technical Director or the Manager's designee."*

  
Signature

Laboratory Management, ARS International

Title

4-10-17  
Date

## Notes (Case Narrative):

### Comments:

- 1.0) All MDA/MDC values are calculated on a sample specific basis.
- 2.0) Soil and Sludge analysis are reported on a wet basis or an as received basis unless otherwise indicated.
- 3.0) Data in this report are within the limits of uncertainty specified in the reference method unless otherwise specified.
- 4.0) Modified analysis procedures are procedures that are modified to meet the certain specifications. An example may be the use of a water method to analyze a solid matrix due to the lack of an officially recognized procedure for the analysis of the solid matrix. Modified analyses are indicated by the subsequent addition of "m" to the procedure number (i.e. 900.0M).
- 5.0) Total activity is actually total gamma activity and is determined utilizing the prominent gamma emitters from the naturally occurring radioactive decay chains and other prominent radioactive nuclides. Total activity may be lower than the actual total activity due to the extent of secular equilibrium achieved in the various decay chains at the time of analysis. The total activity is not representative of nuclides that emit solely alpha or beta particles.
- 6.0) Ra-228 is determined via secular equilibrium with its daughter, Actinium 228 (Gamma Spectroscopy only).
- 7.0) U-238 is determined via secular equilibrium with its daughter, Thorium 234 (Gamma Spectroscopy only).
- 8.0) All gamma spectroscopy was performed utilizing high purity germanium detectors (HPGe).
- 9.0) ARS makes every attempt to match sample density to calibrated density; however, in some cases, it is not practical or possible to do so and data results may be affected (Gamma Spectroscopy only).
- 10.0) Gamma spectroscopy results are calculated values based on the ORTEC® GammaVision ENV32 Analysis Engine.
- 11.0) ACLASS DOD and ISO 17025 certification applies only to the following analytes and methods: Gross Alpha and Gross Beta (EPA 900, SM7110B&C, SW846 9310); Radium 226 (EPA 903, EPA 903.1, SM 7500 Ra-B, SW846 9315); Radium 228 (EPA 904, SM 7500 Ra-B SW846 9320); Iodine-131 (EPA 901.1); Uranium by ICPMS (EPA 200.8); Strontium 89/90 (EPA 905, Eichrom SRW01, HASL 300 Sr-03-RC); Tritium (EPA 906, EPA 906M); Gamma Emitters (EPA 901.1, SM7120B, HASL 300 Ga-01-R); Americium-241, Curium 242/244, Plutonium 239/240 and 241, Thorium 228/230/232, Uranium 234/233 and 238 (Eichrom ACW03 VBS); Lead 210 (HASL 300 Pb-01-RC, Eichrom OTW01); Polonium 210 (HASL 300 Po-01-RC, HASL 300 Po-02-RC); Technetium-99 (Eichrom TCW02, Eichrom TCS01M).

### Method References:

- 1.0) EPA 600/4-80-032; Prescribed Procedures for the Measurements of Radioactivity in Drinking Water, August 1980.
- 2.0) Standard Methods for the Examination of Water and Wastewater (On-Line Edition)
- 3.0) EPA SW-846; Test Methods for Evaluating Solid Waste, (On-Line edition)
- 4.0) EPA 600/4/79-020; Methods for Chemical Analysis of Water and Waste, March 1983.
- 5.0) HASL 300; The Procedures Manual of the Environmental Measurements Laboratory, Volume I, 28th Edition February, 1997.

### Definitions:

CRDL	Contract Required Detection Limit
CSU	Combined Standard Uncertainty
DLC	Decision Level Concentration (ANSI N42.23) or critical level
DO	Duplicate Original
DUP	Method Duplicate
LCS/LCSD	Laboratory Control Sample/Laboratory Control Sample Duplicate
MDA	Minimum Detectable Activity
MDC	(Minimum Detectable Concentration) minimum concentration of the analyte that ARS can detect utilizing the specific analysis
MBL	Method Blank
MS/MSD	Matrix Spike/Matrix Spike Duplicate
N/A	Not Applicable
NP	Not Provided
NR	Not Referenced
LOD	Limit of Detection
LOQ	Limit of Quantitation

### Data Qualifiers:

B	The analyte is found in both the associated method blank and the sample. This flag indicates probable blank contamination.
D	Sample analysis accomplished through dilution.
J	The reported result is an estimated value above the limit of detection but outside of quantitation range (e.g., matrix interference was observed).
Q	One or more quality control criteria failed (e.g., LCS recovery, surrogate spike recovery, or CCV recovery).
U	Activity is below the MDC, MDA, MDL, or LOD
N	The analyte is a tentatively identified compound using mass spectrometry or any non-customer requested compounds that are tentatively identified.
*	LCS/LCSD or MS/MSD fails RPD criteria.
S	Spike
SC	Subcontracted out to another qualified laboratory
H	Holding time exceeded

LELAP Cert# 01949

NELAP Cert# E87558

ARS-059-010

Revision: 9.1

Revision Date: 03-14-2017



2609 North River Road • Port Allen, Louisiana 70767

---

1 (800) 401-4277 • Fax (225) 381-2996

# **American Radiation Services Analytical Reports**

**for**

**Los Alamos National Laboratory**

## **Low Level Tritium by Low Level Liquid Scintillation Counting**





2609 North River Road • Port Allen, Louisiana 70767

1 (800) 401-4277 • Fax (225) 381-2996

# **American Radiation Services Analytical Reports**

for

**Los Alamos National Laboratory**

**Low Level Tritium  
by  
Low Level Liquid  
Scintillation Counting  
Laboratory  
Records**



2609 North River Road, Port Allen, Louisiana 70767

1 (800) 401-4277 FAX (225) 381-2996

ARS Sample Delivery Group: ARS1-17-00129

Client Sample ID: CAPA-17-129178

Sample Collection Date: 01/10/17

Sample Matrix: Aqueous

Percent Solids: N/A

Request or PO Number: 2017-840

ARS Sample ID: ARS1-17-00129-001

Date Received: 01/13/17

Report Date: 04/05/17

## Radiochemistry

Analysis Description	Analysis Results	1s	MDC	DLC	CRDL	Qual	Analysis Units	Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	-0.778	0.523	1.794	0.866	3.221	U	pCi/L	ARS-040	03/31/17 11:57	SWHITE	N/A

Project Manager Review

Notes: American Radiation Services, Inc. assumes no liability for the use or interpretation of any analytical results provided other than the cost of the analysis itself. Reproduction of this report in less than full requires the written consent of the client.

LELAP Certificate# 01949



2609 North River Road, Port Allen, Louisiana 70767

1 (800) 401-4277 FAX (225) 381-2996

ARS Sample Delivery Group: ARS1-17-00129

Client Sample ID: CAPA-17-129183

Sample Collection Date: 01/10/17

Sample Matrix: Aqueous

Percent Solids: N/A

Request or PO Number: 2017-840

ARS Sample ID: ARS1-17-00129-002

Date Received: 01/13/17

Report Date: 04/05/17

## Radiochemistry

Analysis Description	Analysis Results	1s	MDC	DLC	CRDL	Qual	Analysis Units	Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	0.061	0.545	1.852	0.894	3.221	U	pCi/L	ARS-040	03/31/17 16:08	SWHITE	N/A

Project Manager Review

Notes: American Radiation Services, Inc. assumes no liability for the use or interpretation of any analytical results provided other than the cost of the analysis itself. Reproduction of this report in less than full requires the written consent of the client.

LELAP Certificate# 01949



2609 North River Road, Port Allen, Louisiana 70767

1 (800) 401-4277 FAX (225) 381-2996

ARS Sample Delivery Group: ARS1-17-00129

Client Sample ID: CAPA-17-129187

Sample Collection Date: 01/11/17

Sample Matrix: Aqueous

Percent Solids: N/A

Request or PO Number: 2017-840

ARS Sample ID: ARS1-17-00129-003

Date Received: 01/13/17

Report Date: 04/05/17

## Radiochemistry

Analysis Description	Analysis Results	1s	MDC	DLC	CRDL	Qual	Analysis Units	Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	-0.005	0.483	1.644	0.794	3.221	U	pCi/L	ARS-040	03/31/17 20:19	SWHITE	N/A

Project Manager Review

Notes: American Radiation Services, Inc. assumes no liability for the use or interpretation of any analytical results provided other than the cost of the analysis itself. Reproduction of this report in less than full requires the written consent of the client.

LELAP Certificate# 01949





2609 North River Road, Port Allen, Louisiana 70767

1 (800) 401-4277 FAX (225) 381-2996

ARS Sample Delivery Group: ARS1-17-00129

Client Sample ID: CAPA-17-129188

Sample Collection Date: 01/11/17

Sample Matrix: Aqueous

Percent Solids: N/A

Request or PO Number: 2017-840

ARS Sample ID: ARS1-17-00129-004

Date Received: 01/13/17

Report Date: 04/05/17

## Radiochemistry

Analysis Description	Analysis Results	1s	MDC	DLC	CRDL	Qual	Analysis Units	Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	-0.546	0.606	2.085	1.007	3.221	U	pCi/L	ARS-040	04/01/17 0:30	SWHITE	N/A

Project Manager Review

Notes: American Radiation Services, Inc. assumes no liability for the use or interpretation of any analytical results provided other than the cost of the analysis itself. Reproduction of this report in less than full requires the written consent of the client.

LELAP Certificate# 01949



2609 North River Road, Port Allen, Louisiana 70767

1 (800) 401-4277 FAX (225) 381-2996

ARS Sample Delivery Group: ARS1-17-00129

Client Sample ID: CAPA-17-129190

Sample Collection Date: 01/09/17

Sample Matrix: Aqueous

Percent Solids: N/A

Request or PO Number: 2017-840

ARS Sample ID: ARS1-17-00129-005

Date Received: 01/13/17

Report Date: 04/05/17

## Radiochemistry

Analysis Description	Analysis Results	1s	MDC	DLC	CRDL	Qual	Analysis Units	Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	-1.435	0.550	1.833	0.885	3.221	U	pCi/L	ARS-040	04/01/17 4:40	SWHITE	N/A

Project Manager Review

Notes: American Radiation Services, Inc. assumes no liability for the use or interpretation of any analytical results provided other than the cost of the analysis itself. Reproduction of this report in less than full requires the written consent of the client.

LELAP Certificate# 01949



2609 North River Road, Port Allen, Louisiana 70767

1 (800) 401-4277 FAX (225) 381-2996

ARS Sample Delivery Group: ARS1-17-00129

Client Sample ID: CAPA-17-129192

Sample Collection Date: 01/09/17

Sample Matrix: Aqueous

Percent Solids: N/A

Request or PO Number: 2017-840

ARS Sample ID: ARS1-17-00129-006

Date Received: 01/13/17

Report Date: 04/05/17

## Radiochemistry

Analysis Description	Analysis Results	1s	MDC	DLC	CRDL	Qual	Analysis Units	Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	0.203	0.475	1.601	0.773	3.221	U	pCi/L	ARS-040	04/01/17 8:51	SWHITE	N/A

Project Manager Review

Notes: American Radiation Services, Inc. assumes no liability for the use or interpretation of any analytical results provided other than the cost of the analysis itself. Reproduction of this report in less than full requires the written consent of the client.

LELAP Certificate# 01949



## QC Evaluation

Method: ARS-040

Batch ID: ARS1-B17-00275

SDG's: ARS1-17-00129;130;180;181

LCS	<div style="border: 1px solid black; padding: 2px;">15.8740</div>	CSU (2s)	<div style="border: 1px solid black; padding: 2px;">4.9330</div>																																																																																																
LSCD	<div style="border: 1px solid black; padding: 2px;">21.4240</div>	CSU-D (2s)	<div style="border: 1px solid black; padding: 2px;">6.6070</div>																																																																																																
<p><b>DER =</b> <math>\frac{\text{abs}(LSC-LSCD)}{\text{sqr}((2s \text{ CSU}/2)^2 + ((2s \text{ CSU-D}/2)^2) \text{ at } 2 \text{ sigma}} =</math> <b>DER</b> <span style="float: right;"><b>&lt;3</b></span></p>																																																																																																			
<p><b>DER=</b> <math>\frac{5.55}{4.12271} =</math> <span style="float: right;"><div style="border: 1px solid black; padding: 2px;">1.346202</div> <b>&lt; 3</b></span></p>																																																																																																			
<p><b>% RPD=</b> <math>\frac{\text{ABS}(LCS - LSCD)}{(LCS+LSCD)/2} =</math> <b>RPD</b> <span style="float: right;"><b>&lt;25%</b></span></p>																																																																																																			
<p><b>%RPD=</b> <math>\frac{5.55}{18.649} =</math> <span style="float: right;"><div style="border: 1px solid black; padding: 2px;">29.76031</div> <b>&lt; 25%</b></span></p>																																																																																																			
<p>The RPD shall be less than 25% or other client-applied criteria</p>																																																																																																			
<p><b>RER=</b> <math>\frac{\text{abs}((LCS-LSCD))}{(CSU)+(CSD) \text{ at } 2 \text{ sigma}} =</math> <span style="float: right;"><b>&lt;1</b></span></p>																																																																																																			
<p><b>RER =</b> <math>\frac{5.55}{11.5400} =</math> <span style="float: right;"><div style="border: 1px solid black; padding: 2px;">0.480936</div> <b>&lt;1</b></span></p>																																																																																																			
<p style="text-align: center;"><b>Blank Information</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th style="text-align: center;">Act</th> <th style="text-align: center;">CSU(2s)</th> <th style="text-align: center;">MDA</th> <th style="text-align: center;">Act&gt;MDA</th> </tr> </thead> <tbody> <tr><td>AM-241</td><td></td><td></td><td></td><td></td></tr> <tr><td>U-234</td><td></td><td></td><td></td><td></td></tr> <tr><td>U-235</td><td></td><td></td><td></td><td></td></tr> <tr><td>U-238</td><td></td><td></td><td></td><td></td></tr> <tr><td>Pu-238</td><td></td><td></td><td></td><td></td></tr> <tr><td>Pu-239/240</td><td></td><td></td><td></td><td></td></tr> <tr><td>Th-228</td><td></td><td></td><td></td><td></td></tr> <tr><td>Th-230</td><td></td><td></td><td></td><td></td></tr> <tr><td>Th-232</td><td></td><td></td><td></td><td></td></tr> <tr><td>H3</td><td style="text-align: center;">0.438</td><td style="text-align: center;">1.099</td><td style="text-align: center;">1.864</td><td></td></tr> <tr><td>Ra-226</td><td></td><td></td><td></td><td></td></tr> <tr><td>Ra-228</td><td></td><td></td><td></td><td></td></tr> <tr><td>Total U</td><td></td><td></td><td></td><td></td></tr> <tr><td>Pb-210</td><td></td><td></td><td></td><td></td></tr> <tr><td>Po-209</td><td></td><td></td><td></td><td></td></tr> <tr><td>Sr-90</td><td></td><td></td><td></td><td></td></tr> <tr><td>TC-99</td><td></td><td></td><td></td><td></td></tr> <tr><td>NI-63</td><td></td><td></td><td></td><td></td></tr> </tbody> </table> <div style="margin-top: 10px;"> <p>*MDA should be below RDL</p> <p>*Blank activity must be below MDA</p> <p>*Blank activity must be &lt; 1.65*CSU</p> <div style="display: flex; justify-content: flex-end; align-items: flex-start; margin-top: 10px;"> <div style="margin-right: 20px;"> <p>ACT = <div style="border: 1px solid black; padding: 2px;">0.438</div></p> <p>CSU = <div style="border: 1px solid black; padding: 2px;">1.099</div></p> <p>Is ACT&lt;1.65*CSU? <div style="border: 1px solid black; padding: 2px; background-color: #cccccc;">YES</div></p> </div> </div> </div>						Act	CSU(2s)	MDA	Act>MDA	AM-241					U-234					U-235					U-238					Pu-238					Pu-239/240					Th-228					Th-230					Th-232					H3	0.438	1.099	1.864		Ra-226					Ra-228					Total U					Pb-210					Po-209					Sr-90					TC-99					NI-63				
	Act	CSU(2s)	MDA	Act>MDA																																																																																															
AM-241																																																																																																			
U-234																																																																																																			
U-235																																																																																																			
U-238																																																																																																			
Pu-238																																																																																																			
Pu-239/240																																																																																																			
Th-228																																																																																																			
Th-230																																																																																																			
Th-232																																																																																																			
H3	0.438	1.099	1.864																																																																																																
Ra-226																																																																																																			
Ra-228																																																																																																			
Total U																																																																																																			
Pb-210																																																																																																			
Po-209																																																																																																			
Sr-90																																																																																																			
TC-99																																																																																																			
NI-63																																																																																																			



2609 North River Road, Port Allen, Louisiana 70767

1 (800) 401-4277 FAX (225) 381-2996

**QC Results Report**Sample Delivery Group: ARS1-17-00129; 130;  
180; 181**Laboratory Control Sample Evaluation**

Analysis Batch	QC Type	Analyte	Analysis Results	CSU 1 (1s)	MDC	Expected Value	Qual	Report Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Percent Recovery (%)	LCS Acceptance Range
ARS1-B17-00275	LCSD	H3	21.424	3.371	2.239	26.078		pCi/L	ARS-040	3/31/17 1:35	SWHITE	82	80%-120%

**Blank Evaluation**

Analysis Batch	QC Type	Analyte	Analysis Results	CSU 1 (1s)	MDC	Expected Value	Qual	Report Units	Analysis Test Method	Analysis Date/Time	Analysis Technician
ARS1-B17-00275	MBL	H3	0.438	0.561	1.864	NA	U	pCi/L	ARS-040	3/31/17 1:35	SWHITE

**Sample RER Duplicate Evaluation**

Analysis Batch	QC Type	Analysis Description	Result 1	CSU 1 (1s)	Result 2	CSU 2 (1s)	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	RER	RER Acceptance Range
ARS1-B17-00275	LCSD	H3	21.424	3.371	15.874	2.517		pCi/L	ARS-040	3/31/17 1:35	SWHITE	0.94	< 1

**Sample DER Duplicate Evaluation**

Analysis Batch	QC Type	Analysis Description	Result 1	CSU 1 (1s)	Result 2	CSU 2 (1s)	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	DER	DER Acceptance Range
ARS1-B17-00275	LCSD	H3	21.424	3.371	15.874	2.517		pCi/L	ARS-040	3/31/17 1:35	SWHITE	2.64	< 3

  
Project Manager Review

Notes: American Radiation Services, Inc. assumes no liability for the use or interpretation of any analytical results provided other than the cost of the analysis itself. Reproduction of this report in less than full requires the written consent of ARS International.

LELAP Certificate# 01949

NELAP Certificate # E87558



# Analytical Batch Report

Analysis Batch ID    ARS1-B17-00275											
Method		ARS-040		Analysis		LSC-A-022		Matrix		AQ	
Description				Low Level Tritium by Electrolytic Enrichment							
ABatch Sample ID	Type	Blind Iso1	Blind Iso2	Blind Iso3	SDG	FR	Run	Prep Code	Client ID	Group Name	Lab Deadline
ARS1-B17-00275-01	LCS	B-23152									
ARS1-B17-00275-02	LCSD	B-23153									
ARS1-B17-00275-03	MBL										
ARS1-B17-00275-04	TRG				ARS1-17-00129	001	1		CAPA-17-129178	STD	02/19/17
ARS1-B17-00275-05	TRG				ARS1-17-00129	002	1		CAPA-17-129183	STD	02/19/17
ARS1-B17-00275-06	TRG				ARS1-17-00129	003	1		CAPA-17-129187	STD	02/19/17
ARS1-B17-00275-07	TRG				ARS1-17-00129	004	1		CAPA-17-129188	STD	02/19/17
ARS1-B17-00275-08	TRG				ARS1-17-00129	005	1		CAPA-17-129190	STD	02/19/17
ARS1-B17-00275-09	TRG				ARS1-17-00129	006	1		CAPA-17-129192	STD	02/19/17
ARS1-B17-00275-10	TRG				ARS1-17-00130	001	1		CAWA-17-127948	STD	02/19/17
ARS1-B17-00275-11	TRG				ARS1-17-00130	002	1		CAWA-17-127911	STD	02/19/17
ARS1-B17-00275-12	TRG				ARS1-17-00180	001	1		CAWR-17-127835	STD	02/26/17
ARS1-B17-00275-13	TRG				ARS1-17-00180	002	1		CAWR-17-127836	STD	02/26/17
ARS1-B17-00275-14	TRG				ARS1-17-00181	001	1		CAPA-17-129179	STD	02/26/17
ARS1-B17-00275-16	TRG				ARS1-17-00181	003	1		CAPA-17-129181	STD	02/26/17
ARS1-B17-00275-17	TRG				ARS1-17-00181	004	1		CAPA-17-129182	STD	02/26/17
ARS1-B17-00275-18	TRG				ARS1-17-00181	005	1		CAPA-17-129184	STD	02/26/17
ARS1-B17-00275-20	TRG				ARS1-17-00181	007	1		CAPA-17-129189	STD	02/26/17
ARS1-B17-00275-21	TRG				ARS1-17-00181	008	1		CAPA-17-129209	STD	02/26/17
ARS1-B17-00275-22	TRG				ARS1-17-00181	009	1		CAPA-17-129213	STD	02/26/17
ARS1-B17-00275-23	TRG				ARS1-17-00181	010	1		CAPA-17-129191	STD	02/26/17

Procedure Data		Client ID	Parent	Tare Wt of Electrolysis Cell & Electrodes	Tare Wt Reservoir	Gross Weight of Sample Reservoir	WT Sodium Peroxide	Gross Sample Added	Electrolysis Start Date & Time	Start AMP	Start Bath (C)	Electrolysis End Date/Time
ABatch Sample ID												
ARS1-B17-00275-01				334.0900	217.8800	725.6000	2.0000	507.7200	2/24/2017 2:10:00 PM	5.0000	2.0000	3/30/2017 1:20:00 PM
ARS1-B17-00275-02				317.1900	212.6100	718.3900	2.0000	505.7800	2/24/2017 2:20:00 PM	5.0000	2.0000	3/30/2017 12:50:00 PM
ARS1-B17-00275-03				330.7700	229.8700	735.0000	2.0000	505.1300	2/24/2017 2:35:00 PM	5.0000	2.0000	3/30/2017 8:50:00 AM
ARS1-B17-00275-04		CAPA-17-129178		322.9200	197.8000	700.7200	2.0000	502.9200	2/21/2017 4:55:00 PM	5.0000	2.0000	3/28/2017 4:40:00 PM
ARS1-B17-00275-05		CAPA-17-129183		325.3400	212.8500	712.8500	2.0000	500.0000	2/22/2017 11:05:00 AM	5.0000	2.0000	3/28/2017 3:40:00 PM
ARS1-B17-00275-06		CAPA-17-129187		315.5500	217.4700	720.5700	2.0000	503.1000	2/22/2017 11:15:00 AM	5.0000	2.0000	3/6/2017 2:20:00 PM
ARS1-B17-00275-07		CAPA-17-129188		296.8000	213.5700	746.1800	2.0000	532.6100	2/22/2017 11:25:00 AM	5.0000	2.0000	3/8/2017 4:20:00 PM
ARS1-B17-00275-08		CAPA-17-129190		313.1700	221.7000	758.1900	2.0000	536.4900	2/22/2017 11:30:00 AM	5.0000	2.0000	3/24/2017 3:25:00 PM
ARS1-B17-00275-09		CAPA-17-129192		314.9400	220.7200	771.1800	2.0000	550.4600	2/22/2017 11:35:00 AM	5.0000	2.0000	3/28/2017 9:25:00 AM
ARS1-B17-00275-10		CAWA-17-127948		319.3000	231.9000	780.0500	2.0000	548.1500	2/22/2017 11:45:00 AM	5.0000	2.0000	3/24/2017 12:40:00 PM
ARS1-B17-00275-11		CAWA-17-127911		326.6900	183.6500	715.7500	2.0000	532.1000	2/22/2017 11:55:00 AM	5.0000	2.0000	3/29/2017 11:45:00 AM
ARS1-B17-00275-12		CAWR-17-127835		306.3000	258.2000	792.4500	2.0000	534.2500	2/22/2017 12:00:00 PM	5.0000	2.0000	3/30/2017 1:30:00 PM
ARS1-B17-00275-13		CAWR-17-127836		324.5900	269.6200	781.7900	2.0000	512.1700	2/23/2017 4:15:00 PM	5.0000	2.0000	3/29/2017 9:35:00 AM
ARS1-B17-00275-14		CAPA-17-129179		325.9400	222.8900	735.2000	2.0000	512.3100	2/23/2017 4:20:00 PM	5.0000	2.0000	3/28/2017 10:00:00 AM
ARS1-B17-00275-16		CAPA-17-129181		324.6400	271.2800	777.4100	2.0000	506.1300	2/23/2017 4:40:00 PM	5.0000	2.0000	3/29/2017 1:10:00 PM
ARS1-B17-00275-17		CAPA-17-129182		319.9700	255.2000	768.5600	2.0000	513.3600	2/23/2017 4:45:00 PM	5.0000	2.0000	3/29/2017 4:00:00 PM
ARS1-B17-00275-18		CAPA-17-129184		321.1600	203.4100	706.9400	2.0000	503.5300	2/23/2017 4:50:00 PM	5.0000	2.0000	3/31/2017 10:00:00 AM
ARS1-B17-00275-20		CAPA-17-129189		314.8500	216.9800	712.4000	2.0000	495.4200	2/23/2017 5:00:00 PM	5.0000	2.0000	3/31/2017 10:20:00 AM
ARS1-B17-00275-21		CAPA-17-129209		317.8800	211.0300	721.8200	2.0000	510.7900	2/23/2017 5:05:00 PM	5.0000	2.0000	3/31/2017 10:55:00 AM
ARS1-B17-00275-22		CAPA-17-129213		331.6000	207.7400	724.6300	2.0000	516.8900	2/23/2017 5:10:00 PM	5.0000	2.0000	3/31/2017 11:00:00 AM
ARS1-B17-00275-23		CAPA-17-129191		318.5200	223.5500	731.0100	2.0000	507.4600	2/23/2017 5:15:00 PM	5.0000	2.0000	3/31/2017 11:20:00 AM

# LCS Report

## Analytical Batch: ARS1-B17-00275

Blind ID	ABatch Sample ID	Blind Group	Std ID	Isotope	Exp Addition (g)	Expected Value (pCi/g)	Empty Wt (g)	Gross Wt (g)	Net Wt (g)	Expected Value CT (pCi/g)	Mid Point Count Date	Known Value (pCi)	User ID	Mod Date
B-23152	ARS1-B17-00275-01	B-H3	S-0318	H-3	5	2.67473	17.1675	22.1334	4.9659	2.65135	03/30/2017	13.16634	JBVRD	02/01/2017
B-23153	ARS1-B17-00275-02	B-H3	S-0318	H-3	5	2.67473	17.1211	22.0965	4.9754	2.65094	03/31/2017	13.18950	JBVRD	02/01/2017

5.8851 dpm/g @ 3/31/17 01:35

**Expected Value Calculations**

**ARS Batch Number:** ARS1-B17 - 00275

LCS	CALCULATED EXPECTED VALUE		=	25.928	Range	19.446	—	32.410
	Current ACT	5.8851						
	NetWt	4.9659						
	Aliquot	0.5077						
Enter these Values								
		Standards Report						
		LCS Report						
		Procedural Data Report						

<div>Enter these Values</div>	CALCULATED EXPECTED VALUE		=	26.078	Range	19.558	—	32.597
	Current ACT	5.8851						
	NetWt	4.9754						
	Aliquot	0.5058						
		Standards Report						
		LCS Report						
		Procedural Data Report						

INTERNATIONAL

LSC Instrument Data Transfer Report

Batch Sample ID

Non-BKG Samples Transferred

21

21

ARS1-B17-00275

LSC Count Date

LSC CPHA

LSC ISIE

LSC EFF

LSC Count Dur

Analysis Batch

LIMS S#G

LIMS Run

LSC S#

LSC PID

LSC P#

LIMS Batch Sample ID

BKG

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

03/30/17 17:13

03/30/17 21:24

03/31/17 01:35

03/31/17 05:46

03/31/17 09:57

03/31/17 14:07

03/31/17 18:18

03/31/17 22:29

04/01/17 02:40

04/01/17 06:51

04/01/17 11:01

04/01/17 15:12

04/03/17 08:34

04/03/17 12:45

04/03/17 16:55

04/03/17 21:06

04/04/17 01:17

04/04/17 05:28

04/04/17 09:39

04/04/17 13:49

04/04/17 18:00

04/04/17 22:11

1.14

3.98

4.32

1.22

1.00

1.15

1.14

1.05

0.88

1.18

1.08

1.12

1.26

1.08

1.04

4.88

1.12

1.03

1.06

1.14

1.11

1.22

407.70

412.01

440.83

424.34

393.16

376.70

425.75

421.30

406.24

479.54

416.96

419.63

415.18

433.71

405.84

418.12

412.19

441.19

434.12

433.78

420.99

418.85

23.5900

23.7500

24.8000

24.2000

23.0600

22.4800

24.2500

24.0900

23.5400

26.2100

23.9300

24.0300

23.8600

24.5400

23.5200

23.9700

23.7500

24.8100

24.5600

24.5400

24.0800

24.0000

240.00

240.00

240.00

240.00

240.00

240.00

240.00

240.00

240.00

240.00

240.00

240.00

240.00

240.00

240.00

240.00

240.00

240.00

240.00

240.00

240.00

240.00

ARS1-B17-00275

ARS1-B17-00275

ARS1-B17-00275

ARS1-B17-00275

ARS1-B17-00275

ARS1-B17-00275

ARS1-B17-00275

ARS1-B17-00275

ARS1-B17-00275

ARS1-B17-00275

ARS1-B17-00275

ARS1-B17-00275

ARS1-B17-00275

ARS1-B17-00275

ARS1-B17-00275

ARS1-B17-00275

ARS1-B17-00275

ARS1-B17-00275

ARS1-B17-00275

ARS1-B17-00275

ARS1-B17-00275

ARS1-B17-00275

ARS1-B17-00275

ARS1-17-00129

ARS1-17-00129

ARS1-17-00129

ARS1-17-00129

ARS1-17-00129

ARS1-17-00129

ARS1-17-00129

ARS1-17-00129

ARS1-17-00129

ARS1-17-00130

ARS1-17-00130

ARS1-17-00180

ARS1-17-00180

ARS1-17-00181

ARS1-17-00181

ARS1-17-00181

ARS1-17-00181

ARS1-17-00181

ARS1-17-00181

ARS1-17-00181

ARS1-17-00181

ARS1-17-00181

ARS1-17-00181

\\Packard3170\\Results\\H3 Low Level\\Low Level H31





ARS-040 Calculation Results

ARS1-B17-00275

ACF 1

UCF 2.22

Sys Error 0.15

AnalysisCode	ABatchSampleID	Total Bkg Count	Duration_min	DF	Sample Activity Conc	Standard Counting Uncertainty	CU 1	CSU 1	CU 1_96	CSU 1_96	MDC	DLC	ActivityReportUnits
LSC-A-022	ARS1-B17-00275-01	240.000	0.97596	0.97596	15.874	0.816	0.816	2.517	1.600	4.933	1.855	0.896	pCI
LSC-A-022	ARS1-B17-00275-02	240.000	0.97596	0.97596	21.424	1.017	1.017	3.371	1.993	6.607	2.239	1.082	pCI
LSC-A-022	ARS1-B17-00275-03	240.000	0.99416	0.99416	0.438	0.557	0.557	0.561	1.091	1.099	1.864	0.900	pCI
LSC-A-022	ARS1-B17-00275-04	240.000	0.98775	0.98775	-0.778	0.510	0.510	0.523	0.999	1.025	1.794	0.866	pCI
LSC-A-022	ARS1-B17-00275-05	240.000	0.98775	0.98775	0.061	0.545	0.545	0.545	1.068	1.068	1.852	0.894	pCI
LSC-A-022	ARS1-B17-00275-06	240.000	0.98791	0.98791	-0.005	0.483	0.483	0.483	0.946	0.946	1.644	0.794	pCI
LSC-A-022	ARS1-B17-00275-07	240.000	0.98775	0.98775	-0.546	0.600	0.600	0.606	1.177	1.188	2.085	1.007	pCI
LSC-A-022	ARS1-B17-00275-08	240.000	0.98745	0.98745	-1.435	0.507	0.507	0.550	0.993	1.079	1.833	0.885	pCI
LSC-A-022	ARS1-B17-00275-09	240.000	0.98745	0.98745	0.203	0.474	0.474	0.475	0.930	0.932	1.601	0.773	pCI
LSC-A-022	ARS1-B17-00275-10	240.000	0.98456	0.98456	-0.315	0.489	0.489	0.491	0.958	0.963	1.688	0.815	pCI
LSC-A-022	ARS1-B17-00275-11	240.000	0.98456	0.98456	-0.115	0.466	0.466	0.466	0.913	0.914	1.595	0.770	pCI
LSC-A-022	ARS1-B17-00275-12	240.000	0.98760	0.98760	0.627	0.514	0.514	0.522	1.007	1.024	1.705	0.823	pCI
LSC-A-022	ARS1-B17-00275-13	240.000	0.98760	0.98760	-0.331	0.531	0.531	0.533	1.040	1.045	1.832	0.885	pCI
LSC-A-022	ARS1-B17-00275-14	240.000	0.98760	0.98760	-0.632	0.621	0.621	0.628	1.217	1.231	2.162	1.044	pCI
LSC-A-022	ARS1-B17-00275-16	240.000	0.98821	0.98821	24.365	1.033	1.033	3.798	2.024	7.444	2.166	1.046	pCI
LSC-A-022	ARS1-B17-00275-17	240.000	0.98836	0.98836	-0.123	0.476	0.476	0.476	0.932	0.933	1.629	0.787	pCI
LSC-A-022	ARS1-B17-00275-18	240.000	0.98745	0.98745	-0.723	0.597	0.597	0.607	1.171	1.190	2.088	1.008	pCI
LSC-A-022	ARS1-B17-00275-20	240.000	0.98760	0.98760	-0.597	0.672	0.672	0.678	1.317	1.329	2.333	1.127	pCI
LSC-A-022	ARS1-B17-00275-21	240.000	0.98760	0.98760	0.023	0.562	0.562	0.562	1.102	1.102	1.913	0.924	pCI
LSC-A-022	ARS1-B17-00275-22	240.000	0.98760	0.98760	-0.172	0.574	0.574	0.574	1.124	1.125	1.966	0.950	pCI
LSC-A-022	ARS1-B17-00275-23	240.000	0.98821	0.98821	0.439	0.580	0.580	0.583	1.136	1.143	1.943	0.938	pCI

ARS-040 Calculation Results

ARS1-B17-00275

ACF 1

UCF 2.22

Sys Error 0.15

AnalysisCode	BatchSampleID	Initial_Mass_sample_g	Mass_Na2O2_added_g	Final_mass_electrolyzed_sample_NaOH_g	Mass_equivalent_NaOH_g	Final_Mass_Electrolyzed_sample_g	VolumeFactor_X	Enrichment_Factor_Y
LSC-A-022	ARS1-B17-00275-01	507.720	2.000	13.390	2.052	11.338	0.022	34.677
LSC-A-022	ARS1-B17-00275-02	505.780	2.000	16.410	2.052	14.358	0.028	27.534
LSC-A-022	ARS1-B17-00275-03	505.130	2.000	14.000	2.052	11.948	0.024	32.812
LSC-A-022	ARS1-B17-00275-04	502.920	2.000	12.680	2.052	10.628	0.021	36.565
LSC-A-022	ARS1-B17-00275-05	500.000	2.000	14.930	2.052	12.878	0.026	30.233
LSC-A-022	ARS1-B17-00275-06	503.100	2.000	12.300	2.052	10.248	0.020	37.880
LSC-A-022	ARS1-B17-00275-07	532.610	2.000	15.830	2.052	13.778	0.026	30.106
LSC-A-022	ARS1-B17-00275-08	536.490	2.000	14.030	2.052	11.978	0.022	34.584
LSC-A-022	ARS1-B17-00275-09	550.460	2.000	11.790	2.052	9.738	0.018	43.378
LSC-A-022	ARS1-B17-00275-10	548.150	2.000	13.480	2.052	11.428	0.021	37.044
LSC-A-022	ARS1-B17-00275-11	532.100	2.000	12.500	2.052	10.448	0.020	39.241
LSC-A-022	ARS1-B17-00275-12	534.250	2.000	13.170	2.052	11.118	0.021	37.109
LSC-A-022	ARS1-B17-00275-13	512.170	2.000	14.530	2.052	12.478	0.024	31.893
LSC-A-022	ARS1-B17-00275-14	512.310	2.000	15.680	2.052	13.628	0.027	29.310
LSC-A-022	ARS1-B17-00275-16	506.130	2.000	15.620	2.052	13.568	0.027	29.093
LSC-A-022	ARS1-B17-00275-17	513.360	2.000	12.400	2.052	10.348	0.020	38.264
LSC-A-022	ARS1-B17-00275-18	503.530	2.000	15.480	2.052	13.428	0.027	29.239
LSC-A-022	ARS1-B17-00275-20	495.420	2.000	16.960	2.052	14.908	0.030	26.034
LSC-A-022	ARS1-B17-00275-21	510.790	2.000	14.380	2.052	12.328	0.024	32.182
LSC-A-022	ARS1-B17-00275-22	516.890	2.000	14.700	2.052	12.648	0.024	31.759
LSC-A-022	ARS1-B17-00275-23	507.460	2.000	14.230	2.052	12.178	0.024	32.359

ARS-040 Calculation Results

ARS1-B17-00275

ACF 1

UCF 2.22

Sys Error 0.15

AnalysisCode	ABatchSampleID	Average_Sample_CPM	Bkg_CPM	tsIE	Detector_Eff_decimal	Aliquot	AliqUnits	Activity_reference_date	Start_Date_of_Count	Sample_Count_Duration_min
LSC-A-022	ARS1-B17-00275-01	3.981	1.140	412.010	0.238	0.01003	L	10/24/2016	3/30/2017	240.000
LSC-A-022	ARS1-B17-00275-02	4.316	1.140	440.830	0.248	0.01002	L	10/24/2016	3/31/2017	240.000
LSC-A-022	ARS1-B17-00275-03	1.218	1.140	424.340	0.242	0.01016	L	2/21/2017	3/31/2017	240.000
LSC-A-022	ARS1-B17-00275-04	0.996	1.140	393.160	0.231	0.01001	L	1/10/2017	3/31/2017	240.000
LSC-A-022	ARS1-B17-00275-05	1.151	1.140	376.700	0.225	0.01203	L	1/10/2017	3/31/2017	240.000
LSC-A-022	ARS1-B17-00275-06	1.139	1.140	425.750	0.243	0.01002	L	1/11/2017	3/31/2017	240.000
LSC-A-022	ARS1-B17-00275-07	1.053	1.140	421.300	0.241	0.01001	L	1/11/2017	3/31/2017	240.000
LSC-A-022	ARS1-B17-00275-08	0.880	1.140	406.240	0.235	0.01012	L	1/9/2017	4/1/2017	240.000
LSC-A-022	ARS1-B17-00275-09	1.182	1.140	479.540	0.262	0.00832	L	1/9/2017	4/1/2017	240.000
LSC-A-022	ARS1-B17-00275-10	1.078	1.140	416.960	0.239	0.01015	L	12/21/2016	4/1/2017	240.000
LSC-A-022	ARS1-B17-00275-11	1.116	1.140	419.630	0.240	0.01010	L	12/21/2016	4/1/2017	240.000
LSC-A-022	ARS1-B17-00275-12	1.262	1.140	415.180	0.239	0.01003	L	1/12/2017	4/3/2017	240.000
LSC-A-022	ARS1-B17-00275-13	1.080	1.140	433.710	0.245	0.01056	L	1/12/2017	4/3/2017	240.000
LSC-A-022	ARS1-B17-00275-14	1.043	1.140	405.840	0.235	0.01016	L	1/12/2017	4/3/2017	240.000
LSC-A-022	ARS1-B17-00275-16	4.875	1.140	418.120	0.240	0.01002	L	1/17/2017	4/3/2017	240.000
LSC-A-022	ARS1-B17-00275-17	1.115	1.140	412.190	0.238	0.01022	L	1/18/2017	4/4/2017	240.000
LSC-A-022	ARS1-B17-00275-18	1.025	1.140	441.190	0.248	0.01000	L	1/12/2017	4/4/2017	240.000
LSC-A-022	ARS1-B17-00275-20	1.055	1.140	434.120	0.246	0.01015	L	1/13/2017	4/4/2017	240.000
LSC-A-022	ARS1-B17-00275-21	1.144	1.140	433.780	0.245	0.01002	L	1/13/2017	4/4/2017	240.000
LSC-A-022	ARS1-B17-00275-22	1.111	1.140	420.990	0.241	0.01007	L	1/13/2017	4/4/2017	240.000
LSC-A-022	ARS1-B17-00275-23	1.215	1.140	418.850	0.240	0.01003	L	1/18/2017	4/4/2017	240.000

**ARS-040 Calculation Results**

**ARS1-B17-00275**

ACF	1
UCF	2.22
Sys Error	0.15

AnalysisCode	ABatchSampleID	AliquotReportUnits	UserID	ModDate
LSC-A-022	ARS1-B17-00275-01	L	AMRAD\SWHITE	4/5/2017
LSC-A-022	ARS1-B17-00275-02	L	AMRAD\SWHITE	4/5/2017
LSC-A-022	ARS1-B17-00275-03	L	AMRAD\SWHITE	4/5/2017
LSC-A-022	ARS1-B17-00275-04	L	AMRAD\SWHITE	4/5/2017
LSC-A-022	ARS1-B17-00275-05	L	AMRAD\SWHITE	4/5/2017
LSC-A-022	ARS1-B17-00275-06	L	AMRAD\SWHITE	4/5/2017
LSC-A-022	ARS1-B17-00275-07	L	AMRAD\SWHITE	4/5/2017
LSC-A-022	ARS1-B17-00275-08	L	AMRAD\SWHITE	4/5/2017
LSC-A-022	ARS1-B17-00275-09	L	AMRAD\SWHITE	4/5/2017
LSC-A-022	ARS1-B17-00275-10	L	AMRAD\SWHITE	4/5/2017
LSC-A-022	ARS1-B17-00275-11	L	AMRAD\SWHITE	4/5/2017
LSC-A-022	ARS1-B17-00275-12	L	AMRAD\SWHITE	4/5/2017
LSC-A-022	ARS1-B17-00275-13	L	AMRAD\SWHITE	4/5/2017
LSC-A-022	ARS1-B17-00275-14	L	AMRAD\SWHITE	4/5/2017
LSC-A-022	ARS1-B17-00275-16	L	AMRAD\SWHITE	4/5/2017
LSC-A-022	ARS1-B17-00275-17	L	AMRAD\SWHITE	4/5/2017
LSC-A-022	ARS1-B17-00275-18	L	AMRAD\SWHITE	4/5/2017
LSC-A-022	ARS1-B17-00275-20	L	AMRAD\SWHITE	4/5/2017
LSC-A-022	ARS1-B17-00275-21	L	AMRAD\SWHITE	4/5/2017
LSC-A-022	ARS1-B17-00275-22	L	AMRAD\SWHITE	4/5/2017
LSC-A-022	ARS1-B17-00275-23	L	AMRAD\SWHITE	4/5/2017

Assay Definition-

Assay Description:  
LLH3 Assay in DPM Mode

Assay Type: DPM (Single)  
Report Name: Report1  
Output Data Path: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\20170330\_1705  
Raw Results Path: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\20170330\_1705.results  
RTF File Name: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\20170330\_1705\LLH3.rtf  
Comma-Delimited File Name: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\20170330\_1705\LLH3 Results.csv  
Assay File Name: C:\Packard\TriCarb\Assays\Low Level H3.1sa

Count Conditions-

Nuclide: Low Level H3  
Quench Indicator: tSIE/AEC  
External Std Terminator (sec): 0.5 2s%  
Pre-Count Delay (min): 0.00  
Quench Set:  
Low Energy: ARS LL H3 10mL  
Count Time (min): 240.00  
Count Mode: Low Level  
Assay Count Cycles: 1 Repeat Sample Count: 1  
#Vials/Sample: 1 Calculate % Reference: Off

Background Subtract: Off  
Low CPM Threshold: Off  
2 Sigma % Terminator: On - Any Region

Regions	LL	UL	2Sigma % Terminator
A	2.0	18.6	0.50
B	0.0	2000.0	0.00
C	0.0	2000.0	0.00

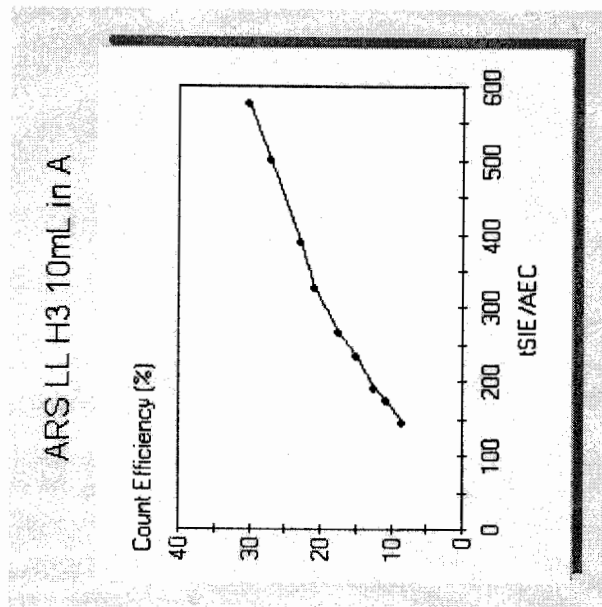
Count Corrections-

Static Controller: On Luminescence Correction: Off  
Colored Samples: Off Heterogeneity Monitor: Off  
Coincidence Time (nsec): 18 Delay Before Burst (nsec): 75  
Half Life-

Half Life Correction: Off  
Regions Half Life Units Reference Date Reference Time

A  
 B  
 C

Cycle 1 Results  
 Quench Curve Block Data



Date Acquired: 08/23/2014  
 Date Modified:  
 ARS LL H3 10mL in A

tSIE/AEC	Count Efficiency (%)
579.14	30.08
502.50	27.05
390.30	22.96
328.76	20.79
269.84	17.56
235.00	14.99
193.53	12.42
175.30	10.70
145.76	8.35

P#	S#	SMPL ID	CPMA	DPM1	tsIE	Eff	Nucl	In A	Count	Time	DATE	TIME	MESSAGES
2	1	BACKGROUND	1.140	4.83	407.70			23.59	240.00		3/30/2017	5:13:55 PM	
2	2	B17-00275-01	3.981	16.76	412.01			23.75	240.00		3/30/2017	9:24:36 PM	
2	3	B17-00275-02	4.316	17.40	440.83			24.80	240.00		3/31/2017	1:35:28 AM	
2	4	B17-00275-03	1.218	5.03	424.34			24.20	240.00		3/31/2017	5:46:21 AM	
2	5	B17-00275-04	0.996	4.32	393.16			23.06	240.00		3/31/2017	9:57:10 AM	
2	6	B17-00275-05	1.151	5.12	376.70			22.48	240.00		3/31/2017	2:07:59 PM	
2	7	B17-00275-06	1.139	4.69	425.75			24.25	240.00		3/31/2017	6:18:49 PM	
2	8	B17-00275-07	1.053	4.37	421.30			24.09	240.00		3/31/2017	10:29:37 PM	
2	9	B17-00275-08	0.880	3.74	406.24			23.54	240.00		4/1/2017	2:40:24 AM	
2	10	B17-00275-09	1.182	4.51	479.54			26.21	240.00		4/1/2017	6:51:12 AM	
2	11	B17-00275-10	1.078	4.50	416.96			23.93	240.00		4/1/2017	11:01:59 AM	
2	12	B17-00275-11	1.116	4.65	419.63			24.03	240.00		4/1/2017	3:12:47 PM	
2	13	B17-00275-12	1.262	5.29	415.18			23.86	240.00		4/3/2017	8:34:17 AM	
2	14	B17-00275-13	1.080	4.40	433.71			24.54	240.00		4/3/2017	12:45:03 PM	
2	15	B17-00275-14	1.043	4.44	405.84			23.52	240.00		4/3/2017	4:55:51 PM	
2	16	B17-00275-16	4.875	20.34	418.12			23.97	240.00		4/3/2017	9:06:42 PM	
2	17	B17-00275-17	1.115	4.69	412.19			23.75	240.00		4/4/2017	1:17:29 AM	
2	18	B17-00275-18	1.025	4.13	441.19			24.81	240.00		4/4/2017	5:28:17 AM	
2	19	B17-00275-20	1.055	4.29	434.12			24.56	240.00		4/4/2017	9:39:08 AM	
2	20	B17-00275-21	1.144	4.66	433.78			24.54	240.00		4/4/2017	1:49:55 PM	
2	21	B17-00275-22	1.111	4.61	420.99			24.08	240.00		4/4/2017	6:00:39 PM	
2	22	B17-00275-23	1.215	5.06	418.85			24.00	240.00		4/4/2017	10:11:24 PM	



**Procedure Data**

Abatch Sample ID	Client ID	Parent	End Bath (C)	End Wt of Cell + Resv + Sample	Gross Sample Recovered	Enrichment Factor	Tare Wt Cryo- distill flask	Gross Wt flask + Sample	Recovered Water	Tare Weight of LSC Vial	Vial + Sample
ARS1-B17-00275-01			2.0000	565.3600	13.3900	37.9178	123.3600	134.2600	10.9000	6.4800	16.5100
ARS1-B17-00275-02			2.0000	546.2100	16.4100	30.8215	94.0200	105.0200	11.0000	6.5900	16.6100
ARS1-B17-00275-03			2.0000	574.6400	14.0000	36.0807	110.7500	122.6000	11.8500	6.6200	16.7800
ARS1-B17-00275-04	CAPA-17-129178		2.0000	533.4000	12.6800	39.6625	123.2200	133.6400	10.4200	6.5500	16.5600
ARS1-B17-00275-05	CAPA-17-129183		2.0000	553.1200	14.9300	33.4896	111.0000	122.8300	11.8300	6.5700	18.6000
ARS1-B17-00275-06	CAPA-17-129187		2.0000	545.3200	12.3000	40.9024	123.0400	133.2900	10.2500	6.6500	16.6700
ARS1-B17-00275-07	CAPA-17-129188		2.0000	526.2000	15.8300	33.6456	103.6700	115.2700	11.6000	6.6500	16.6600
ARS1-B17-00275-08	CAPA-17-129190		2.0000	548.9000	14.0300	38.2388	107.2900	119.6400	12.3500	6.5400	16.6600
ARS1-B17-00275-09	CAPA-17-129192		2.0000	547.4500	11.7900	46.6887	118.7300	126.7700	8.0400	6.5900	14.9100
ARS1-B17-00275-10	CAWA-17-127948		2.0000	564.6800	13.4800	40.6639	118.0500	130.6400	12.5900	6.6400	16.7900
ARS1-B17-00275-11	CAWA-17-127911		2.0000	522.8400	12.5000	42.5680	110.5700	121.1000	10.5300	6.4700	16.5700
ARS1-B17-00275-12	CAWR-17-127835		2.0000	577.6700	13.1700	40.5657	118.7500	129.8900	11.1400	6.5400	16.5700
ARS1-B17-00275-13	CAWR-17-127836		2.0000	608.7400	14.5300	35.2491	100.4300	110.8200	10.3900	6.6400	17.2000
ARS1-B17-00275-14	CAPA-17-129179		2.0000	564.5100	15.6800	32.6728	97.3800	109.0300	11.6500	6.6300	16.7900
ARS1-B17-00275-16	CAPA-17-129181		2.0000	611.5400	15.6200	32.4027	114.3500	126.2500	11.9000	6.6000	16.6200
ARS1-B17-00275-17	CAPA-17-129182		2.0000	587.5700	12.4000	41.4000	103.6100	114.2100	10.6000	6.4900	16.7100
ARS1-B17-00275-18	CAPA-17-129184		2.0000	540.0500	15.4800	32.5278	114.4400	126.8200	12.3800	6.6300	16.6300
ARS1-B17-00275-20	CAPA-17-129189		2.0000	548.7900	16.9600	29.2111	110.9400	124.6700	13.7300	6.4400	16.5900
ARS1-B17-00275-21	CAPA-17-129209		2.0000	543.2900	14.3800	35.5209	103.7600	114.1200	10.3600	6.5700	16.5900
ARS1-B17-00275-22	CAPA-17-129213		2.0000	554.0400	14.7000	35.1626	103.3800	114.7300	11.3500	6.5500	16.6200
ARS1-B17-00275-23	CAPA-17-129191		2.0000	556.3000	14.2300	35.6613	110.4200	122.6400	12.2200	6.8300	16.8600

Procedure Data		Client ID	Parent	Net Sample	Gross Wt Vial + Dead Water If used	Net Dead Water Added	Tare Wt b/f Cocktail	Gross Wt Vial + Cocktail	Net Wt of Cocktail Added	User ID
ABatch Sample ID										
ARS1-B17-00275-01				10.0300	16.5100	0.0000	16.5100	26.5600	10.0500	SWHITE
ARS1-B17-00275-02				10.0200	16.6100	0.0000	16.6100	26.7200	10.1100	SWHITE
ARS1-B17-00275-03				10.1600	16.7800	0.0000	16.7800	26.8700	10.0900	SWHITE
ARS1-B17-00275-04	CAPA-17-129178			10.0100	16.5600	0.0000	16.5600	26.5300	9.9700	SWHITE
ARS1-B17-00275-05	CAPA-17-129183			12.0300	18.6000	0.0000	18.6000	28.5500	9.9500	SWHITE
ARS1-B17-00275-06	CAPA-17-129187			10.0200	16.6700	0.0000	16.6700	26.7000	10.0300	SWHITE
ARS1-B17-00275-07	CAPA-17-129188			10.0100	16.6600	0.0000	16.6600	26.7700	10.1100	SWHITE
ARS1-B17-00275-08	CAPA-17-129190			10.1200	16.6600	0.0000	16.6600	26.6600	10.0000	SWHITE
ARS1-B17-00275-09	CAPA-17-129192			8.3200	14.9100	0.0000	14.9100	24.9300	10.0200	SWHITE
ARS1-B17-00275-10	CAWA-17-127948			10.1500	16.7900	0.0000	16.7900	26.8700	10.0800	SWHITE
ARS1-B17-00275-11	CAWA-17-127911			10.1000	16.5700	0.0000	16.5700	26.5900	10.0200	SWHITE
ARS1-B17-00275-12	CAWR-17-127835			10.0300	16.5700	0.0000	16.5700		-16.5700	SWHITE
ARS1-B17-00275-13	CAWR-17-127836			10.5600	17.2000	0.0000	17.2000	27.2400	10.0400	SWHITE
ARS1-B17-00275-14	CAPA-17-129179			10.1600	16.7900	0.0000	16.7900	26.8800	10.0900	SWHITE
ARS1-B17-00275-16	CAPA-17-129181			10.0200	16.6200	0.0000	16.6200	26.7000	10.0800	SWHITE
ARS1-B17-00275-17	CAPA-17-129182			10.2200	16.7100	0.0000	16.7100	26.7900	10.0800	SWHITE
ARS1-B17-00275-18	CAPA-17-129184			10.0000	16.6300	0.0000	16.6300	26.6500	10.0200	SWHITE
ARS1-B17-00275-20	CAPA-17-129189			10.1500	16.5900	0.0000	16.5900	26.6800	10.0900	SWHITE
ARS1-B17-00275-21	CAPA-17-129209			10.0200	16.5900	0.0000	16.5900	26.6800	10.0900	SWHITE
ARS1-B17-00275-22	CAPA-17-129213			10.0700	16.6200	0.0000	16.6200	26.6800	10.0600	SWHITE
ARS1-B17-00275-23	CAPA-17-129191			10.0300	16.8600	0.0000	16.8600	26.8600	10.0000	SWHITE

Reagent Amounts				
Batch Sample ID	Client ID	14.2.12 DISTILLAT - Ionize & add O to electrolysis - Sodium Peroxide (granular) Reagent Grade (g)	14.3.22 DISTILLATION - Add scint cocktail - Ultima Gold LLT Reagent Grade (mL)	User ID
ARS1-B17-00275-01		2.00	10.00	SWHITE
ARS1-B17-00275-02		2.00	10.00	SWHITE
ARS1-B17-00275-03		2.00	10.00	SWHITE
ARS1-B17-00275-04	CAPA-17-129178	2.00	10.00	SWHITE
ARS1-B17-00275-05	CAPA-17-129183	2.00	10.00	SWHITE
ARS1-B17-00275-06	CAPA-17-129187	2.00	10.00	SWHITE
ARS1-B17-00275-07	CAPA-17-129188	2.00	10.00	SWHITE
ARS1-B17-00275-08	CAPA-17-129190	2.00	10.00	SWHITE
ARS1-B17-00275-09	CAPA-17-129192	2.00	10.00	SWHITE
ARS1-B17-00275-10	CAWA-17-127948	2.00	10.00	SWHITE
ARS1-B17-00275-11	CAWA-17-127911	2.00	10.00	SWHITE
ARS1-B17-00275-12	CAWR-17-127835	2.00	10.00	SWHITE
ARS1-B17-00275-13	CAWR-17-127836	2.00	10.00	SWHITE
ARS1-B17-00275-14	CAPA-17-129179	2.00	10.00	SWHITE
ARS1-B17-00275-16	CAPA-17-129181	2.00	10.00	SWHITE
ARS1-B17-00275-17	CAPA-17-129182	2.00	10.00	SWHITE
ARS1-B17-00275-18	CAPA-17-129184	2.00	10.00	SWHITE
ARS1-B17-00275-20	CAPA-17-129189	2.00	10.00	SWHITE
ARS1-B17-00275-21	CAPA-17-129209	2.00	10.00	SWHITE
ARS1-B17-00275-22	CAPA-17-129213	2.00	10.00	SWHITE
ARS1-B17-00275-23	CAPA-17-129191	2.00	10.00	SWHITE

Reagent Tracking	
Procedure Section	Reagent ID
14.2.12 DISTILLAT - Ionize & add O to electrolysis	R16-00810
14.3.22 DISTILLATION - Add scint cocktail	R16-00057

# Beta Liquid Scintillation Counter Log Book

Date	Time	ARS Sample I.D. Number	Batch Number	Liquid Scintillation File Number	Technician Initials
3-13-17	0920	Background	B17-00420	1052	EC
↓	↓	B17-00420-07	↓	1052	EC
3-24-17	15:45	SVC 9	QA	QA	SL
3-24-17	16:20	Background	B17-00517	1722	SL
↓	↓	B17-00517-01	↓	1722	SL
↓	↓	08	↓	↓	SL
↓	↓	09	↓	↓	SL
↓	↓	10	↓	↓	SL
↓	↓	11	↓	↓	SL
↓	↓	12	↓	↓	SL
↓	↓	13	↓	↓	SL
↓	↓	14	↓	↓	SL
↓	↓	15	↓	↓	SL
↓	↓	16	↓	↓	SL
↓	↓	17	↓	↓	SL
↓	↓	18	↓	↓	SL
3-30-17	15:25	SVC 9	QA	QA	SL
3-30-17	17:00	Background	B17-00275	1705	SL
↓	↓	B17-00275-01	↓	↓	SL
↓	↓	02	↓	↓	SL

\*B17-00517  
00519  
3-27-17  
SL

# Beta Liquid Scintillation Counter Log Book

Date	Time	ARS Sample I.D. Number	Batch Number	Liquid Scintillation File Number	Technician Initials
3-30-17	17:00	B17-00275-03	B17-00275	1703	SLW
		04			SLW
		05			SLW
		06			SLW
		07			SLW
		08			SLW
		09			SLW
		10			SLW
		11			SLW
		12			SLW
		13			SLW
		14			SLW
		16			SLW
		17			SLW
		18			SLW
		20			SLW
		21			SLW
		22			SLW
<del>4-5-17</del>					<del>SLW</del>



2609 North River Road • Port Allen, Louisiana 70767

1 (800) 401-4277 • Fax (225) 381-2996

# **American Radiation Services Analytical Reports**

for

**Los Alamos National Laboratory**

**Low Level Tritium**

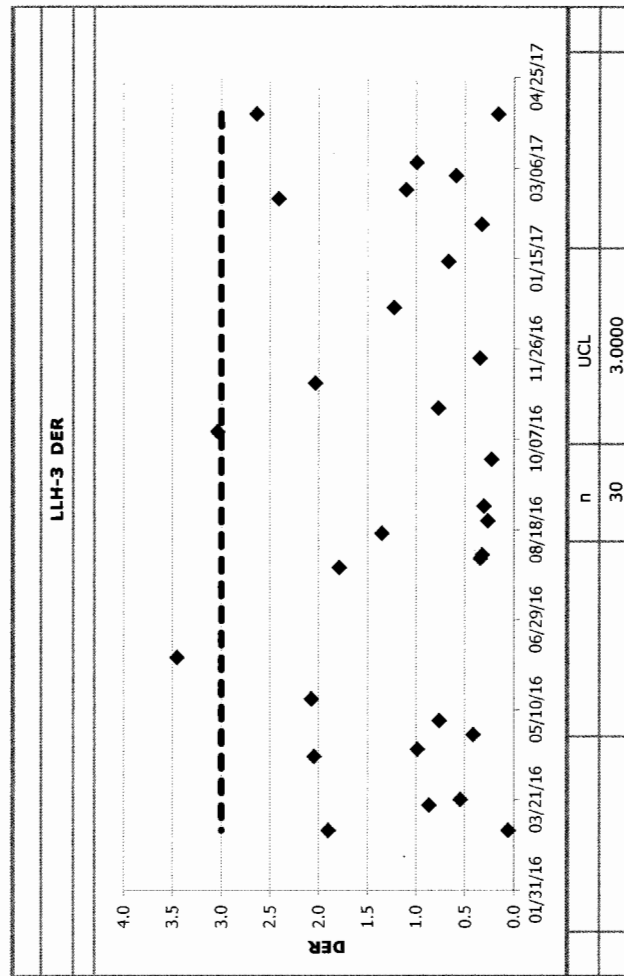
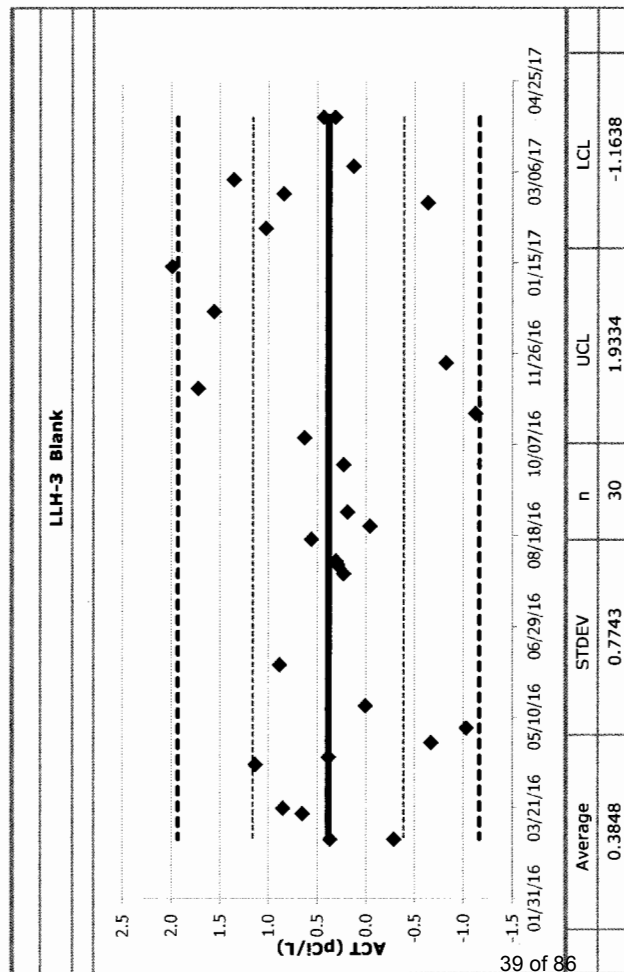
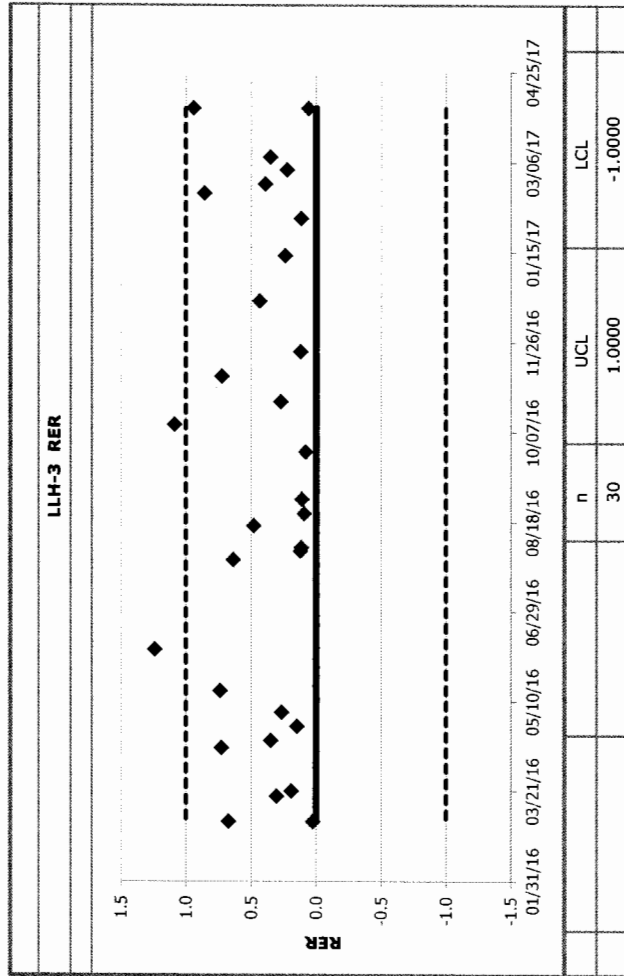
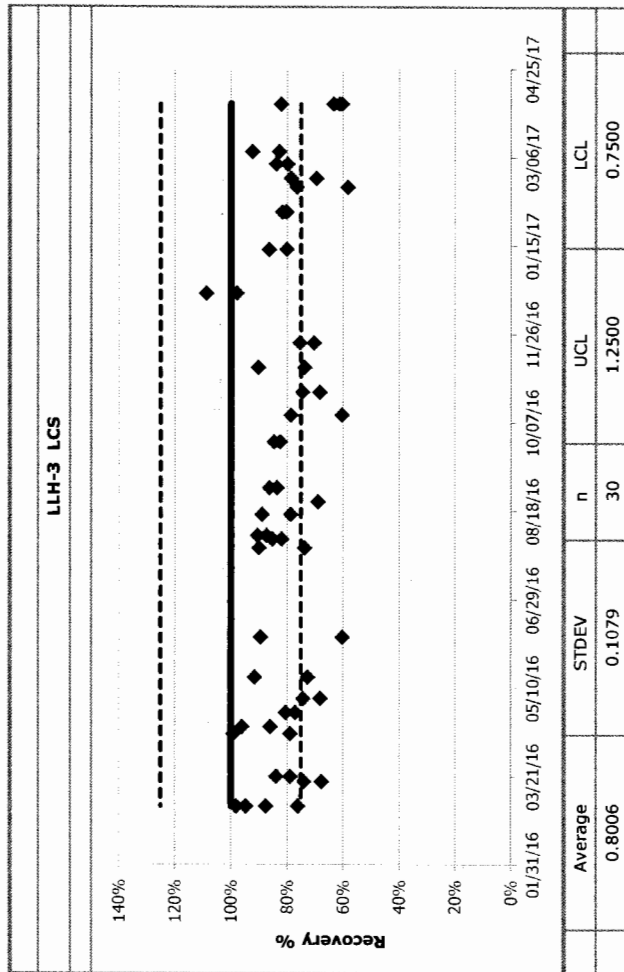
by

**Low Level Liquid  
Scintillation Counting**

**Control Charts**



# QC Chart



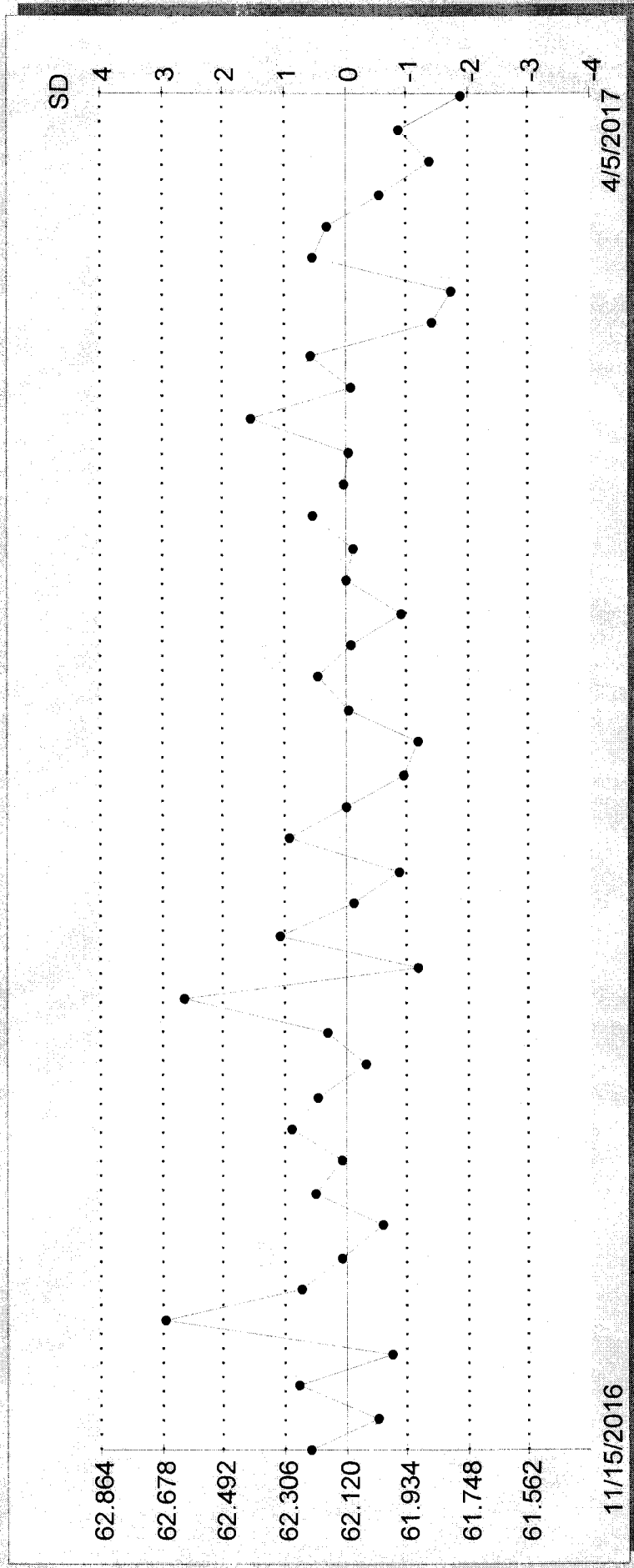
## 3H Efficiency

Total # pts : 6429  
Valid # pts : 43  
Mean : 62.12  
SD : 0.19

Date	Value	Valid Pt
Nov 15, 2016	62.23	X
Nov 15, 2016	62.02	X
Nov 18, 2016	62.26	X
Nov 18, 2016	61.98	X
Nov 20, 2016	62.67	X
Nov 21, 2016	62.25	X
Nov 24, 2016	62.13	X
Nov 28, 2016	62.01	X
Dec 07, 2016	62.21	X
Dec 12, 2016	62.13	X
Dec 16, 2016	62.28	X
Dec 21, 2016	62.20	X
Dec 22, 2016	62.06	X
Dec 27, 2016	62.18	X
Dec 29, 2016	62.61	X
Jan 04, 2017	61.90	X
Jan 05, 2017	62.32	X
Jan 05, 2017	62.10	X
Jan 05, 2017	61.95	X
Jan 05, 2017	62.29	X
Jan 05, 2017	62.12	X
Jan 05, 2017	61.95	X
Jan 05, 2017	61.90	X
Jan 09, 2017	62.11	X
Jan 12, 2017	62.21	X
Jan 27, 2017	62.10	X
Jan 29, 2017	61.95	X
Jan 30, 2017	62.12	X
Feb 03, 2017	62.10	X
Feb 03, 2017	62.22	X
Feb 15, 2017	62.13	X
Feb 17, 2017	62.11	X
Feb 17, 2017	62.41	X
Feb 22, 2017	62.10	X
Feb <sup>4</sup> 23, 2017	62.23	X
Feb <sup>8</sup> 27, 2017	61.86	X
Mar <sup>6</sup> 03, 2017	61.80	X
Mar 10, 2017	62.22	X
Mar 13, 2017	62.17	X
Mar 13, 2017	62.02	X
Mar 24, 2017	61.87	X
Mar 30, 2017	61.96	X



3H Efficiency : 6429  
Total # pts : 43  
Valid # pts : 62.12  
Mean : 62.12  
SD : 0.19



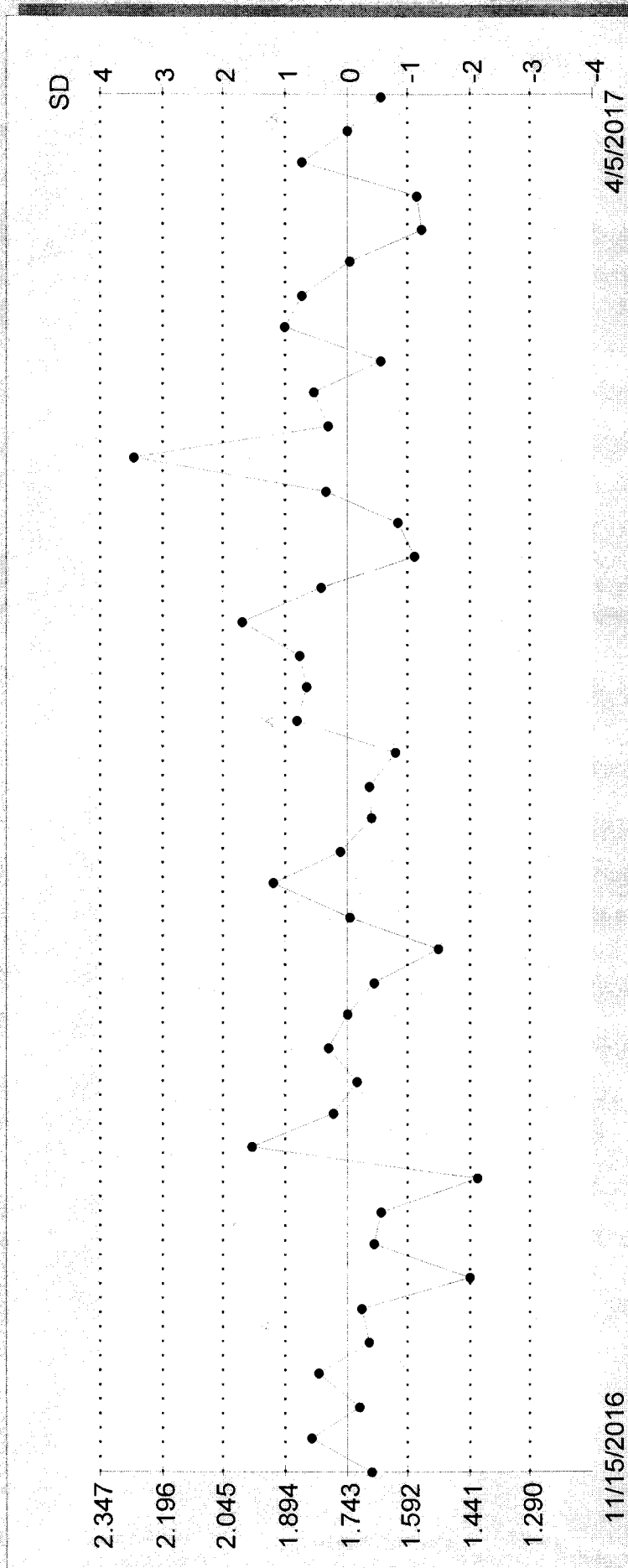
3H Background

Total # pts : 6350  
Valid # pts : 43  
Mean : 1.74  
SD : 0.15

Date	Value	Valid Pt
Nov 15, 2016	1.68	X
Nov 15, 2016	1.83	X
Nov 18, 2016	1.71	X
Nov 18, 2016	1.81	X
Nov 20, 2016	1.69	X
Nov 21, 2016	1.70	X
Nov 24, 2016	1.44	X
Nov 28, 2016	1.67	X
Dec 07, 2016	1.66	X
Dec 12, 2016	1.42	X
Dec 16, 2016	1.98	X
Dec 21, 2016	1.77	X
Dec 22, 2016	1.72	X
Dec 27, 2016	1.79	X
Dec 29, 2016	1.74	X
Jan 04, 2017	1.67	X
Jan 05, 2017	1.52	X
Jan 05, 2017	1.73	X
Jan 05, 2017	1.92	X
Jan 05, 2017	1.76	X
Jan 05, 2017	1.68	X
Jan 05, 2017	1.69	X
Jan 05, 2017	1.63	X
Jan 09, 2017	1.87	X
Jan 12, 2017	1.84	X
Jan 27, 2017	1.86	X
Jan 29, 2017	2.00	X
Jan 30, 2017	1.81	X
Feb 03, 2017	1.58	X
Feb 03, 2017	1.62	X
Feb 15, 2017	1.79	X
Feb 17, 2017	2.26	X
Feb 17, 2017	1.79	X
Feb 22, 2017	1.82	X
Feb 23, 2017	1.66	X
Feb 27, 2017	1.90	X
Mar 03, 2017	1.85	X
Mar 10, 2017	1.74	X
Mar 13, 2017	1.56	X
Mar 13, 2017	1.57	X
Mar 24, 2017	1.85	X
Mar 30, 2017	1.74	X



3H Background  
Total # pts : 6350  
Valid # pts : 43  
Mean : 1.74  
SD : 0.15





2609 North River Road • Port Allen, Louisiana 70767

1 (800) 401-4277 • Fax (225) 381-2996

# **American Radiation Services Analytical Reports**

**for**

**Los Alamos National Laboratory**

## **Tritium- Screening by Low Level Liquid Scintillation Counting**





2609 North River Road • Port Allen, Louisiana 70767

1 (800) 401-4277 • Fax (225) 381-2996

# **American Radiation Services Analytical Reports**

for

**Los Alamos National Laboratory**

## **Tritium-Screening by Low Level Liquid Scintillation Counting Samples**

ARS File ID Numbers: ARS1-B17-00165  
ARS Batch ID: ARS1-B17-00165

Sample ID:	COUNT TIME	CPMA	Background CPMA	Eff Nucl In A	Aliquot (grams)	ACTIVITY	units	MDA	Sample Must be analyzed as LSC-A-001
1 B17-00165-04	120	1.078	0.842	22.87	10.00	46.483	pCi/L	98.61051	NO
2 B17-00165-05	120	1.042	0.842	21.43	10.00	42.039	pCi/L	105.2367	NO
3 B17-00165-06	120	0.975	0.842	22	10.00	27.232	pCi/L	102.5101	NO
4 B17-00165-07	120	1.303	0.842	22.69	10.00	91.519	pCi/L	99.39279	NO
5 B17-00165-08	120	0.961	0.842	22.61	10.00	23.708	pCi/L	99.74447	NO
6 B17-00165-09	120	1.177	0.842	22.71	10.00	66.447	pCi/L	99.30526	NO
7 B17-00165-10	120	1.132	0.842	22.79	10.00	57.319	pCi/L	98.95666	NO
8 B17-00165-11	120	1.184	0.842	22.76	10.00	67.686	pCi/L	99.0871	NO
9 B17-00165-12	120	1.088	0.842	22.59	10.00	49.053	pCi/L	99.83277	NO
10 B17-00165-13	120	0.992	0.842	22.85	10.00	29.570	pCi/L	98.69682	NO
11 B17-00165-14	120	1.219	0.842	22.57	10.00	75.241	pCi/L	99.92124	NO
12 B17-00165-15	120	1.291	0.842	22.92	10.00	88.243	pCi/L	98.39539	NO
13 B17-00165-16	120	1.367	0.842	22.68	10.00	104.271	pCi/L	99.43661	YES, analyze by LSC-A-001.
14 B17-00165-17	120	1.186	0.842	22.69	10.00	68.292	pCi/L	99.39279	NO
15 B17-00165-18	120	1.468	0.842	22.8	10.00	123.676	pCi/L	98.91326	YES, analyze by LSC-A-001.
16 B17-00165-19	120	1.285	0.842	22.67	10.00	88.024	pCi/L	99.48047	NO
17 B17-00165-20	120	1.059	0.842	22.96	10.00	42.573	pCi/L	98.22397	NO
18 B17-00165-21	120	1.198	0.842	22.95	10.00	69.874	pCi/L	98.26677	NO
19 B17-00165-22	120	1.241	0.842	22.68	10.00	79.246	pCi/L	99.43661	NO
20 B17-00165-23	120	1.409	0.842	22.88	10.00	111.628	pCi/L	98.56741	YES, analyze by LSC-A-001.
21						#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
22						#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
23						#DIV/0!	pCi/L	#DIV/0!	#DIV/0!

Run all samples  
by LSC-A-022 (ARS-040)  
Sheet 1-30-17



2609 North River Road • Port Allen, Louisiana 70767

1 (800) 401-4277 • Fax (225) 381-2996

# **American Radiation Services Analytical Reports**

for

**Los Alamos National Laboratory**

## **Tritium-Screening by Low Level Liquid Scintillation Counting Laboratory Records**

# Analytical Batch Report



## Analysis Batch ID ARS1-B17-00165

INTERNATIONAL											
Method		ARS-054		Analysis		LSC-A-021		Matrix		AQ	
Description Low Level Tritium Screening											
ABatch Sample ID	Type	Blind Iso1	Blind Iso2	Blind Iso3	SDG	FR	Run	Prep Code	Client ID	Group Name	Lab Deadline
ARS1-B17-00165-01	LCS										
ARS1-B17-00165-02	LCSD										
ARS1-B17-00165-03	MBL										
ARS1-B17-00165-04	TRG				ARS1-17-00129	001	1		CAPA-17-129178	STD	02/19/17
ARS1-B17-00165-05	TRG				ARS1-17-00129	002	1		CAPA-17-129183	STD	02/19/17
ARS1-B17-00165-06	TRG				ARS1-17-00129	003	1		CAPA-17-129187	STD	02/19/17
ARS1-B17-00165-07	TRG				ARS1-17-00129	004	1		CAPA-17-129188	STD	02/19/17
ARS1-B17-00165-08	TRG				ARS1-17-00129	005	1		CAPA-17-129190	STD	02/19/17
ARS1-B17-00165-09	TRG				ARS1-17-00129	006	1		CAPA-17-129192	STD	02/19/17
ARS1-B17-00165-10	TRG				ARS1-17-00130	001	1		CAWA-17-127948	STD	02/19/17
ARS1-B17-00165-11	TRG				ARS1-17-00130	002	1		CAWA-17-127911	STD	02/19/17
ARS1-B17-00165-12	TRG				ARS1-17-00180	001	1		CAWR-17-127835	STD	02/26/17
ARS1-B17-00165-13	TRG				ARS1-17-00180	002	1		CAWR-17-127836	STD	02/26/17
ARS1-B17-00165-14	TRG				ARS1-17-00181	001	1		CAPA-17-129179	STD	02/26/17
ARS1-B17-00165-15	TRG				ARS1-17-00181	002	1		CAPA-17-129180	STD	02/26/17
ARS1-B17-00165-16	TRG				ARS1-17-00181	003	1		CAPA-17-129181	STD	02/26/17
ARS1-B17-00165-17	TRG				ARS1-17-00181	004	1		CAPA-17-129182	STD	02/26/17
ARS1-B17-00165-18	TRG				ARS1-17-00181	005	1		CAPA-17-129184	STD	02/26/17
ARS1-B17-00165-19	TRG				ARS1-17-00181	006	1		CAPA-17-129186	STD	02/26/17
ARS1-B17-00165-20	TRG				ARS1-17-00181	007	1		CAPA-17-129189	STD	02/26/17
ARS1-B17-00165-21	TRG				ARS1-17-00181	008	1		CAPA-17-129209	STD	02/26/17
ARS1-B17-00165-22	TRG				ARS1-17-00181	009	1		CAPA-17-129213	STD	02/26/17
ARS1-B17-00165-23	TRG				ARS1-17-00181	010	1		CAPA-17-129191	STD	02/26/17

**Procedure Data**

ABatch Sample ID	Client ID	Parent	ICOC ID	Aliquot 1 Vol/Wt	Aliquot 1 Units	Aliquot 2 Vol/Wt	Aliquot 2 Units	User ID
ARS1-B17-00165-01								SWHITE
ARS1-B17-00165-02								SWHITE
ARS1-B17-00165-03								SWHITE
ARS1-B17-00165-04	CAPA-17-129178		256058	0.0100 L				SWHITE
ARS1-B17-00165-05	CAPA-17-129183		256059	0.0100 L				SWHITE
ARS1-B17-00165-06	CAPA-17-129187		256060	0.0100 L				SWHITE
ARS1-B17-00165-07	CAPA-17-129188		256061	0.0100 L				SWHITE
ARS1-B17-00165-08	CAPA-17-129190		256062	0.0100 L				SWHITE
ARS1-B17-00165-09	CAPA-17-129192		256063	0.0100 L				SWHITE
ARS1-B17-00165-10	CAWA-17-127948		256064	0.0100 L				SWHITE
ARS1-B17-00165-11	CAWA-17-127911		256065	0.0100 L				SWHITE
ARS1-B17-00165-12	CAWR-17-127835		256066	0.0100 L				SWHITE
ARS1-B17-00165-13	CAWR-17-127836		256067	0.0100 L				SWHITE
ARS1-B17-00165-14	CAPA-17-129179		256068	0.0100 L				SWHITE
ARS1-B17-00165-15	CAPA-17-129180		256069	0.0100 L				SWHITE
ARS1-B17-00165-16	CAPA-17-129181		256070	0.0100 L				SWHITE
ARS1-B17-00165-17	CAPA-17-129182		256071	0.0100 L				SWHITE
ARS1-B17-00165-18	CAPA-17-129184		256072	0.0100 L				SWHITE
ARS1-B17-00165-19	CAPA-17-129186		256073	0.0100 L				SWHITE
ARS1-B17-00165-20	CAPA-17-129189		256074	0.0100 L				SWHITE
ARS1-B17-00165-21	CAPA-17-129209		256075	0.0100 L				SWHITE
ARS1-B17-00165-22	CAPA-17-129213		256076	0.0100 L				SWHITE
ARS1-B17-00165-23	CAPA-17-129191		256077	0.0100 L				SWHITE

### Reagent Amounts

ABatch Sample ID	Client ID	14.1.5 OPTIONAL AQ W/O DIST - Add scint cocktail - Ultima Gold LLT Reagent Grade (mL)	User ID
ARS1-B17-00165-01		10.00	SWHITE
ARS1-B17-00165-02		10.00	SWHITE
ARS1-B17-00165-03		10.00	SWHITE
ARS1-B17-00165-04	CAPA-17-129178	10.00	SWHITE
ARS1-B17-00165-05	CAPA-17-129183	10.00	SWHITE
ARS1-B17-00165-06	CAPA-17-129187	10.00	SWHITE
ARS1-B17-00165-07	CAPA-17-129188	10.00	SWHITE
ARS1-B17-00165-08	CAPA-17-129190	10.00	SWHITE
ARS1-B17-00165-09	CAPA-17-129192	10.00	SWHITE
ARS1-B17-00165-10	CAWA-17-127948	10.00	SWHITE
ARS1-B17-00165-11	CAWA-17-127911	10.00	SWHITE
ARS1-B17-00165-12	CAWR-17-127835	10.00	SWHITE
ARS1-B17-00165-13	CAWR-17-127836	10.00	SWHITE
ARS1-B17-00165-14	CAPA-17-129179	10.00	SWHITE
ARS1-B17-00165-15	CAPA-17-129180	10.00	SWHITE
ARS1-B17-00165-16	CAPA-17-129181	10.00	SWHITE
ARS1-B17-00165-17	CAPA-17-129182	10.00	SWHITE
ARS1-B17-00165-18	CAPA-17-129184	10.00	SWHITE
ARS1-B17-00165-19	CAPA-17-129186	10.00	SWHITE
ARS1-B17-00165-20	CAPA-17-129189	10.00	SWHITE
ARS1-B17-00165-21	CAPA-17-129209	10.00	SWHITE
ARS1-B17-00165-22	CAPA-17-129213	10.00	SWHITE
ARS1-B17-00165-23	CAPA-17-129191	10.00	SWHITE

**Reagent Tracking**

**Procedure Section**

14.1.5 OPTIONAL AQ W/O DIST - Add scint cocktail

**Reagent ID**

R16-00057

Assay Definition-

Assay Description:

LLH3 Assay in DPM Mode

Assay Type: DPM (Single)

Report Name: Report1

Output Data Path: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\_3\20170127\_1759

Raw Results Path: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\_3\20170127\_1759\20170127\_1759.results

RTF File Name: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\_3\20170127\_1759\LLH3.rtf

Comma-Delimited File Name: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\_3\20170127\_1759\LLH3 Results.csv

Assay File Name: C:\Packard\Tricarb\Assays\Low Level H3\_3.lsa

Count Conditions-

Nuclide: Low Level H3

Quench Indicator: tSIE/AEC

External Std Terminator (sec): 0.5 2s%

Pre-Count Delay (min): 0.00

Quench Set:

Low Energy: ARS LL H3 10mL

Count Time (min): 120.00

Count Mode: Low Level

Assay Count Cycles: 1

#Vials/Sample: 1

Repeat Sample Count: 1

Calculate % Reference: Off

Background Subtract: Off

Low CPM Threshold: Off

2 Sigma % Terminator: On - Any Region

Regions	LL	UL	2Sigma % Terminator
A	2.0	18.6	0.50
B	0.0	2000.0	0.00
C	0.0	2000.0	0.00

Count Corrections-

Static Controller: On

Colored Samples: Off

Coincidence Time (nsec): 18

Half Life-

Luminescence Correction: Off

Heterogeneity Monitor: Off

Delay Before Burst (nsec): 75

Half Life Correction: Off

Regions Half Life

Units Reference Date

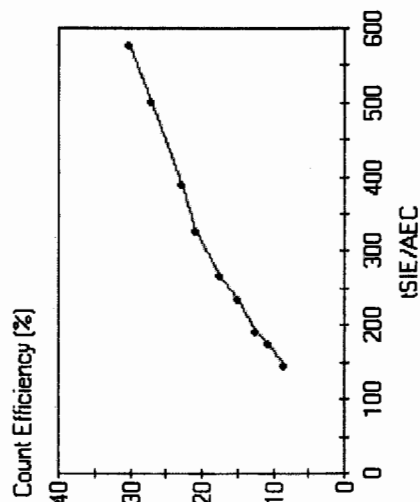
Reference Time



A  
 B  
 C

Cycle 1 Results  
 Quench Curve Block Data

ARS LL H3 10mL in A



Date Acquired: 08/23/2014  
 Date Modified:  
 ARS LL H3 10mL in A

tSIE/AEC	Count Efficiency (%)
579.14	30.08
502.50	27.05
390.30	22.96
328.76	20.79
269.84	17.56
235.00	14.99
193.53	12.42
175.30	10.70
145.76	8.35

P#	S#	SMPL_ID	CPMA	DPM1	TSIE	Eff Nuc1	In A	Count Time	DATE	TIME	MESSAGES
10	1	BACKGROUND	0.842	3.69	385.45	22.79	120.00	1/27/2017	6:08:33 PM		
10	2	B17-00165-04	1.078	4.71	387.87	22.87	120.00	1/27/2017	8:18:19 PM		
10	3	B17-00165-05	1.042	4.86	346.91	21.43	120.00	1/27/2017	10:28:07 PM		
10	4	B17-00165-06	0.975	4.43	363.07	22.00	120.00	1/28/2017	12:37:53 AM		
10	5	B17-00165-07	1.303	5.74	382.62	22.69	120.00	1/28/2017	2:47:41 AM		
10	6	B17-00165-08	0.961	4.25	380.55	22.61	120.00	1/28/2017	4:57:30 AM		
10	7	B17-00165-09	1.177	5.18	383.31	22.71	120.00	1/28/2017	7:07:17 AM		
10	8	B17-00165-10	1.132	4.97	385.53	22.79	120.00	1/28/2017	9:17:04 AM		
10	9	B17-00165-11	1.184	5.20	384.76	22.76	120.00	1/28/2017	11:26:53 AM		
10	10	B17-00165-12	1.088	4.81	379.94	22.59	120.00	1/28/2017	1:36:39 PM		
10	11	B17-00165-13	0.992	4.34	387.28	22.85	120.00	1/28/2017	3:46:25 PM		
10	12	B17-00165-14	1.219	5.40	379.43	22.57	120.00	1/28/2017	5:56:13 PM		
10	13	B17-00165-15	1.291	5.63	389.35	22.92	120.00	1/28/2017	8:06:05 PM		
10	14	B17-00165-16	1.367	6.03	382.33	22.68	120.00	1/28/2017	10:15:50 PM		
10	15	B17-00165-17	1.186	5.23	382.62	22.69	120.00	1/29/2017	12:25:35 AM		
10	16	B17-00165-18	1.468	6.44	386.00	22.80	120.00	1/29/2017	2:35:22 AM		
10	17	B17-00165-19	1.285	5.67	382.17	22.67	120.00	1/29/2017	4:45:09 AM		
10	18	B17-00165-20	1.059	4.61	390.30	22.96	120.00	1/29/2017	6:54:54 AM		
10	19	B17-00165-21	1.198	5.22	390.08	22.95	120.00	1/29/2017	9:04:40 AM		
10	20	B17-00165-22	1.241	5.47	382.58	22.68	120.00	1/29/2017	11:14:30 AM		
10	21	B17-00165-23	1.409	6.16	388.15	22.88	120.00	1/29/2017	1:24:18 PM		

### Low Level Tritium pH Checks

SDG#	Fraction	pH	Date	Analyst
ARS1-17-00129	001	8	1-27-2017	SL
↓	002	8	↓	SL
↓	003	8	↓	SL
↓	004	8	↓	SL
↓	005	8	↓	SL
↓	006	8	↓	SL
ARS1-17-00130	001	8		SL
↓	002	8		SL
ARS1-17-00180	001	8		SL
↓	002	8		SL
ARS1-17-00181	001	8		SL
↓	002	8		SL
↓	003	8	↓	SL
↓	004	8	↓	SL
↓	005	8		SL
↓	006	8		SL
↓	007	8		SL
↓	008	8		SL
↓	009	8		SL
↓	010	8	↓	SL
<div style="text-align: center;"> <del> SL 4-5-17 </del> </div>				

# Beta Liquid Scintillation Counter Log Book

Date	Time	ARS Sample I.D. Number	Batch Number	Liquid Scintillation File Number	Technician Initials
1-9-17	09:10	B16-02003-09	B16-02003	10309	SW ✓
↓	↓	09	↓	↓	SW ✓
↓	↓	10	↓	↓	SW ✓
↓	↓	11	↓	↓	SW ✓
↓	↓	12	↓	↓	SW ✓
↓	↓	13	↓	↓	SW ✓
↓	↓	14	↓	↓	SW ✓
↓	↓	15	↓	↓	SW ✓
↓	↓	16	↓	↓	SW ✓
↓	↓	17	↓	↓	SW ✓
↓	↓	SNC 9	QA	QA	SW ✓
1-27-17	16:26	↓	↓	↓	SW ✓
↓	↓	Background	B17-00165	1759	SV ✓
↓	↓	B17-00165-04	↓	↓	SV ✓
↓	↓	05	↓	↓	SV ✓
↓	↓	06	↓	↓	SV ✓
↓	↓	07	↓	↓	SV ✓
↓	↓	08	↓	↓	SV ✓
↓	↓	09	↓	↓	SV ✓
↓	↓	10	↓	↓	SV ✓

# Beta Liquid Scintillation Counter Log Book

Time	ARS Sample I.D. Number	Batch Number	Liquid Scintillation File Number	Technician Initials
16:25	B17-00165-11	B17-00165	1759	SW
		12		SW
		13		SW
		14		SW
		15		SW
		16		SW
		17		SW
		18		SW
		19		SW
		20		SW
		21		SW
		22		SW
		23		SW
1-27-17 14:00	S/N/C 9	Q1	Q1	SW
1-27-17	Background	B16-02099	1108	SW
	B16-02099-01			SW
		02		SW
		03		SW
		04		SW
		05		SW



2609 North River Road • Port Allen, Louisiana 70767

1 (800) 401-4277 • Fax (225) 381-2996

# **American Radiation Services Analytical Reports**

for

**Los Alamos National Laboratory**

## **Tritium-Screening by Low Level Liquid Scintillation Counting Control Charts**

## 3H Background

Total # pts : 6350  
Valid # pts : 68  
Mean : 1.79  
SD : 0.16

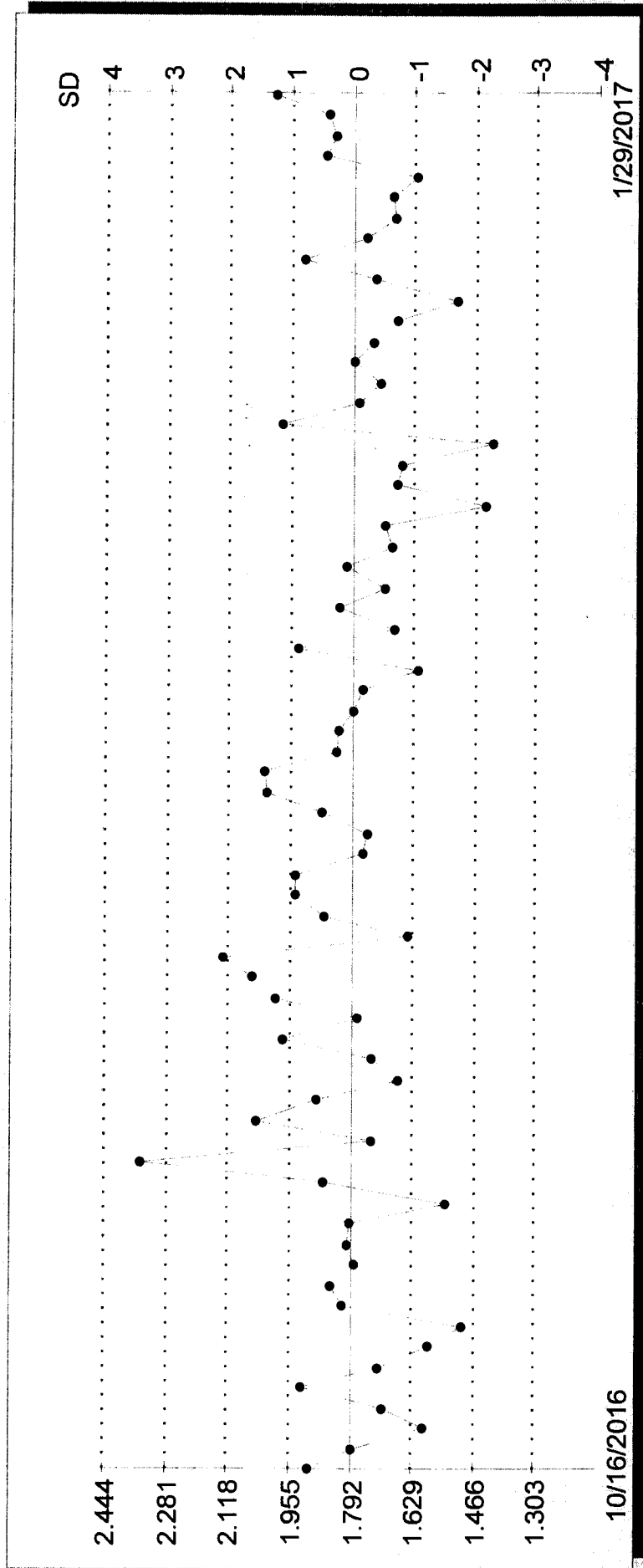
Date	Value	Valid Pt
Oct 16, 2016	1.91	X
Oct 16, 2016	1.79	X
Oct 16, 2016	1.60	X
Oct 16, 2016	1.71	X
Oct 16, 2016	1.92	X
Oct 16, 2016	1.72	X
Oct 16, 2016	1.59	X
Oct 16, 2016	1.49	X
Oct 16, 2016	1.81	X
Oct 16, 2016	1.84	X
Oct 16, 2016	1.78	X
Oct 16, 2016	1.80	X
Oct 16, 2016	1.80	X
Oct 16, 2016	1.54	X
Oct 17, 2016	1.86	X
Oct 17, 2016	2.35	X
Oct 17, 2016	1.74	X
Oct 17, 2016	2.05	X
Oct 17, 2016	1.88	X
Oct 17, 2016	1.67	X
Oct 17, 2016	1.74	X
Oct 17, 2016	1.97	X
Oct 17, 2016	1.77	X
Oct 17, 2016	2.00	X
Oct 17, 2016	2.06	X
Oct 17, 2016	2.13	X
Oct 17, 2016	1.64	X
Oct 17, 2016	1.87	X
Oct 18, 2016	1.94	X
Oct 18, 2016	1.94	X
Oct 18, 2016	1.76	X
Oct 18, 2016	1.75	X
Oct 18, 2016	1.87	X
Oct 18, 2016	2.02	X
Oct 21, 2016	2.03	X
Oct 21, 2016	1.84	X
Nov 03, 2016	1.83	X
Nov 05, 2016	1.79	X
Nov 07, 2016	1.76	X
Nov 09, 2016	1.62	X
Nov 14, 2016	1.93	X
Nov 15, 2016	1.68	X

Nov 15, 2016	1.83	X
Nov 18, 2016	1.71	X
Nov 18, 2016	1.81	X
Nov 20, 2016	1.69	X
Nov 21, 2016	1.70	X
Nov 24, 2016	1.44	X
Nov 28, 2016	1.67	X
Dec 07, 2016	1.66	X
Dec 12, 2016	1.42	X
Dec 16, 2016	1.98	X
Dec 21, 2016	1.77	X
Dec 22, 2016	1.72	X
Dec 27, 2016	1.79	X
Dec 29, 2016	1.74	X
Jan 04, 2017	1.67	X
Jan 05, 2017	1.52	X
Jan 05, 2017	1.73	X
Jan 05, 2017	1.92	X
Jan 05, 2017	1.76	X
Jan 05, 2017	1.68	X
Jan 05, 2017	1.69	X
Jan 05, 2017	1.63	X
Jan 09, 2017	1.87	X
Jan 12, 2017	1.84	X
Jan 27, 2017	1.86	X
Jan 29, 2017	2.00	X



3H Background

Total # pts : 6350  
Valid # pts : 68  
Mean : 1.79  
SD : 0.16



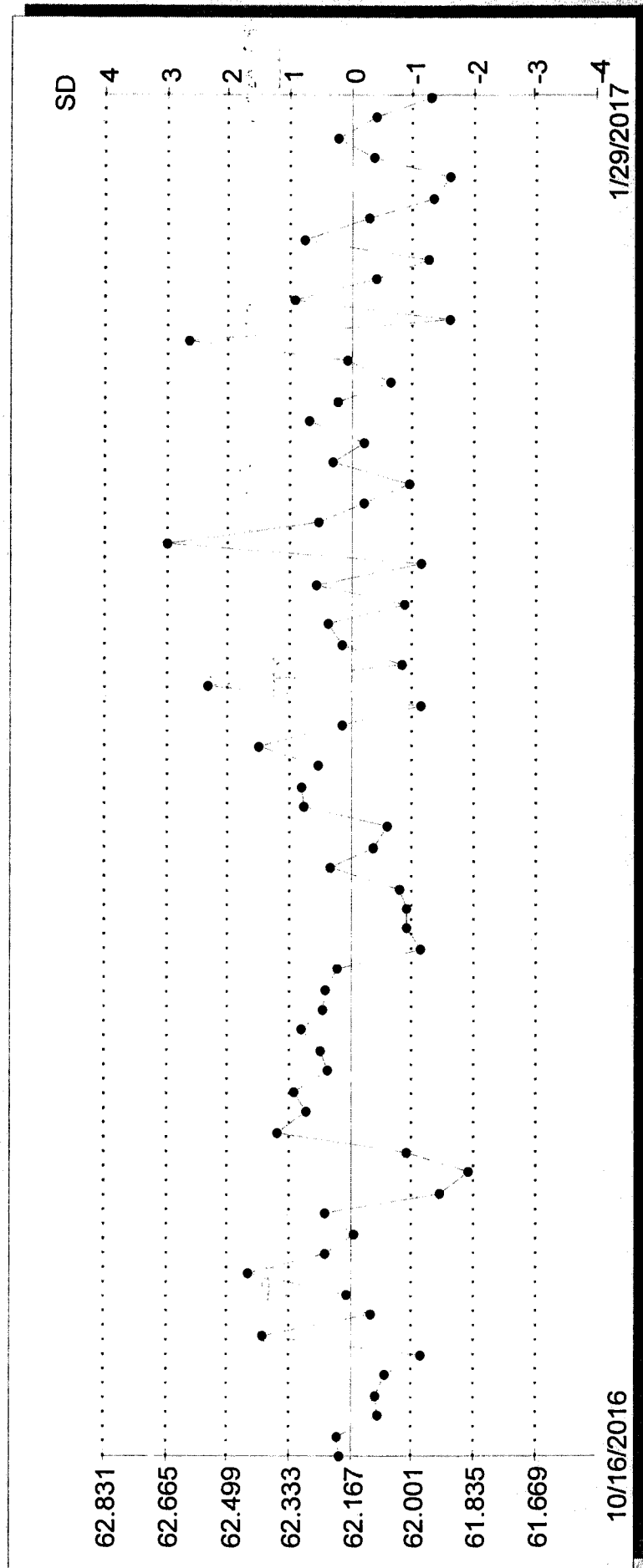
## 3H Efficiency

Total # pts : 6429  
Valid # pts : 68  
Mean : 62.17  
SD : 0.17

Date	Value	Valid Pt
Oct 16, 2016	62.20	X
Oct 16, 2016	62.21	X
Oct 16, 2016	62.10	X
Oct 16, 2016	62.10	X
Oct 16, 2016	62.08	X
Oct 16, 2016	61.98	X
Oct 16, 2016	62.41	X
Oct 16, 2016	62.11	X
Oct 16, 2016	62.18	X
Oct 16, 2016	62.44	X
Oct 16, 2016	62.24	X
Oct 16, 2016	62.16	X
Oct 16, 2016	62.24	X
Oct 16, 2016	61.92	X
Oct 17, 2016	61.85	X
Oct 17, 2016	62.02	X
Oct 17, 2016	62.37	X
Oct 17, 2016	62.29	X
Oct 17, 2016	62.32	X
Oct 17, 2016	62.23	X
Oct 17, 2016	62.25	X
Oct 17, 2016	62.30	X
Oct 17, 2016	62.24	X
Oct 17, 2016	62.24	X
Oct 17, 2016	62.20	X
Oct 17, 2016	61.97	X
Oct 17, 2016	62.02	X
Oct 17, 2016	62.02	X
Oct 18, 2016	62.04	X
Oct 18, 2016	62.22	X
Oct 18, 2016	62.11	X
Oct 18, 2016	62.07	X
Oct 18, 2016	62.29	X
Oct 18, 2016	62.30	X
Oct 21, 2016	62.26	X
Oct 21, 2016	62.41	X
Oct 21, 2016	62.19	X
Nov 03, 2016	61.98	X
Nov 05, 2016	62.55	X
Nov 07, 2016	62.03	X
Nov 09, 2016	62.19	X
Nov 14, 2016	62.23	X
Nov 15, 2016		X

Nov 15, 2016	62.02	X
Nov 18, 2016	62.26	X
Nov 18, 2016	61.98	X
Nov 20, 2016	62.67	X
Nov 21, 2016	62.25	X
Nov 24, 2016	62.13	X
Nov 28, 2016	62.01	X
Dec 07, 2016	62.21	X
Dec 12, 2016	62.13	X
Dec 16, 2016	62.28	X
Dec 21, 2016	62.20	X
Dec 22, 2016	62.06	X
Dec 27, 2016	62.18	X
Dec 29, 2016	62.61	X
Jan 04, 2017	61.90	X
Jan 05, 2017	62.32	X
Jan 05, 2017	62.10	X
Jan 05, 2017	61.95	X
Jan 05, 2017	62.29	X
Jan 05, 2017	62.12	X
Jan 05, 2017	61.95	X
Jan 05, 2017	61.90	X
Jan 09, 2017	62.11	X
Jan 12, 2017	62.21	X
Jan 27, 2017	62.10	X
Jan 29, 2017	61.95	X

3H Efficiency  
Total # pts : 6429  
Valid # pts : 68  
Mean : 62.17  
SD : 0.17





2609 North River Road • Port Allen, Louisiana 70767

---

1 (800) 401-4277 • Fax (225) 381-2996

# **American Radiation Services Analytical Reports**

for

**Los Alamos National Laboratory**

**Low Level Liquid  
Scintillation Counting**

**Calibration  
Information**



**QUALITY CONTROL PROGRAM**  
**AMERICAN RADIATION SERVICES**  
**RADIOACTIVE REFERENCE SOLUTIONS**  
**ANNUAL ACTIVITY VERIFICATION**

VERIFICATION DATE **10/24/2016 20:42** date counted  
 STANDARD REFERENCE # **S-0318**

Principal Radionuclide

**H-3**

ENTER --&gt;

Half Life, Years

**1.232E+01**

OR --&gt;

Half Life, Days

**4.4998E+03****4.4998E+03**Radionuclide **H-3**Dilution Reference Date **10/24/2016 14:38**

Dilution Activity **2.72** pCi per gram ==> dpm/g **6.03**  
 Verif. Date Decay Corrected **2.72** pCi per gram ==> dpm/g **6.03**

**Minimum of 3 Required**

Trial ID	Sample Counts	Count Time (min)	Detector	Efficiency	Bkg. (cpm)	Net Weight	Decay Corrected Activity Result (dpm/g)	Decay Corrected Activity Result (nCi/g)
S-0318-V1	19.36	1	LSC	0.3005	10.09	5.008	6.16	2.77
S-0318-V2	19.04	1	LSC	0.3009	10.09	4.977	5.98	2.69
S-0318-V3	19.21	1	LSC	0.3010	10.09	4.985	6.08	2.74
S-0318-V4	18.99	1	LSC	0.3015	10.09	4.995	5.91	2.66
S-0318-V5	19.03	1	LSC	0.3008	10.09	5.020	5.92	2.67

**10% Max****PASS**

Standard Deviation percent of known concentration

**5% Max****PASS**

Target Activity

% Diff

Average

Two Sigma Uncertainty

<b>6.01</b>	<b>2.71</b>
<b>0.21</b>	<b>0.09</b>
<b>1.78%</b>	<b>1.78%</b>
<b>6.03</b>	<b>2.72</b>
<b>-0.34%</b>	<b>-0.34%</b>

Verification Expiration Date: **October 24, 2017**Prepared & Counted By Jacob ByrdDate: **10/24/2016 20:42**Verified & Approved By [Signature]Date: **10-31-16**QC Approval [Signature]Date: **10-31-16****S-0318****H-3**Verified **10/24/16****SL****Expires 10/24/17**Manufacturer **NIST SRM 4927F**Sol Matrix **H2O**Ref No **NIST SRM 4927F**Tech **Unknown**Parent ID **S-0316****RADIOACTIVE STANDARDS -- BATON ROUGE LABORATORY**

Q:\QAO\QA Assistant Folder\01 Documenting\01 Documentation\04 Standards\01 Standards\Standard Verification  
 Calculation(without plating recovery)

ARS-038

ARS INTERNATIONAL		Add/Edit Secondary Stds	Parent Standard Data	
Planning		Parent Solution Reference #	NIST SRM 4927F	
Planning Comments	Create a H-3 LCS Standard	Parent Solution #	S-0316	
Target dpm/g (on dil. date)	6	Parent Principal Radionuclide	H-3	Half Life (Days) 4499.8000000
Target Final volume mL	2000	Parent Reference Date	08/10/2016 14:49	
Appx mass g of Parent Sol'n	5.091121556	Parent Certified Act	2384.430444	Cert Act/Vol Units dpm g
Appx vol mL of Parent Sol'n	5.1003021	Parent Cert Act Uncert 1 Sigma	0.0036	
Expected Addition for Analysis g	5	Parent Sp. Gravity G/ML	0.9982	
Standards Preparation / Dilution		Parent Supplier	NIST SRM 4927F	
Secondary Solution #	S-0318	Parent Date Recvd	01/02/00	
Dilution Date (New Ref Date)	10/24/2016 14:38	Parent Received By	Unknown	
Ampoule, Empty (g)		Parent Cert Exp Date		
Ampoule /Solution Gross (g)		Parent Matrix	H2O	
Net Wt Removed (g)		Certified dpm/g At Ref Date	2384.430444	
Transfer Container, empty (g)	17.3192	Certified dpm/g on 10/24/2016 14:38	2357.044488	
Container Plus Solution (g)	22.4163	Parent Comments	Intermediate level H-3 standard for creating LCS solutions and matrix spikes. Dilution performed as stated above by Jacob Byrd-JPB 08/10/2016	
Net Wt Transferred (g)	5.0971			
DPM Xferred on 10/24/2016 14:38	12014.09146			
Diluent/matrix	Deionized H2O	Parent Tech	Unknown	
Diluent Density Cont, empty (g)		Is_Primary	FALSE	
Test Mass of 5 mL of Diluent (g)		Is_LCS	TRUE	
Diluent Density Test - (g/mL)		Is_Tracer	FALSE	
Dilution Empty Container Mass (g)	402.37	Is_Calib	FALSE	
Dilution Full Cont g (if measured)	2394.73			
Dilution Final Volume mL (if measured)	2000			
Final Dilution Density (g/mL)	0.99618			
Final Dilution Measured Mass g	1992.36			
Comments	H3 LCS intermediate standard. Dilution performed as stated above by Jacob Byrd. JPB 10/24/2016.			
Final Dilution dpm/g	6.030080637			
Final Dil New Ref Date/Time	10/24/2016 14:38			

Assay Definition

Assay Description:  
 H3 Normal Lvl  
 Assay Type: DPM (Single)  
 Report Name: Report1  
 Output Data Path: C:\Packard\Tricarb\Results\ARS\H3 Normal Lvl 2\20161024\_1817  
 Raw Results Path: C:\Packard\Tricarb\Results\ARS\H3 Normal Lvl 2\20161024\_1817\20161024\_1817.results  
 RTF File Name: C:\Packard\Tricarb\Results\ARS\H3 Normal Lvl 2\20161024\_1817\H3 Results.rtf  
 Comma-Delimited File Name: C:\Packard\Tricarb\Results\ARS\H3 Normal Lvl 2\20161024\_1817\H3 Results.csv  
 Assay File Name: C:\Packard\Tricarb\Assays\H3 Normal Lvl 2.lsa

Count Conditions

Nuclide: Standard H3  
 Quench Indicator: tSIE/AEC  
 External Std Terminator (sec): 0.5 2s%  
 Pre-Count Delay (min): 0.00  
 Quench Set:  
   Low Energy: PE UG STD H3  
 Count Time (min): 240.00  
 Count Mode: Normal  
 Assay Count Cycles: 1      Repeat Sample Count: 1  
 #Vials/Sample: 1      Calculate % Reference: Off

Background Subtract

Background Subtract: Off  
 Low CPM Threshold: Off  
 2 Sigma & Terminator: On - Any Region

Regions	LL	UL	2Sigma % Terminator
A	2.0	18.6	0.50
B	0.0	2000.0	0.00
C	0.0	2000.0	0.00

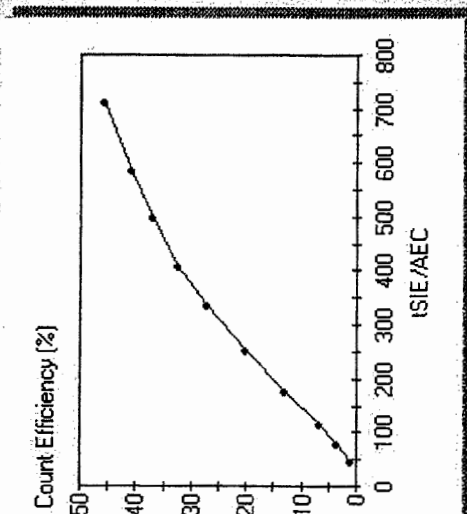
Count Corrections

Static Controller: On      Luminescence Correction: n/a  
 Colored Samples: Off      Heterogeneity Monitor: n/a  
 Coincidence Time (nsec): 18      Delay Before Burst (nsec): 75



Cycle 1 Results  
Quench Curve Block Data

PE UG STD H3 in A



Date Acquired: 08/19/2016  
 Date Modified:  
 PE UG STD H3 in A

tSIE/AEC	Count Efficiency (%)
713.96	45.87
587.32	40.89
498.20	36.92
407.51	32.24
337.27	26.99
254.20	20.17
178.24	13.10
115.35	6.77
80.47	3.53
47.41	1.20

11	1	BACKGROUND	10.09	33.20	382.76	30.39	240.00	10/24/2016	6:17:40 PM
11	2	S-0318-V1	19.36	64.42	378.23	30.05	240.00	10/24/2016	10:42:16 PM
11	3	S-0318-V2	19.04	63.28	378.71	30.09	240.00	10/25/2016	3:06:46 AM
11	4	S-0318-V3	19.21	63.84	378.83	30.10	240.00	10/25/2016	7:31:20 AM
11	5	S-0318-V4	18.99	62.98	379.57	30.15	240.00	10/25/2016	11:55:54 AM
11	6	S-0318-V5	19.03	63.26	378.58	30.08	240.00	10/25/2016	4:20:23 PM

### S-0318 Verification Weights

Tech:	JPB
Pipette:	FJ15820
Scale ID:	12332539
Standard ID:	S-0318

Sample ID	Std. Weight(g)
S-0318-V1	5.008
S-0318-V2	4.9772
S-0318-V3	4.9847
S-0318-V4	4.9946
S-0318-V5	5.0201



2609 North River Road • Port Allen, Louisiana 70767

---

1 (800) 401-4277 • Fax (225) 381-2996

# **American Radiation Services Analytical Reports**

**for**

**Los Alamos National Laboratory**

# **Folder Duplicate**



## Report Compilation Checklist

ARS SDG: 17-00129Client Name: LANLSample Matrix: AQ**LEVEL 1 COMPONENTS**

	1st Reviewer			
1) Cover Page Complete and Accurate (see ARS-059)?	Yes	No	N/A	
2) Technical Review Checklist(s) Complete and Accurate?	Yes	No	N/A	
3) Case Narrative Complete and Accurate (see ARS-059)? <small>Include subcontractor name and information</small>	Yes	No	N/A	
4) Form 1s Present for all Samples and Tests? <small>Note: Ensure original Subcontract Forms 1s included if applicable.</small>	Yes	No	N/A	
5) Client Specific Components are Present and Complete?	Yes	No	N/A	

**LEVEL 2 COMPONENTS**

	1st Reviewer			
6) Batch Quality Control Report is Present and Accurate? <small>Include subcontractor QC reports if applicable</small>	Yes	No	N/A	
7) DQO Report is Present and Accurate?	Yes	No	N/A	
8) Client Specific Batch QC Components are Present and Complete?	Yes	No	N/A	

**LEVEL 3 COMPONENTS**

Ensure all original subcontractor information is included, if applicable

	1st Reviewer			
9) Efficiencies are Present?	Yes	No	N/A	
10) Calibrations are Present?	Yes	No	N/A	
11) Backgrounds are Present?	Yes	No	N/A	
12) Spectrum Analysis is Present?	Yes	No	N/A	
13) Spectral Plots are Present?	Yes	No	N/A	
14) Plateaus are Present?	Yes	No	N/A	
15) Control Charts are Present?	Yes	No	N/A	
16) Other:	Yes	No	N/A	

**LEVEL 4 COMPONENTS**

Ensure all original subcontractor information is included, if applicable

	1st Reviewer			
17) Preparation Raw Data Present and Complete?	Yes	No	N/A	
18) Instrument Raw Data Present and Complete?	Yes	No	N/A	
19) Calibration Certificates Present?	Yes	No	N/A	
20) Copies of Log Book Pages Present?	Yes	No	N/A	
21) Sample Receiving Documentation Present?	Yes	No	N/A	
22) LIMS Reports Present?	Yes	No	N/A	
23) Applicable Correspondence Present?	Yes	No	N/A	
24) Other:	Yes	No	N/A	

Report Generator Signature

Date

4-5-16

Management Review Signature

Date

4-10-17



# LSC Technical Review Checklist

ARS SDG ARS1-17-00129

Sample Matrix: AQ Aliquot (Circle One): Dry As Received ☒ Filtered Other: \_\_\_\_\_

Required QC Samples (Mark all that apply): ☒ Blank ☒ LSC ☒ LQSD Sample Dup MS MSD

ARS A. Batch ID(s): Batch A: B17-00275 Batch B: N/A Batch C: N/A

Test Method(s): LSC-A-022 N/A N/A

## A. RADIOCHEMICAL PREPARATION REVIEW

	Chemist Review	Verifier Review
1) 100% of Manual Transcriptions Verified?	<input checked="" type="radio"/> Yes No N/A	<input checked="" type="radio"/> Yes No N/A
2) 100% of Manual Calculations Verified?	Yes No <input checked="" type="radio"/> N/A	Yes No <input checked="" type="radio"/> N/A
3) Blank Composition/Configuration Matches Calibration?	<input checked="" type="radio"/> Yes No N/A	<input checked="" type="radio"/> Yes No N/A
4) Deviations from procedure are documented and verified?	Yes No <input checked="" type="radio"/> N/A	Yes No <input checked="" type="radio"/> N/A
5) Appropriate Cocktail Selected?	<input checked="" type="radio"/> Yes No N/A	<input checked="" type="radio"/> Yes No N/A
6) Sample Prep Anomaly? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (See Tech Notes) NCR # (If initiated): _____		
Chemist Signature <u>[Signature]</u>		Verifier Review Signature <u>[Signature]</u>
Date <u>4-3-17</u>		Date <u>4-3-17</u>

## B. ANALYSIS REVIEW

	Analyst Review	QA Officer Review
1) Calibrations Valid and Current?	<input checked="" type="radio"/> Yes No N/A	<input checked="" type="radio"/> Yes No N/A
2) Backgrounds Valid and Current?	<input checked="" type="radio"/> Yes No N/A	<input checked="" type="radio"/> Yes No N/A
3) Source Checks Completed and Acceptable?	<input checked="" type="radio"/> Yes No N/A	<input checked="" type="radio"/> Yes No N/A
QA Officer Signature _____		Date _____
	Analyst Review	Technical Review
4) Background Checks Complete and Acceptable?	<input checked="" type="radio"/> Yes No N/A	<input checked="" type="radio"/> Yes No N/A
5) 100% of Manually Entered Parameters Verified Accurate?	<input checked="" type="radio"/> Yes No N/A	<input checked="" type="radio"/> Yes No N/A
6) Appropriate QC samples initiated at required frequency?	<input checked="" type="radio"/> Yes No N/A	<input checked="" type="radio"/> Yes No N/A
6) Test/Sample Specific Parameters (See ARS-059 for details)		
a) Analysis Parameters Checked and Correct and Peak Shapes are Acceptable?	<input checked="" type="radio"/> Yes No N/A	<input checked="" type="radio"/> Yes No N/A
b) Spectra show no Evidence of Interferences?	<input checked="" type="radio"/> Yes No N/A	<input checked="" type="radio"/> Yes No N/A
c) Sample Quench for All Samples within Range of Quench Curve?	<input checked="" type="radio"/> Yes No N/A	<input checked="" type="radio"/> Yes No N/A
7) Analysis Anomaly? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (See Comments) NCR # (If initiated): _____		
Analyst Signature <u>[Signature]</u>		Technical Reviewer Signature <u>[Signature]</u>
Date <u>4-5-17</u>		Date <u>4-5-17</u>





# LSC Technical Review Checklist

ARS SDG ARS1-17-00129

Sample Matrix: AQ Aliquot (Circle One) : Dry As ~~Received~~ Filtered Other: \_\_\_\_\_

Required QC Samples (Mark all that apply): Blank LCS LCSD Sample Dup MS MSD

ARS A. Batch ID(s): Batch A: B17-00165 Batch B: N/A Batch C: N/A

Test Method(s): LSC-A-021 N/A N/A

## A. RADIOCHEMICAL PREPARATION REVIEW

	Chemist Review			Verifier Review		
1) 100% of Manual Transcriptions Verified?	<input checked="" type="radio"/> Yes	<input type="radio"/> No	<input type="radio"/> N/A	<input checked="" type="radio"/> Yes	<input checked="" type="radio"/> No	<input type="radio"/> N/A
2) 100% of Manual Calculations Verified?	<input type="radio"/> Yes	<input type="radio"/> No	<input checked="" type="radio"/> N/A	<input type="radio"/> Yes	<input checked="" type="radio"/> No	<input type="radio"/> N/A
3) Blank Composition/Configuration Matches Calibration?	<input type="radio"/> Yes	<input type="radio"/> No	<input checked="" type="radio"/> N/A	<input type="radio"/> Yes	<input checked="" type="radio"/> No	<input type="radio"/> N/A
4) Deviations from procedure are documented and verified?	<input type="radio"/> Yes	<input type="radio"/> No	<input checked="" type="radio"/> N/A	<input type="radio"/> Yes	<input checked="" type="radio"/> No	<input type="radio"/> N/A
5) Appropriate Cocktail Selected?	<input checked="" type="radio"/> Yes	<input type="radio"/> No	<input type="radio"/> N/A	<input type="radio"/> Yes	<input type="radio"/> No	<input checked="" type="radio"/> N/A
6) Sample Prep Anomaly? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (See Tech Notes) NCR # (If initiated): _____						
Chemist Signature <u>[Signature]</u>		Date <u>1-27-17</u>		Verifier Review Signature <u>No reviewer present</u>		Date _____

## B. ANALYSIS REVIEW

	Analyst Review			QA Officer Review		
1) Calibrations Valid and Current?	<input checked="" type="radio"/> Yes	<input type="radio"/> No	<input type="radio"/> N/A	<input checked="" type="radio"/> Yes	<input type="radio"/> No	<input type="radio"/> N/A
2) Backgrounds Valid and Current?	<input checked="" type="radio"/> Yes	<input type="radio"/> No	<input type="radio"/> N/A	<input checked="" type="radio"/> Yes	<input type="radio"/> No	<input type="radio"/> N/A
3) Source Checks Completed and Acceptable?	<input checked="" type="radio"/> Yes	<input type="radio"/> No	<input type="radio"/> N/A	<input checked="" type="radio"/> Yes	<input type="radio"/> No	<input type="radio"/> N/A
QA Officer Signature <u>[Signature]</u>				Date <u>4-10-17</u>		
	Analyst Review			Technical Review		
4) Background Checks Complete and Acceptable?	<input checked="" type="radio"/> Yes	<input type="radio"/> No	<input type="radio"/> N/A	<input checked="" type="radio"/> Yes	<input type="radio"/> No	<input type="radio"/> N/A
5) 100% of Manually Entered Parameters Verified Accurate?	<input checked="" type="radio"/> Yes	<input type="radio"/> No	<input type="radio"/> N/A	<input checked="" type="radio"/> Yes	<input type="radio"/> No	<input type="radio"/> N/A
6) Appropriate QC samples initiated at required frequency?	<input checked="" type="radio"/> Yes	<input type="radio"/> No	<input type="radio"/> N/A	<input checked="" type="radio"/> Yes	<input type="radio"/> No	<input type="radio"/> N/A
6) Test/Sample Specific Parameters (See ARS-059 for details)						
a) Analysis Parameters Checked and Correct and Peak Shapes are Acceptable?	<input checked="" type="radio"/> Yes	<input type="radio"/> No	<input type="radio"/> N/A	<input type="radio"/> Yes	<input type="radio"/> No	<input type="radio"/> N/A
b) Spectra show no Evidence of Interferences?	<input checked="" type="radio"/> Yes	<input type="radio"/> No	<input type="radio"/> N/A	<input type="radio"/> Yes	<input type="radio"/> No	<input type="radio"/> N/A
c) Sample Quench for All Samples within Range of Quench Curve?	<input checked="" type="radio"/> Yes	<input type="radio"/> No	<input type="radio"/> N/A	<input type="radio"/> Yes	<input type="radio"/> No	<input type="radio"/> N/A
7) Analysis Anomaly? <input type="checkbox"/> No <input type="checkbox"/> Yes (See Comments) NCR # (If initiated): _____						
Analyst Signature <u>[Signature]</u>		Date <u>1-30-17</u>		Technical Reviewer Signature <u>No review required</u>		Date _____





Batch A: B17-00165

**LSC**  
**Technical Review Checklist**

**C. BATCH QC VALIDATION**

	Proj. Mgr. Review	QA Officer Review
1) Activity + 3xCSU a Negative Number?	Yes   No <u>N/A</u>	Yes   No <u>N/A</u>
2) RDL Criteria are Met?	Yes   No <u>N/A</u>	Yes   No <u>N/A</u>
3) Method Blank Criterion Met?	Yes   No <u>N/A</u>	Yes   No <u>N/A</u>
4) LCS/LCD Criteria Met?	Yes   No <u>N/A</u>	Yes   No <u>N/A</u>
5) Duplicate (Sample Duplicate, LCSD, MSD) Criteria Met?	Yes   No <u>N/A</u>	Yes   No <u>N/A</u>
6) MS/MSD Criteria Met?	Yes   No <u>N/A</u>	Yes   No <u>N/A</u>
7) Batch QC Anomaly? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (See Tech Notes)    NCR # (If initiated): _____		
<u>  n/a  </u> Project Manager Signature	Date	<u>  n/a  </u> QA Officer Signature
Date		

**GENERAL COMMENTS**

## SDG Report - Samples and Containers

SDG Specific Data												
SDG		ARS1-17-00129		TAT Days		28		Project Type		Environmental		
Sample Count		6		Rpt Level		4		Date Received		1/13/2017		
Client		Los Alamos National Laboratory		Client Deadline		2/10/2017		COC Number		2017-840		
Client Code		114		Internal Deadline		2/9/2017		PO Number				
Profile Number		PN-00094		Lab Deadline		2/7/2017		Job Number				
Temperature (C)				Comments				Job Location				
Samples and Containers Checked In Thus Far												
FR	Name	Matrix	Start Date	End Date	Disp	Hold	Arch	Storage	Conductivity		Comments	
001	CAPA-17-129178	AQ	1/10/2017 1:08 PM	1/10/2017 1:08 PM	H	90	5	O4				
	IC_ID	Cnt	Volume (mL)	Container Type	pH Orig	pH Final	CPM	uR Hr	Stor VOA	Head	AF Units	AF Mins
	255353	1	1000.00	HDP Bottle			60	15	N	N/A		AF Vol
002	CAPA-17-129183	AQ	1/10/2017 11:38 AM	1/10/2017 11:38 AM	H	90	5	O4				
	IC_ID	Cnt	Volume (mL)	Container Type	pH Orig	pH Final	CPM	uR Hr	Stor VOA	Head	AF Units	AF Mins
	255354	1	1000.00	HDP Bottle			70	20	N	N/A		AF Vol
003	CAPA-17-129187	AQ	1/11/2017 11:34 AM	1/11/2017 11:34 AM	H	90	5	O4				
	IC_ID	Cnt	Volume (mL)	Container Type	pH Orig	pH Final	CPM	uR Hr	Stor VOA	Head	AF Units	AF Mins
	255355	1	1000.00	HDP Bottle			70	16	N	N/A		AF Vol
004	CAPA-17-129188	AQ	1/11/2017 11:59 AM	1/11/2017 11:59 AM	H	90	5	O4				
	IC_ID	Cnt	Volume (mL)	Container Type	pH Orig	pH Final	CPM	uR Hr	Stor VOA	Head	AF Units	AF Mins
	255356	1	1000.00	HDP Bottle			70	17	N	N/A		AF Vol
005	CAPA-17-129190	AQ	1/9/2017 3:20 PM	1/9/2017 3:20 PM	H	90	5	O4				
	IC_ID	Cnt	Volume (mL)	Container Type	pH Orig	pH Final	CPM	uR Hr	Stor VOA	Head	AF Units	AF Mins
	255357	1	1000.00	HDP Bottle			80	15	N	N/A		AF Vol
006	CAPA-17-129192	AQ	1/9/2017 1:05 PM	1/9/2017 1:05 PM	H	90	5	O4				
	IC_ID	Cnt	Volume (mL)	Container Type	pH Orig	pH Final	CPM	uR Hr	Stor VOA	Head	AF Units	AF Mins
	255358	1	1000.00	HDP Bottle			80	15	N	N/A		AF Vol

## SDG Report - Analysis Assignments

SDG	ARS1-17-00129	Sample Count	6
Client	Los Alamos National Laboratory	Analysis Count	2-12

Sample Count Totals Per Analysis			
Analysis Code	Analysis Description	Samples Count	
LSC-A-021	Low Level Tritium Screen in (Aqueous)	6	
LSC-A-022	Low Level Tritium by Enrichment Process in (Aqueous [AQ])	6	

Analyses Assigned Per Fraction		
Fraction	Analysis Code	X = Assigned
001	LSC-A-021	X
001	LSC-A-022	X
002	LSC-A-021	X
002	LSC-A-022	X
003	LSC-A-021	X
003	LSC-A-022	X
004	LSC-A-021	X
004	LSC-A-022	X
005	LSC-A-021	X
005	LSC-A-022	X
006	LSC-A-021	X
006	LSC-A-022	X

DQO Report for SDG  
ARS1-17-00129

Analysis Code	Prep Type	Units	Aliquot	Prep Code	Procedure	Count Time				
LSC-A-021	WRAD	pCi	L	N/A	ARS-054					
LSC-A-022	H-3	Analyte		RDL	LCS LL/UL	MS LL/UL	Rdy LL/UL	Grav LL/UL	RER	RPD
				0	75/125	60/140	30/110	40/110	1	25
LSC-A-021	WRAD	pCi	L	N/A	ARS-040					
		Analyte		RDL	LCS LL/UL	MS LL/UL	Rdy LL/UL	Grav LL/UL	RER	RPD
				3.221 pCi/L	80/120	60/140	30/110	40/110	1	25

Legend: Blue - RDL source was client profile. Green - RDL source was analyte library.

Analysis Code	Fraction	Units	Aliquot	Conductivity	Analyte Count
LSC-A-021	001	pCi	L	N/A	1
LSC-A-021		Group		Analyte	
	STD				
				H-3	
LSC-A-021	002	pCi	L	N/A	1
		Group		Analyte	
	STD				
LSC-A-021	003	pCi	L	N/A	1
		Group		Analyte	
	STD				
LSC-A-021	004	pCi	L	N/A	1
		Group		Analyte	
	STD				
LSC-A-021	005	pCi	L	N/A	1
		Group		Analyte	
	STD				
LSC-A-021	006	pCi	L	N/A	1
		Group		Analyte	
	STD				
LSC-A-022	001	pCi	L	N/A	1
		Group		Analyte	
	STD				
LSC-A-022	002	pCi	L	N/A	1
		Group		Analyte	
	STD				

**DQO Report for SDG**

ARS1-17-00129

LSC-A-022	003	pCi	Group	L	N/A	Analyte	1
		STD			Enriched H-3		
LSC-A-022	004	pCi	Group	L	N/A	Analyte	1
		STD			Enriched H-3		
LSC-A-022	005	pCi	Group	L	N/A	Analyte	1
		STD			Enriched H-3		
LSC-A-022	006	pCi	Group	L	N/A	Analyte	1
		STD			Enriched H-3		

# ARS FILE TRACKING SHEET

SDG: ARS1-17-00129

Task	Date / Time	Initials
Date & Time Samples Received	01-13-17 09:41	MEC
ICOC Initiated/Storage Location: <u>O4</u>	01-13-17 11:34	MEC
Technical Checks Performed	<i>See Match</i>	
Report Written / EDD Generated <u>4-5-17 / 1303</u>   <i>SIA</i>	<u>4-5-17 / 1551</u>	<i>SIA</i>
Report / EDD Reviewed for accuracy and completeness	<u>4-10-17 / 1223</u>	<i>[Signature]</i>
Quality Assurance Checks Performed on Report	<i>[Signature]</i>	<i>[Signature]</i>
Management Checks Performed on Report	<i>[Signature]</i>	<i>[Signature]</i>
Preliminary Report Scan		
Report E-mailed/Faxed		
Invoice Completed Invoice #: _____		
Requires Report Mailed Yes / No		
Requires Original COC mailed Yes / No		
Report Reviewed and Imaged		

## SPECIAL REQUIREMENTS

Requirement	Yes	No
3 Hour Rush	<input type="checkbox"/>	<input checked="" type="checkbox"/>
24 Hour Rush	<input type="checkbox"/>	<input checked="" type="checkbox"/>
48 Hour Rush	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3 Day Rush	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5 Day Rush	<input type="checkbox"/>	<input checked="" type="checkbox"/>
10 Day Rush	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Standard Oil/Gas Client (5 Day)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Standard Turnaround	<input checked="" type="checkbox"/>	<input type="checkbox"/>

## NOTES

*EDD  
Loaded  
4-5-17  
SIA*

SDG: ARS1-17-00129

### External and Internal Surveys

Exposure Rate Meter:	M3 124334	Serial No.:	RN 17782	Calibration Due Date:	1/25/17
Count Rate Meter:	M3 237983	Serial No.:	PR 165363	Calibration Due Date:	2/3/17
<hr/>					
Background Exposure Rate ( $\mu$ R/hr)	20	Max. Exposure Rate on Shipping Containers Externals (Plus Bkgd)		20	$\mu$ R/hr
<hr/>					
Background Count Rate (cpm)	80	Max. Removable Count Rate on Shipping Containers Externals (Plus Bkgd)		80	cpm
<hr/>					
		Max. Removable Count Rate on Shipping Containers Internals (Plus Bkgd)		80	cpm

COC ☒ Yes ☐ No

Good Condition ☒ Yes ☐ No  
 Sec. Seals ☐ Yes ☒ No  
 Seal Intact ☐ Yes ☐ No ☒ N/A  
 Radioactive ☐ Yes ☒ No

Matrix [ AF , AO , BI , FE , LT , SI , SO , UR , VG ]

[illegible]

Date/Time Surveyed:

American Radiation	Chain of Custody/Analysis Request	COC/Lab Request #:
Baton Rouge LA		2017-840 Page 1 of 1

Special Instructions:					
Relinquished by:	Print Name:	Date/Time:	Received by:	Print Name:	Date/Time:
Relinquished by:	Print Name:	Date/Time:	Received by:	Print Name:	Date/Time:
Relinquished by:	Print Name:	Date/Time:	Received by:	Print Name:	Date/Time: