American Radiation Services - Primary
1726 Wooddale Court
Baton Rouge LA 70806

Chain of Custody/Analysis Request

ARCP

COC/Lab Request #: 2014-3390

Page 1 of 1

Client Contact:

Lab Agreement # : 63641-001-10

Project Number :

Analysis Turnaround Time:

24 Hour - ☐ Other - ☐

7 Day - ☐

14 Day - ☐

21 Day - ☐

28 Day - ☒

Site Name: Los Alamos National Laboratory

Rad Screening Info: Yes, Below Background

Lab Reporting Limit Type: Sample Quantitation Limit

Special Instructions:

Field Sample ID	Sample Date	Sample Time	Sample Matrix	WSP-LL-H-3
CAMO-14-75543	May 6 2014	9:45	W	1
CAMO-14-75545	May 9 2014	11:20	W	1
CAMO-14-75546	May 12 2014	11:51	W	1

Special Instructions:

Relinquished by:	Print Name:	Date/Time:	Received by:	Print Name:	Date/Time:
	Melissa Martin	5/14/14 3:00			
Relinquished by:	Print Name:	Date/Time:	Received by:	Print Name:	Date/Time:
Relinquished by:	Print Name:	Date/Time:	Received by:	Print Name:	Date/Time:

SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

EVENT ID: 4642 **EVENT NAME:** Mortandad/Sandia (MDA C and GS Investigation) MY2014 Q3 Watershed Sampling

SAMPLE ID: CAMO-14-75543 **WORK ORDER:** NA

	AS PLANNED	AS COLLECTED		AS PLANNED	AS COLLECTED
DATE COLLECTED (MM/DD/YYYY):		05/06/2014	**FIELD MATRIX:** WG		Ok
TIME COLLECTED (HH:MM):		9:45	**MEDIA:** UA		↓
PRS ID:		Ok	**SAMPLE TECH CODE:** UA		GSP
LOCATION ID: R-14 S1		↓	**FIELD PREP:** UF		Ok
LOCATION TYPE: MON		↓	**FIELD QC TYPE:** REG		↓
PORT: SINGLE COMPLETION		↓	**SAMPLE USAGE:** INV		↓

PRIORITY	ORDER	CONTAINER	#	PRESERVATIVE	COLLECTED Y/N	SPECIAL INSTRUCTIONS
N/A	WSP-8260B-VOA	40 ML SEPTUM AMBER GLASS	2	HCL	Y	NONE
↓	WSP-8270C-SVOA	1 LITER AMBER GLASS	3	ICE	↓	
↓	WSP-LL-H-3	1 LITER POLY	1	NONE	↓	

SAMPLE COMMENTS: Sampled within 50' of running diesel generator

LOCATION COMMENTS: none.

FIELD PARAMETERS:

Dissolved Oxygen 5.69 mg/L Flow (in gpm) 7.3 GPM Oxidation-Reduction Potential -14.3 mV

pH 8.19 SU Specific Conductance 134 uS/cm Temperature 23.00 deg C

Turbidity 0.8 NTU

COLLECTED BY (PRINT) D. Fellenz

RELINQUISHED BY (Printed Name) Julie Maze **(Signature)** Julie Maze	**Date/Time** 05/06/14 1230	**RECEIVED BY (Printed Name)** S. Isenwood **(Signature)** S. Isenwood	**Date/Time** 05/06/14 1230
RELINQUISHED BY (Printed Name) (Signature)	**Date/Time**	**RECEIVED BY (Printed Name) (Signature)**	**Date/Time**

Report Date 05/01/2014

SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

EVENT ID: 4642 **EVENT NAME:** Mortandad/Sandia (MDA C and GS Investigation) MY2014 Q3 Watershed Sampling

SAMPLE ID: CAMO-14-75545 **WORK ORDER:** NA

	AS PLANNED	AS COLLECTED		AS PLANNED	AS COLLECTED
DATE COLLECTED (MM/DD/YYYY):		05/09/2014	**FIELD MATRIX:**	WG	ok
TIME COLLECTED (HH:MM):		1120	**MEDIA:**	UA	↓
PRS ID:		ok	**SAMPLE TECH CODE:**	UA	BSP
LOCATION ID:	R-46	↓	**FIELD PREP:**	UF	ok
LOCATION TYPE:	MON	↓	**FIELD QC TYPE:**	REG	↓
PORT:	SINGLE COMPLETION	↓	**SAMPLE USAGE:**	INV	↓

PRIORITY	ORDER	CONTAINER	#	PRESERVATIVE	COLLECTED Y/N	SPECIAL INSTRUCTIONS
NA	MSGP-Hg	1 LITER POLY	1	HNO3	Y	NA
↓	WSP-8260B-VOA	40 ML SEPTUM AMBER GLASS	2	HCL	↓	↓
↓	WSP-8270C-SVOA	1 LITER AMBER GLASS	2	ICE JA 5/9/14	↓	↓
↓	WSP-CN(T)	250 ML POLY	1	NAOH	↓	↓
↓	WSP-LL-H-3	1 LITER POLY	1	NONE	↓	↓
↓	WSP-TKN+TOC	500 ML AMBER GLASS	1	H2SO4	↓	↓

SAMPLE COMMENTS:

NA

LOCATION COMMENTS: diesel generator running 40' downward

FIELD PARAMETERS:

Dissolved Oxygen 6.49 mg/L Flow (in gpm) 4.69 GPM Oxidation-Reduction Potential 46.6 mV

pH 7.83 SU Specific Conductance 126 uS/cm Temperature 21.08 deg C

Turbidity 0.65 NTU

COLLECTED BY (PRINT) A. Vigil

RELINQUISHED BY (Printed Name) Andrew Jaramillo **(Signature)**	**Date/Time** 5/9/14 1210	**RECEIVED BY (Printed Name)** K. Greene **(Signature)**	**Date/Time** 5/9/14 1210
RELINQUISHED BY (Printed Name) (Signature)	**Date/Time**	**RECEIVED BY (Printed Name) (Signature)**	**Date/Time**

Report Date 05/01/2014

SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

EVENT ID: 4642 **EVENT NAME:** Mortandad/Sandia (MDA C and GS Investigation) MY2014 Q3 Watershed Sampling

SAMPLE ID: CAMO-14-75546 **WORK ORDER:** NA

	AS PLANNED	AS COLLECTED		AS PLANNED	AS COLLECTED
DATE COLLECTED (MM/DD/YYYY):		05/12/2014	**FIELD MATRIX:** WG		OK
TIME COLLECTED (HH:MM):		11:51	**MEDIA:** UA		↓
PRS ID:		OK	**SAMPLE TECH CODE:** UA		GSP
LOCATION ID: R-60			**FIELD PREP:** UF		OK
LOCATION TYPE: MON			**FIELD QC TYPE:** REG		↓
PORT: SINGLE COMPLETION		↓	**SAMPLE USAGE:** INV		↓

PRIORITY	ORDER	CONTAINER	#	PRESERVATIVE	COLLECTED Y/N	SPECIAL INSTRUCTIONS
N/A	MSGP-Hg	1 LITER POLY	1	HNO3	Y	NONE
↓	WSP-8260B-VOA	40 ML SEPTUM AMBER GLASS	2	HCL	↓	↓
↓	WSP-8270C-SVOA	1 LITER AMBER GLASS	3	ICE	↓	↓
↓	WSP-CN(T)	250 ML POLY	1	NAOH	↓	↓
↓	WSP-LL-H-3	1 LITER POLY	1	NONE	↓	↓
↓	WSP-TKN+TOC	500 ML AMBER GLASS	1	H2SO4	↓	↓

SAMPLE COMMENTS: Sampled within 50' of running diesel generator

LOCATION COMMENTS: NONE

FIELD PARAMETERS:

Dissolved Oxygen 5.79 mg/L Flow (in gpm) 1.27 GPM Oxidation-Reduction Potential 74.9 mV

pH 8.18 SU Specific Conductance 130 uS/cm Temperature 23.21 deg C

Turbidity 3.40 NTU

COLLECTED BY (PRINT) A. Stocker

RELINQUISHED BY (Printed Name) Julie Mayfield **(Signature)**	**Date/Time** 05/12/2014 1235	**RECEIVED BY (Printed Name)** K. Greene **(Signature)**	**Date/Time** 05/12/2014 1235
RELINQUISHED BY (Printed Name) (Signature)	**Date/Time**	**RECEIVED BY (Printed Name) (Signature)**	**Date/Time**

Report Date 05/01/2014

DATA VALIDATION REPORT

Chain Of Custody No. 2014-3390

1. Distribution Of Samples In EDD.

SDG	Analytical Method	Regular Samples	Field Duplicates	Trip Blanks	Field Blanks	Equipment Blanks
ARS1-14-01217	Generic:Low_Level_Tritium	1				
ARS1-14-01217	Generic:Low_Level_Tritium	1				
ARS1-14-01217	Generic:Low_Level_Tritium	1				

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
ARS1-14-01217	Generic:Low_Level_Tritium	ARS1-B14-	ARS1-B14-	3					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	CAMO-14-75543	ARS1-B14-01132-06	REG	1	0	0	0
Generic:Low_Level_Tritium	RAD	CAMO-14-75545	ARS1-B14-01132-07	REG	1	0	0	0
Generic:Low_Level_Tritium	RAD	CAMO-14-75546	ARS1-B14-01132-08	REG	1	0	0	0
Generic:Low_Level_Tritium	RAD	LCS	ARS1-B14-01132-01	LCS	0	0	1	0
Generic:Low_Level_Tritium	RAD	LCSD	ARS1-B14-01132-02	LCSD	0	0	1	0
Generic:Low_Level_Tritium	RAD	MB	ARS1-B14-01132-03	MB	1	0	0	0

3. Are any analytes missing?

No.

4. Were any holding times exceeded?

No.

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-B14-01132-01	ARS1-B14-01132-02	Generic:Low_Level_Tritium	Tritium	ARS1-B14-01132	06-11-2014	W	74.000	81.000	120.00	80.000		10	10.851	

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?

No.

DATA VALIDATION REPORT

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	Paramter 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-14 S1	2014-3390	CAMO-14-75543	REG	INIT	RAD	Generic:Low_Level_Tritiu	Tritium	U	U	R5	N	1.2900	pCi/L	1.2900	pCi/L	1.9700	0.6300	W	05/06/2014		ARS1-B14-01132	VAL	Y
R-46	2014-3390	CAMO-14-75545	REG	INIT	RAD	Generic:Low_Level_Tritiu	Tritium		J-	R12a	Y	13.1100	pCi/L	13.1100	pCi/L	1.8900	2.1200	W	05/09/2014		ARS1-B14-01132	VAL	Y
R-60	2014-3390	CAMO-14-75546	REG	INIT	RAD	Generic:Low_Level_Tritiu	Tritium	U	U	R5	N	1.3700	pCi/L	1.3700	pCi/L	2.0000	0.6500	W	05/12/2014		ARS1-B14-01132	VAL	Y

Reason Code	Description
R12a	The LCS percent recovery was <the LAL but >10%. Follow the external laboratory limits located within the associated data package.
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
CAMO-14-75543	R-14 S1	REG	Generic:Low_Level_Tritium	0	1
CAMO-14-75545	R-46	REG	Generic:Low_Level_Tritium	0	1
CAMO-14-75546	R-60	REG	Generic:Low_Level_Tritium	0	1

2609 North River Road, Port Allen, Louisiana 70767

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

ARS International, LLC

Laboratory Analysis Report

ARS1-14-01217

Prepared for:

Los Alamos National Laboratory

Keith Greene
P.O. Box 1663
MS M992
Los Alamos, NM 87545
kgreene@lanl.gov

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

Susan Reese
Project Manager Review

James D. Lum
Management Review

Notes: ARS International, LLC 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.

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

Project Manager

ProjectManagers@amrad.com

Phone: 225.381.2991
Fax: 225.381.2996

ACCREDITED
DoD ELAP

LELAP Cert# 01949

2609 North River Road, Port Allen, Louisiana 70767
1 (800) 401-4277 FAX (225) 381-2996

ARS Sample Delivery Group: ARS1-14-01217
Client Sample ID: CAMO-14-75543
Sample Collection Date: 05/06/14
Sample Matrix: Aqueous

Request or PO Number: 2014-3390
ARS Sample ID: ARS1-14-01217-001
Date Received: 05/15/14
Report Date: 06/12/14

Analysis Description	Analysis Results	CSU +/- 1 s	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	1.290	0.630	1.970	0.950	U	pCi/L	ARS-040	06/11/14 01:02	JPB	NA

NOTES: Contract 250953

Project Manager Review

LELAP Certificate# 01949

2609 North River Road, Port Allen, Louisiana 70767
1 (800) 401-4277 FAX (225) 381-2996

ARS Sample Delivery Group: ARS1-14-01217
Client Sample ID: CAMO-14-75545
Sample Collection Date: 05/09/14
Sample Matrix: Aqueous

Request or PO Number: 2014-3390
ARS Sample ID: ARS1-14-01217-002
Date Received: 05/15/14
Report Date: 06/12/14

Analysis Description	Analysis Results	CSU +/- 1 s	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	13.110	2.120	1.890	0.910		pCi/L	ARS-040	06/11/14 05:13	JPB	NA

NOTES: Contract 250953

Project Manager Review

LELAP Certificate# 01949

2609 North River Road, Port Allen, Louisiana 70767
1 (800) 401-4277 FAX (225) 381-2996

ARS Sample Delivery Group: ARS1-14-01217
Client Sample ID: CAMO-14-75546
Sample Collection Date: 05/12/14
Sample Matrix: Aqueous

Request or PO Number: 2014-3390
ARS Sample ID: ARS1-14-01217-003
Date Received: 05/15/14
Report Date: 06/12/14

Analysis Description	Analysis Results	CSU +/- 1 s	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	1.370	0.650	2.000	0.960	U	pCi/L	ARS-040	06/11/14 09:24	JPB	NA

NOTES: Contract 250953

Project Manager Review

LELAP Certificate# 01949

2609 North River Road, Port Allen, Louisiana 70767
1 (800) 401-4277 FAX (225) 381-2996

QC Results Report

Sample Delivery Group: ARS1-14-01217
Date Received: 5/15/2014

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-B14-01132	LCSD	H3	20.110	3.160	2.030	24.870		pCi/L	ARS-040	6/10/14 16:40	JPB	81	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-B14-01132	MBL	H3	1.310	0.580	1.780	NA	U	pCi/L	ARS-040	6/10/14 16:40	JPB

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 AcceptanceRange
ARS1-B14-01132	LCS	H3	20.110	3.160	18.040	2.850		pCi/L	ARS-040	6/10/14 16:40	JPB	0.34	< 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 AcceptanceRange
ARS1-B14-01132	LCS	H3	20.110	3.160	18.040	2.850		pCi/L	ARS-040	6/10/14 16:40	JPB	0.97	< 3

Project Manager Review

LELAP Certificate# 01949 NELAP Certificate # E87558

QC Evaluation

EPA Method: ARS-090
Batch ID: ARS1-B14-01132
SDG's: ARS1-14-01217

LCS	18.0400	**CSU (2s)**	5.5900
LCSD	20.1100	**CSU-D (2s)**	6.1900

DER = $\frac{\text{abs(LSC-LSCD)}}{\text{sqr((2s CSU/2)^2)+((2s CSU-D/2)^2) } \textit{at 1 sigma}}$ = **< 3**

DER $\frac{2.07}{4.170258}$ = 0.496372 **< 3**

% RPD= $\frac{\text{ABS(LCS - LSCD)}}{\text{(LCS+LCSD)/2}}$ * 100 = **< 25%**

%RPD $\frac{2.07}{19.075}$ *100 = 10.8519 **< 25%**

The *RPD* shall be less than 25% or other client-applied criteria

RER= $\frac{\text{abs((LCS-LCSD))}}{\text{(CSU)+(CSD) } \textit{at 2 sigma}}$ = **<1** ***<--LANL Requirement***

RER = $\frac{2.07}{11.7800}$ 0.175721562 **<1**

Blank Information

	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	1.31	1.14	1.78	
Ra-226				
Ra-228				
Total U				
Pb-210				
Po-209				
Sr-90				
TC-99				
NI-63				

*MDA should be below RDL
*Blank activity must be below MDA
*Blank activity must be < 1.65*CSU (DOE only)

ACT = 1.31
CSU = 1.14
Is ACT<1.65*CSU? YES

American Radiation Services - Primary
1726 Wooddale Court
Baton Rouge LA 70806

Chain of Custody/Analysis Request

COC/Lab Request #: 2014-3390

Page 1 of 1

Client Contact:

Lab Agreement # : 63641-001-10

Project Number :

Site Name: Los Alamos National Laboratory

Analysis Turnaround Time:

24 Hour - ☐ Other - ☐
7 Day - ☐
14 Day - ☐
21 Day - ☐
28 Day - ☒

Rad Screening Info: Yes, Below Background

Lab Reporting Limit Type: Sample Quantitation Limit

Special Instructions:

Field Sample ID	Sample Date	Sample Time	Sample Matrix	WSP-LL-H-3
CAMO-14-75543	May 6 2014	9:45	W	1
CAMO-14-75545	May 9 2014	11:20	W	1
CAMO-14-75546	May 12 2014	11:51	W	1

Special Instructions:

Relinquished by:	Print Name:	Date/Time:	Received by:	Print Name:	Date/Time:
		5/14/14 3:0			5-15-14 11:4
Relinquished by:	Print Name:	Date/Time:	Received by:	Print Name:	Date/Time:
Relinquished by:	Print Name:	Date/Time:	Received by:	Print Name:	Date/Time:

INTERNATIONAL

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: 2014-3390

INTERNATIONAL

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: 2014-3390

Original COC

American Radiation Services - Primary 1726 Wooddale Court Baton Rouge LA 70806	**Chain of Custody/Analysis Request**	**COC/Lab Request #:** 2014-3390 Page 1 of 1

Client Contact:	**Lab Agreement # :** 63641-001-10	**Site Name:** Los Alamos National Laboratory	**Rad Screening Info:**
	Project Number :		Yes, Below Background
	Analysis Turnaround Time: 24 Hour - ☐ Other - ☐ 7 Day - ☐ 14 Day - ☐ 21 Day - ☐ 28 Day - ☒		**Lab Reporting Limit Type:** Sample Quantitation Limit

Field Sample ID	Sample Date	Sample Time	Sample Matrix	WSP-LL-H-3																					**Special Instructions:**
CAMO-14-75543	May 6 2014	9:45	W	1																					
CAMO-14-75545	May 9 2014	11:20	W	1																					
CAMO-14-75546	May 12 2014	11:51	W	1																					

Special Instructions:

Relinquished by:	Print Name:	Date/Time:	Received by:	Print Name:	Date/Time:
		5/14/14 3:0			5-15-14/1145
Relinquished by:	Print Name:	Date/Time:	Received by:	Print Name:	Date/Time:
Relinquished by:	Print Name:	Date/Time:	Received by:	Print Name:	Date/Time:

INTERNATIONAL

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: 2014-3390

Case Narrative

ARS INTERNATIONAL

2609 North River Road • Port Allen, Louisiana 70767
1 (800) 401-4277 • Fax (225) 381-2996

June 13, 2014

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

Request Number: **2014-3390**
LANL Sample ID: **CAMO-14-75543; CAMO-14-75545; CAMO-14-75546.**

Dear Mr. Greene;

On May 15, 2014, ARS International received three (3) 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.

The client and QA/QC samples were counted with a count time sufficient to meet quality control parameters for counting equipment and were within acceptance criteria and statistical sound detection limits.

If you have any questions please do not hesitate to call at 225.381.2991 or email LANL@amrad.com.

Sincerely,

James D. [illegible]

Laboratory Management
ARS International

ARS INTERNATIONAL
2609 North River Road • Port Allen, Louisiana 70767
1 (800) 401-4277 • Fax (225) 381-2996

COVER PAGE

PROJECT SAMPLE IDENTIFICATION CROSS-REFERENCE TO ARS SAMPLE LABORATORY IDs

Subcontract (LANL Agreement Number) 250953

Request Number	LANL PROJECT SAMPLE ID NUMBER	American Radiation Services SAMPLE ID NUMBER(S)
2014-3390	CAMO-14-75543	ARS1-14-01217-001
2014-3390	CAMO-14-75545	ARS1-14-01217-002
2014-3390	CAMO-14-75546	ARS1-14-01217-003

SAMPLE RECEIPT

The samples were received in good condition. The samples were screened for radioactive contamination as per procedure **ARS-062 "Sample Receiving"**. A 28-day turnaround was requested on the chain of custody.

ANALYTICAL METHODS

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

ANALYTICAL RESULTS

The result data that are flagged with "U" indicate that the activity is below the MDC.

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."

"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	Title	Date
James D Pa	Laboratory Management, ARS International	06-16-14

2609 North River Road, Port Allen, Louisiana 70767

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

ARS International, LLC

Laboratory Analysis Report

ARS1-14-01217

Prepared for:

Los Alamos National Laboratory

Keith Greene
P.O. Box 1663
MS M992
Los Alamos, NM 87545
kgreene@lanl.gov

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

Susan Reese
Project Manager Review

James D. Lum
Management Review

Notes: ARS International, LLC 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.

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

Project Manager

ProjectManagers@amrad.com

Phone: 225.381.2991
Fax: 225.381.2996

LELAP Cert# 01949

INTERNATIONAL

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

ARS Sample Delivery Group:	ARS1-14-01217	**Request or PO Number:**	2014-3390
Client Sample ID:	CAMO-14-75543	**ARS Sample ID:**	ARS1-14-01217-001
Sample Collection Date:	05/06/14	**Date Received:**	05/15/14
Sample Matrix:	Aqueous	**Report Date:**	06/12/14

Analysis Description	Analysis Results	CSU +/- 1 s	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	1.290	0.630	1.970	0.950	U	pCi/L	ARS-040	06/11/14 01:02	JPB	NA

NOTES: Contract 250953

Project Manager Review

LELAP Certificate# 01949

2609 North River Road, Port Allen, Louisiana 70767
1 (800) 401-4277 FAX (225) 381-2996

ARS Sample Delivery Group: ARS1-14-01217
Client Sample ID: CAMO-14-75545
Sample Collection Date: 05/09/14
Sample Matrix: Aqueous

Request or PO Number: 2014-3390
ARS Sample ID: ARS1-14-01217-002
Date Received: 05/15/14
Report Date: 06/12/14

Analysis Description	Analysis Results	CSU +/- 1 s	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	13.110	2.120	1.890	0.910		pCi/L	ARS-040	06/11/14 05:13	JPB	NA

NOTES: Contract 250953

Project Manager Review

LELAP Certificate# 01949

2609 North River Road, Port Allen, Louisiana 70767
1 (800) 401-4277 FAX (225) 381-2996

ARS Sample Delivery Group:	ARS1-14-01217	**Request or PO Number:**	2014-3390
Client Sample ID:	CAMO-14-75546	**ARS Sample ID:**	ARS1-14-01217-003
Sample Collection Date:	05/12/14	**Date Received:**	05/15/14
Sample Matrix:	Aqueous	**Report Date:**	06/12/14

Analysis Description	Analysis Results	CSU +/- 1 s	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	1.370	0.650	2.000	0.960	U	pCi/L	ARS-040	06/11/14 09:24	JPB	NA

NOTES: Contract 250953

Project Manager Review

LELAP Certificate# 01949

2609 North River Road, Port Allen, Louisiana 70767
1 (800) 401-4277 FAX (225) 381-2996

QC Results Report

Sample Delivery Group: ARS1-14-01217
Date Received: 5/15/2014

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-B14-01132	LCSD	H3	20.110	3.160	2.030	24.870		pCi/L	ARS-040	6/10/14 16:40	JPB	81	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-B14-01132	MBL	H3	1.310	0.580	1.780	NA	U	pCi/L	ARS-040	6/10/14 16:40	JPB

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 AcceptanceRange
ARS1-B14-01132	LCS	H3	20.110	3.160	18.040	2.850		pCi/L	ARS-040	6/10/14 16:40	JPB	0.34	< 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 AcceptanceRange
ARS1-B14-01132	LCS	H3	20.110	3.160	18.040	2.850		pCi/L	ARS-040	6/10/14 16:40	JPB	0.97	< 3

Project Manager Review

LELAP Certificate# 01949 NELAP Certificate # E87558

QC Evaluation

EPA Method: ARS-090
Batch ID: ARS1-B14-01132
SDG's: ARS1-14-01217

LCS	18.0400	**CSU (2s)**	5.5900
LCSD	20.1100	**CSU-D (2s)**	6.1900

DER = $\frac{\text{abs(LSC-LSCD)}}{\text{sqr((2s CSU/2)^2)+((2s CSU-D/2)^2) } \textit{at 1 sigma}}$ = **< 3**

DER $\frac{2.07}{4.170258}$ = 0.496372 **< 3**

% RPD= $\frac{\text{ABS(LCS - LSCD)}}{\text{(LCS+LCSD)/2}}$ * 100 = **< 25%**

%RPD $\frac{2.07}{19.075}$ *100 = 10.8519 **< 25%**

The *RPD* shall be less than 25% or other client-applied criteria

RER= $\frac{\text{abs((LCS-LCSD))}}{\text{(CSU)+(CSD) } \textit{at 2 sigma}}$ = **<1** ***<--LANL Requirement***

RER = $\frac{2.07}{11.7800}$ 0.175721562 **<1**

Blank Information

	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	1.31	1.14	1.78	
Ra-226				
Ra-228				
Total U				
Pb-210				
Po-209				
Sr-90				
TC-99				
NI-63				

*MDA should be below RDL
*Blank activity must be below MDA
*Blank activity must be < 1.65*CSU (DOE only)

ACT = 1.31
CSU = 1.14
Is ACT<1.65*CSU? YES

INTERNATIONAL

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

Analysis Batch Report

15 of 15

INTERNATIONAL

Analysis Batch ID **ARS1-B14-01132**

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	Client ID	Isotope Group	Lab Deadline
ARS1-B14-01132-01	LCS	B-16816								
ARS1-B14-01132-02	LCSD	B-16817								
ARS1-B14-01132-03	MBL									
ARS1-B14-01132-04	DUP									
ARS1-B14-01132-05	MS									
ARS1-B14-01132-06	TRG				**ARS1-14-01217**	001	1	CAMO-14-75543	STD	06/09/14
ARS1-B14-01132-07	TRG				**ARS1-14-01217**	002	1	CAMO-14-75545	STD	06/09/14
ARS1-B14-01132-08	TRG				**ARS1-14-01217**	003	1	CAMO-14-75546	STD	06/09/14
ARS1-B14-01132-09	DO				**ARS1-14-01215**	001	1	119-051114-3	STD	06/10/14
ARS1-B14-01132-10	MSO				**ARS1-14-01215**	002	1	119-051114-4	STD	06/10/14

American Radiation Services
Baton Rouge Laboratory

LCS Report
Analytical Batch: ARS1-B14-01132

16

BlindID	ABatch	ABatchSampleID	BlindGroup	StdID	Isotope	ExpectedAddition	ExpectedValue	EmptyWt	GrossWt	NetWt	UserID	ModDate	ExpectedValue_CT	MidPointCountDate	KnownValue
B-16816	ARS1-B14-01132	ARS1-B14-01132-01	B-H3	S-0289	H-3	5	2.46361847	13.1708	18.2443	5.0735	AMRAD\BSTEFFENS	5/19/2014			
B-16817	ARS1-B14-01132	ARS1-B14-01132-02	B-H3	S-0289	H-3	5	2.46361847	13.1126	18.1772	5.0646	AMRAD\BSTEFFENS	5/19/2014			

ID_31001_040	ABatch	AnalysisCode	ABatchSampleID	ClientID	IC_ID	S01_1_EnrichCellNo
1039	ARS1-B14-01132	LSC-A-022	ARS1-B14-01132-01			94
1040	ARS1-B14-01132	LSC-A-022	ARS1-B14-01132-02			41
1041	ARS1-B14-01132	LSC-A-022	ARS1-B14-01132-03			0
1042	ARS1-B14-01132	LSC-A-022	ARS1-B14-01132-04			0
1043	ARS1-B14-01132	LSC-A-022	ARS1-B14-01132-05			0
1044	ARS1-B14-01132	LSC-A-022	ARS1-B14-01132-06	CAMO-14-75543		22
1045	ARS1-B14-01132	LSC-A-022	ARS1-B14-01132-07	CAMO-14-75545		0
1046	ARS1-B14-01132	LSC-A-022	ARS1-B14-01132-08	CAMO-14-75546		0
1047	ARS1-B14-01132	LSC-A-022	ARS1-B14-01132-09	119-051114-3		0
1048	ARS1-B14-01132	LSC-A-022	ARS1-B14-01132-10	119-051114-4		0

S01_2_TareCell	S01_3_TareResv	S02_GrossWtResv	S03_1_WtNa2O2	C_GrossSampleAdded	S04_1_ElectrolSD
334.89	205.62	720	2.06	514.38	05/23/2014 14:30:00
328.18	199.52	699.54	2.01	500.02	05/23/2014 15:45:00
319	200.37	700.44	2	500.07	05/23/2014 15:45:00
330.3	209.13	707.66	2	498.53	05/23/2014 15:45:00
328.5	192.84	692.9	2.06	500.06	05/23/2014 00:00:00
323.93	210.36	710.39	2.01	500.03	05/23/2014 15:45:00
334.77	195.97	696	2.04	500.03	05/23/2014 15:45:00
322.35	216.93	716.93	2	500	05/23/2014 15:45:00
321.7	203.76	703.76	2.05	500	05/23/2014 15:45:00
319.62	229.82	729.9	2	500.08	05/23/2014 15:45:00

S04_2_StartAmp	S04_3_StartBathC	S05_1_ElectrolED	S05_2_EndBathC	S05_3_EndCellWt	C_GrossSmplRec
5	2	06/09/2014 16:35:00	2	556.73	16.22
5	2	06/09/2014 12:30:00	2	543.8	16.1
5	2	06/09/2014 10:30:00	2	534.63	15.26
5	2	06/09/2014 12:30:00	2	554.73	15.3
5	2	06/09/2014 12:30:00	2	537.18	15.84
5	2	06/09/2014 09:43:00	2	551.14	16.85
5	2	06/09/2014 12:30:00	2	547.29	16.55
5	2	06/09/2014 00:00:00	2	556.27	16.99
5	2	06/09/2014 12:30:00	2	540.94	15.48
5	2	06/09/2014 16:35:00	2	566.22	16.78

C_EnrichmentF	S06_TareWt	S07_GrossWt	C_RecoveredWa	S08_TearWtLSCVial	S09_VialPlusSmpl	C_NetSample
31.71270037	95.24	106.53	11.29	6.49	16.49	10
31.05714286	109.78	122.63	12.85	6.41	16.41	10
32.76998689	93.24	104.87	11.63	6.53	16.54	10.01
32.58366013	108.24	120.09	11.85	6.46	16.47	10.01
31.56944444	109.83	121.7	11.87	6.51	16.52	10.01
29.67537092	102.92	116	13.08	6.61	16.62	10.01
30.21329305	107.16	115.84	8.68	6.53	15.16	8.63
29.42907593	108.57	122.43	13.86	6.52	16.52	10
32.2997416	110.08	121.74	11.66	6.58	16.61	10.03
29.80214541	96.57	109.38	12.81	6.62	16.62	10

S10_1_WtVislSmplDrWatFill	C_NetDeadWaterAdded	C_TareWtBFCocktail	S10_2_GrossWtVSC	C_NetWtCocktailAdded
16.49	0	16.49	26.75	10.26
16.41	0	16.41	26.7	10.29
16.54	0	16.54	26.8	10.26
16.46	-0.01	16.46	26.8	10.34
16.52	0	16.52	26.83	10.31
16.62	0	16.62	26.92	10.3
16.58	1.42	16.58	26.87	10.29
16.52	0	16.52	26.81	10.29
16.61	0	16.61	26.9	10.29
16.62	0	16.62	26.89	10.27

UserID	ModDate
AMRAD\JBYRD	06/10/2014 17:26:54
AMRAD\JBYRD	06/09/2014 15:16:36
AMRAD\JBYRD	06/09/2014 13:18:30
AMRAD\JBYRD	06/09/2014 15:13:21
AMRAD\JBYRD	06/09/2014 16:41:59
AMRAD\JBYRD	06/09/2014 11:33:10
AMRAD\JBYRD	06/09/2014 16:48:46
AMRAD\JBYRD	06/10/2014 14:05:09
AMRAD\JBYRD	06/09/2014 17:46:00
AMRAD\JBYRD	06/10/2014 17:37:28

ARS-040 Calculation Results	
ARS1-B14-01132	
ACF	1
UCF	2.22
Sys Error	0.15

AnalysisCode	ABatchSampleID	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-B14-01132-01	514.380	2.060	16.220	2.114	14.106	0.027	28.464
LSC-A-022	ARS1-B14-01132-02	500.020	2.010	16.100	2.062	14.038	0.028	27.830
LSC-A-022	ARS1-B14-01132-03	500.070	2.000	15.260	2.052	13.208	0.026	29.511
LSC-A-022	ARS1-B14-01132-04	498.530	2.000	15.300	2.052	13.248	0.027	29.338
LSC-A-022	ARS1-B14-01132-05	500.060	2.060	15.840	2.114	13.726	0.027	28.438
LSC-A-022	ARS1-B14-01132-06	500.030	2.010	16.850	2.062	14.788	0.030	26.472
LSC-A-022	ARS1-B14-01132-07	500.030	2.040	16.550	2.093	14.457	0.029	27.054
LSC-A-022	ARS1-B14-01132-08	500.000	2.000	16.990	2.052	14.938	0.030	26.215
LSC-A-022	ARS1-B14-01132-09	500.000	2.050	15.480	2.103	13.377	0.027	29.149
LSC-A-022	ARS1-B14-01132-10	500.080	2.000	16.780	2.052	14.728	0.029	26.578

ARS-040 Calculation Results	
ARS1-B14-01132	
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-B14-01132-01	4.007	1.073	405.990	0.272	0.01000	L	1/3/2013	6/11/2014	240.000
LSC-A-022	ARS1-B14-01132-02	4.271	1.073	404.180	0.271	0.01000	L	1/3/2013	6/10/2014	240.000
LSC-A-022	ARS1-B14-01132-03	1.310	1.073	402.390	0.270	0.01001	L	6/9/2014	6/10/2014	240.000
LSC-A-022	ARS1-B14-01132-04	1.284	1.073	407.000	0.273	0.01001	L	5-11-14	6/11/2014	240.000
LSC-A-022	ARS1-B14-01132-05	3.309	1.073	416.550	0.277	0.01001	L	5-11-14	6/11/2014	240.000
LSC-A-022	ARS1-B14-01132-06	1.294	1.073	403.670	0.271	0.01001	L	5/6/2014	6/11/2014	240.000
LSC-A-022	ARS1-B14-01132-07	1.378	1.073	419.920	0.279	0.00863	L	5/9/2014	6/11/2014	240.000
LSC-A-022	ARS1-B14-01132-08	1.203	1.073	407.780	0.273	0.01000	L	5/12/2014	6/11/2014	240.000
LSC-A-022	ARS1-B14-01132-09	1.383	1.073	413.790	0.276	0.01003	L	5/11/2014	6/12/2014	240.000
LSC-A-022	ARS1-B14-01132-10	1.304	1.073	409.380	0.274	0.01000	L	5/11/2014	6/12/2014	240.000

2260

ARS-040 Calculation Results	
ARS1-B14-01132	
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-B14-01132-01	240.000	0.92246	18.506	0.918	0.918	2.924	1.799	5.730	2.033	0.981	pCi
LSC-A-022	ARS1-B14-01132-02	240.000	0.92260	20.695	0.966	0.966	3.251	1.893	6.372	2.086	1.007	pCi
LSC-A-022	ARS1-B14-01132-03	240.000	0.99969	1.338	0.563	0.563	0.597	1.103	1.171	1.820	0.878	pCi
LSC-A-022	ARS1-B14-01132-04	240.000										pCi
LSC-A-022	ARS1-B14-01132-05	240.000										pCi
LSC-A-022	ARS1-B14-01132-06	240.000	0.99447	1.394	0.627	0.627	0.661	1.228	1.295	2.034	0.982	pCi
LSC-A-022	ARS1-B14-01132-07	240.000	0.99493	2.120	0.702	0.702	0.771	1.377	1.511	2.241	1.081	pCi
LSC-A-022	ARS1-B14-01132-08	240.000	0.99539	0.822	0.616	0.616	0.628	1.207	1.231	2.039	0.984	pCi
LSC-A-022	ARS1-B14-01132-09	240.000	0.99508	1.739	0.567	0.567	0.625	1.112	1.224	1.809	0.873	pCi
LSC-A-022	ARS1-B14-01132-10	240.000	0.99508	1.437	0.619	0.619	0.656	1.214	1.285	2.006	0.968	pCi

ARS-040 Calculation Results	
ARS1-B14-01132	
ACF	1
UCF	2.22
Sys Error	0.15

AnalysisCode	ABatchSampleID	AliquotReportUnits	UserID	ModDate
LSC-A-022	ARS1-B14-01132-01	L	AMRAD\JBYRD	6/12/2014
LSC-A-022	ARS1-B14-01132-02	L	AMRAD\JBYRD	6/12/2014
LSC-A-022	ARS1-B14-01132-03	L	AMRAD\JBYRD	6/12/2014
LSC-A-022	ARS1-B14-01132-04	L	AMRAD\JBYRD	6/12/2014
LSC-A-022	ARS1-B14-01132-05	L	AMRAD\JBYRD	6/12/2014
LSC-A-022	ARS1-B14-01132-06	L	AMRAD\JBYRD	6/12/2014
LSC-A-022	ARS1-B14-01132-07	L	AMRAD\JBYRD	6/12/2014
LSC-A-022	ARS1-B14-01132-08	L	AMRAD\JBYRD	6/12/2014
LSC-A-022	ARS1-B14-01132-09	L	AMRAD\JBYRD	6/12/2014
LSC-A-022	ARS1-B14-01132-10	L	AMRAD\JBYRD	6/12/2014

ARS Batch Number: ARS1-B14 - 01132

Enter these Values for LCS

Current ACT	5.4507	Standards Report
NetWt	5.0735	LCS Report
Aliquot	0.5144	Procedural Data Report

Enter these Values for LCSD

Current ACT	5.4507	Standards Report
NetWt	5.0646	LCS Report
Aliquot	0.5000	Procedural Data Report

Expected Value Calculations

ARS Batch Number:

LCS

CALCULATED EXPECTED VALUE = 24.2171

Range 18.1629 - 30.2714

LCSD

CALCULATED EXPECTED VALUE = 24.8689

Range 18.6517 - 31.0862

Standards Activity as of: 06/10/14 16:40

Active	Std ID	Isotope	PSCLT	Verification Date	Exp Date	Status	Ref Date	Ref ACT (dpm)	ACT at Date Above (dpm/g)	Halflife (days)	Parent ID	Expended Date
A	**S-0289**	H-3	**SL**	01/07/14	01/07/15	OK	01/03/13	5.9080E+00	**5.4507**	4.500E+03	**S-0237**	

Beta Liquid Scintillation Counter Log Book

Date	Time	ARS Sample I.D. Number	Batch Number	Liquid Scintillation File Number	Technician Initials
6-9-14		BLH-01132-08	BLH-01132		
↓	↓	↓ -01	↓		
↓	↓	↓ -10	↓		
6-10-14		SNC 16	QA	Q1	
↓	↓	Background	BLH-01132	1220	
↓	↓	BLH-01132- 06	↓	↓	
↓	↓	↓ 03	↓	↓	
↓	↓	↓ 02	↓	↓	
↓	↓	↓ 09	↓	↓	
↓	↓	↓ 04	↓	↓	
↓	↓	↓ 05	↓	↓	
↓	↓	↓ 07	↓	↓	
↓	↓	↓ 08	↓	↓	
↓	↓	↓ 01	↓	↓	
↓	↓	↓ 10	↓	↓	

Samples Recounted 6-10-14

6-12-14

SDL 6-12-14

Reviewed By: SDL Date: 6-12-14
Initials

INTERNATIONAL

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

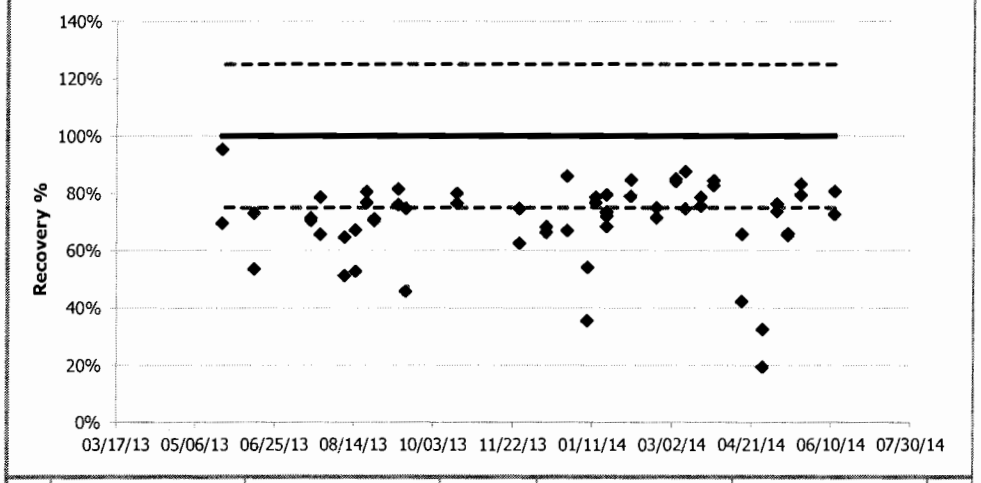
Control Charts

American Radiation Services
Baton Rouge Laboratory

QC Chart

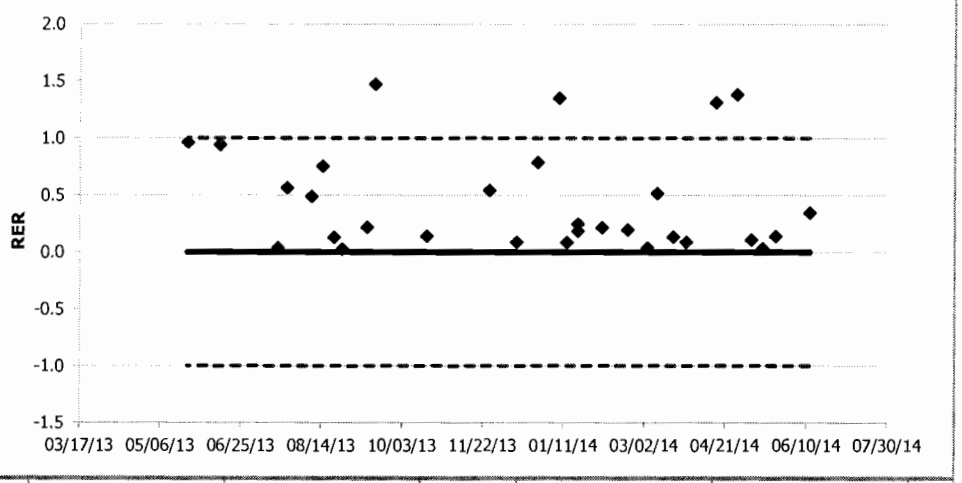
Printed: 6/12/2014 12:19 PM
Page 1 of 1

LLH-3 LCS



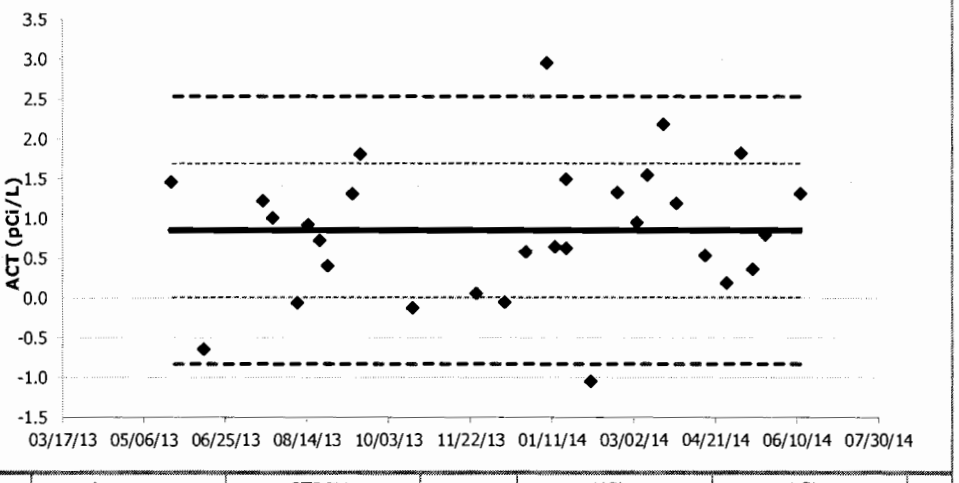
Average	STDEV	n	UCL	LCL
0.7053	0.1404	30	1.2500	0.7500

LLH-3 RER



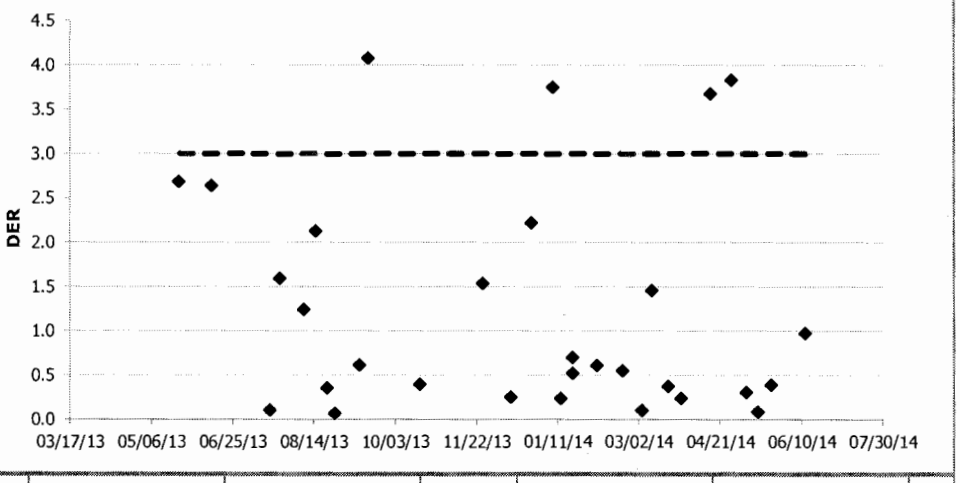
n	UCL	LCL
30	1.0000	-1.0000

LLH-3 Blank



Average	STDEV	n	UCL	LCL
0.8516	0.8394	30	2.5304	-0.8273

LLH-3 DER



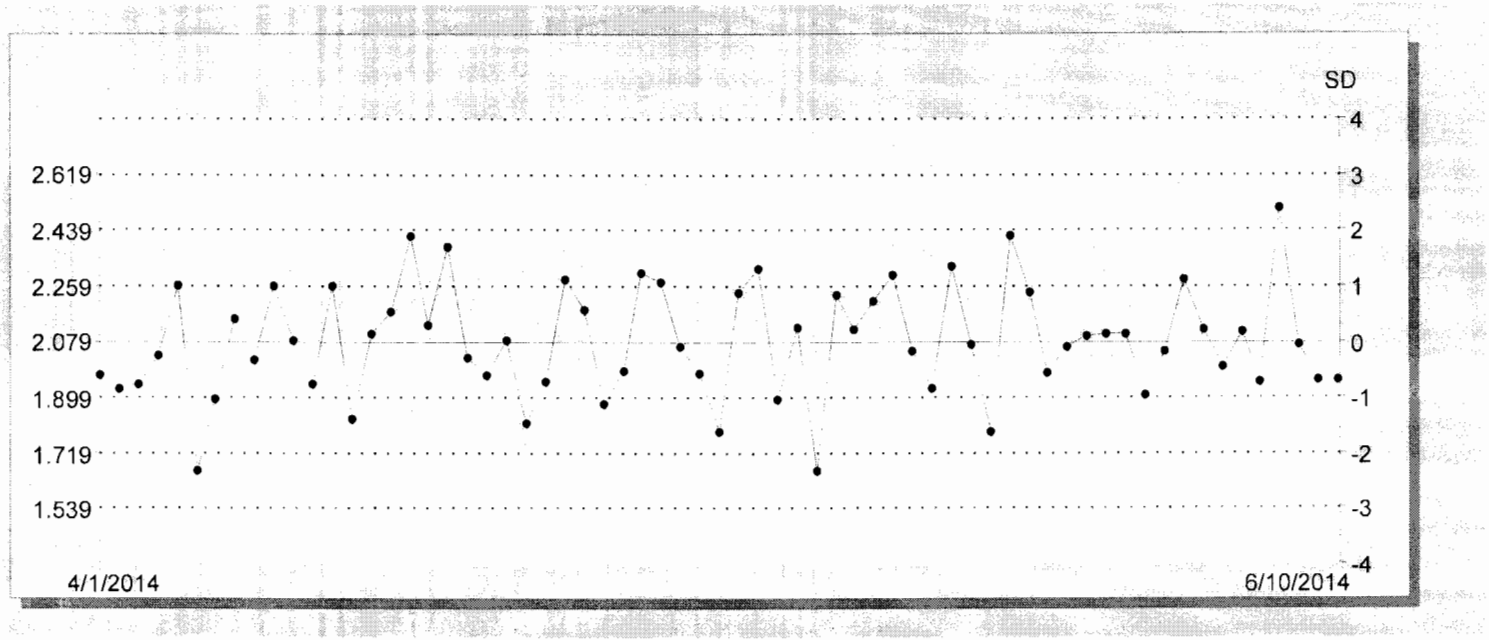
n	UCL
30	3.0000

3H Background
Total # pts : 5807
Valid # pts : 65
Mean : 2.08
SD : 0.18

Date	Value	Valid Pt
Apr 01, 2014	1.97	X
Apr 02, 2014	1.93	X
Apr 02, 2014	1.94	X
Apr 02, 2014	2.03	X
Apr 02, 2014	2.26	X
Apr 02, 2014	1.66	X
Apr 02, 2014	1.89	X
Apr 02, 2014	2.15	X
Apr 02, 2014	2.02	X
Apr 02, 2014	2.26	X
Apr 02, 2014	2.08	X
Apr 02, 2014	1.94	X
Apr 02, 2014	2.26	X
Apr 02, 2014	1.83	X
Apr 02, 2014	2.11	X
Apr 03, 2014	2.17	X
Apr 03, 2014	2.42	X
Apr 03, 2014	2.13	X
Apr 03, 2014	2.39	X
Apr 03, 2014	2.03	X
Apr 03, 2014	1.97	X
Apr 03, 2014	2.08	X
Apr 03, 2014	1.81	X
Apr 03, 2014	1.95	X
Apr 03, 2014	2.28	X
Apr 03, 2014	2.18	X
Apr 03, 2014	1.88	X
Apr 03, 2014	1.99	X
Apr 03, 2014	2.30	X
Apr 04, 2014	2.27	X
Apr 04, 2014	2.06	X
Apr 04, 2014	1.98	X
Apr 04, 2014	1.79	X
Apr 04, 2014	2.24	X
Apr 04, 2014	2.32	X
Apr 04, 2014	1.89	X
Apr 04, 2014	2.13	X
Apr 08, 2014	1.66	X
Apr 11, 2014	2.23	X
Apr 12, 2014	2.12	X
Apr 15, 2014	2.21	X
Apr 17, 2014	2.29	X
Apr 24, 2014	2.05	X
Apr 25, 2014	1.93	X
Apr 28, 2014	2.32	X
Apr 30, 2014	2.07	X
May 02, 2014	1.79	X
May 02, 2014	2.42	X
May 05, 2014	2.24	X
May 06, 2014	1.98	X
May 07, 2014	2.06	X
May 09, 2014	2.09	X
May 09, 2014	2.10	X
May 09, 2014	2.10	X
May 10, 2014	1.90	X
May 14, 2014	2.04	X
May 14, 2014	2.28	X
May 16, 2014	2.12	X

May 21, 2014	2.11	X
May 22, 2014	1.95	X
Jun 06, 2014	2.51	X
Jun 09, 2014	2.07	X
Jun 10, 2014	1.96	X
Jun 10, 2014	1.96	X

3H Background
Total # pts : 5807
Valid # pts : 65
Mean : 2.08
SD : 0.18

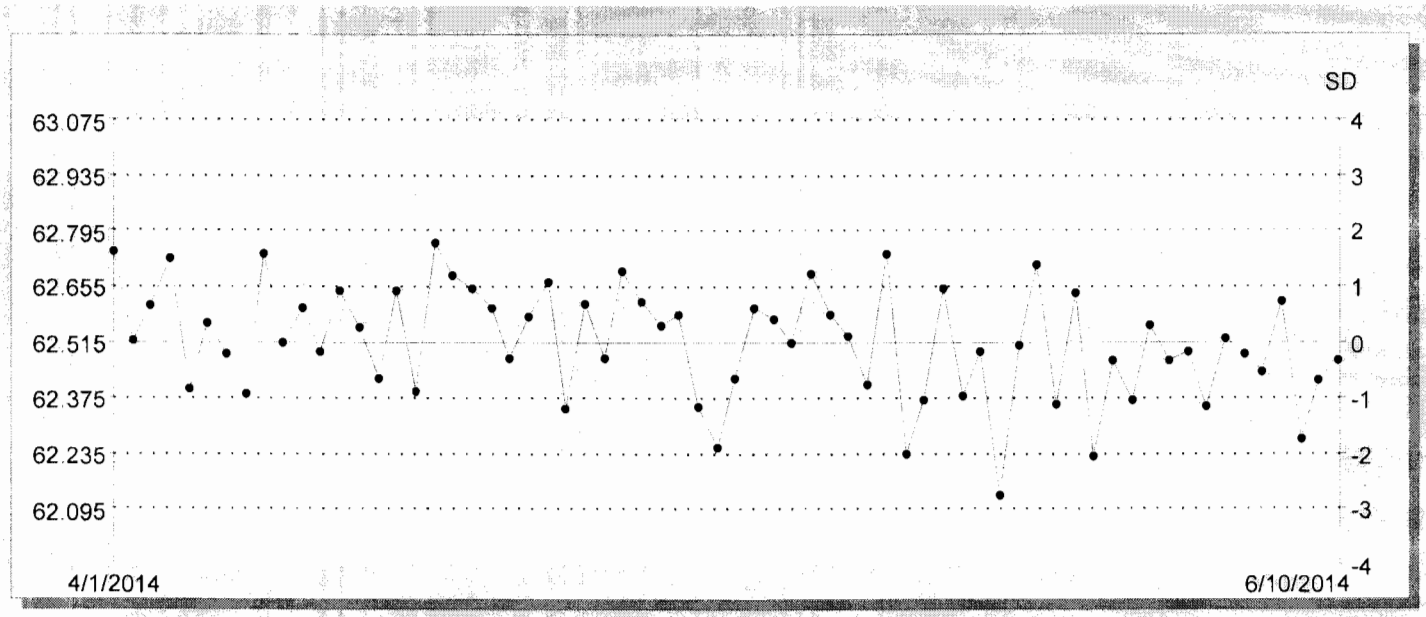


3H Efficiency
Total # pts : 5882
Valid # pts : 66
Mean : 62.52
SD : 0.14

Date	Value	Valid Pt
Apr 01, 2014	62.74	X
Apr 02, 2014	62.52	X
Apr 02, 2014	62.61	X
Apr 02, 2014	62.73	X
Apr 02, 2014	62.40	X
Apr 02, 2014	62.56	X
Apr 02, 2014	62.48	X
Apr 02, 2014	62.39	X
Apr 02, 2014	62.74	X
Apr 02, 2014	62.51	X
Apr 02, 2014	62.60	X
Apr 02, 2014	62.49	X
Apr 02, 2014	62.65	X
Apr 02, 2014	62.55	X
Apr 02, 2014	62.43	X
Apr 03, 2014	62.64	X
Apr 03, 2014	62.39	X
Apr 03, 2014	62.76	X
Apr 03, 2014	62.69	X
Apr 03, 2014	62.65	X
Apr 03, 2014	62.60	X
Apr 03, 2014	62.47	X
Apr 03, 2014	62.58	X
Apr 03, 2014	62.67	X
Apr 03, 2014	62.35	X
Apr 03, 2014	62.61	X
Apr 03, 2014	62.48	X
Apr 03, 2014	62.70	X
Apr 03, 2014	62.62	X
Apr 04, 2014	62.56	X
Apr 04, 2014	62.59	X
Apr 04, 2014	62.36	X
Apr 04, 2014	62.25	X
Apr 04, 2014	62.43	X
Apr 04, 2014	62.60	X
Apr 04, 2014	62.58	X
Apr 04, 2014	62.51	X
Apr 08, 2014	62.69	X
Apr 11, 2014	62.59	X
Apr 12, 2014	62.53	X
Apr 15, 2014	62.41	X
Apr 17, 2014	62.74	X
Apr 24, 2014	62.24	X
Apr 25, 2014	62.37	X
Apr 28, 2014	62.65	X
Apr 30, 2014	62.38	X
May 02, 2014	62.49	X
May 02, 2014	62.13	X
May 05, 2014	62.51	X
May 06, 2014	62.71	X
May 07, 2014	62.36	X
May 09, 2014	62.64	X
May 09, 2014	62.23	X
May 09, 2014	62.47	X
May 10, 2014	62.37	X
May 14, 2014	62.56	X
May 14, 2014	62.47	X
May 16, 2014	62.49	X

May 21, 2014	62.53	X
May 22, 2014	62.49	X
May 22, 2014	62.44	X
Jun 06, 2014	62.62	X
Jun 09, 2014	62.27	X
Jun 10, 2014	62.42	X
Jun 10, 2014	62.47	X

3H Efficiency
Total # pts : 5882
Valid # pts : 66
Mean : 62.52
SD : 0.14



INTERNATIONAL

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

INTERNATIONAL

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

Procedures: **ARS-060** **ARS-040** *Section 14.1 Tritium Screen in Clean Water without Distillation*

ARS File ID Numbers: ARS1-14-01215; 1217
ARS Batch ID: ARS1-B14-01079

	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	B14-01079-04	120	1.101	1.215	26.31	10.06	-19.401	pCi/L	101.58	NO
2	B14-01079-05	120	1.283	1.215	26.21	10.00	11.687	pCi/L	102.5794	NO
3	B14-01079-06	120	1.179	1.215	26.29	10.00	-6.168	pCi/L	102.2672	NO
4	B14-01079-07	120	1.198	1.215	26.46	10.00	-2.894	pCi/L	101.6102	NO
5	B14-01079-08	120	1.327	1.215	26.77	10.01	18.827	pCi/L	100.3332	NO
6							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
7							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
8							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
9							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
10							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
11							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
12							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
13							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
14							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
15							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
16							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
17							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
18							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
19							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
20							#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
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!

INTERNATIONAL

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

Analysis Batch Report

Analysis Batch ID **ARS1-B14-01079**

					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	Client ID	Isotope Group	Lab Deadline
ARS1-B14-01079-01	LCS									
ARS1-B14-01079-02	LCSD									
ARS1-B14-01079-03	MBL									
ARS1-B14-01079-04	TRG				**ARS1-14-01217**	001	1	CAMO-14-75543	STD	06/09/14
ARS1-B14-01079-05	TRG				**ARS1-14-01217**	002	1	CAMO-14-75545	STD	06/09/14
ARS1-B14-01079-06	TRG				**ARS1-14-01217**	003	1	CAMO-14-75546	STD	06/09/14
ARS1-B14-01079-07	TRG				**ARS1-14-01215**	001	1	119-051114-3	STD	06/10/14
ARS1-B14-01079-08	TRG				**ARS1-14-01215**	002	1	119-051114-4	STD	06/10/14

ID_31001_054	ABatch	ABatchSampleID	ClientID	Aliquot1	AliquotUnits1	IC_ID1	Aliquot2	AliquotUnits2	IC_ID2	UserID	ModDate
13662	ARS1-B14-01079	ARS1-B14-01079-01		1	L					AMRAD\JBYRD	05/16/2014 11:57:44
13663	ARS1-B14-01079	ARS1-B14-01079-02		1	L					AMRAD\JBYRD	05/16/2014 11:57:44
13664	ARS1-B14-01079	ARS1-B14-01079-03		1	L					AMRAD\JBYRD	05/16/2014 11:57:44
13665	ARS1-B14-01079	ARS1-B14-01079-04	CAMO-14-75543	10.06	L	163018				AMRAD\JBYRD	05/16/2014 11:57:44
13666	ARS1-B14-01079	ARS1-B14-01079-05	CAMO-14-75545	10	L	163019				AMRAD\JBYRD	05/16/2014 11:57:44
13667	ARS1-B14-01079	ARS1-B14-01079-06	CAMO-14-75546	10	L	163020				AMRAD\JBYRD	05/16/2014 11:57:44
13668	ARS1-B14-01079	ARS1-B14-01079-07	119-051114-3	10	L	163023				AMRAD\JBYRD	05/16/2014 11:57:44
13669	ARS1-B14-01079	ARS1-B14-01079-08	119-051114-4	10.01	L	163024				AMRAD\JBYRD	05/16/2014 11:57:45

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\20140516_1347
Raw Results Path: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3_3\20140516_1347\20140516_1347.results
RTF File Name: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3_3\20140516_1347\LLH3.rtf
Comma-Delimited File Name: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3_3\20140516_1347\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 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

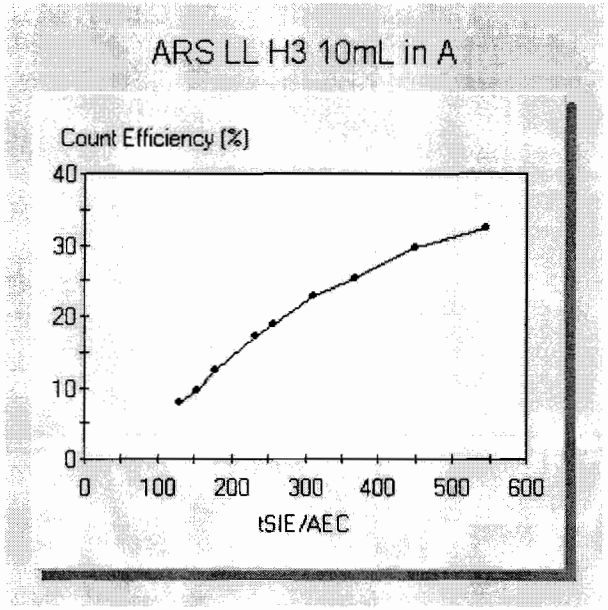
Half Life-

Half Life Correction: Off

Regions	Half Life	Units	Reference Date	Reference Time

A
B
C
45 of 76

Cycle 1 Results
Quench Curve Block Data



Date Acquired: 08/22/2013
Date Modified:
ARS LL H3 10mL in A

tSIE/AEC	Count Efficiency (%)
544.56	32.36
451.00	29.46
369.98	25.40
311.75	22.73
257.34	18.93
232.82	17.19
180.53	12.39
154.79	9.65
131.07	7.78

PR#	S#	SMPL_ID	CPMA	DPM1	tSIE	Eff Nucl In A	Count Time	DATE	TIME	MESSAGES
10	1	BACKGROUND	1.215	4.73	375.67	25.68	120.00	5/16/2014	1:56:10 PM	
10	2	B14-01079-04	1.101	4.19	388.10	26.31	120.00	5/16/2014	4:06:02 PM	
10	3	B14-01079-05	1.283	4.89	386.12	26.21	120.00	5/16/2014	6:15:54 PM	
10	4	B14-01079-06	1.179	4.48	387.77	26.29	120.00	5/16/2014	8:25:46 PM	
10	5	B14-01079-07	1.198	4.53	391.06	26.46	120.00	5/16/2014	10:35:38 PM	
10	6	B14-01079-05	1.327	4.96	397.39	26.77	120.00	5/17/2014	12:45:30 AM	

Beta Liquid Scintillation Counter Log Book

Date	Time	ARS Sample I.D. Number	Batch Number	Liquid Scintillation File Number	Technician Initials
5-12-14	15:44	B14-00899-13	B14-00899	1917	JB
↓	↓	↓ -19	↓	↓	JB
↓	↓	↓ -20	↓	↓	JB
↓	↓	↓ -08	↓	↓	JB
↓	↓	↓ -09	↓	↓	JB
↓	↓	↓ -22	↓	↓	JB
JB 5-16-14	~~5-16-14~~	~~12:01~~	~~B14-01079-04~~		
5-16-14		SNC16	QA	QA	JB
↓	↓	B14-01079-04	B14-01079	1347	JB
↓	↓	↓ 05	↓	↓	JB
↓	↓	↓ 06	↓	↓	JB
↓	↓	↓ 07	↓	↓	JB
↓	↓	↓ 08	↓	↓	JB

SDR 6-13-14

Reviewed By: SDR Date: 6-13-14
Initials

Low Level Tritium pH Checks

SDG#	Fraction	pH	Date	Analyst
ARS1-14-01217	001	7	5-16-14	JB
↓	002	7	↓	JB
↓	003	7	↓	JB
ARS1-14-01215	001	7	↓	JB
↓	002	7	↓	JB
		SDL 6-13-14		

INTERNATIONAL

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

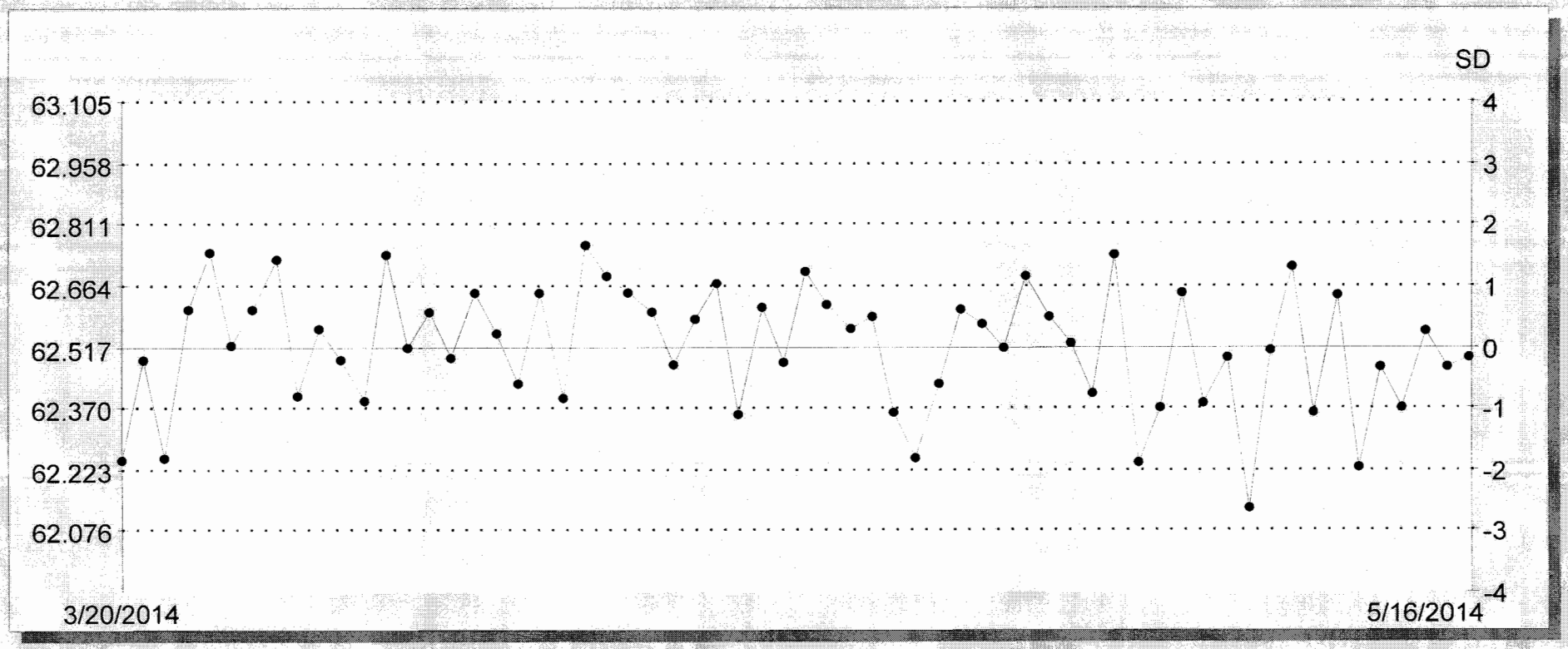
Control Charts

3H Efficiency
Total # pts : 5874
Valid # pts : 62
Mean : 62.52
SD : 0.15

Date	Value	Valid Pt
Mar 20, 2014	62.24	X
Mar 20, 2014	62.49	X
Mar 21, 2014	62.25	X
Mar 28, 2014	62.60	X
Apr 01, 2014	62.74	X
Apr 02, 2014	62.52	X
Apr 02, 2014	62.61	X
Apr 02, 2014	62.73	X
Apr 02, 2014	62.40	X
Apr 02, 2014	62.56	X
Apr 02, 2014	62.48	X
Apr 02, 2014	62.39	X
Apr 02, 2014	62.74	X
Apr 02, 2014	62.51	X
Apr 02, 2014	62.60	X
Apr 02, 2014	62.49	X
Apr 02, 2014	62.65	X
Apr 02, 2014	62.55	X
Apr 02, 2014	62.43	X
Apr 03, 2014	62.64	X
Apr 03, 2014	62.39	X
Apr 03, 2014	62.76	X
Apr 03, 2014	62.69	X
Apr 03, 2014	62.65	X
Apr 03, 2014	62.60	X
Apr 03, 2014	62.47	X
Apr 03, 2014	62.58	X
Apr 03, 2014	62.67	X
Apr 03, 2014	62.35	X
Apr 03, 2014	62.61	X
Apr 03, 2014	62.48	X
Apr 03, 2014	62.70	X
Apr 03, 2014	62.62	X
Apr 04, 2014	62.56	X
Apr 04, 2014	62.59	X
Apr 04, 2014	62.36	X
Apr 04, 2014	62.25	X
Apr 04, 2014	62.43	X
Apr 04, 2014	62.60	X
Apr 04, 2014	62.58	X
Apr 04, 2014	62.51	X
Apr 08, 2014	62.69	X

Apr 11, 2014	62.59	X
Apr 12, 2014	62.53	X
Apr 15, 2014	62.41	X
Apr 17, 2014	62.74	X
Apr 24, 2014	62.24	X
Apr 25, 2014	62.37	X
Apr 28, 2014	62.65	X
Apr 30, 2014	62.38	X
May 02, 2014	62.49	X
May 02, 2014	62.13	X
May 05, 2014	62.51	X
May 06, 2014	62.71	X
May 07, 2014	62.36	X
May 09, 2014	62.64	X
May 09, 2014	62.23	X
May 09, 2014	62.47	X
May 10, 2014	62.37	X
May 14, 2014	62.56	X
May 14, 2014	62.47	X
May 16, 2014	62.49	X

3H Efficiency
Total # pts : 5874
Valid # pts : 62
Mean : 62.52
SD : 0.15

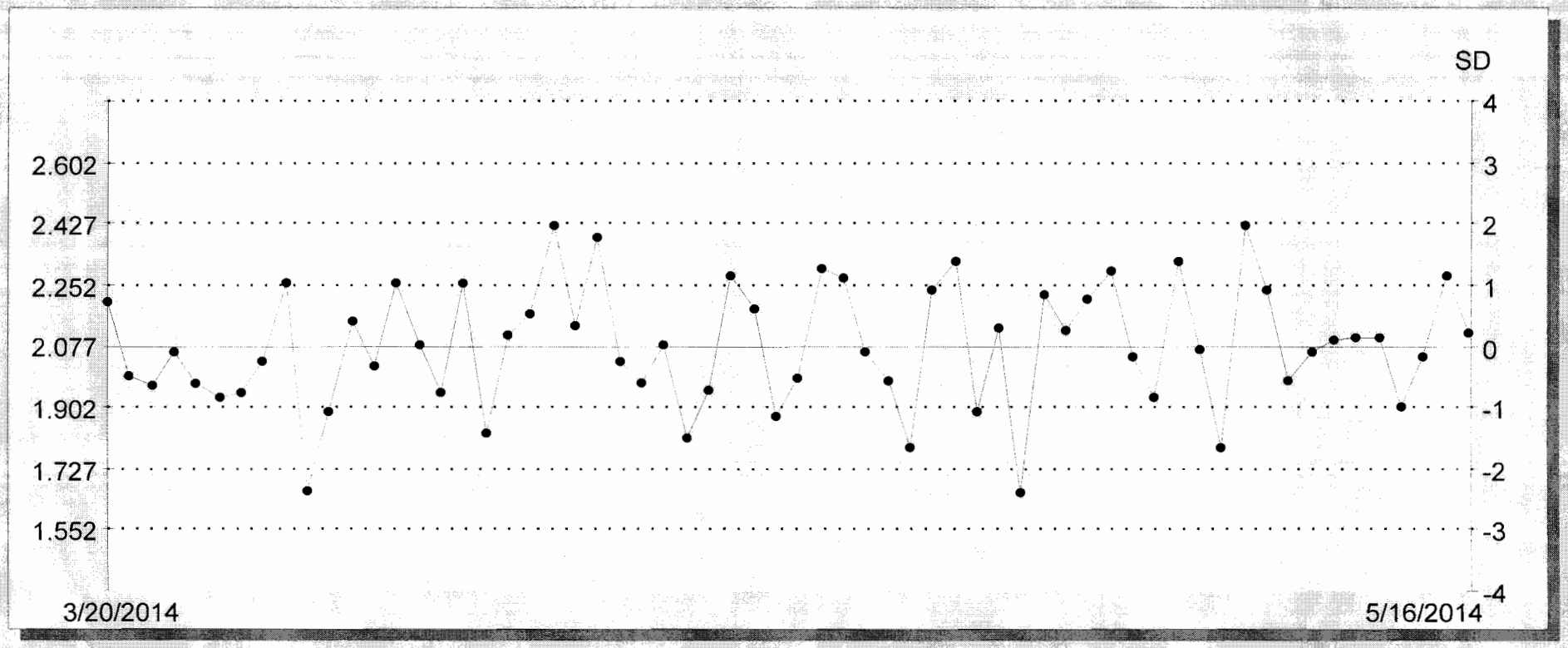


3H Background
Total # pts : 5800
Valid # pts : 62
Mean : 2.08
SD : 0.17

Date	Value	Valid Pt
Mar 20, 2014	2.20	X
Mar 20, 2014	1.99	X
Mar 21, 2014	1.96	X
Mar 28, 2014	2.06	X
Apr 01, 2014	1.97	X
Apr 02, 2014	1.93	X
Apr 02, 2014	1.94	X
Apr 02, 2014	2.03	X
Apr 02, 2014	2.26	X
Apr 02, 2014	1.66	X
Apr 02, 2014	1.89	X
Apr 02, 2014	2.15	X
Apr 02, 2014	2.02	X
Apr 02, 2014	2.26	X
Apr 02, 2014	2.08	X
Apr 02, 2014	1.94	X
Apr 02, 2014	2.26	X
Apr 02, 2014	1.83	X
Apr 02, 2014	2.11	X
Apr 03, 2014	2.17	X
Apr 03, 2014	2.42	X
Apr 03, 2014	2.13	X
Apr 03, 2014	2.39	X
Apr 03, 2014	2.03	X
Apr 03, 2014	1.97	X
Apr 03, 2014	2.08	X
Apr 03, 2014	1.81	X
Apr 03, 2014	1.95	X
Apr 03, 2014	2.28	X
Apr 03, 2014	2.18	X
Apr 03, 2014	1.88	X
Apr 03, 2014	1.99	X
Apr 03, 2014	2.30	X
Apr 04, 2014	2.27	X
Apr 04, 2014	2.06	X
Apr 04, 2014	1.98	X
Apr 04, 2014	1.79	X
Apr 04, 2014	2.24	X
Apr 04, 2014	2.32	X
Apr 04, 2014	1.89	X
Apr 04, 2014	2.13	X
Apr 08, 2014	1.66	X

Apr 11, 2014	2.23	X
Apr 12, 2014	2.12	X
Apr 15, 2014	2.21	X
Apr 17, 2014	2.29	X
Apr 24, 2014	2.05	X
Apr 25, 2014	1.93	X
Apr 28, 2014	2.32	X
Apr 30, 2014	2.07	X
May 02, 2014	1.79	X
May 02, 2014	2.42	X
May 05, 2014	2.24	X
May 06, 2014	1.98	X
May 07, 2014	2.06	X
May 09, 2014	2.09	X
May 09, 2014	2.10	X
May 09, 2014	2.10	X
May 10, 2014	1.90	X
May 14, 2014	2.04	X
May 14, 2014	2.28	X
May 16, 2014	2.12	X

3H Background
Total # pts : 5800
Valid # pts : 62
Mean : 2.08
SD : 0.17



INTERNATIONAL

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

ARS INTERNATIONAL

QUALITY CONTROL PROGRAM

AMERICAN RADIATION SERVICES
RADIOACTIVE REFERENCE SOLUTIONS

ANNUAL ACTIVITY VERIFICATION

VERIFICATION DATE: 1/7/2014 3:43 *date counted*
STANDARD REFERENCE #: S-0289

Principal Radionuclide		Half Life, Years		Half Life, Days
H-3	*ENTER -->*		*OR -->*	4.4998E+03
		1.232E+01		4.4998E+03

Radionuclide: H-3 Dilution Reference Date: 1/3/2014 13:25

Dilution Activity	2.66 pCi per gram ===> dpm/g	5.91
Verif. Date Decay Corrected	2.66 pCi per gram ===> dpm/g	5.90

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 (pCi/g)
S-0289-V1	21.75	1	LSC	0.3549	10.54	5.019	6.29	2.83
S-0289-V2	20.53	1	LSC	0.3546	10.54	4.993	5.64	2.54
S-0289-V3	20.60	1	LSC	0.3546	10.54	4.996	5.68	2.56
S-0289-V4	21.00	1	LSC	0.3547	10.54	5.005	5.89	2.65
S-0289-V5	21.18	1	LSC	0.3542	10.54	4.993	6.02	2.71

	Average	5.90	2.66
	Two Sigma Uncertainty	0.52	0.24
10% Max *PASS*	Standard Deviation percent of known concentration	4.51%	4.51%
	Target Activity	5.90	2.66
5% Max *PASS*	% Diff	0.00%	0.00%

Verification Expiration Date: January 7, 2015

Prepared & Counted By: _____ Date: 1/7/2014 3:43

Verified & Approved By: D H Mulligan Date: 1-8-14

QC Approval: D H Mulligan Date: 1-8-14

S-0289
H-3
SL
Manufactuer
Sol Matrix
Ref No
Tech
Parent ID

NIST SRM 4927F
H2O
NIST SRM 4927F
Unknown
S-0237

Verified 1/7/14
Expires 1/7/15

ARS INTERNATIONAL
RADIOACTIVE STANDARDS – BATON ROUGE LABORATORY

Assay Definition-

Assay Description:
H3 Normal Lvl

Assay Type: DPM (Single)
Report Name: Report1
Output Data Path: C:\Packard\Tricarb\Results\ARS\H3 Normal Lvl2\20140106_1733
Raw Results Path: C:\Packard\Tricarb\Results\ARS\H3 Normal Lvl2\20140106_1733\20140106_1733.results
RTF File Name: C:\Packard\Tricarb\Results\ARS\H3 Normal Lvl2\20140106_1733\H3 Results.rtf
Comma-Delimited File Name: C:\Packard\Tricarb\Results\ARS\H3 Normal Lvl2\20140106_1733\H3 Results.csv
Assay File Name: C:\Packard\TriCarb\Assays\H3 Normal Lvl2.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): 120.00
Count Mode: Normal
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: n/a
Colored Samples: Off Heterogeneity Monitor: n/a
Coincidence Time (nsec): 18 Delay Before Burst (nsec): 75

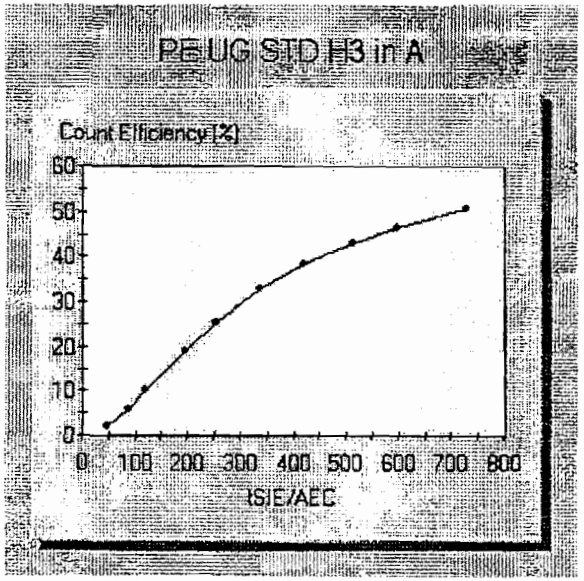
Half Life-

Half Life Correction: Off

Regions	Half Life	Units	Reference Date	Reference Time

59 of 76m C

Cycle 1 Results
Quench Curve Block Data



Date Acquired: 05/30/2013
Date Modified:
PE UG STD H3 in A

tSIE/AEC	Count Efficiency (%)
726.67	50.69
595.82	46.27
512.39	42.97
421.70	38.56
337.18	32.90
253.25	25.44
195.24	19.09
120.68	10.06
85.94	5.83
47.95	1.96

60 of 76

P#	S#	SMPL_ID	CPMA	DPM1	tSIE	Eff Nucl In A	Count Time	DATE	TIME	MESSAGES
20	1	BACKGROUND	10.54	29.70	375.63	35.48	120.00	1/6/2014	5:34:01 PM	
20	2	S-0289-V1	21.75	61.30	375.79	35.49	120.00	1/6/2014	7:35:52 PM	
20	3	S-0289-V2	20.53	57.89	375.34	35.46	120.00	1/6/2014	9:37:44 PM	
20	4	S-0289-V3	20.60	58.09	375.37	35.46	120.00	1/6/2014	11:39:36 PM	
20	5	S-0289-V4	21.00	59.21	375.58	35.47	120.00	1/7/2014	1:41:31 AM	
20	6	S-0289-V5	21.18	59.80	374.77	35.42	120.00	1/7/2014	3:43:23 AM	

STD ID: S-0289

ARS INTERNATIONAL

Add/Edit *Secondary Stds*

Planning

Planning Comments	Create an H-3 LCS standard
Target dpm/g (on dil. date)	5.5
Target Final volume mL	2000
Appx mass g of Parent Sol'n	3.67265132
Appx vol ml of Parent Sol'n	3.679273813
Expected Addition for Analysis g	5

Standards Preparation / Dilution

Secondary Solution #	S-0289
Dilution Date (New Ref Date)	01/03/2013 13:25
Ampoule, Empty (g)	
Ampoule /Solution Gross (g)	
Net Wt Removed (g)	
Transfer Container, empty (g)	1.8639
Container Plus Solution (g)	5.8014
Net Wt Transferred (g)	3.9375
DPM Xferred on 01/03/2013 13:25	11793.25195
Diluent/matrix	DI H2O
Diluent Density Cont, empty (g)	
Test Mass of 5 ml of Diluent (g)	
Diluent Density Test - (g/mL)	
Dilution Empty Container Mass (g)	416.9
Dilution Full Cont g (if measured)	2413.04
Dilution Final Volume ml (if measured)	2000
Final Dilution Density (g/mL)	0.99807
Final Dilution Measured Mass g	1996.14
Comments	H3 LCS standard. Dilution performed as stated above by BSteffens on 1/3/13. BJS 1/3/13
Final Dilution dpm/g	5.908028472
Final Dil New Ref Date/Time	01/03/2013 13:25

Parent Standard Data

Parent Solution Reference #	NIST SRM 4927F		
Parent Solution #	S-0237		
Parent Principal Radionuclide	H-3	Half Life (Days)	4499.8000000
Parent Reference Date	03/22/2010 10:10		
Parent Certified Act	3503.682716	Certi Act/Vol Units	dpm / g
Parent Cert Act Uncert 1 Sigma	0.0036		
Parent Sp. Gravity G/Ml	0.9982		
Parent Supplier	NIST SRM 4927F		
Parent Date Recvd	01/02/00		
Parent Received By	Unknown		
Parent Cert Exp Date			
Parent Matrix	H2O		
Certified dpm/g At Ref Date	3503.682716		
Certified dpm/g on 01/03/2013 13:25	2995.111607		
Parent Comments	Intermediate level H-3 standard for creating LCS solutions and matrix spikes. Dilution performed as stated above by B Steffens -BJS 3/22/10		
Parent Tech	Unknown		
Is_Primary	FALSE		
Is_LCS	TRUE		
Is_Tracer	FALSE		
Is_Calib	FALSE		

H-3 Standard Verification

Verifier's Name: Brian Steffens **Date:** 1/6/2014

Pipettor ID: FJ40469
Pipettor ID: Auto-pipettor
Pipettor ID: na
Standard ID: S-0289
Standard ID: N/A

Standards brought up to ~5g with distilled dead water.
Standards made in glass vials.

15mL of Ultima Gold added to standard

	Weight of Standard
S-0289-V1	5.019 g
S-0289-V2	4.993 g
S-0289-V3	4.996 g
S-0289-V4	5.005 g
S-0289-V5	4.993 g

Balance ID: H1331122173560P

H-3 Standard Verification

Verifier's Name: Brian Steffens **Date:** 1-6-14

Pipettor ID: FJ40469

Pipettor ID: Auto-pipettor

Pipettor ID: na

Standard ID: S-0289

Standard ID: N/A

Standards brought up to ~5g with distilled dead water.
Standards made in glass vials.

15mL of Ultima Gold added to standard

	Weight of Standard	
S-0289-V1	5.019	g
S-0289-V2	4.993	g
S-0289-V3	4.996	g
S-0289-V4	5.005	g
S-0289-V5	4.993	g

Balance ID: H1331122173560P

STD ID: S-0289

ARS INTERNATIONAL

Add/Edit *Secondary Stds*

Planning

Planning Comments	
Target dpm/g (on dil. date)	5.5
Target Final volume mL	2000
Appx mass g of Parent Sol'n	3.884999595
Appx vol ml of Parent Sol'n	3.892005204
Expected Addition for Analysis g	

Standards Preparation / Dilution

Secondary Solution #	S-0289
Dilution Date (New Ref Date)	1-3-13 1325
Ampoule, Empty (g)	
Ampoule /Solution Gross (g)	
Net Wt Removed (g)	
Transfer Container, empty (g)	1.8639
Container Plus Solution (g)	5.8014
Net Wt Transferred (g)	
DPM Xferred on 01/03/2014 11:01	
Diluent/matrix	
Diluent Density Cont, empty (g)	
Test Mass of 5 ml of Diluent (g)	
Diluent Density Test - (g/mL)	
Dilution Empty Container Mass (g)	416.90
Dilution Full Cont g (If measured)	2413.04
Dilution Final Volume ml (If measured)	
Final Dilution Density (g/mL)	
Final Dilution Measured Mass g	
Comments	
Final Dilution dpm/g	
Final Dil New Ref Date/Time	01/03/2014 11:01

Parent Standard Data

Parent Solution Reference #	NIST SRM 4927F
Parent Solution #	S-0237
Parent Principal Radionuclide	H-3 (Half Life (Days): 4499.8000000)
Parent Reference Date	03/22/2010 10:10
Parent Certified Act	3503.682716 (Certl Act/Vol Units: dpm : 0)
Parent Certl Act Uncert 1 Sigma	0.0036
Parent Sp. Gravity G/Ml	0.9982
Parent Supplier	NIST SRM 4927F
Parent Date Recvd	01/02/00
Parent Received By	Unknown
Parent Cert Exp Date	
Parent Matrix	H2O
Certified dpm/g At Ref Date	3503.682716
Certified dpm/g on 01/03/2014 11:01	2831.403127
Parent Comments	Intermediate level H-3 standard for creating LCS solutions and matrix spikes. Dilution performed as stated above by B Steffens. -BJS 3/22/10
Parent Tech	Unknown
Is_Primary	FALSE
Is_LCS	TRUE
Is_Tracer	FALSE
Is_Calib	FALSE

INTERNATIONAL

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

ARS INTERNATIONAL

Report Compilation Checklist

ARS SDG: 14-01217 **Client Name:** LANL **Sample 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)?	~~Yes~~ No N/A	
4) Form 1s Present for all Samples and Tests?	~~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?	~~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	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	1st Reviewer	
17) Preparation Raw Data Present, Signed 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~~	

SDL 6-13-14
Report Generator Signature Date

James D. Pu 6-16-14
Management Review Signature Date

LSC
Technical Review Checklist

ARS SDG ARS1-14-01217

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:** B14-01079 **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?	Yes No N/A	Yes No N/A
2) 100% of Manual Calculations Verified?	Yes No N/A	Yes No N/A
3) Blank Composition/Configuration Matches Calibration? 5-19-14	Yes No N/A	Yes No N/A
4) Deviations from procedure are documented and verified?	Yes No N/A	Yes No N/A
5) Appropriate Cocktail Selected?	Yes No N/A	Yes No N/A

6) Sample Prep Anomaly? ☑ No ☐ Yes (See Tech Notes) NCR # (If initiated): _____

Chemist Signature 5-16-14 Date

Verifier Review Signature 5-19-14 Date

B. ANALYSIS REVIEW

	Analyst Review	QA Officer Review
1) Calibrations Valid and Current?	Yes No N/A	Yes No N/A
2) Backgrounds Valid and Current?	Yes No N/A	Yes No N/A
3) Source Checks Completed and Acceptable?	Yes No N/A	Yes No N/A

James D. Pun 6-16-14
QA Officer Signature Date

	Analyst Review	Technicial Review
4) Background Checks Complete and Acceptable?	Yes No N/A	Yes No N/A
5) 100% of Manually Entered Parameters Verified Accurate?	Yes No N/A	Yes No N/A
6) Appropriate QC samples initiated at required frequency?	Yes No N/A	Yes No N/A
6) Test/Sample Specific Parameters (See ARS-059 for details)		N/A
a) Analysis Parameters Checked and Correct and Peak Shapes are Acceptable?	Yes No N/A	Yes No N/A
b) Spectra show no Evidence of Interferences?	Yes No N/A	Yes No N/A 5-19-14
c) Sample Quench for All Samples within Range of Quench Curve?	Yes No N/A	Yes No N/A

7) Analysis Anomaly? ☑ No ☐ Yes (See Comments) NCR # (If initiated): _____

Analyst Signature 5-19-14 Date

NA
Technicial Reviewer Signature Date

ARS INTERNATIONAL

Batch A: B14-01079

LSC
Technical Review Checklist

C. BATCH QC VALIDATION

	Proj. Mgr. Review	QA Officer Review
1) Activity + 3xCSU a Negative Number?	Yes No ~~N/A~~	Yes No (N/A)
2) RDL Criteria are Met?	Yes No ~~N/A~~	Yes No (N/A)
3) Method Blank Criterion Met?	Yes No ~~N/A~~	Yes No (N/A)
4) LCS/LCD Criteria Met?	Yes No ~~N/A~~	Yes No (N/A)
5) Duplicate (Sample Duplicate, LCSD, MSD) Criteria Met?	Yes No ~~N/A~~	Yes No (N/A)
6) MS/MSD Criteria Met?	Yes No ~~N/A~~	Yes No (N/A)
7) Batch QC Anomaly? ☑ No ☐ Yes (See Tech Notes) NCR # (If initiated):		

SDh 6-13-14
Project Manager Signature Date

James D. Lee 6-16-14
QA Officer Signature Date

GENERAL COMMENTS

LSC
Technical Review Checklist

ARS SDG ARS1-14-01217

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:** B14-01132 **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?	Yes No N/A	Yes No N/A
2) 100% of Manual Calculations Verified?	Yes No N/A	Yes No N/A
3) Blank Composition/Configuration Matches Calibration?	Yes No N/A	Yes No N/A
4) Deviations from procedure are documented and verified?	Yes No N/A	Yes No N/A
5) Appropriate Cocktail Selected?	Yes No N/A	Yes No N/A

6) Sample Prep Anomaly? ☑ No ☐ Yes (See Tech Notes) NCR # (If initiated): _____

Jacob Ryd 6-9-14
Chemist Signature Date

Heather Harrington 6/12/14
Verifier Review Signature Date

B. ANALYSIS REVIEW

	Analyst Review	QA Officer Review
1) Calibrations Valid and Current?	Yes No N/A	Yes No N/A
2) Backgrounds Valid and Current?	Yes No N/A	Yes No N/A
3) Source Checks Completed and Acceptable?	Yes No N/A	Yes No N/A

James D Ln 6-16-14
QA Officer Signature Date

	Analyst Review	Technicial Review
4) Background Checks Complete and Acceptable?	Yes No N/A	Yes No N/A
5) 100% of Manually Entered Parameters Verified Accurate?	Yes No N/A	Yes No N/A
6) Appropriate QC samples initiated at required frequency?	Yes No N/A	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?	Yes No N/A	Yes No N/A
b) Spectra show no Evidence of Interferences?	Yes No N/A	Yes No N/A
c) Sample Quench for All Samples within Range of Quench Curve?	Yes No N/A	Yes No N/A

7) Analysis Anomaly? ☑ No ☐ Yes (See Comments) NCR # (If initiated): _____

Jacob Ryd 6-9-14 6-12-14
Analyst Signature Date

Technicial Reviewer Signature 6-12-14
Date

JB 6-12-14

ARS INTERNATIONAL

Batch A: B14-01132

LSC
Technical Review Checklist

C. BATCH QC VALIDATION

	Proj. Mgr. Review			QA Officer Review		
1) Activity + 3xCSU a Negative Number?	Yes	~~No~~	N/A	Yes	(No)	N/A
2) RDL Criteria are Met?	~~Yes~~	No	N/A	(Yes)	No	N/A
3) Method Blank Criterion Met?	~~Yes~~	No	N/A	(Yes)	No	N/A
4) LCS/LCD Criteria Met?	~~Yes~~	No	N/A	(Yes)	No	N/A
5) Duplicate (Sample Duplicate, LCSD, MSD) Criteria Met?	~~Yes~~	No	N/A	(Yes)	No	N/A
6) MS/MSD Criteria Met?	Yes	No	~~N/A~~	Yes	No	(N/A)

7) Batch QC Anomaly? ☑ No ☐ Yes (See Tech Notes) NCR # (If initiated): _____

SDL 6-13-14
Project Manager Signature Date

James D. Lee 6-16-14
QA Officer Signature Date

GENERAL COMMENTS

DQO Report for SDG

ARS1-14-01217

71 of 80

Analysis Code	Group	Isotope	Activity Units	Aliquot Units	ProcedureNo	RDL	LCS_LL	LCS_UL	MS_LL	MS_UL	RadY_LL	RadY_UL	GravY_LL	GravY_UL	RER	RPD	DiltionReq	RoughPrepReq	BlankCorrectionMDA	BlankCorrectionAll	CountTimeReq	AliquotRequired
LSC-A-021	STD	H-3	pCi	L	ARS-054	0.00E+00	75	125	60	140	30	110	40	110	1.00	25	FALSE	FALSE	FALSE	FALSE		
LSC-A-022	STD	Enriched H-3	pCi	L	ARS-040	0.00E+00	75	125	60	140	30	110	40	110	1.00	25	FALSE	FALSE	FALSE	FALSE		

SDG Report - Samples and Containers

SDG Specific Data

SDG	ARS1-14-01217	TAT Days	28	Project Type	Environmental
Sample Count	3 Rpt Level 4	Date Received	5/15/2014	COC Number	2014-3390
Client	Los Alamos National Laboratory	Client Deadline	6/12/2014	PO Number	63641-001-10
Client Code	114	Internal Deadline	6/11/2014	Job Number	
Profile Number	PN-00094	Lab Deadline	6/9/2014	Job Location	
Comments					

Samples and Containers (→) Checked In Thus Far

FR	ClientID	Matrix	SampleStartDate	SampleEndDate	Disp	Hold	Arch	Storage	X	Units	Y	Units	Z	Units	Comments
001	CAMO-14-75543	AQ	05/06/14 09:45 AM	05/06/14 09:45 AM	H	90	5	O1							
→	IC_ID	Cnt	Volume_mL	Wt_g	pH_Orig	pH_Final	CPM	uR_Hr	Storage	VOA	Head Sp	AF Units	AF Rate	AF Mins	AF Total Vol
	162965	1	1000.00				80	24		N	N/A				
002	CAMO-14-75545	AQ	05/09/14 11:20 AM	05/09/14 11:20 AM	H	90	5	O1							
→	IC_ID	Cnt	Volume_mL	Wt_g	pH_Orig	pH_Final	CPM	uR_Hr	Storage	VOA	Head Sp	AF Units	AF Rate	AF Mins	AF Total Vol
	162966	1	1000.00				80	24		N	N/A				
003	CAMO-14-75546	AQ	05/12/14 11:51 AM	05/12/14 11:51 AM	H	90	5	O1							
→	IC_ID	Cnt	Volume_mL	Wt_g	pH_Orig	pH_Final	CPM	uR_Hr	Storage	VOA	Head Sp	AF Units	AF Rate	AF Mins	AF Total Vol
	162967	1	1000.00				80	24		N	N/A				

SDG Report - Analysis Assignments

Temp SDG	**ARS1-14-01217**	**Sample Count**	
Client	**Los Alamos National Laboratory**	**Analysis Count**	**2-6**

Samples Count Totals per Analysis

Analysis Code	Analysis Description	Samples Count
LSC-A-021	Low Level Tritium Screen in (Aqueous)	3
LSC-A-022	Low Level Tritium by Enrichment Process in (Aqueous [AQ])	3

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

ARS FILE TRACKING SHEET

SDG: ARS1-14-01217

Task	Date / Time	Initials
Date & Time Samples Received	05-15-14 11:45	MD
ICOC Initiated/Storage Location: O1	05-15-14 13:00	MD
Technical Checks Performed	See Later	
Report Written / EDD Generated 6-12-14 1106 | SDL	6-13-14 1714	SDL
Quality Assurance Checks Performed on Report	6-16-14 0800	JDC
Management Checks Performed on Report		
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	☐	☑
24 Hour Rush	☐	☑
48 Hour Rush	☐	☑
3 Day Rush	☐	☑
5 Day Rush	☐	☑
10 Day Rush	☐	☑
Standard Oil/Gas Client (5 Day)	☐	☑
Standard Turnaround	☑	☐

NOTES EDD Loaded - met TAT 6-12-14

American Radiation Services - Primary
1726 Wooddale Court
Baton Rouge LA 70806

Chain of Custody/Analysis Request

AP&P

COC/Lab Request #: 2014-3390

Client Contact:

Lab Agreement # : 63641-001-10
Project Number :
Analysis Turnaround Time:
24 Hour - ☐ Other - ☐
7 Day - ☐
14 Day - ☐
21 Day - ☐
28 Day - ☒

Site Name: Los Alamos National Laboratory

Rad Screening Info: Yes, Below Background

Lab Reporting Limit Type: Sample Quantitation Limit

Special Instructions:

Field Sample ID	Sample Date	Sample Time	Sample Matrix	WSP-LL-H-3
CAMO-14-75543	May 6 2014	9:45	W	1
CAMO-14-75545	May 9 2014	11:20	W	1
CAMO-14-75546	May 12 2014	11:51	W	1

Special Instructions:

Relinquished by:	Print Name:	Date/Time:	Received by:	Print Name:	Date/Time:
	Melissa Martin	5/14/14 3:00		Michael Rivera	5-15-14/1149
Relinquished by:	Print Name:	Date/Time:	Received by:	Print Name:	Date/Time:
Relinquished by:	Print Name:	Date/Time:	Received by:	Print Name:	Date/Time:

COMPANY NAME: LANL **SDG:** ARS-14-0217

SHIPPING CONTAINER

Good Condition	☑ Yes	☐ No
Radioactive	☐ Yes	☑ No
UN2910	☑ Yes	☐ No
Sec. Seals	☑ Yes	☐ No
Seals Intact	☑ Yes	☐ No ☐ N/A
Air Bill	☐ Yes	☑ No

COC PRESENT WITH SAMPLES

COC	☑ Yes	☐ No

SAMPLE CONTAINER(S)

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

Samples Rcv: 3

Matrix: [AF , (AQ) , BI , FE , LT , SI , SO , UR , VG]

External and Internal Surveys

Exposure Rate Meter:	M3 242861	Serial No.:	PR 264266	Calibration Due Date:	4/16/15
Count Rate Meter:	M2 154859	Serial No.:	PR 184559	Calibration Due Date:	4/16/15

Background Exposure Rate (µR/hr)	24	Max. Exposure Rate on Shipping Containers Externals (Plus Bkgd)	24 µR/hr
Background Count Rate (cpm)	60	Max. Removable Count Rate on Shipping Containers Externals (Plus Bkgd)	60 cpm
		Max. Removable Count Rate on Shipping Containers Internals (Plus Bkgd)	60 cpm

Sample Label/Comments/Notes	pH Orig (pH ≤ 2 is Acceptable)	pH Final (pH ≤ 2 is Acceptable)	Mark if Preserve	Acid Lot #	Weight(g) / Volume(mL)	µR/hr (Acceptance Limits <500 µR/hr)	cpm (Acceptance Limits <100 cpm/cm²)
CAMO-14-75543			☐		1000	24	60
75545		5-15-14	☐		1000	24	60
75546			☐		1000	24	60
			☐				
			☐				
			☐				
			☐				
			☐				
			☐				
			☐				
			☐				
			☐				
			☐				
			☐				
			☐				
			☐				
			☐				
			☐				
			☐				

Surveyors' Name: Michael Davis

Date/Time Surveyed: 5-15-14 11:45