



*Environmental Programs*  
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Los Alamos, New Mexico 87545  
(505) 606-2337/FAX (505) 665-1812



*National Nuclear Security Administration*  
Los Alamos Site Office, MS A316  
Environmental Restoration Program  
Los Alamos, New Mexico 87544  
(505) 667-4255/FAX (505) 606-2132

Date: DEC 07 2011

Refer To: EP2011-0402

Mr. Brian Snyder, Water Division Director  
Acting Public Utilities Division Director  
Sangre de Cristo Water Division  
City of Santa Fe  
801 West San Mateo  
P.O. Box 909  
Santa Fe, New Mexico 87504

**Subject: Responses to Sangre de Cristo Water Division Questions Regarding Low-Level Tritium Results Reported by the Los Alamos National Laboratory Sitewide Monitoring Program for the City of Santa Fe Buckman Water Supply Wells**

Dear Mr. Snyder:

This letter provides responses to Mr. Alex Puglisi questions (in bold), received by email on November 7, 2011, regarding the low-level tritium results discussed by the Los Alamos National Laboratory (the Laboratory) in its October 25, 2011, letter report. In this report, the Laboratory states that tritium results from the May 17, 2011, sampling event for City of Santa Fe Buckman Water Supply Wells Nos 1, 6, and 8 were all nondetects. However, two of the three water samples collected on March 14, 2011, from wells 1 and 6 resulted in tritium detects. The letter report further states that the Laboratory is working with American Radiation Services laboratory to reevaluate its calculation errors of the March 14, 2011, results.

**What were these calculation errors?**

The analytical laboratory found that rounding functions programmed into its controlled spreadsheet were incorrect. The laboratory also found input errors that were a direct result of manual data entry.

**How were they determined to have occurred at this late point in time and why were they not discovered when the March 14th results were first reported?**

The Laboratory identified the two tritium detects from the March 14, 2011, sampling event as elevated compared with previous results immediately after pulling the data from The Laboratory's database. The Laboratory requested that the analytical laboratory review the data packages to ensure the accuracy of the results; however, the review was not completed before the 120-day deadline for releasing the data to the public or posting it to the RACER database. The August 16, 2011, letter reporting the March 16, 2011, sampling event results did identify a



discrepancy between the March 14, 2011, sample results analyzed by ARS and previous results analyzed by the University of Miami Tritium Laboratory. The discrepancy was attributed to differences in each laboratory's minimum detectable activity and counting uncertainty. It has recently been determined that rounding functions and input errors are factors that resulted in the tritium detections in the March 14, 2011, samples.

Over the last 2 yr, the Laboratory has transitioned from using the University of Miami to ARS for low-level tritium analysis and has been working with ARS to match our data-quality requirements with capabilities and limitations inherent to the analytical method. This past summer, the Laboratory conducted an assessment of all tritium data received from ARS and identified a body of tritium results that appeared erroneous when assessed as part of a larger body of data. The Laboratory requested that ARS review its protocol, and it has just completed its assessment of potential issues associated with low-level tritium analysis.

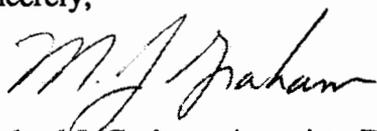
For these Buckman well samples, revised calculation activities were significantly different from initially reported. When recalculated using the correct spreadsheet, the results previously reported as detections are now considered nondetects.

**Were the March 14th results entered into the RACER database, and will the Laboratory make changes in that database?**

Yes, the results were uploaded to RACER following the City of Santa Fe's review period. Once the results are reviewed and corrected by the analytical laboratory and the Laboratory's review of the changes is concluded, the updated results will be added to RACER. The superseded results will be retained in RACER but with new qualifiers that indicate the results are rejected.

If you have any further questions, please contact Steve Paris at (505) 606-0915 (smparis@lanl.gov) or Woody Woodworth at (505) 665-5820 (lance.woodworth@nnsa.doe.gov).

Sincerely,



Michael J. Graham, Associate Director  
Environmental Programs  
Los Alamos National Laboratory

Sincerely,



George J. Rael, Assistant Manager  
Environmental Projects Office  
Los Alamos Site Office

MG/GR/CD/SP:sm

Cy: (w/enc.)

- Laurie King, EPA Region 6, Dallas, TX
- Alex Puglisi, City of Santa Fe, 801 West San Mateo, Santa Fe, NM 87505
- Claudia Borchert, City of Santa Fe, 801 West San Mateo, Santa Fe, NM 87505
- Michael Gonzales, City of Santa Fe, 801 West San Mateo, Santa Fe, NM 87505
- John Kieling, NMED-HWB, 2905 Rodeo Park Drive East, Building 1, Santa Fe, NM 87505
- Margaret Ryan, NMED-DWB, P.O. Box 5469, Santa Fe, NM 87502
- Steve Yanicak, NMED-DOE-OB, MS M894
- Hai Shen, DOE-LASO, MS A316 (date-stamped letter emailed)
- Woody Woodworth, DOE-LASO, MS A316 (date-stamped letter emailed)
- Gene Turner, DOE-LASO, MS A316 (date-stamped letter emailed)
- Neil Weber, San Ildefonso Pueblo (date-stamped letter emailed)
- Steve Paris, EP-CAP, MS M992 (date-stamped letter emailed)
- Craig Douglass EP-CAP MS M996 (date-stamped letter emailed)
- Suzanne Coyne, IRM-DCS, MS M992 (date-stamped letter emailed)
- William Alexander, EP-BPS, MS M992 (date-stamped letter emailed)
- RPF, MS M707 (electronic copy)
- Public Reading Room, MS M992 (hard copy)

## DATA VALIDATION COVER SHEET

5119-1

### Data Validation Cover Sheet

Records Use only



#### Section I.

 REQUEST NUMBER: 11-3383      VALIDATION DATE: 10/25/11      LAB CODE: ARS

 CONTRACT LABORATORY NAME: American Radiation Services

 VALIDATOR: Larry Fukui      ORGANIZATION: Analytical Quality Associates, Inc.

ANALYTICAL SUITE (CHECK ALL THAT APPLY):

- |   |  |   |  |
|---|--|---|--|
| <input type="checkbox"/> TPH-GRO  | <input type="checkbox"/> HIGH EXPLOSIVES           | <input type="checkbox"/> DIOXIN FURANS          | <input type="checkbox"/> LCMSMS PERCHLORATES                                 |
| <input type="checkbox"/> TPH-DRO  | <input type="checkbox"/> METALS                    | <input type="checkbox"/> PCB CONGENERS          | <input type="checkbox"/> ORGANOCHLORINE PESTICIDES/POLYCHLORINATED BIPHENYLS |
| <input type="checkbox"/> GENERAL CHEMISTRY                                | <input checked="" type="checkbox"/> RADIOCHEMISTRY | <input type="checkbox"/> LCMSMS HIGH EXPLOSIVES |  |
| <input checked="" type="checkbox"/> OTHER (DESCRIBE): <u>Tritium Only</u> |  |   |  |

#### Section II.      Completeness Check

- | YES                                 | NO                       | N/A                                 | (CHECK ONE)                 | YES                                 | NO                       | N/A                                 | (CHECK ONE)              |
|-------------------------------------|--------------------------|-------------------------------------|-----------------------------|-------------------------------------|--------------------------|-------------------------------------|--------------------------|
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | 1. CHAIN-OF-CUSTODY FORM(S) | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | 6. RAW/BSS DATA          |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | 2. CASE NARRATIVE           | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | 7. QUALITY CONTROL FORMS |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | 3. SAMPLE RESULT FORMS      | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | 8. QUANTITATION REPORTS  |
| <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> | 4. SAMPLE CHROMATOGRAMS     | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> | 9. TICS FORMS            |
| <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> | 5. STANDARD CHROMATOGRAMS   | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> | 10. TICS MASS SPECTRA    |

Comments/problems noted (include information about requests for further information submitted to the contract laboratory and agreed-upon date of resolution and contract laboratory point of contact):

- In the EQB, sample Buckman1-11-26863 associated with field samples -26862 and -26864, tritium was detected. The associated field sample results were NDs and, thus, were not qualified.
- It should be noted that no MS or duplicate samples were analyzed. However, an LCS and LCSD were analyzed, met acceptance criteria and, thus, no sample data were qualified.
- It should also be noted that the LCS/LCSD RER was hand-calculated using the 2-sigma TPU values and was found to be within specifications. No sample data were qualified as a result.

**Reviewed by:** Susan Ball
**Level:** I
**Date:** 10/26/11

VALIDATOR'S SIGNATURE: \_\_\_\_\_

DATE: 10/25/11

## RAD ANALYTICAL DATA VALIDATION CHECKLIST

5119-2

### Rad Analytical Data Validation Checklist

Records Use only



Yes No N/A  (Check One)				Assign Qualifier Listed Below If Criterion = Yes	
				Non-detected Analyte	Detected Analyte
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. The holding time was >1 and ≤2 times the applicable holding time requirement.	UJ, R9	J-, R9
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. The holding time was >2 times the applicable holding time requirement.	R, R9a	J-, R9a
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	3. The results for the affected analytes are considered not detected (U) because the associated sample concentration was less than or equal to the MDC.	U, R5	N/A
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	4. The analyte should be regarded as rejected because spectral interferences prevent positive identification of the analytes.	R, R5a	R, R5a
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. The MDC and/or TPU documentation is missing. Data may not be acceptable for use. Contact the SMO or external laboratory for information.	R, R5b	J-, R5b
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	6. The results for the affected analytes should be regarded as not detected (U) because the associated sample concentration was less than 3X the 1 sigma TPU.	U, R11	N/A
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. The sample result is ≤5X the concentration of the related analyte in the method blank.	U, R4	N/A
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. The affected analytes are considered estimated and biased high because this analyte was identified in the method blank but was >5X.	N/A	J, R4a
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	9. The sample result is ≤5X the concentration of the related analyte in the trip blank, rinsate blank, or equipment blank.	U, R4d	N/A
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. Required method blank information is missing. Data may not be acceptable for use. Contact the SMO or external laboratory for information.	R, R4e	R, R4e
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	11. The tracer is <10%R. Follow the external laboratory limits located within the associated data package. Tracer%R is not applicable for Gamma Spectroscopy.	R, R3	R, R3

## RAD ANALYTICAL DATA VALIDATION CHECKLIST

5119-2

### Rad Analytical Data Validation Checklist

Records Use only



Yes No N/A  (Check One)				Assign Qualifier Listed Below If Criterion = Yes	
				Non-detected Analyte	Detected Analyte
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	12. The tracer is < the Lower Acceptance Level (LAL) but $\geq 10\%R$ . Follow the external laboratory limits located within the associated data package. Tracer%R is not applicable for Gamma Spectroscopy.	UJ, R3a	J-, R3a
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	13. The Tracer%R value is > the Upper Acceptance Limit (UAL). Follow the external laboratory limits located within the associated data package. Tracer%R is not applicable for Gamma Spectroscopy.	N/A	J+, R3b
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	14. Required tracer information is missing. Data may not be acceptable for use. Contact the SMO or external laboratory for information. Tracer%R is not applicable for Gamma Spectroscopy.	R, R3d	R, R3d
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	15. The LCS percent recovery was <10%. Follow the external laboratory limits located within the associated data package.	R, R12	R, R12
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	16. The LCS percent recovery was < the LAL but >10%. Follow the external laboratory limits located within the associated data package.	UJ, R12a	J-, R12a
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	17. The LCS percent recovery was > the UAL. Follow the external laboratory limits located within the associated data package.	N/A	J+, R12b
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	18. The LCS documentation is missing. Data may not be acceptable for use. Contact the SMO or external laboratory for information.	R, R12c	R, R12c
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	19. Associated duplicate sample has DER or RER > the analytical laboratory's acceptance limits.	R, R10	J, J10
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	20. The duplicate sample was not prepared and/or analyzed with the samples for unspecified reasons. The duplicate information is missing. Data may not be acceptable for use. Contact the SMO or external laboratory for information.	R, R6	R, R6

## RAD ANALYTICAL DATA VALIDATION CHECKLIST

5119-2

### Rad Analytical Data Validation Checklist

Records Use only



Yes No N/A  (Check One)				Assign Qualifier Listed Below If Criterion = Yes	
				Non-detected Analyte	Detected Analyte
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	21. The associated matrix spike recovery was <10%. Follow the external laboratory limits. MS/MSD is not applicable to Gamma Spectroscopy.	R, R6	R, R6
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	22. The associated matrix spike recovery was <10%. Follow the external laboratory limits. MS/MSD is not applicable to Gamma Spectroscopy.	UJ, R6a	J-, R6a
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	23. The associated matrix spike recovery was above the UAL. Follow the external laboratory limits. MS/MSD is not applicable to Gamma Spectroscopy.	UJ, R6b	J+, R6b
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	24. Required matrix spike information is missing. Data may not be acceptable for use. Contact the SMO or external laboratory for information. If LCS information is present, do not Reject. Qualify data based on LCS information. MS/MSD is not applicable to Gamma Spectroscopy.	R, R6c	R, R6c
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	25. Duplicate, dilution, or reanalysis.	UJ, R88	J, R88
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	26. The LANL project chemist identified quality deficiencies in the reported data that require further qualification. This code can ONLY be used and/or under advisement by the LANL project chemist.	UJ, R, R19	J, R, R19
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	27. Quantification of data via data validation did not occur based on Quality Control requirements in this procedure. Adhere to the external laboratory qualifiers found within the Form I analytical data summary sheets generated by the external laboratory.	U, U_LAB	J, J_LAB NQ, NQ



2609 North River Road, Port Allen, Louisiana 70767

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

ARS Sample Delivery Group: ARS1-11-01918  
Client Sample ID: Buckman1-11-26862  
Sample Collection Date: 08/31/11  
Sample Matrix: Aqueous

Request or PO Number: 11-3383  
ARS Sample ID: ARS1-11-01918-001  
Date Received: 09/01/11  
Report Date: 10/11/11

Analysis Description	Analysis Results	Analysis Error +/- 1 s	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	-0.060	0.220	0.750	0.360	U	TU	ARS-040	10/07/11 00:58	RU	NA

**NOTES: Project Cost Code WEPR1158W100**

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 American Radiation Services, Inc.

LELAP Certificate# 01949

NELAP Certificate # E87558



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

**ARS Sample Delivery Group:** ARS1-11-01918  
**Client Sample ID:** Buckman1-11-26863  
**Sample Collection Date:** 08/31/11  
**Sample Matrix:** Aqueous

**Request or PO Number:** 11-3383  
**ARS Sample ID:** ARS1-11-01918-002  
**Date Received:** 09/01/11  
**Report Date:** 10/11/11

Analysis Description	Analysis Results	Analysis Error +/- 1 s	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	2.240	0.430	0.740	0.360		TU	ARS-040	10/07/11 05:09	RU	NA

**NOTES: Project Cost Code WEPR1158W100**

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 American Radiation Services, Inc.

LELAP Certificate# 01949

NELAP Certificate # E87558



2609 North River Road, Port Allen, Louisiana 70767

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

ARS Sample Delivery Group: ARS1-11-01918  
Client Sample ID: Buckman1-11-26864  
Sample Collection Date: 08/31/11  
Sample Matrix: Aqueous

Request or PO Number: 11-3383  
ARS Sample ID: ARS1-11-01918-003  
Date Received: 09/01/11  
Report Date: 10/11/11

Analysis Description	Analysis Results	Analysis Error +/- 1 s	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	-0.040	0.190	0.640	0.310	U	TU	ARS-040	10/07/11 09:20	RU	NA

**NOTES: Project Cost Code WEPR1158W100**

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 American Radiation Services, Inc.

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2609 North River Road, Port Allen, Louisiana 70767

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

**ARS Sample Delivery Group:** ARS1-11-01918  
**Client Sample ID:** Buckman06-11-26865  
**Sample Collection Date:** 08/31/11  
**Sample Matrix:** Aqueous

**Request or PO Number:** 11-3383  
**ARS Sample ID:** ARS1-11-01918-004  
**Date Received:** 09/01/11  
**Report Date:** 10/11/11

Analysis Description	Analysis Results	Analysis Error +/- 1 s	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	-0.220	0.210	0.720	0.350	U	TU	ARS-040	10/07/11 13:31	RU	NA

**NOTES: Project Cost Code WEPR1158W100**

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 American Radiation Services, Inc.*

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NELAP Certificate # E87558



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

ARS Sample Delivery Group: ARS1-11-01918  
Client Sample ID: Buckman08-11-26866  
Sample Collection Date: 08/31/11  
Sample Matrix: Aqueous

Request or PO Number: 11-3383  
ARS Sample ID: ARS1-11-01918-005  
Date Received: 09/01/11  
Report Date: 10/11/11

Analysis Description	Analysis Results	Analysis Error +/- 1 s	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	0.420	0.230	0.730	0.350	U	TU	ARS-040	10/07/11 17:42	RU	NA

NOTES: Project Cost Code WEPR1158W100

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 American Radiation Services, Inc.

LELAP Certificate# 01949

NELAP Certificate # E87558

Wednesday, August 31, 2011

LAB CHAIN OF CUSTODY DOCUMENT NUMBER: 11-3383C

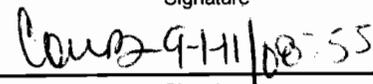
LOS ALAMOS  
NATIONAL LABORATORY

REQUEST NUMBER: 11-3383

ATTN: Danny Coleman  
American Radiation Services - Primary  
1726 Wooddale Court  
Baton Rouge, LA 70806  
LAB REQUEST COMMENTS:

TURNAROUND/REPORT DUE: 9/30/2011  
TURNAROUND REQ'D: 30

SAMPLE ID	CTNR	CTNR DESC	ORDER	PRESERV	MATRIX
Buckman1-11-26862	1	POLY	WSP-LL-H-3	None	WG
Buckman1-11-26863	1	POLY	WSP-LL-H-3	None	WG
Buckman1-11-26864	1	POLY	WSP-LL-H-3	None	WG
Buckman06-11-26865	1	POLY	WSP-LL-H-3	None	WG
Buckman08-11-26866	1	POLY	WSP-LL-H-3	None	WG

Relinquished By:	Date	Time	Received By:	Date	Time
	8/31/11	1400		9-11/11	10:55
Signature			Signature		
Signature			Signature		
Signature			Signature		

Received for DISPOSAL By:	Date	Time	Remarks:
Signature			

Wednesday, August 31, 2011

REQUEST NUMBER: 11-3383

**LOS ALAMOS**  
NATIONAL LABORATORY

ATTN: Danny Coleman  
American Radiation Services - Primary  
1726 Wooddale Court  
Baton Rouge, LA 70806

These Samples are on:  
LANL Request Number:11-3383  
Per Agreement Number:63641-001-10  
Project Cost Code: WEPR1158W100

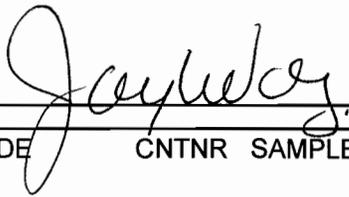
Please analyse the enclosed samples  
according to the schedule indicated:

**SHIP DATE: 8/31/2011**  
**TURNAROUND/REPORT DUE: 9/30/2011**  
**TURNAROUND REQ'D: 30 Days**

**RAD SCREENING: Not Required**  
**LAB REQUEST COMMENTS:**

LANL ER SMO CONTACT:

Signature:



PRIORITY	METHOD CODE	CNTNR	SAMPLE ID	SAMPLE MATRIX	DATE SAMPLED	SPECIAL INSTRUCTIONS
	Generic:Low_Level_Tritium	1	Buckman1-11-26862	WG	8/31/2011	
		1	Buckman1-11-26863	WG	8/31/2011	
		1	Buckman1-11-26864	WG	8/31/2011	
		1	Buckman06-11-26865	WG	8/31/2011	
		1	Buckman08-11-26866	WG	8/31/2011	



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: 11-3383**



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: 11-3383**

# **Original COC**

Wednesday, August 31, 2011

LAB CHAIN OF CUSTODY DOCUMENT NUMBER: 11-3383C

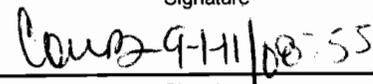
LOS ALAMOS  
NATIONAL LABORATORY

REQUEST NUMBER: 11-3383

ATTN: Danny Coleman  
American Radiation Services - Primary  
1726 Wooddale Court  
Baton Rouge, LA 70806  
LAB REQUEST COMMENTS:

TURNAROUND/REPORT DUE: 9/30/2011  
TURNAROUND REQ'D: 30

SAMPLE ID	CTNR	CTNR DESC	ORDER	PRESERV	MATRIX
Buckman1-11-26862	1	POLY	WSP-LL-H-3	None	WG
Buckman1-11-26863	1	POLY	WSP-LL-H-3	None	WG
Buckman1-11-26864	1	POLY	WSP-LL-H-3	None	WG
Buckman06-11-26865	1	POLY	WSP-LL-H-3	None	WG
Buckman08-11-26866	1	POLY	WSP-LL-H-3	None	WG

Relinquished By:	Date	Time	Received By:	Date	Time
	8/31/11	1400		9-11/11	10:55
Signature			Signature		
Signature			Signature		
Signature			Signature		

Received for DISPOSAL By:	Date	Time	Remarks:
Signature			

Wednesday, August 31, 2011

REQUEST NUMBER: 11-3383

**LOS ALAMOS  
NATIONAL LABORATORY**

ATTN: Danny Coleman  
American Radiation Services - Primary  
1726 Wooddale Court  
Baton Rouge, LA 70806

These Samples are on:  
LANL Request Number: 11-3383  
Per Agreement Number: 63641-001-10  
Project Cost Code: WEPR1158W100

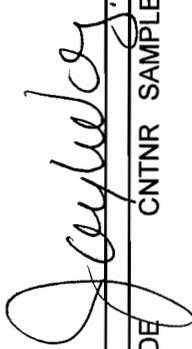
Please analyse the enclosed samples  
according to the schedule indicated:

**SHIP DATE: 8/31/2011**  
**TURNAROUND/REPORT DUE: 9/30/2011**  
**TURNAROUND REQ'D: 30 Days**

**RAD SCREENING: Not Required**  
**LAB REQUEST COMMENTS:**

LANL ER SMO CONTACT:

Signature:



PRIORITY	METHOD CODE	CNTNR	SAMPLE ID	SAMPLE MATRIX	DATE SAMPLED	SPECIAL INSTRUCTIONS
	Generic:Low_Level_Tritium	1	Buckman1-11-26862	WG	8/31/2011	
		1	Buckman1-11-26863	WG	8/31/2011	
		1	Buckman1-11-26864	WG	8/31/2011	
		1	Buckman06-11-26865	WG	8/31/2011	
		1	Buckman08-11-26866	WG	8/31/2011	



2609 North River Road • Port Allen, Louisiana 70767

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1 (800) 401-4277 • Fax (225) 381-2996

# **American Radiation Services Analytical Reports**

for

**Los Alamos National Laboratory  
Request: 11-3383**

# **Case Narrative**



2609 North River Road • Port Allen, Louisiana 70767

1 (800) 401-4277 • Fax (225) 381-2996

October 11, 2011

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

Request Number: **11-3383**

LANL Sample ID: **Buckman1-11-26862; Buckman1-11-26863; Buckman1-11-26864; Buckman06-11-26865; Buckman08-11-26866.**

Dear Mr. Greene;

On September 1, 2011, ARS International received five (5) water samples to be analyzed for Low Level Tritium.

The samples underwent enrichment and 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](mailto:LANL@amrad.com).

Sincerely,

A handwritten signature in black ink that reads 'Virginia Mulhegan'. The signature is written in a cursive, flowing style.

Laboratory Management  
ARS International



COVER PAGE

PROJECT SAMPLE IDENTIFICATION  
CROSS-REFERENCE  
TO ARS SAMPLE LABORATORY IDs  
Subcontract (LANL Agreement Number) 63641-001-10

Request Number	LANL PROJECT SAMPLE ID NUMBER	American Radiation Services SAMPLE ID NUMBER(S)
11-3383	Buckman1-11-26862	ARS1-11-01918-001
11-3383	Buckman1-11-26863	ARS1-11-01918-002
11-3383	Buckman1-11-26864	ARS1-11-01918-003
11-3383	Buckman06-11-26865	ARS1-11-01918-004
11-3383	Buckman08-11-26866	ARS1-11-01918-005

**ANALYTICAL METHODS**

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

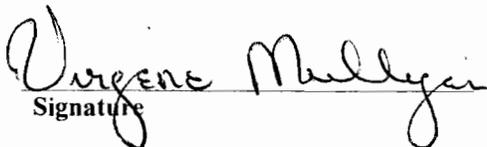
**ANALYTICAL RESULTS**

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 is 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

10-12-11  
Date



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# **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: ARS1-11-01918  
Client Sample ID: Buckman1-11-26862  
Sample Collection Date: 08/31/11  
Sample Matrix: Aqueous

Request or PO Number: 11-3383  
ARS Sample ID: ARS1-11-01918-001  
Date Received: 09/01/11  
Report Date: 10/11/11

Analysis Description	Analysis Results	Analysis Error +/- 1 s	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	-0.060	0.220	0.750	0.360	U	TU	ARS-040	10/07/11 00:58	RU	NA

**NOTES: Project Cost Code WEPR1158W100**

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 American Radiation Services, Inc.

LELAP Certificate# 01949

NELAP Certificate # E87558



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**ARS Sample Delivery Group:** ARS1-11-01918  
**Client Sample ID:** Buckman1-11-26863  
**Sample Collection Date:** 08/31/11  
**Sample Matrix:** Aqueous

**Request or PO Number:** 11-3383  
**ARS Sample ID:** ARS1-11-01918-002  
**Date Received:** 09/01/11  
**Report Date:** 10/11/11

Analysis Description	Analysis Results	Analysis Error +/- 1 s	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	2.240	0.430	0.740	0.360		TU	ARS-040	10/07/11 05:09	RU	NA

**NOTES: Project Cost Code WEPR1158W100**

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 American Radiation Services, Inc.

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NELAP Certificate # E87558



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**ARS Sample Delivery Group:** ARS1-11-01918  
**Client Sample ID:** Buckman1-11-26864  
**Sample Collection Date:** 08/31/11  
**Sample Matrix:** Aqueous

**Request or PO Number:** 11-3383  
**ARS Sample ID:** ARS1-11-01918-003  
**Date Received:** 09/01/11  
**Report Date:** 10/11/11

Analysis Description	Analysis Results	Analysis Error +/- 1 s	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	-0.040	0.190	0.640	0.310	U	TU	ARS-040	10/07/11 09:20	RU	NA

**NOTES: Project Cost Code WEPR1158W100**

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 American Radiation Services, Inc.*

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ARS Sample Delivery Group: ARS1-11-01918  
Client Sample ID: Buckman06-11-26865  
Sample Collection Date: 08/31/11  
Sample Matrix: Aqueous

Request or PO Number: 11-3383  
ARS Sample ID: ARS1-11-01918-004  
Date Received: 09/01/11  
Report Date: 10/11/11

Analysis Description	Analysis Results	Analysis Error +/- 1 s	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	-0.220	0.210	0.720	0.350	U	TU	ARS-040	10/07/11 13:31	RU	NA

NOTES: Project Cost Code WEPR1158W100

Project Manager Review

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ARS Sample Delivery Group: ARS1-11-01918  
Client Sample ID: Buckman08-11-26866  
Sample Collection Date: 08/31/11  
Sample Matrix: Aqueous

Request or PO Number: 11-3383  
ARS Sample ID: ARS1-11-01918-005  
Date Received: 09/01/11  
Report Date: 10/11/11

Analysis Description	Analysis Results	Analysis Error +/- 1 s	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	0.420	0.230	0.730	0.350	U	TU	ARS-040	10/07/11 17:42	RU	NA

**NOTES: Project Cost Code WEPR1158W100**

Project Manager Review

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## QC Results Report

Sample Delivery Group: ARS1-11-01918

Date Received: 9/1/2011

### 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-B11-03362	LCS	H3	6.990	1.100	0.770	6.995		TU	ARS-040	10/5/11 11:17	RU	100	75%-125%

### 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-B11-03362	MBL	H3	-0.190	0.210	0.710	NA	U	TU	ARS-040	10/5/11 19:40	RU

### 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-B11-03362	LCSD	H3	6.990	1.100	6.900	1.090		TU	ARS-040	10/5/11 15:29	RU	0.04	< 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-B11-03362	LCSD	H3	6.990	1.100	6.900	1.090		TU	ARS-040	10/5/11 15:29	RU	0.12	< 3

*Susan Heese*

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

LANL

ARS Batch Number:

ARS1-B11

- 03662

Enter these Values for LCS

Current ACT NetWt Aliquot

5.3082  
5.0576  
0.5368

Report Name Field Name on the Report

Standards Report ACT at Date Above (dpm/g)  
LCS Report NetWt  
Tritium Enrichment Data Gross Sample Added/1000

Enter these Values for LCSD

Current ACT NetWt Aliquot

5.3082  
5.0412  
0.5172

Report Name Field Name on the Report

Standards Report ACT at Date Above (dpm/g)  
LCS Report NetWt  
Tritium Enrichment Data Gross Sample Added/1000

Expected Value Calculations

ARS Batch Number:

ARS1-B11

- 03662

LCS

CALCULATED EXPECTED VALUE

22.528

Range

18.023

27.034

LCSD

CALCULATED EXPECTED VALUE

23.306

Range

18.645

27.967



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# **American Radiation Services Analytical Reports**

for

## **Los Alamos National Laboratory**

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

ARS Tritium Enrichment Calculations

Procedures ARS-040, ARS-060  
 ARS File ID Number ARS1-11-01860; 1917; 1918; 1919  
 ARS Batch ID Number ARS1-B11-03362

Enrichment Factor  
 Curve coeff. - Power  
 $y = a \cdot x^b$   
 a 8.978E-01  
 b -9.611E-01

lambda 1.5403E-04  
 Syserror (%) 15%  
 Coverage Factor 1  
 ACF (def. = 1) 1  
 Reporting Units TU  
 UCF 7.151  
 Aliquot must be entered in liters!!

Sample ID	Initial Mass sample (g)	Mass Na2O2 added (g)	Final mass electrolyzed sample w/ NaOH (g)	Final Mass electrolyzed sample (g pure H2O)	Volume factor	Enrichment Factor	Average Sample CPM			Detector Eff (decimal)	Aliquot Units	Enter final Rep. Units	Activity reference date	Start Date of Count	Total Sample Count (min)	Total Big Count (min)	Decay Correction to T <sub>c</sub>	Sample Activity Conc. AC <sub>i</sub>	Standard Counting Uncertainty CU	Counting Uncertainty 1s CU	Combined Standard Uncertainty 1s CSU	Minimum Detectable Conc. MDC	Decision Level Conc. DLC	Reporting Units
							R <sub>s</sub>	R <sub>b</sub>	R <sub>0</sub>															
ARS1-B11-03362-01	536.76	2.00	17.26	15.21	0.0283	27.59	4.297	1.198	352.65	0.2368	0.01003	L	10/11/2010	10/5/2011	240	240	0.946191	6.99	0.34	1.10	0.77	0.37	TU	
ARS1-B11-03362-02	517.18	2.04	17.03	14.94	0.0289	27.08	4.161	1.198	346.4	0.2333	0.01004	L	10/11/2010	10/5/2011	240	240	0.946191	6.90	0.35	1.09	0.79	0.38	TU	
ARS1-B11-03362-03	548.08	2.06	17.09	14.98	0.0273	28.56	1.106	1.198	346.34	0.2332	0.01002	L	10/4/2011	10/5/2011	240	240	0.999833	-0.19	0.21	0.21	0.71	0.34	TU	
ARS1-B11-03362-04	548.23	2.00	16.77	14.72	0.0268	29.05	3.449	1.198	345.05	0.2325	0.01005	L	8/18/2011	10/5/2011	240	240	0.992621	4.67	0.29	0.76	0.71	0.34	TU	
ARS1-B11-03362-05	531.93	2.01	16.79	14.73	0.0277	28.20	1.242	1.198	348.84	0.2346	0.00993	L	8/19/2011	10/6/2011	240	240	0.992621	0.09	0.22	0.22	0.73	0.35	TU	
ARS1-B11-03362-06	512.61	2.06	16.87	14.76	0.0288	27.17	1.131	1.198	345.54	0.2328	0.00990	L	8/11/2011	10/6/2011	240	240	0.991399	-0.15	0.22	0.22	0.72	0.37	TU	
ARS1-B11-03362-07	532.15	2.08	16.86	14.73	0.0277	28.22	1.239	1.198	346.01	0.2331	0.01004	L	8/30/2011	10/6/2011	240	240	0.994304	0.09	0.21	0.22	0.72	0.35	TU	
ARS1-B11-03362-08	532.60	2.00	17.23	15.18	0.0285	27.43	1.082	1.198	349.91	0.2352	0.01008	L	8/30/2011	10/6/2011	240	240	0.994304	-0.25	0.21	0.21	0.74	0.36	TU	
ARS1-B11-03362-09	532.85	2.06	17.06	14.95	0.0280	27.65	1.118	1.198	348.83	0.2346	0.01001	L	8/30/2011	10/6/2011	240	240	0.994304	-0.17	0.21	0.21	0.73	0.35	TU	
ARS1-B11-03362-10	523.35	2.06	17.09	14.98	0.0286	27.32	1.171	1.198	343.84	0.2318	0.01004	L	8/31/2011	10/7/2011	240	240	0.994304	-0.06	0.22	0.22	0.75	0.36	TU	
ARS1-B11-03362-11	533.79	2.01	17.25	15.19	0.0285	27.47	2.227	1.198	347.89	0.2341	0.01003	L	8/31/2011	10/7/2011	240	240	0.994304	2.24	0.26	0.43	0.74	0.36	TU	
ARS1-B11-03362-12	538.95	2.04	15.36	13.27	0.0246	31.58	1.179	1.198	350.76	0.2357	0.01003	L	8/31/2011	10/7/2011	240	240	0.994304	-0.04	0.19	0.19	0.64	0.31	TU	
ARS1-B11-03362-13	547.27	2.03	16.92	14.84	0.0271	28.78	1.095	1.198	340.66	0.2301	0.01005	L	8/31/2011	10/7/2011	240	240	0.994304	-0.22	0.21	0.21	0.72	0.35	TU	
ARS1-B11-03362-14	543.12	2.00	17.25	15.20	0.0280	27.92	1.392	1.198	346.77	0.2335	0.01003	L	8/31/2011	10/7/2011	240	240	0.994304	0.42	0.22	0.23	0.73	0.35	TU	
ARS1-B11-03362-17	537.94	2.02	17.13	15.06	0.0280	27.91	1.230	1.198	341.77	0.2307	0.00996	L	8/29/2011	10/7/2011	240	240	0.993998	0.07	0.22	0.22	0.75	0.36	TU	
ARS1-B11-03362-18	539.29	2.01	17.28	15.22	0.0282	27.69	1.204	1.198	348.75	0.2346	0.01004	L	8/29/2011	10/8/2011	240	240	0.993845	0.01	0.22	0.22	0.73	0.35	TU	

Reviewed: 8/28/10-10-11

Reviewed: 10-11-11  
 UFM

# ARS Tritium Enrichment Calculations

Procedures ARS-040, ARS-060  
 ARS File ID Number ARS1-11-01860, 1917, 1918, 1919  
 ARS Batch ID Number ARS1-B11-03362

Enrichment Factor  
 Curve coeff. Power  
 $y = a \cdot x^b$   
 a 8.978E-01  
 b -9.611E-01

lambda 1.5403E-04  
 Syserror (%) 15%  
 Coverage Factor 1  
 ACF (def. = 1) 1  
 Reporting Units pCi  
 UCF 2.22

Sample ID	Initial Mass sample (g)	Final mass electrolyzed sample (g)	Mass Na2O2 added (g)	Final mass electrolyzed sample (g)	Mass equivalent NaOH (g)	Volume factor	Enrichment Factor	Average CPM	Bgk CPM	QIP	ISIE	Rb	Rs	Y	X	Vr	Vr	Vr	Detector Eff (decimal)	Aliquot Units	Enter final Rep Units	Activity reference date	Start Date of Count	Total Sample Count (min)	Total Bkg Count (min)	Decay Correction	Sample Activity Conc. AC1	Standard Counting Uncertainty CU	Counting Uncertainty 1s CU	Combined Standard Uncertainty 1s CSU	Minimum Detectable Conc. MDC	Decision Level Conc. DLC	Reporting Units							
																																		Y	X	Vr	Vr	Y	X	Vr
ARS1-B11-03362-01	536.76	2.00	17.26	2.052	2.052	0.0283	27.59	4.297	1.198	352.65	0.2368	0.01003	L	10/11/2010	10/5/2011	240	240	0.946191	22.52	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	pCi/L						
ARS1-B11-03362-02	517.18	2.04	17.03	2.093	2.093	0.0289	27.08	4.161	1.198	346.4	0.2333	0.01004	L	10/11/2010	10/5/2011	240	240	0.946191	22.24	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	pCi/L						
ARS1-B11-03362-03	548.08	2.06	17.09	2.114	2.114	0.0273	28.56	1.106	1.198	346.34	0.2332	0.01002	L	10/4/2011	10/5/2011	240	240	0.999633	-0.62	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	pCi/L					
ARS1-B11-03362-04	548.23	2.00	16.77	2.052	2.052	0.0268	29.05	3.449	1.198	345.05	0.2325	0.01005	L	8/18/2011	10/5/2011	240	240	0.992621	15.05	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	pCi/L					
ARS1-B11-03362-05	531.93	2.01	16.79	2.062	2.062	0.0277	28.20	1.242	1.198	348.84	0.2346	0.00993	L	8/19/2011	10/6/2011	240	240	0.992621	0.30	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	pCi/L				
ARS1-B11-03362-06	512.61	2.06	16.87	2.114	2.114	0.0288	27.17	1.131	1.198	345.54	0.2328	0.00990	L	8/11/2011	10/6/2011	240	240	0.991399	-0.49	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	pCi/L			
ARS1-B11-03362-07	532.15	2.08	16.86	2.134	2.134	0.0277	28.22	1.239	1.198	346.01	0.2331	0.01004	L	8/30/2011	10/6/2011	240	240	0.994304	0.28	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	pCi/L		
ARS1-B11-03362-08	532.60	2.00	17.23	2.052	2.052	0.0285	27.43	1.062	1.198	349.91	0.2352	0.01008	L	8/30/2011	10/6/2011	240	240	0.994304	-0.81	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	pCi/L		
ARS1-B11-03362-09	532.85	2.06	17.06	2.114	2.114	0.0280	27.85	1.118	1.198	348.83	0.2346	0.01001	L	8/30/2011	10/6/2011	240	240	0.994304	-0.55	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	pCi/L		
ARS1-B11-03362-10	523.35	2.06	17.09	2.114	2.114	0.0286	27.32	1.171	1.198	343.84	0.2318	0.01004	L	8/31/2011	10/7/2011	240	240	0.994304	-0.19	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	pCi/L	
ARS1-B11-03362-11	533.79	2.01	17.25	2.062	2.062	0.0285	27.47	1.227	1.198	347.89	0.2341	0.01003	L	8/31/2011	10/7/2011	240	240	0.994304	7.23	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	pCi/L	
ARS1-B11-03362-12	538.95	2.04	15.36	2.093	2.093	0.0246	31.58	1.179	1.198	350.76	0.2357	0.01003	L	8/31/2011	10/7/2011	240	240	0.994304	-0.12	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	pCi/L	
ARS1-B11-03362-13	547.27	2.03	16.92	2.083	2.083	0.0271	28.78	1.095	1.198	340.66	0.2301	0.01005	L	8/31/2011	10/7/2011	240	240	0.994304	-0.70	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	pCi/L
ARS1-B11-03362-14	543.12	2.00	17.25	2.052	2.052	0.0280	27.92	1.392	1.198	346.77	0.2335	0.01003	L	8/31/2011	10/7/2011	240	240	0.994304	1.34	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	pCi/L
ARS1-B11-03362-17	537.94	2.02	17.13	2.073	2.073	0.0280	27.91	1.230	1.198	341.77	0.2307	0.00996	L	8/29/2011	10/7/2011	240	240	0.993998	0.23	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	pCi/L
ARS1-B11-03362-18	539.29	2.01	17.28	2.062	2.062	0.0282	27.69	1.204	1.198	348.75	0.2346	0.01004	L	8/29/2011	10/8/2011	240	240	0.993845	0.04	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	pCi/L

Reviewed: Salt 10-10-11  
 Reviewed: 10-11-11  
 UJm

# QC Evaluation

Method: ARS-040

Batch ID: ARS1-B11-03362

SDG's: ARS1-11-01860; 1917; 1918; 1919

LCS	<u>22.5200</u>	CSU (2s)	<u>3.5500</u>
LCS D	<u>22.2400</u>	CSU-D (2s)	<u>3.5200</u>

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

$$DER = \frac{0.28}{2.499645} = 0.112016 < 3$$

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

$$\% \text{ RPD} = \frac{0.28}{22.38} * 100 = 1.251117 < 25\%$$

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

$$RER = \frac{\text{abs}((LCS-LCS D))}{(CSU)+(CS D) \text{ at } 2 \text{ sigma}} = < 1 \quad \leftarrow \text{LANL Requirement}$$

$$RER = \frac{0.28}{7.0700} = 0.03960396 < 1$$

### Blank Information

	Act	CSU(2s)	MDA	Act>MDA	
AM-241					
U-234					*MDA should be below RDL
U-235					*Blank activity must be below MDA
U-238					*Blank activity must be < 1.65*CSU (DOE only)
Pu-238					
Pu-239/240					ACT = -0.62
Th-228					CSU = 0.67
Th-230					Is ACT < 1.65*CSU? YES
Th-232					
H3	-0.62	0.67	2.3		
Ra-226					
Ra-228					
Total U					
Pb-210					
Po-209					
Sr-90					
TC-99					
NI-63					



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# **American Radiation Services Analytical Reports**

for

## **Los Alamos National Laboratory**

### **Low Level Tritium**

by

### **Low Level Liquid Scintillation Counting**

# **Laboratory**

# **Records**

Analysis Batch Report

Analysis Batch ID ARS1-B11-03362											
Method		ARS-054			Analysis			LSC-A-022		Matrix	AQ
Description											
Type	Blind Iso1	Blind Iso2	Blind Iso3	SDG	FR	Run	Client ID	Isotope Group	Lab Deadline		
ARS1-B11-03362-01	LCS	B-12428									
ARS1-B11-03362-02	LCSD	B-12429									
ARS1-B11-03362-03	MBL										
ARS1-B11-03362-04	TRG			ARS1-11-01860	001	1	CAMO-11-24698	STD	09/20/11		
ARS1-B11-03362-05	TRG			ARS1-11-01860	002	1	CAMO-11-24703	STD	09/20/11		
ARS1-B11-03362-06	TRG			ARS1-11-01860	003	1	CAMO-11-24650	STD	09/20/11		
ARS1-B11-03362-07	TRG			ARS1-11-01917	001	1	CALA-11-26771	STD	09/27/11		
ARS1-B11-03362-08	TRG			ARS1-11-01917	002	1	CALA-11-26774	STD	09/27/11		
ARS1-B11-03362-09	TRG			ARS1-11-01917	003	1	CALA-11-26783	STD	09/27/11		
ARS1-B11-03362-10	TRG			ARS1-11-01918	001	1	Buckman1-11-26862	STD	09/27/11		
ARS1-B11-03362-11	TRG			ARS1-11-01918	002	1	Buckman1-11-26863	STD	09/27/11		
ARS1-B11-03362-12	TRG			ARS1-11-01918	003	1	Buckman1-11-26864	STD	09/27/11		
ARS1-B11-03362-13	TRG			ARS1-11-01918	004	1	Buckman06-11-26865	STD	09/27/11		
ARS1-B11-03362-14	TRG			ARS1-11-01918	005	1	Buckman08-11-26866	STD	09/27/11		
ARS1-B11-03362-17	TRG			ARS1-11-01919	003	1	CAPU-11-26380	STD	09/27/11		
ARS1-B11-03362-18	TRG			ARS1-11-01919	004	1	CAPU-11-26381	STD	09/27/11		

96838  
11-01860-001-1  
XRAD

96849  
11-01917-001-1  
XRAD

96859  
11-01918-001-1  
XRAD

96863  
11-01918-004-1  
XRAD

96842  
11-01860-002-1  
XRAD

96852  
11-01917-002-1  
XRAD

96861  
11-01918-002-1  
XRAD

96864  
11-01918-005-1  
XRAD

96846  
11-01860-003-1  
XRAD

96856  
11-01917-003-1  
XRAD

96862  
11-01918-003-1  
XRAD

96865  
11-01919-003-1  
XRAD

96866  
11-01919-004-1  
XRAD

LCS Report  
Analytical Batch: ARS1-B11-03362

BlindID	ABatch	ABatchSampleID	BlindGroup	StdID	Isotope	ExpectedAddition	ExpectedValue	EmptyWt	GrossWt	NetWt	UserID	ModDate	ExpectedValue_CT	MidPointCountDate	KnownValue
B-12428	ARS1-B11-03362	ARS1-B11-03362-01	B-H3	S-0247	H-3	5	2.401427384	13.4244	18.482	5.0576	BSTEFFENS	9/7/2011			
B-12429	ARS1-B11-03362	ARS1-B11-03362-02	B-H3	S-0247	H-3	5	2.401427384	13.3287	18.3699	5.0412	BSTEFFENS	9/7/2011			

ID_31001_054	ABatch	ABatchSampleID	ClientID	Aliquot1	AliquotUnits1	IC_ID1	Aliquot2	AliquotUnits2	IC_ID2	UserID	ModDate
10098	ARS1-B11-03362	ARS1-B11-03362-01		10.03 g						RUSEY	10/04/2011 15:59:40
10099	ARS1-B11-03362	ARS1-B11-03362-02		10.04 g						RUSEY	10/04/2011 15:59:40
10100	ARS1-B11-03362	ARS1-B11-03362-03		10.02 g						RUSEY	10/04/2011 15:59:41
10101	ARS1-B11-03362	ARS1-B11-03362-04	CAMO-11-24698	10.05 g		96838				RUSEY	10/04/2011 15:59:41
10102	ARS1-B11-03362	ARS1-B11-03362-05	CAMO-11-24703	9.93 g		96842				RUSEY	10/04/2011 15:59:41
10103	ARS1-B11-03362	ARS1-B11-03362-06	CAMO-11-24650	9.9 g		96846				RUSEY	10/04/2011 15:59:41
10104	ARS1-B11-03362	ARS1-B11-03362-07	CALA-11-26771	10.04 g		96849				RUSEY	10/04/2011 15:59:41
10105	ARS1-B11-03362	ARS1-B11-03362-08	CALA-11-26774	10.08 g		96852				RUSEY	10/04/2011 15:59:41
10106	ARS1-B11-03362	ARS1-B11-03362-09	CALA-11-26783	10.01 g		96856				RUSEY	10/04/2011 15:59:41
10107	ARS1-B11-03362	ARS1-B11-03362-10	Buckman1-11-26862	10.04 g		96859				RUSEY	10/04/2011 15:59:42
10108	ARS1-B11-03362	ARS1-B11-03362-11	Buckman1-11-26863	10.03 g		96861				RUSEY	10/04/2011 15:59:42
10109	ARS1-B11-03362	ARS1-B11-03362-12	Buckman1-11-26864	10.03 g		96862				RUSEY	10/04/2011 15:59:42
10110	ARS1-B11-03362	ARS1-B11-03362-13	Buckman06-11-26865	10.05 g		96863				RUSEY	10/04/2011 15:59:42
10111	ARS1-B11-03362	ARS1-B11-03362-14	Buckman08-11-26866	10.03 g		96864				RUSEY	10/04/2011 15:59:42
10112	ARS1-B11-03362	ARS1-B11-03362-17	CAPU-11-26380	9.96 g		96865				RUSEY	10/04/2011 15:59:42
10113	ARS1-B11-03362	ARS1-B11-03362-18	CAPU-11-26381	10.04 g		96866				RUSEY	10/04/2011 15:59:42

Procedures: ARS-040

Date: 9/8/2011

ARS File ID Numbers: ARS1-11-01860; -01917; -01918; -01919

ARS Batch ID: ARS1-B11-03362

Vf

A Batch ID:	Gross Sample Recovered	Enrichment t factor	Cryo-Distil Flask #	Tare Wt Cryo-distil flask	Gross Wt flask + Sample	Recovered Water	Tare Weight of LSC Vial	Vial + Sample	Net Sample	Wt of Vial, Sample & Dead Water Filler If used	Net Dead Water Added	Tare Wt b/f Cocktail	Gross Wt Vial + Sample + Cocktail	Net Wt of Cocktail Added
1	ARS1-B11-03362-01	17.26	31.10	N/A	115.43	129.20	13.77	6.46	16.49	10.03	0.00	16.49	27.11	10.62
2	ARS1-B11-03362-02	17.03	30.37	N/A	103.70	114.64	10.34	6.62	16.66	10.04	0.00	16.66	27.10	10.44
3	ARS1-B11-03362-03	17.09	32.07	N/A	113.07	124.25	11.18	6.58	16.60	10.02	0.00	16.60	26.78	10.18
4	ARS1-B11-03362-04	16.77	32.69	N/A	121.28	132.25	10.97	6.49	16.54	10.05	0.00	16.54	27.19	10.66
5	ARS1-B11-03362-05	16.79	31.68	N/A	112.00	122.11	10.11	6.57	16.50	9.93	16.58	16.58	27.28	10.70
6	ARS1-B11-03362-06	16.87	30.39	N/A	102.88	112.92	10.04	6.40	16.30	9.90	16.49	16.49	27.14	10.65
7	ARS1-B11-03362-07	16.86	31.56	N/A	108.76	119.36	10.60	6.52	16.56	10.04	0.00	16.56	27.22	10.66
8	ARS1-B11-03362-08	17.23	30.91	N/A	113.40	123.92	10.52	6.48	16.56	10.08	0.00	16.56	27.24	10.68
9	ARS1-B11-03362-09	17.06	31.23	N/A	99.08	112.03	12.95	6.50	16.51	10.01	0.00	16.51	27.18	10.87
10	ARS1-B11-03362-10	17.09	30.62	N/A	117.60	130.35	12.75	6.43	16.47	10.04	0.00	16.47	27.15	10.68
11	ARS1-B11-03362-11	17.25	30.94	N/A	91.34	103.99	12.65	6.52	16.55	10.03	0.00	16.55	27.17	10.62
12	ARS1-B11-03362-12	15.36	35.09	N/A	103.07	116.47	13.40	6.55	16.58	10.03	0.00	16.58	27.24	10.66
13	ARS1-B11-03362-13	16.92	32.34	N/A	109.20	121.75	12.55	6.55	16.60	10.05	0.00	16.60	27.21	10.61
14	ARS1-B11-03362-14	17.25	31.49	N/A	109.00	119.82	10.82	6.58	16.61	10.03	0.00	16.61	27.27	10.66
15	ARS1-B11-03362-17	17.13	31.40	N/A	94.61	104.59	9.98	6.45	16.41	9.96	16.49	16.49	27.14	10.65
16	ARS1-B11-03362-18	17.28	31.21	N/A	109.40	120.26	10.88	6.56	16.60	10.04	0.00	16.60	27.27	10.67
17		0.00					0.00			0.00	0.00			0.00
18		0.00					0.00			0.00	0.00			0.00
19		0.00					0.00			0.00	0.00			0.00
20		0.00					0.00			0.00	0.00			0.00
21		0.00					0.00			0.00	0.00			0.00
22		0.00					0.00			0.00	0.00			0.00
23		0.00					0.00			0.00	0.00			0.00
24		0.00					0.00			0.00	0.00			0.00
25		0.00					0.00			0.00	0.00			0.00
26		0.00					0.00			0.00	0.00			0.00
27		0.00					0.00			0.00	0.00			0.00
28		0.00					0.00			0.00	0.00			0.00
29		0.00					0.00			0.00	0.00			0.00

Chemist Signature: *[Handwritten Signature]* 10-4-11

Procedures: ARS-040

Date: 9/8/2011

ARS File ID Numbers: ARS1-11-01860; -01917; -01918; -01919

ARS Batch ID: ARS1-B11-03362

	A Batch ID:	Enrichment Cell No.	Tare Wt of Electrolysis Cell & Electrodes	Tare Wt Reservoir	Wt Na <sub>2</sub> O <sub>2</sub>	mi	Gross Weight of Sample Reservoir	Vi Gross Sample Added	Electrolysis Start Date & Time	Start AMP	Start Bath C°	Electrolysis End Date & Time	End Bath C°	End Wt of Cell + Resv. + Sample
1	ARS1-B11-03362-01	97	332.47	196.12	2.00		732.88	536.76	9-8-11 0800	5.00	2.0	9-29-11 1345	2.0	545.85
2	ARS1-B11-03362-02	28	332.65	216.22	2.04		733.40	517.18	9-8-11 0802	5.00	2.0	9-28-11 1322	2.0	565.90
3	ARS1-B11-03362-03	N/A	333.88	197.53	2.06		745.61	548.08	9-8-11 0803	5.00	2.0	9-27-11 1346	2.0	548.50
4	ARS1-B11-03362-04	78	326.40	205.99	2.00		754.22	548.23	9-8-11 0915	5.00	2.0	9-28-11 1157	2.0	549.16
5	ARS1-B11-03362-05	N/A	324.03	201.29	2.01		733.22	531.93	9-8-11 0916	5.00	2.0	9-28-11 1546	2.0	542.11
6	ARS1-B11-03362-06	38	334.50	214.55	2.06		727.16	512.61	9-8-11 0917	5.00	2.0	9-27-11 1125	2.0	565.92
7	ARS1-B11-03362-07	64	331.45	193.05	2.08		725.20	532.15	9-8-11 1000	5.00	2.0	9-30-11 0758	2.0	541.36
8	ARS1-B11-03362-08	68	336.30	223.00	2.00		755.60	532.60	9-8-11 1001	5.00	2.0	9-28-11 0811	2.0	576.53
9	ARS1-B11-03362-09	98	327.77	207.30	2.06		740.15	532.85	9-8-11 1002	5.00	2.0	9-28-11 1051	2.0	552.13
10	ARS1-B11-03362-10	42	331.49	179.68	2.06		703.03	523.35	9-8-11 1141	5.00	2.0	9-29-11 1106	2.0	528.26
11	ARS1-B11-03362-11	25	325.96	197.27	2.01		731.06	533.79	9-8-11 1142	5.00	2.0	9-26-11 1536	2.0	540.48
12	ARS1-B11-03362-12	89	333.33	206.76	2.04		745.71	538.95	9-8-11 1143	5.00	2.0	9-28-11 1534	2.0	555.45
13	ARS1-B11-03362-13	11	331.39	209.86	2.03		757.13	547.27	9-8-11 1519	5.00	2.0	9-29-11 1345	2.0	558.17
14	ARS1-B11-03362-14	N/A	327.61	207.74	2.00		750.86	543.12	9-8-11 1520	5.00	2.0	9-30-11 0759	2.0	562.60
15	ARS1-B11-03362-17	N/A	343.98	203.92	2.02		741.86	537.94	9-8-11 1521	5.00	2.0	9-28-11 0740	2.0	565.03
16	ARS1-B11-03362-18	55	332.23	199.53	2.01		738.82	539.29	9-8-11 1522	5.00	2.0	9-29-11 1010	2.0	549.04
17								0.00						
18								0.00						
19								0.00						
20								0.00						
21								0.00						
22								0.00						
23								0.00						
24								0.00						
25								0.00						
26								0.00						
27								0.00						
28								0.00						
29								0.00						

Chemist Signature:  10-4-11

26  
 06  
 76

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\20111005\_0657  
 Raw Results Path: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\_3\20111005\_0657\20111005\_0657.results  
 RTF File Name: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\_3\20111005\_0657\LLH3.rtf  
 Comma-Delimited File Name: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\_3\20111005\_0657\Report1.txt  
 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  
 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

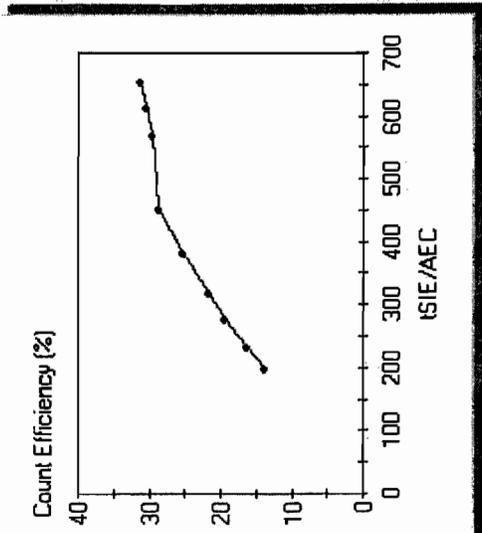
Half Life-

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

27 of 76  
A  
B  
C

Cycle 1 Results  
Quench Curve Block Data

ARS LL H3 in A



Date Acquired: 11/19/2010  
Date Modified:  
ARS LL H3 in A

tSIE/AEC	Count Efficiency (%)
655.11	31.16
613.27	30.29
569.42	29.56
454.14	28.64
383.12	25.38
318.52	21.77
280.21	19.43
235.97	16.27
199.12	13.89

QuantaSmart (TM) - 2.03 - Serial# 423814

28 of 76

P#	S#	SMPL_ID	Count Time	CPMA	DPM1	tsIE	Eff Nucl	In A	DATE	TIME	MESSAGES
10	1	BACKGROUND	240.00	1.198	5.24	337.74	22.84	10/5/2011	7:06:42 AM		
10	2	B11-03362-01	240.00	4.297	18.15	352.65	23.68	10/5/2011	11:17:55 AM		
10	3	B11-03362-02	240.00	4.161	17.84	346.40	23.33	10/5/2011	3:29:04 PM		
10	4	B11-03362-03	240.00	1.106	4.74	346.34	23.32	10/5/2011	7:40:12 PM		
10	5	B11-03362-04	240.00	3.449	14.83	345.05	23.25	10/5/2011	11:51:19 PM		
10	6	B11-03362-05	240.00	1.242	5.29	348.84	23.46	10/6/2011	4:02:24 AM		
10	7	B11-03362-06	240.00	1.131	4.86	345.54	23.28	10/6/2011	8:13:31 AM		
10	8	B11-03362-07	240.00	1.239	5.32	346.01	23.31	10/6/2011	12:24:37 PM		
10	9	B11-03362-08	240.00	1.082	4.60	349.91	23.52	10/6/2011	4:35:48 PM		
10	10	B11-03362-09	240.00	1.118	4.77	348.83	23.46	10/6/2011	8:46:53 PM		
10	11	B11-03362-10	240.00	1.171	5.05	343.84	23.18	10/7/2011	12:58:00 AM		
10	12	B11-03362-11	240.00	2.227	9.51	347.89	23.41	10/7/2011	5:09:04 AM		
10	13	B11-03362-12	240.00	1.179	5.00	350.76	23.57	10/7/2011	9:20:14 AM		
10	14	B11-03362-13	240.00	1.095	4.76	340.66	23.01	10/7/2011	1:31:21 PM		
10	15	B11-03362-14	240.00	1.392	5.96	346.77	23.35	10/7/2011	5:42:27 PM		
10	16	B11-03362-17	240.00	1.230	5.33	341.77	23.07	10/7/2011	9:53:37 PM		
10	17	B11-03362-18	240.00	1.204	5.13	348.75	23.46	10/8/2011	2:04:46 AM		

## Beta Liquid Scintillation Counter Log Book

Date	Time	ARS Sample I.D. Number	Batch Number	Liquid Scintillation File Number	Technician Initials
9-29-11	1613	B11-03191-14	B11-03191	2208	RJN
↓	↓	B11-03191-15	↓	↓	RJN
↓	↓	B11-03191-16	↓	↓	RJN
↓	↓	B11-03191-17	↓	↓	RJN
↓	↓	B11-03191-18	↓	↓	RJN
↓	↓	B11-03191-19	↓	↓	RJN
↓	↓	B11-03191-20	↓	↓	RJN
↓	↓	B11-03191-21	↓	↓	RJN
↓	↓	B11-03191-22	↓	↓	RJN
10-3-11	1116	SNC-51	QA	QA	RJN
10-3-11	1119	B11-03191-18	B11-03191	1256	RJN
↓	↓	B11-03191-19	↓	↓	RJN
↓	↓	B11-03191-20	↓	↓	RJN
↓	↓	B11-03191-21	↓	↓	RJN
↓	↓	B11-03191-22	↓	↓	RJN
* 10-4-11	1231	Background	*	1234	RJN
* ↓	↓	B11-02448-19	*	↓	RJN
* ↓	↓	B11-02473-19	*	↓	RJN
* ↓	↓	B11-02473-20	*	↓	RJN
10-4-11	1630	SNC-51	QA	QA	RJN

\* Done as request per client request \*

## Beta Liquid Scintillation Counter Log Book

Date	Time	ARS Sample I.D. Number	Batch Number	Liquid Scintillation File Number	Technician Initials
10-4-11	1630	Background	B11-03362	0657	RJA
↓	↓	B11-03362-01	↓	↓	RJA
↓	↓	B11-03362-02	↓	↓	RJA
↓	↓	B11-03362-03	↓	↓	RJA
↓	↓	B11-03362-04	↓	↓	RJA
↓	↓	B11-03362-05	↓	↓	RJA
↓	↓	B11-03362-06	↓	↓	RJA
↓	↓	B11-03362-07	↓	↓	RJA
↓	↓	B11-03362-08	↓	↓	RJA
↓	↓	B11-03362-09	↓	↓	RJA
↓	↓	B11-03362-10	↓	↓	RJA
↓	↓	B11-03362-11	↓	↓	RJA
↓	↓	B11-03362-12	↓	↓	RJA
↓	↓	B11-03362-13	↓	↓	RJA
↓	↓	B11-03362-14	↓	↓	RJA
↓	↓	B11-03362-17	↓	↓	RJA
↓	↓	B11-03362-18	↓	↓	RJA
<del>                     *NO data                      SRK 10-11-11                 </del>					

\*NO B11-03362-15 or 16 in the batch\*



# Standards Activity as of: 10/05/11 11:17

Active	Std ID	Isotope	PSCLT	Verification Date	Exp Date	Status	Ref Date	Ref ACT (dpm)	ACT at Date Above (dpm/g)	Half-life (days)	Parent ID	Expanded Date	Comments
	S-0247	Th-232	PSLT	10/15/10	10/15/11	OK	10/15/10	5.6100E+00	5.032	4.500E+03	S-0237		



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# **American Radiation Services Analytical Reports**

for

## **Los Alamos National Laboratory**

### **Low Level Tritium**

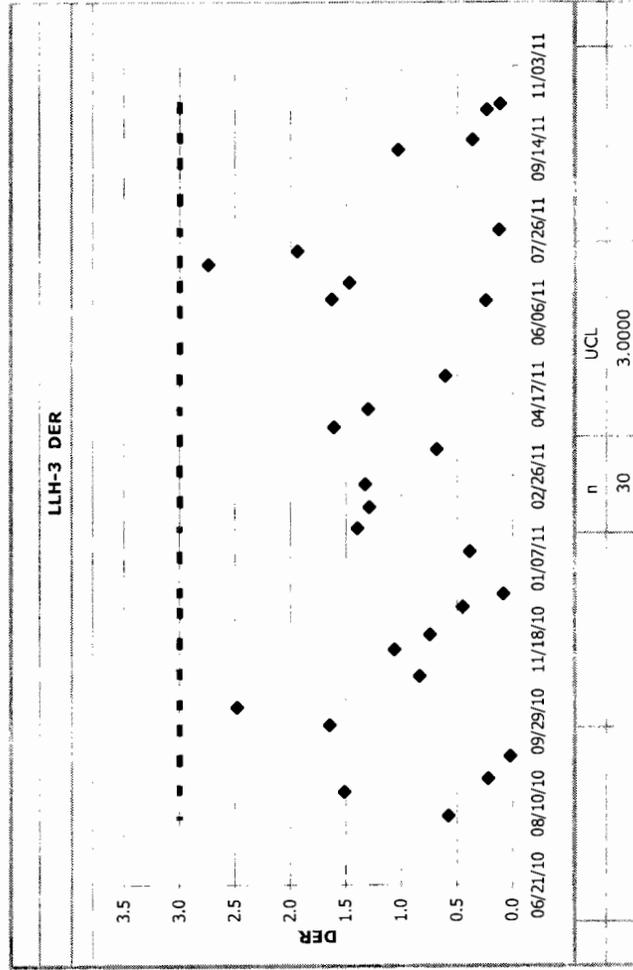
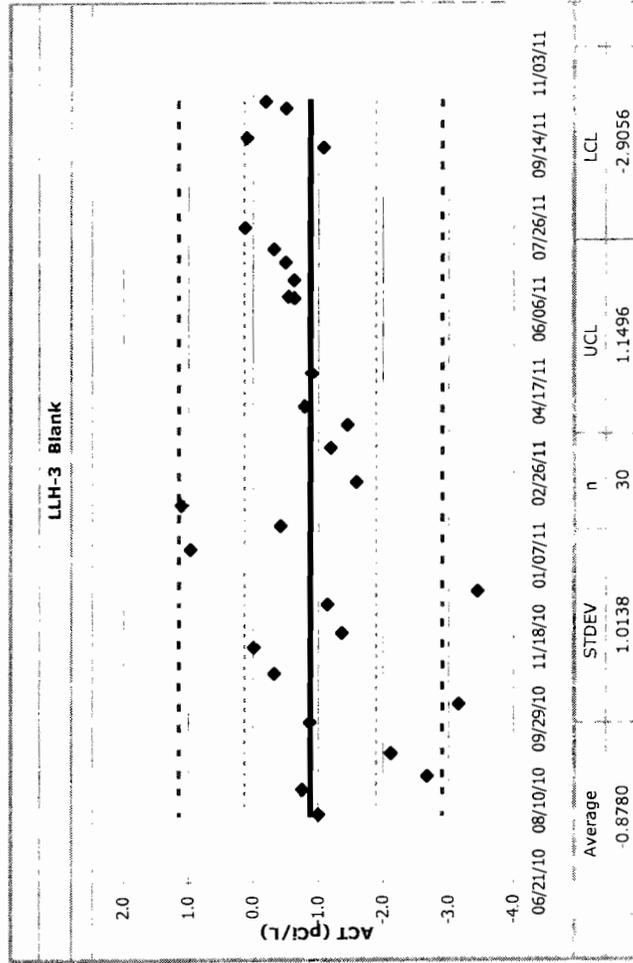
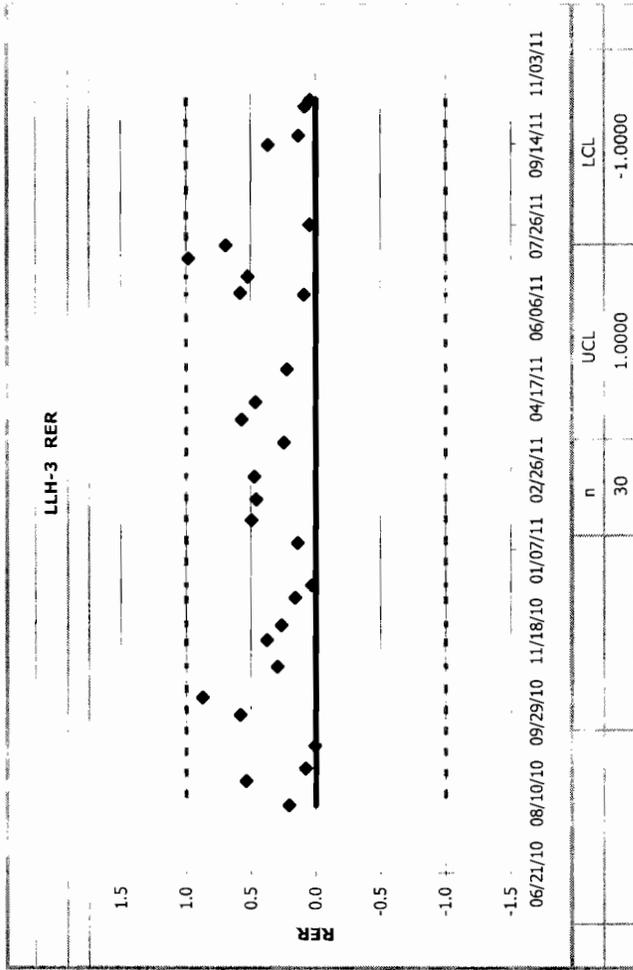
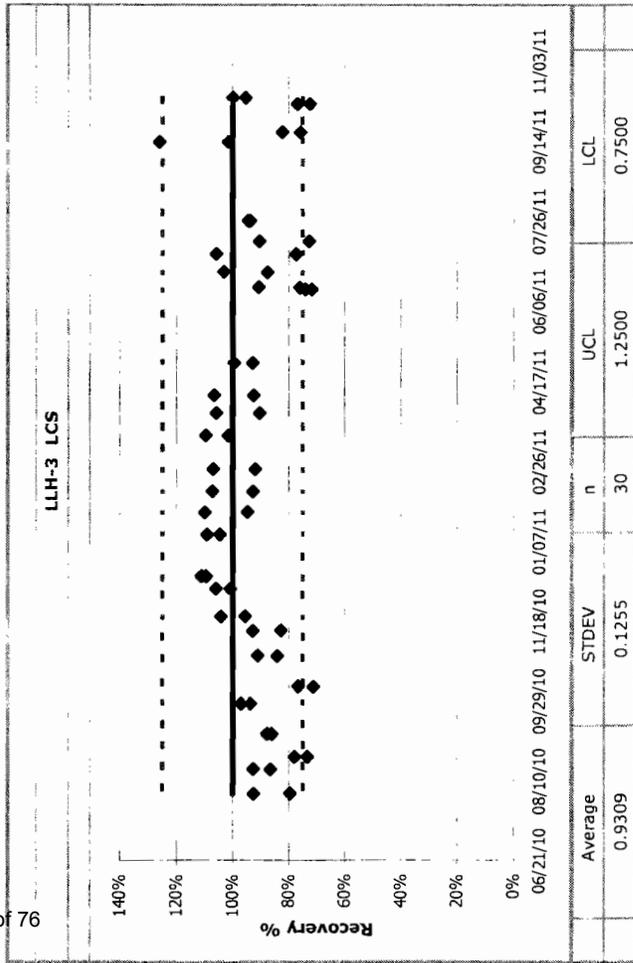
by

### **Low Level Liquid Scintillation Counting**

# **Control Charts**

# QC Chart

33 of 76

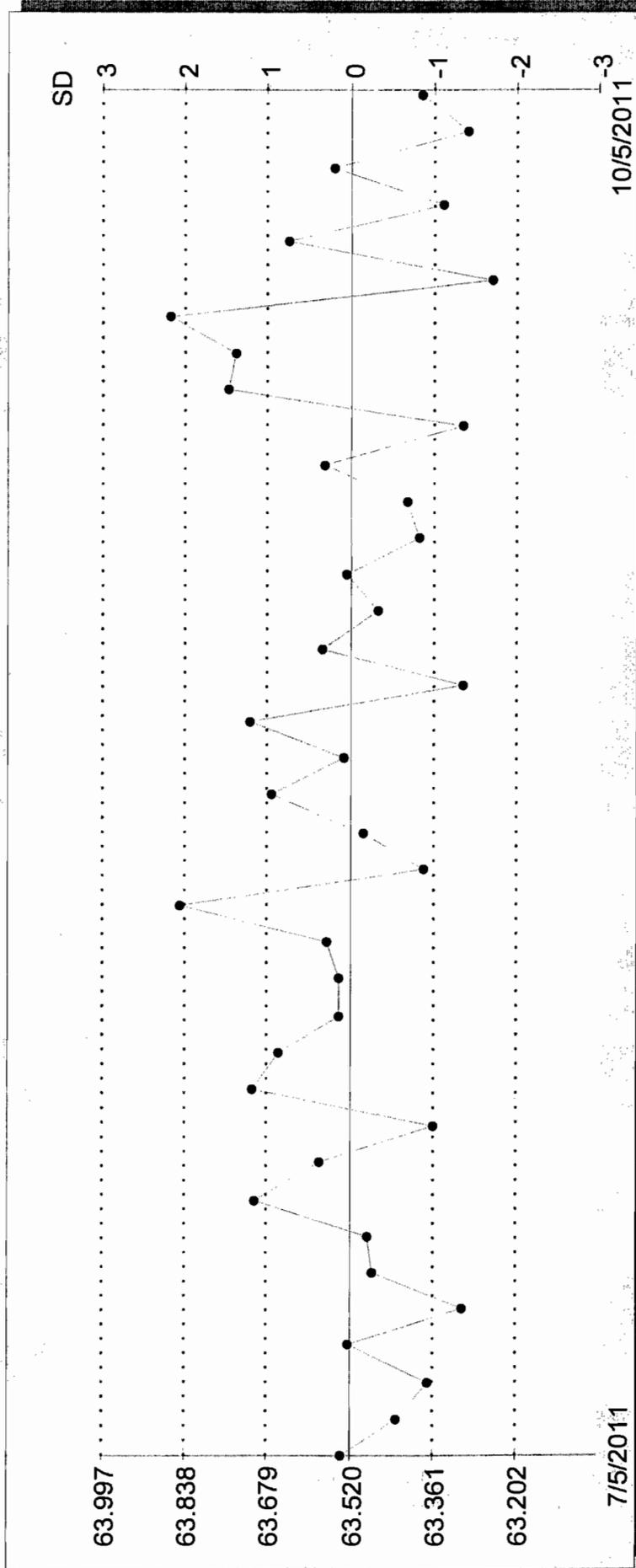


3H Efficiency

Total # pts : 5377  
 Valid # pts : 38  
 Mean % : 63.52  
 SD : 0.16

Date	Value	Valid Pt
Jul 05, 2011	63.53	X
Jul 05, 2011	63.43	X
Jul 05, 2011	63.37	X
Jul 05, 2011	63.52	X
Jul 05, 2011	63.30	X
Jul 08, 2011	63.47	X
Jul 11, 2011	63.48	X
Jul 14, 2011	63.70	X
Jul 18, 2011	63.58	X
Jul 19, 2011	63.36	X
Jul 23, 2011	63.71	X
Jul 28, 2011	63.66	X
Aug 04, 2011	63.54	X
Aug 11, 2011	63.54	X
Aug 15, 2011	63.56	X
Aug 16, 2011	63.85	X
Aug 21, 2011	63.38	X
Aug 25, 2011	63.50	X
Aug 29, 2011	63.67	X
Sep 02, 2011	63.53	X
Sep 04, 2011	63.71	X
Sep 04, 2011	63.30	X
Sep 04, 2011	63.58	X
Sep 04, 2011	63.47	X
Sep 04, 2011	63.53	X
Sep 04, 2011	63.39	X
Sep 04, 2011	63.41	X
Sep 04, 2011	63.57	X
Sep 06, 2011	63.31	X
Sep 06, 2011	63.75	X
Sep 11, 2011	63.74	X
Sep 14, 2011	63.87	X
Sep 17, 2011	63.25	X
Sep 21, 2011	63.64	X
Sep 26, 2011	63.34	X
Sep 29, 2011	63.55	X
Oct 03, 2011	63.29	X
Oct 05, 2011	63.38	X

3H Efficiency : 5377  
 Total # pts : 38  
 Valid # pts : 63.52  
 Mean : 0.76  
 SD : 0.16

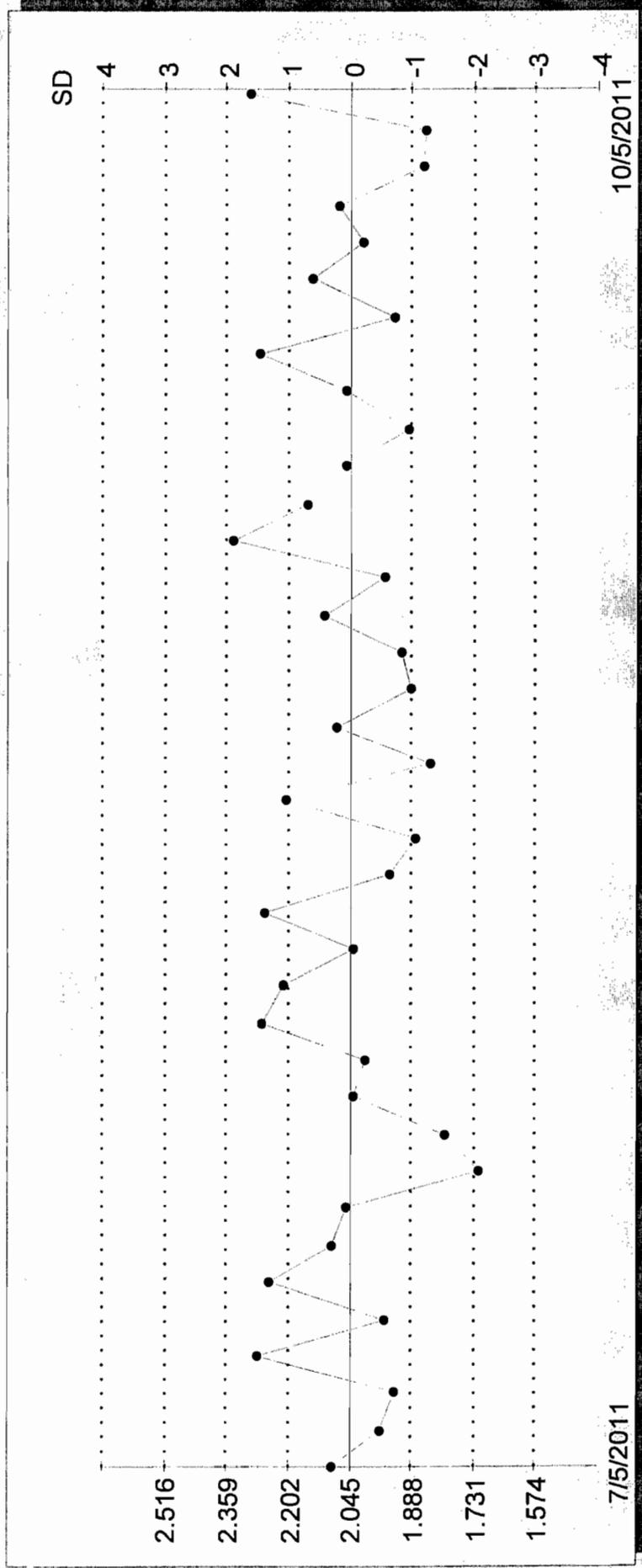


3H Background

Total # pts : 5303  
 Valid # pts : 38  
 Mean : 2.04  
 SD : 0.16

Date	Value	Valid Pt
Jul 05, 2011	2.09	X
Jul 05, 2011	1.97	X
Jul 05, 2011	1.93	X
Jul 05, 2011	2.28	X
Jul 05, 2011	1.96	X
Jul 08, 2011	2.25	X
Jul 11, 2011	2.09	X
Jul 14, 2011	2.05	X
Jul 18, 2011	1.72	X
Jul 19, 2011	1.80	X
Jul 23, 2011	2.04	X
Jul 28, 2011	2.00	X
Aug 04, 2011	2.27	X
Aug 11, 2011	2.21	X
Aug 15, 2011	2.03	X
Aug 16, 2011	2.26	X
Aug 21, 2011	1.94	X
Aug 25, 2011	1.88	X
Aug 29, 2011	2.21	X
Sep 02, 2011	1.84	X
Sep 04, 2011	2.08	X
Sep 04, 2011	1.89	X
Sep 04, 2011	1.91	X
Sep 04, 2011	2.11	X
Sep 04, 2011	1.95	X
Sep 04, 2011	2.34	X
Sep 04, 2011	2.15	X
Sep 04, 2011	2.05	X
Sep 06, 2011	1.89	X
Sep 06, 2011	2.05	X
Sep 11, 2011	2.27	X
Sep 14, 2011	1.93	X
Sep 17, 2011	2.14	X
Sep 21, 2011	2.01	X
Sep 26, 2011	2.07	X
Sep 29, 2011	1.85	X
Oct 03, 2011	1.85	X
Oct 05, 2011	2.30	X

3H Background  
 Total # pts : 5303  
 Valid # pts : 38  
 Mean : 2.04  
 SD : 0.16



7/5/2011

10/5/2011



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# **American Radiation Services Analytical Reports**

for

## **Los Alamos National Laboratory**

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



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**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: ARS1-11-01860; 1917; 1918; 1919  
ARS Batch ID: ARS1-B11-03361

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 B11-03361-04	120	1.532	1.524	29.32	5.04	2.439 pCi/L	202.9426	NO
2 B11-03361-05	120	1.431	1.524	28.95	5.05	-28.654 pCi/L	205.1293	NO
3 B11-03361-06	120	1.505	1.524	29.5	5.00	-5.802 pCi/L	203.318	NO
4 B11-03361-07	120	1.407	1.524	28.93	5.04	-36.145 pCi/L	205.6784	NO
5 B11-03361-08	120	1.417	1.524	29.45	5.01	-32.667 pCi/L	203.2566	NO
6 B11-03361-09	120	1.472	1.524	29.37	5.04	-15.824 pCi/L	202.5971	NO
7 B11-03361-10	120	1.598	1.524	29.29	5.03	22.625 pCi/L	203.5543	NO
8 B11-03361-11	120	1.457	1.524	29.39	5.08	-20.214 pCi/L	200.8651	NO
9 B11-03361-12	120	1.347	1.524	29.08	5.00	-54.835 pCi/L	206.2545	NO
10 B11-03361-13	120	1.472	1.524	29.36	5.06	-15.767 pCi/L	201.8651	NO
11 B11-03361-14	120	1.643	1.524	29.41	5.03	36.235 pCi/L	202.7238	NO
12 B11-03361-15	120	2.491	1.524	29.2	5.05	295.392 pCi/L	203.3731	YES, analyze by LSC-A-001
13 <u>B11-03361-16</u>	120	2.916	1.524	29.28	5.07	422.384 pCi/L	202.0174	YES, analyze by LSC-A-001
14 B11-03361-17	120	1.918	1.524	29.48	5.03	119.687 pCi/L	202.2424	NO
15 B11-03361-18	120	1.402	1.524	29.35	5.01	-37.373 pCi/L	203.9492	NO
16						#DIV/0!	#DIV/0!	#DIV/0!
17						#DIV/0!	#DIV/0!	#DIV/0!
18						#DIV/0!	#DIV/0!	#DIV/0!
19						#DIV/0!	#DIV/0!	#DIV/0!
20						#DIV/0!	#DIV/0!	#DIV/0!
21						#DIV/0!	#DIV/0!	#DIV/0!
22						#DIV/0!	#DIV/0!	#DIV/0!
23						#DIV/0!	#DIV/0!	#DIV/0!

*Please re-screen*  
*B11-03361-15,16*  
*SDH*  
*9-6-11*

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

ARS File ID Numbers: ARS1-11-01919  
 ARS Batch ID: ARS1-B11-03361

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 B11-03361-15	120	2.397	1.495	29.09	5.05	276.579	pCi/L	202.2567	YES, analyze by LSC-A-001.
2 B11-03361-16	120	2.274	1.495	29.11	5.07	237.758	pCi/L	201.3204	YES, analyze by LSC-A-001.
3						#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
4						#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
5						#DIV/0!	pCi/L	#DIV/0!	#DIV/0!
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!



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**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		ARS-054		Analysis		LSC-A-021		Matrix		AQ			
ARS1-B11-03361		ARS1-B11-03361		Low Level Tritium Screening		LSC-A-021		Matrix		AQ			
Method		Description		Run		Client ID		Isotope Group		Lab Deadline			
ARS-054		LSC-A-021		Run		Client ID		Isotope Group		Lab Deadline			
Type		Blind Iso1		Blind Iso2		Blind Iso3		SDG		FR			
ARS1-B11-03361-01	LCS												
ARS1-B11-03361-02	LCSD												
ARS1-B11-03361-03	MBL												
ARS1-B11-03361-04	TRG							ARS1-11-01860	001	1	CAMO-11-24698	STD	09/20/11
ARS1-B11-03361-05	TRG							ARS1-11-01860	002	1	CAMO-11-24703	STD	09/20/11
ARS1-B11-03361-06	TRG							ARS1-11-01860	003	1	CAMO-11-24650	STD	09/20/11
ARS1-B11-03361-07	TRG							ARS1-11-01917	001	1	CALA-11-26771	STD	09/27/11
ARS1-B11-03361-08	TRG							ARS1-11-01917	002	1	CALA-11-26774	STD	09/27/11
ARS1-B11-03361-09	TRG							ARS1-11-01917	003	1	CALA-11-26783	STD	09/27/11
ARS1-B11-03361-10	TRG							ARS1-11-01918	001	1	Buckman1-11-26862	STD	09/27/11
ARS1-B11-03361-11	TRG							ARS1-11-01918	002	1	Buckman1-11-26863	STD	09/27/11
ARS1-B11-03361-12	TRG							ARS1-11-01918	003	1	Buckman1-11-26864	STD	09/27/11
ARS1-B11-03361-13	TRG							ARS1-11-01918	004	1	Buckman06-11-26865	STD	09/27/11
ARS1-B11-03361-14	TRG							ARS1-11-01918	005	1	Buckman08-11-26866	STD	09/27/11
ARS1-B11-03361-15	TRG							ARS1-11-01919	001	1	CAPU-11-26374	STD	09/27/11
ARS1-B11-03361-16	TRG							ARS1-11-01919	002	1	CAPU-11-26377	STD	09/27/11
ARS1-B11-03361-17	TRG							ARS1-11-01919	003	1	CAPU-11-26380	STD	09/27/11
ARS1-B11-03361-18	TRG							ARS1-11-01919	004	1	CAPU-11-26381	STD	09/27/11

95002  
11-01860-001-1  
XRAD

95005  
11-01917-001-1  
XRAD

95008  
11-01918-001-1  
XRAD

95011  
11-01918-004-1  
XRAD

95014  
11-01919-002-1  
XRAD

95003  
11-01860-002-1  
XRAD

95006  
11-01917-002-1  
XRAD

95009  
11-01918-002-1  
XRAD

95012  
11-01918-005-1  
XRAD

95015  
11-01919-003-1  
XRAD

95004  
11-01860-003-1  
XRAD

95007  
11-01917-003-1  
XRAD

95010  
11-01918-003-1  
XRAD

95013  
11-01919-001-1  
XRAD

95016  
11-01919-004-1  
XRAD

ID_31001_054	ABatch	ABatchSampleID	ClientID	Aliquot1	AliquotUnits1	IC_ID1	Aliquot2	AliquotUnits2	IC_ID2	UserID	ModDate
9843	ARS1-B11-03361	ARS1-B11-03361-01		1 g						RUSEY	09/02/2011 14:25:21
9844	ARS1-B11-03361	ARS1-B11-03361-02		1 g						RUSEY	09/02/2011 14:25:21
9845	ARS1-B11-03361	ARS1-B11-03361-03		1 g						RUSEY	09/02/2011 14:25:21
9846	ARS1-B11-03361	ARS1-B11-03361-04	CAMO-11-24698	5.04 g		95002				RUSEY	09/02/2011 14:25:21
9847	ARS1-B11-03361	ARS1-B11-03361-05	CAMO-11-24703	5.05 g		95003				RUSEY	09/02/2011 14:25:21
9848	ARS1-B11-03361	ARS1-B11-03361-06	CAMO-11-24650	5 g		95004				RUSEY	09/02/2011 14:25:21
9849	ARS1-B11-03361	ARS1-B11-03361-07	CALA-11-26771	5.04 g		95005				RUSEY	09/02/2011 14:25:21
9850	ARS1-B11-03361	ARS1-B11-03361-08	CALA-11-26774	5.01 g		95006				RUSEY	09/02/2011 14:25:22
9851	ARS1-B11-03361	ARS1-B11-03361-09	CALA-11-26783	5.04 g		95007				RUSEY	09/02/2011 14:25:22
9852	ARS1-B11-03361	ARS1-B11-03361-10	Buckman1-11-26862	5.03 g		95008				RUSEY	09/02/2011 14:25:22
9853	ARS1-B11-03361	ARS1-B11-03361-11	Buckman1-11-26863	5.08 g		95009				RUSEY	09/02/2011 14:25:22
9854	ARS1-B11-03361	ARS1-B11-03361-12	Buckman1-11-26864	5 g		95010				RUSEY	09/02/2011 14:25:22
9855	ARS1-B11-03361	ARS1-B11-03361-13	Buckman06-11-26865	5.06 g		95011				RUSEY	09/02/2011 14:25:22
9856	ARS1-B11-03361	ARS1-B11-03361-14	Buckman08-11-26866	5.03 g		95012				RUSEY	09/02/2011 14:25:23
9857	ARS1-B11-03361	ARS1-B11-03361-15	CAPU-11-26374	5.05 g		95013				RUSEY	09/02/2011 14:25:23
9858	ARS1-B11-03361	ARS1-B11-03361-16	CAPU-11-26377	5.07 g		95014				RUSEY	09/02/2011 14:25:23
9859	ARS1-B11-03361	ARS1-B11-03361-17	CAPU-11-26380	5.03 g		95015				RUSEY	09/02/2011 14:25:23
9860	ARS1-B11-03361	ARS1-B11-03361-18	CAPU-11-26381	5.01 g		95016				RUSEY	09/02/2011 14:25:23

45  
of  
76

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\20110906\_1252  
Raw Results Path: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\20110906\_1252\20110906\_1252.results  
RTF File Name: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\20110906\_1252\LLH3.rtf  
Comma-Delimited File Name: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\20110906\_1252\Report1.txt  
Assay File Name: C:\Packard\TriCarb\Assays\Low Level H3.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  
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

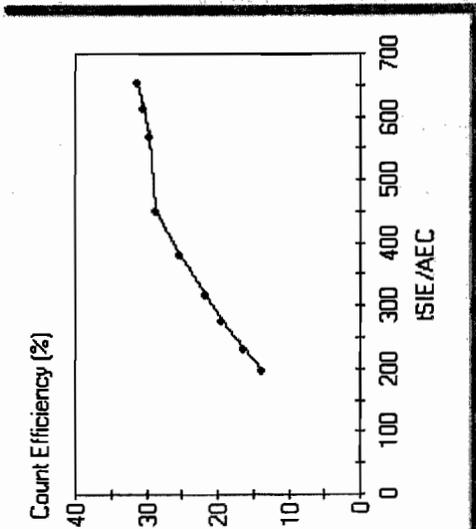
Half Life-

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

46 of 76  
A B C

Cycle 1 Results  
Quench Curve Block Data

ARS LL H3 in A



Date Acquired: 11/19/2010  
Date Modified:  
ARS LL H3 in A

tSIE/AEC	Count Efficiency (%)
655.11	31.16
613.27	30.29
569.42	29.56
454.14	28.64
383.12	25.38
318.52	21.77
280.21	19.43
235.97	16.27
199.12	13.89

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P#	S#	SMPL_ID	Count Time	CPMA	DPM1	tSIE	Eff Nucl	In A	DATE	TIME	MESSAGES
10	1	BACKGROUND	120.00	1.524	5.22	525.43	29.21	29.21	9/2/2011	5:36:40 PM	
10	2	B11-03361-04	120.00	1.532	5.22	540.20	29.32	29.32	9/2/2011	7:46:40 PM	
10	3	B11-03361-05	120.00	1.431	4.95	492.53	28.95	28.95	9/2/2011	9:56:39 PM	
10	4	B11-03361-06	120.00	1.505	5.10	562.97	29.50	29.50	9/3/2011	12:06:40 AM	
10	5	B11-03361-07	120.00	1.407	4.87	489.83	28.93	28.93	9/3/2011	2:16:41 AM	
10	6	B11-03361-08	120.00	1.417	4.81	556.33	29.45	29.45	9/3/2011	4:26:43 AM	
10	7	B11-03361-09	120.00	1.472	5.01	545.88	29.37	29.37	9/3/2011	6:36:44 AM	
10	8	B11-03361-10	120.00	1.598	5.45	535.72	29.29	29.29	9/3/2011	8:46:44 AM	
10	9	B11-03361-11	120.00	1.457	4.96	548.24	29.39	29.39	9/3/2011	10:56:44 AM	
10	10	B11-03361-12	120.00	1.347	4.63	509.91	29.08	29.08	9/3/2011	1:06:44 PM	
10	11	B11-03361-13	120.00	1.472	5.01	544.19	29.36	29.36	9/3/2011	3:16:43 PM	
10	12	B11-03361-14	120.00	1.643	5.59	551.16	29.41	29.41	9/3/2011	5:26:44 PM	
10	13	B11-03361-15	120.00	2.491	8.53	525.00	29.20	29.20	9/3/2011	7:36:51 PM	
10	14	B11-03361-16	120.00	2.916	9.96	534.06	29.28	29.28	9/3/2011	9:46:51 PM	
10	15	B11-03361-17	120.00	1.918	6.51	559.47	29.48	29.48	9/3/2011	11:56:52 PM	
10	16	B11-03361-18	120.00	1.402	4.78	543.36	29.35	29.35	9/4/2011	2:06:54 AM	

48 of 76

P#	S#	SAMPL_ID	Count Time	CPMA	DPM1	tSIE	Eff Nucl	In A	DATE	TIME	MESSAGES
2	1	BACKGROUND	120.00	1.495	5.12	524.51	29.20	9/6/2011		1:00:54 PM	
2	2	B11-03361-15	120.00	2.397	8.24	510.14	29.09	9/6/2011		3:10:53 PM	
2	3	B11-03361-16	120.00	2.274	7.81	513.21	29.11	9/6/2011		5:20:54 PM	

## Beta Liquid Scintillation Counter Log Book

Date	Time	ARS Sample I.D. Number	Batch Number	Liquid Scintillation File Number	Technician Initials
8-23-11	1302	B11-02500-05	B11-02500	0817	WAR
↓	↓	B11-02500-06	↓	↓	WAR
↓	↓	B11-02500-07	↓	↓	WAR
↓	↓	B11-02500-08	↓	↓	WAR
↓	↓	B11-02500-09	↓	↓	WAR
↓	↓	B11-02500-10	↓	↓	WAR
↓	↓	B11-02500-11	↓	↓	WAR
↓	↓	B11-02500-12	↓	↓	WAR
↓	↓	B11-02500-13	↓	↓	WAR
↓	↓	B11-02500-14	↓	↓	WAR
9-2-11	1545	SNC-51	QA	QA	RJW
9-2-11	1547	Background	B11-03361	1727	RJW
↓	↓	B11-03361-04	↓	↓	RJW
↓	↓	B11-03361-05 <del>B11-03361-05</del>	↓	↓	RJW
↓	↓	B11-03361-06	↓	↓	RJW
↓	↓	B11-03361-07	↓	↓	RJW
↓	↓	B11-03361-08	↓	↓	RJW
↓	↓	B11-03361-09	↓	↓	RJW
↓	↓	B11-03361-10 <del>B11-03361-10</del> 9-2-11	↓	↓	RJW
↓	↓	B11-03361-11	↓	↓	RJW

RJW  
9-01-11

## Beta Liquid Scintillation Counter Log Book

Date	Time	ARS Sample I.D. Number	Batch Number	Liquid Scintillation File Number	Technician Initials
4-2-11	1547	B11-03361-12	B11-03361	1727	RJN
↓	↓	B11-03361-13	↓	↓	RJN
↓	↓	B11-03361-14	↓	↓	RJN
↓	↓	B11-03361-15	↓	↓	RJN
↓	↓	B11-03361-16	↓	↓	RJN
↓	↓	B11-03361-17	↓	↓	RJN
↓	↓	B11-03361-18	↓	↓	RJN
<div style="display: flex; justify-content: center; align-items: center;"> <span style="font-size: 2em; margin-right: 10px;">2/4</span> <span style="font-size: 2em;">5-6-11</span> </div>					



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# **American Radiation Services Analytical Reports**

for

## **Los Alamos National Laboratory**

### **Tritium-Screening**

by

### **Low Level Liquid Scintillation Counting**

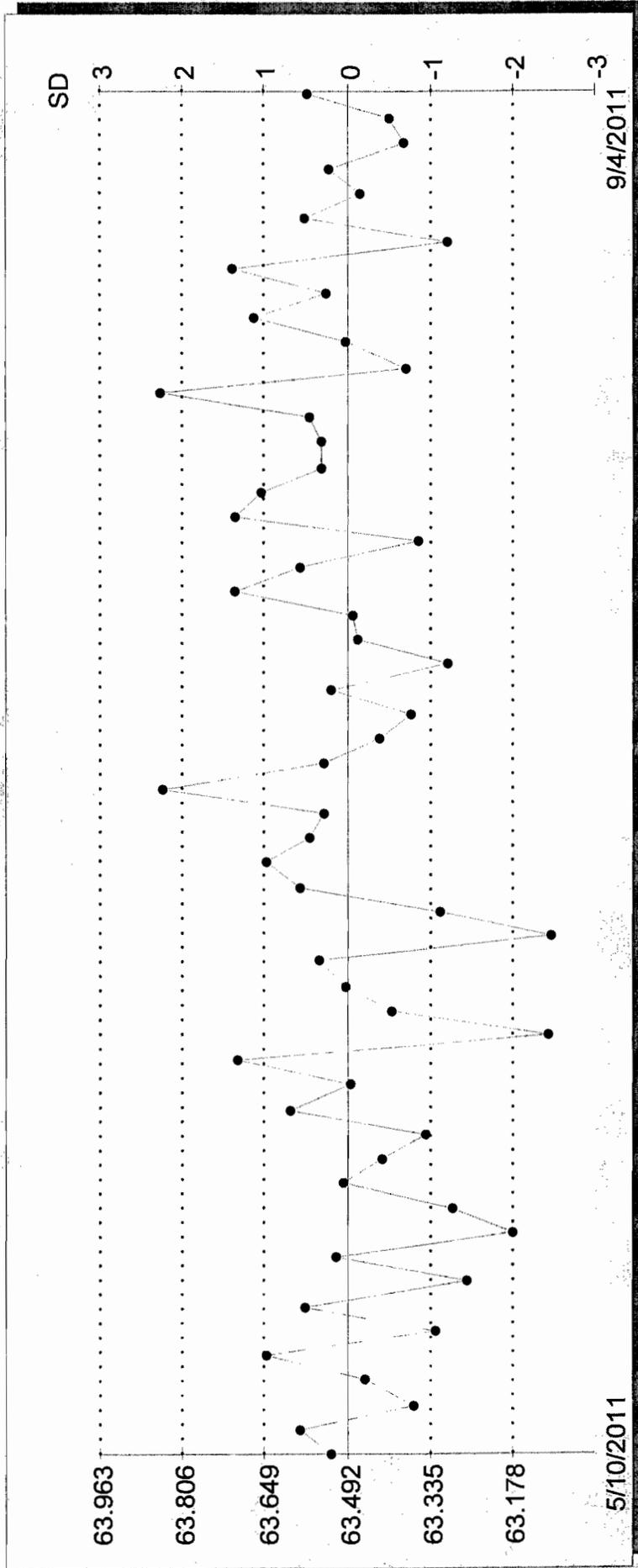
# **Control Charts**

3H Efficiency  
 Total # pts : 5367  
 Valid # pts : 56  
 Mean % : 63.49  
 SD : 0.16

Date	Value	Valid Pt
May 10, 2011	63.52	X
May 16, 2011	63.58	X
May 23, 2011	63.37	X
May 24, 2011	63.46	X
May 31, 2011	63.65	X
Jun 03, 2011	63.33	X
Jun 05, 2011	63.57	X
Jun 05, 2011	63.27	X
Jun 08, 2011	63.51	X
Jun 11, 2011	63.18	X
Jun 14, 2011	63.29	X
Jun 18, 2011	63.50	X
Jun 19, 2011	63.43	X
Jun 20, 2011	63.34	X
Jun 20, 2011	63.60	X
Jun 20, 2011	63.48	X
Jun 20, 2011	63.70	X
Jun 20, 2011	63.11	X
Jun 21, 2011	63.41	X
Jun 24, 2011	63.49	X
Jun 28, 2011	63.55	X
Jul 03, 2011	63.11	X
Jul 04, 2011	63.32	X
Jul 04, 2011	63.58	X
Jul 04, 2011	63.65	X
Jul 04, 2011	63.56	X
Jul 04, 2011	63.54	X
Jul 04, 2011	63.85	X
Jul 05, 2011	63.53	X
Jul 05, 2011	63.43	X
Jul 05, 2011	63.37	X
Jul 05, 2011	63.52	X
Jul 05, 2011	63.30	X
Jul 08, 2011	63.47	X
Jul 11, 2011	63.48	X
Jul 14, 2011	63.70	X
Jul 18, 2011	63.58	X
Jul 19, 2011	63.36	X
Jul 23, 2011	63.71	X
Jul 28, 2011	63.66	X
Aug 04, 2011	63.54	X
Aug 11, 2011	63.54	X

Aug 15, 2011	63.56	X
Aug 16, 2011	63.85	X
Aug 21, 2011	63.38	X
Aug 25, 2011	63.50	X
Aug 29, 2011	63.67	X
Sep 02, 2011	63.53	X
Sep 04, 2011	63.71	X
Sep 04, 2011	63.30	X
Sep 04, 2011	63.58	X
Sep 04, 2011	63.47	X
Sep 04, 2011	63.53	X
Sep 04, 2011	63.39	X
Sep 04, 2011	63.41	X
Sep 04, 2011	63.57	X

3H Efficiency : 5367  
 Total # pts : 56  
 Valid # pts : 63.49  
 Mean : 63.49  
 SD : 0.16



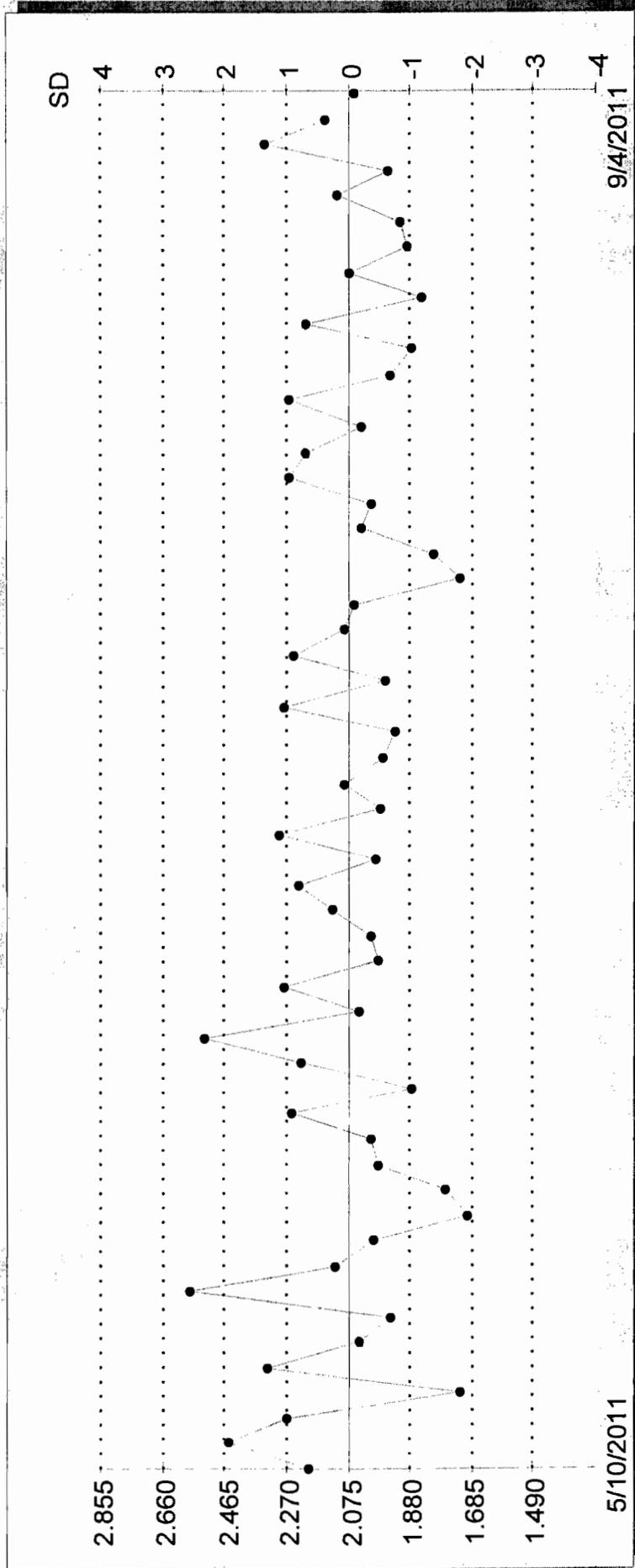
3H Background

Total # pts : 5293  
 Valid # pts : 55  
 Mean : 2.08  
 SD : 0.20

Date	Value	Valid Pt
May 10, 2011	2.20	X
May 16, 2011	2.45	X
May 23, 2011	2.27	X
May 24, 2011	1.72	X
May 31, 2011	2.34	X
Jun 03, 2011	2.05	X
Jun 05, 2011	1.94	X
Jun 05, 2011	2.58	X
Jun 08, 2011	2.12	X
Jun 11, 2011	2.00	X
Jun 14, 2011	1.70	X
Jun 18, 2011	1.77	X
Jun 19, 2011	1.98	X
Jun 20, 2011	2.00	X
Jun 20, 2011	2.25	X
Jun 20, 2011	1.87	X
Jun 20, 2011	2.23	X
Jun 21, 2011	2.53	X
Jun 24, 2011	2.04	X
Jun 28, 2011	2.28	X
Jul 03, 2011	1.98	X
Jul 04, 2011	2.01	X
Jul 04, 2011	2.13	X
Jul 04, 2011	2.23	X
Jul 04, 2011	1.99	X
Jul 04, 2011	2.29	X
Jul 04, 2011	1.97	X
Jul 05, 2011	2.09	X
Jul 05, 2011	1.97	X
Jul 05, 2011	1.93	X
Jul 05, 2011	2.28	X
Jul 05, 2011	1.96	X
Jul 08, 2011	2.25	X
Jul 11, 2011	2.09	X
Jul 14, 2011	2.05	X
Jul 18, 2011	1.72	X
Jul 19, 2011	1.80	X
Jul 23, 2011	2.04	X
Jul 28, 2011	2.00	X
Aug 04, 2011	2.27	X
Aug 11, 2011	2.21	X
Aug 15, 2011	2.03	X

Aug 16, 2011	2.26	X
Aug 21, 2011	1.94	X
Aug 25, 2011	1.88	X
Aug 29, 2011	2.21	X
Sep 02, 2011	1.84	X
Sep 04, 2011	2.08	X
Sep 04, 2011	1.89	X
Sep 04, 2011	1.91	X
Sep 04, 2011	2.11	X
Sep 04, 2011	1.95	X
Sep 04, 2011	2.34	X
Sep 04, 2011	2.15	X
Sep 04, 2011	2.05	X

3H Background  
 Total# pts : 5293  
 Valid# pts : 55  
 Mean  $\bar{x}$  : 2.08  
 SD : 0.20



5/10/2011

9/4/2011



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# **American Radiation Services Analytical Reports**

for

## **Los Alamos National Laboratory**

### **Low Level Liquid Scintillation Counting**

# **Calibration Information**

STD ID: S-0247

ARS INTERNATIONAL		Add/Edit Secondary Stds	Parent Standard Data			
Planning		Parent Solution Reference #	NIST SRM 4927F			
Planning Comments	Create an H-3 LCS standard	Parent Solution #	S-0237			
Target dpm/g (on dil. date)	5.56	Parent Principal Radionuclide	H-3	Half Life (Days)	4499.8000000	
Target Final volume mL	2000	Parent Reference Date	03/22/2010 10:10			
Appx mass g of Parent Sol'n	3.274623294	Parent Certified Act	3503.682716	Certi Act/Vol Units	dpm	g
Appx vol ml of Parent Sol'n	3.280328244	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-0247	Parent Date Recvd	01/02/00			
Dilution Date (New Ref Date)	10/11/2010 10:30	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	3503.682716			
Transfer Container, empty (g)	1.7	Certified dpm/g on 10/11/2010 10:30	3395.81045			
Container Plus Solution (g)	4.994	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			
Net Wt Transferred (g)	3.294	Parent Tech	Unknown			
DPM Xferred on 10/11/2010 10:30	11185.79962	Is_Primary	FALSE			
Diluent/matrix	DI H2O	Is_LCS	TRUE			
Diluent Density Cont, empty (g)		Is_Tracer	FALSE			
Test Mass of 5 ml of Diluent (g)		Is_Calib	FALSE			
Diluent Density Test - (g/mL)						
Dilution Empty Container Mass (g)	473.96					
Dilution Full Cont g (if measured)	2467.85					
Dilution Final Volume ml (if measured)	2000					
Final Dilution Density (g/mL)	0.996945					
Final Dilution Measured Mass g	1993.89					
Comments	Stock H-3 LCS standard. Dilution performed as stated above by B Steffens. -BJS 10/11/10					
Final Dilution dpm/g	5.610038479					
Final Dil New Ref Date/Time	10/11/2010 10:30					

S-0247			
H-3	Verified	10/13/10	
SL	Expires	10/13/11	
Manufacturer	NIST SRM 4927F		
Sol Matrix	H2O		
Ref No	NIST SRM 4927F		
Tech	Unknown		
Parent ID	S-0237		
RADIOACTIVE STANDARDS -- BATON ROUGE LABORATORY			





STD ID: S-0031

ARS INTERNATIONAL		Add/Edit Secondary Stds	Parent Standard Data			
Planning		Parent Solution Reference #	NIST SRM 4927F			
Planning Comments	Dilute Intermediate level solution from SRM 4927F	Parent Solution #	9-0107			
Target dpm/g (on dil. date)	267000	Parent Principal Radionuclide	H-3	Half Life (Days)	4499.800000	
Target Final volume mL	200	Parent Reference Date	09/03/1998 11:00			
Appx mass g of Parent Sol'n	2.093763934	Parent Certified Act	38082000	Carb Act/Vol Units	dpm	g
Appx vol ml of Parent Sol'n	2.097539505	Parent Cert Act Uncert 1 Sigma	0.0036			
Expected Addition for Analysis g		Parent Sp. Gravity G/ML	0.9982			
Standards Preparation / Dilution		Parent Supplier	NIST SRM 4927F			
Secondary Solution #	S-0031	Parent Date Recvd	01/02/00			
Dilution Date (New Ref Date)	10/19/2005 00:00	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	38082000			
Transfer Container, empty (g)	0	Certified dpm/g on 10/19/2005 00:00	25504307.89			
Container Plus Solution (g)	4.7574	Primary for S-0029 - Information entered from dilution records - 4/18/2005 RTS				
Net Wt Transferred (g)	4.7574	Parent Comments				
DPM Xferred on 10/19/2005 00:00	121334194.3					
Diluent/matrix	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)	1	Is_Calib	FALSE			
Dilution Full Cont g (If measured)	200.64					
Dilution Final Volume ml (If measured)	200					
Final Dilution Density (g/mL)	0.9982					
Final Dilution Measured Mass g	199.64					
Comments	S-0031 Intermediate dilution - Information entered from dilution records - 4/19/2005 RTS					
Final Dilution dpm/g	607764.9485					
Final Dil New Ref Date/Time	10/19/2005 00:00					



## Add / Edit *Primary* Standards

Solution Reference #	<b>NIST SRM 4927F</b>		
Solution #	<b>S-0107</b>		
Principal Radionuclide	<b>H-3</b>	Half Life (Days)	<b>4499.8000</b>
Reference Date	<b>09/03/98 11:00</b>		
Certified Act	<b>634700.0000</b>	Cert Act/Vol Units	<b>Bq</b> <b>g</b>
Cert Act Uncert 1 Sigma (fractional .03=3%)	<b>0.0036</b>		
Sp. Gravity G/MI	<b>0.9982</b>		
Supplier	<b>NIST SRM 4927F</b>		
Date Recvd	<b>01/02/00</b>		
Received By	<b>Unknown</b>		
Cert Exp Date			
Matrix	<b>H2O</b>		
Certified dpm/g At Reference Date	<b>38082000</b>		
Certified dpm/g On 10/15/2010 15:48	<b>19261068.03</b>		
Comments	Primary for S-0029 - Information entered from dilution records - 4/18/2006 RTS		
Primary Tech	<b>Unknown</b>		
Is_Primary	<b>TRUE</b>		
Is_LCS	<b>TRUE</b>		
Is_Tracer	<b>FALSE</b>		
Is_Calib	<b>FALSE</b>		

5-0031



# National Institute of Standards & Technology

## Certificate

### Standard Reference Material 4927F Hydrogen-3 Radioactivity Standard

This Standard Reference Material (SRM) consists of radioactive hydrogen-3, as water, in 5 mL of distilled water. The solution is contained in a flame-sealed NIST borosilicate-glass ampoule. The SRM is intended for the calibration of beta-particle counting instruments and for the monitoring of radiochemical procedures.

#### Radlological Hazard

The SRM ampoule contains hydrogen-3 with a total activity of approximately 3.2 MBq. Hydrogen-3 decays by beta-particle emission. None of the beta particles escape from the SRM ampoule. During the decay process no photons are emitted. Approximate unshielded dose rates at several distances (as of the reference time) are given in note [a]\*. There is no detectable external radiation. The SRM should be used only by persons qualified to handle radioactive material.

#### Chemical Hazard

The SRM ampoule contains only distilled water. There is no chemical hazard. If the ampoule is to be opened to transfer the solution, the recommended procedure is given on page 2.

#### Storage and Handling

The SRM should be stored and used at a temperature between 5 and 65 °C. The solution in an unopened ampoule should remain stable and homogeneous until at least September 2008.

The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material. If the ampoule is transported it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) because of the radioactivity.

#### Preparation

This Standard Reference Material was prepared in the Physics Laboratory, Ionizing Radiation Division, Radioactivity Group, L.R. Karam, Group Leader. The overall technical direction and physical measurements leading to certification were provided by L.L. Lucas and M.P. Unterweger of the Radioactivity Group.

The support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by J.W.L. Thomas.

Bert M. Coursey, Chief  
Ionizing Radiation Division

Nancy M. Trahey, Chief  
Standard Reference Materials Program

Gaithersburg, Maryland 20899  
June 1999  
Half-life and text revised October 2000

PROPERTIES OF SRM 4927F

Certified values

Solution density	$(0.998 \pm 0.002) \text{ g} \cdot \text{mL}^{-1}$ at 20.0 °C [b]*
Radionuclide	Hydrogen-3
Reference time	1200 EST, 3 September 1998 1100 CST
Massic activity of the solution [c]	$634.7 \text{ kBq} \cdot \text{g}^{-1}$
Relative expanded uncertainty ( $k=2$ )	0.72% [d] [e]

Uncertified values

Physical Properties:			
Source description	Liquid in flame-sealed NIST borosilicate-glass ampoule		
Ampoule specifications	Body outside diameter	$(16.5 \pm 0.5) \text{ mm}$	
	Wall thickness	$(0.60 \pm 0.04) \text{ mm}$	
	Barium content	Less than 2.5%	
	Lead-oxide content	Less than 0.02%	
	Other heavy elements	Trace quantities	
Solution mass	Approximately 5.0 g		
Chemical Properties:			
Solution composition	Chemical Formula	Concentration ( $\text{mol} \cdot \text{L}^{-1}$ )	Mass Fraction ( $\text{g} \cdot \text{g}^{-1}$ )
	H <sub>2</sub> O <sup>3</sup> H <sub>2</sub> O	55 $6 \times 10^{-7}$	1.00 $1 \times 10^{-8}$
Radiological Properties:			
Radionuclidic impurities	None detected [f]		
Half lives used	Hydrogen-3: $(4500 \pm 8) \text{ d}$ [g]		
Calibration method and measuring instrument(s)	4πB gas counting of SRM 4927E using the NIST length-compensated internal gas proportional counters and intercomparison of SRMs 4927E/4927F using two 4πB liquid-scintillation counting systems [h]		

## NOTES

- [a] The Sievert is the SI unit for dose equivalent. See reference [1]. One  $\mu\text{Sv}$  is equal to 0.1 mrem.  
 Distance from Ampoule (cm): 1 30 100  
 Approximate Dose Rate ( $\mu\text{Sv/h}$ ):  $<0,1$  (Not detectable)
- [b] The stated uncertainty is two times the standard uncertainty.
- [c] Massic activity is the preferred name for the quantity activity divided by the total mass of the sample. See reference [1].
- [d] The reported value,  $y$ , of massic activity (activity per unit mass) at the reference time was not measured directly but was derived from measurements and calculations of other quantities. This can be expressed as  $y = f(x_1, x_2, x_3, \dots, x_n)$ , where  $f$  is a mathematical function derived from the assumed model of the measurement process.

The value,  $x_i$ , used for each input quantity  $i$  has a standard uncertainty,  $u(x_i)$ , that generates a corresponding uncertainty in  $y$ ,  $u_i(y) = |\partial y / \partial x_i| \cdot u(x_i)$ , called a component of combined standard uncertainty of  $y$ .

The combined standard uncertainty of  $y$ ,  $u_c(y)$ , is the positive square root of the sum of the squares of the components of combined standard uncertainty.

The combined standard uncertainty is multiplied by a coverage factor of  $k = 2$  to obtain  $U$ , the expanded uncertainty of  $y$ .

Since it can be assumed that the possible estimated values of the massic activity are approximately normally distributed with approximate standard deviation  $u_c(y)$ , the unknown value of the massic activity is believed to lie in the interval  $\pm U$  with a level of confidence of approximately 95 percent.

For further information on the expression of uncertainties, see references [2] and [3].

- [e] The value of each standard uncertainty component, and hence the value of the expanded uncertainty itself, is a best estimate based upon all available information, but is only approximately known. That is to say, the uncertainty of the uncertainty is large and not well known. This is true for uncertainties evaluated by statistical methods (e.g., the relative standard deviation of the standard deviation of the mean for the massic response is approximately 50%) and for uncertainties evaluated by other methods (which could easily be over estimated or under estimated by substantial amounts). The unknown value of the expanded uncertainty is believed to lie in the interval  $U/2$  to  $2U$  (i.e., within a factor of 2 of the estimated value).
- [f] The estimated limit of detection for radionuclides impurities is  $300 \text{ Bq} \cdot \text{g}^{-1}$ .
- [g] The stated uncertainty is the standard uncertainty. See reference [5].
- [h] Extensive gas counting measurements were made on the SRM 4927E solution during 1998 and 1999. The SRM 4927F solution was intercompared with the SRM 4927E solution using liquid scintillation counting.
- [i] Relative standard uncertainty of the input quantity  $x_i$ .



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for

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## Report Compilation Checklist

ARS SDG:	<u>11-01918</u>	Client Name:	<u>LANL</u>	Sample Matrix:	<u>AQ</u>
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LEVEL 1 COMPONENTS	1st Reviewer			
1) Cover Page Complete and Accurate (see ARS-059)?	<del>Yes</del>	No	N/A	
2) Technical Review Checklist(s) Complete and Accurate?	<del>Yes</del>	No	N/A	
3) Case Narrative Complete and Accurate (see ARS-059)?	<del>Yes</del>	No	N/A	
4) Form 1s Present for all Samples and Tests?	<del>Yes</del>	No	N/A	
5) Client Specific Components are Present and Complete?	<del>Yes</del>	No	N/A	

LEVEL 2 COMPONENTS	1st Reviewer			
6) Batch Quality Control Report is Present and Accurate?	<del>Yes</del>	No	N/A	
7) DQO Report is Present and Accurate?	<del>Yes</del>	No	N/A	
8) Client Specific Batch QC Components are Present and Complete?	<del>Yes</del>	No	N/A	

LEVEL 3 COMPONENTS	1st Reviewer			
9) Efficiencies are Present?	<del>Yes</del>	No	N/A	
10) Calibrations are Present?	<del>Yes</del>	No	N/A	
11) Backgrounds are Present?	<del>Yes</del>	No	N/A	
12) Spectrum Analysis is Present?	<del>Yes</del>	No	N/A	
13) Spectral Plots are Present?	<del>Yes</del>	No	N/A	
14) Plateaus are Present?	<del>Yes</del>	No	N/A	
15) Control Charts are Present?	<del>Yes</del>	No	N/A	
16) Other:	Yes	No	<del>N/A</del>	

LEVEL 4 COMPONENTS	1st Reviewer			
17) Preparation Raw Data Present, Signed and Complete?	<del>Yes</del>	No	N/A	
18) Instrument Raw Data Present and Complete?	<del>Yes</del>	No	N/A	
19) Calibration Certificates Present?	<del>Yes</del>	No	N/A	
20) Copies of Log Book Pages Present?	<del>Yes</del>	No	N/A	
21) Sample Receiving Documentation Present?	<del>Yes</del>	No	N/A	
22) LIMS Reports Present?	<del>Yes</del>	No	N/A	
23) Applicable Correspondence Present?	<del>Yes</del>	No	N/A	
24) Other:	Yes	No	<del>N/A</del>	

Susan Weese      10-11-11  
 Report Generator Signature      Date

Ujm      10-12-11  
 Management Review Signature      Date



## LSC Technical Review Checklist

ARS SDG ARS1-11-01918

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

Required QC Samples (Mark all that apply):  Blank  LGS  LGS-D Sample Dup  MS  MSD

ARS A. Batch ID(s): Batch A: ARS1-B11-03362 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="checkbox"/> Yes No N/A	<input checked="" type="checkbox"/> Yes No N/A
2) 100% of Manual Calculations Verified?	Yes No <input checked="" type="checkbox"/> N/A	Yes No <input checked="" type="checkbox"/> N/A
3) Blank Composition/Configuration Matches Calibration?	<input checked="" type="checkbox"/> Yes No N/A	<input checked="" type="checkbox"/> Yes No N/A
4) Deviations from procedure are documented and verified?	Yes No <input checked="" type="checkbox"/> N/A	Yes No <input checked="" type="checkbox"/> N/A
5) Appropriate Cocktail Selected?	<input checked="" type="checkbox"/> Yes No N/A	<input checked="" type="checkbox"/> 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>10-4-11</u> Date	 Verifier Review Signature
		<u>10-4-11</u> Date

### B. ANALYSIS REVIEW

	Analyst Review	QA Officer Review
1) Calibrations Valid and Current?	<input checked="" type="checkbox"/> Yes No N/A	<input checked="" type="checkbox"/> Yes No N/A
2) Backgrounds Valid and Current?	<input checked="" type="checkbox"/> Yes No N/A	<input checked="" type="checkbox"/> Yes No N/A
3) Source Checks Completed and Acceptable?	<input checked="" type="checkbox"/> Yes No N/A	<input checked="" type="checkbox"/> Yes No N/A
 QA Officer Signature		<u>10-12-11</u> Date
	Analyst Review	Technical Review
4) Background Checks Complete and Acceptable?	<input checked="" type="checkbox"/> Yes No N/A	<input checked="" type="checkbox"/> Yes No N/A
5) 100% of Manually Entered Parameters Verified Accurate?	<input checked="" type="checkbox"/> Yes No N/A	<input checked="" type="checkbox"/> Yes No N/A
6) Appropriate QC samples initiated at required frequency?	<input checked="" type="checkbox"/> Yes No N/A	<input checked="" type="checkbox"/> 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="checkbox"/> Yes No N/A	<input checked="" type="checkbox"/> Yes No N/A
b) Spectra show no Evidence of Interferences?	<input checked="" type="checkbox"/> Yes No N/A	<input checked="" type="checkbox"/> Yes No N/A
c) Sample Quench for All Samples within Range of Quench Curve?	<input checked="" type="checkbox"/> Yes No N/A	<input checked="" type="checkbox"/> Yes No N/A
7) Analysis Anomaly? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (See Comments) NCR # (If initiated): _____		
 Analyst Signature	<u>10-10-11</u> Date	 Technical Reviewer Signature
		<u>10-10-11</u> Date





## LSC Technical Review Checklist

ARS SDG ARS1-11-01918

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: ARS1-B11-03361 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 <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
2) 100% of Manual Calculations Verified?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input checked="" type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input checked="" type="checkbox"/>
3) Blank Composition/Configuration Matches Calibration?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input checked="" type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input checked="" type="checkbox"/>
4) Deviations from procedure are documented and verified?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input checked="" type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input checked="" type="checkbox"/>
5) Appropriate Cocktail Selected?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
6) Sample Prep Anomaly? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (See Tech Notes) NCR # (If initiated): _____		
 Chemist Signature	<u>9-2-11</u> Date	 Verifier Review Signature
<u>9-2-11</u> Date		

### B. ANALYSIS REVIEW

	Analyst Review	QA Officer Review
1) Calibrations Valid and Current?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
2) Backgrounds Valid and Current?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
3) Source Checks Completed and Acceptable?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
 QA Officer Signature		<u>10-12-11</u> Date
	Analyst Review	Technical Review
4) Background Checks Complete and Acceptable?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
5) 100% of Manually Entered Parameters Verified Accurate?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
6) Appropriate QC samples initiated at required frequency?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input checked="" type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input checked="" type="checkbox"/>
6) Test/Sample Specific Parameters (See ARS-059 for details)		
a) Analysis Parameters Checked and Correct and Peak Shapes are Acceptable?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
b) Spectra show no Evidence of Interferences?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
c) Sample Quench for All Samples within Range of Quench Curve?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
7) Analysis Anomaly? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (See Comments) NCR # (If initiated): _____		
 Analyst Signature	<u>9-6-11</u> Date	 Technical Reviewer Signature
<u>9-6-11</u> Date		



**DQO Report for SDG**  
ARS1-11-01918

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

SDG Report - Samples and Containers

780

SDG		ARS1-11-01918		TAT Days		30		Project Type		Environmental	
Sample Count	4	Rpt Level	4	Date Received	9/1/2011	COC Number	11-3383	Head Sp	AF Units	AF Rate	AF Mins
Client	Los Alamos National Laboratory	Client Deadline	9/30/2011	Internal Deadline	9/29/2011	Job Number	WEPR1158W100	Head Sp	AF Units	AF Rate	AF Mins
Client Code	114	Lab Deadline	9/27/2011			Job Location					
Profile Number	PN-00094										
Comments											

Samples and Containers (→) Checked In Thus Far															
FR	ClientID	Matrix	SampleStartDate	SampleEndDate	SampleID	Disp	Hold	Arch	Storage	X	Units	Y	Z	Units	Comments
001	Buckman1-11-26862	AQ	08/31/11 12:00 PM	08/31/11 12:00 PM	WT_g	H	90	5	LL3H	Storage	VOA	Head Sp	AF Rate	AF Mins	AF Total Vol
→	94980	Cnt	Volume_mL			pH_Orig	pH_Final	CPM	uR_Hr		N	N/A			
		1	1000.00				90	40	20						
002	Buckman1-11-26863	AQ	08/31/11 12:00 PM	08/31/11 12:00 PM	WT_g	H	90	5	LL3H	Storage	VOA	Head Sp	AF Rate	AF Mins	AF Total Vol
→	94981	Cnt	Volume_mL			pH_Orig	pH_Final	CPM	uR_Hr		N	N/A			
		1	1000.00				90	40	20						
003	Buckman1-11-26864	AQ	08/31/11 12:00 PM	08/31/11 12:00 PM	WT_g	H	90	5	LL3H	Storage	VOA	Head Sp	AF Rate	AF Mins	AF Total Vol
→	94982	Cnt	Volume_mL			pH_Orig	pH_Final	CPM	uR_Hr		N	N/A			
		1	1000.00				90	35	20						
004	Buckman06-11-26865	AQ	08/31/11 12:00 PM	08/31/11 12:00 PM	WT_g	H	90	5	LL3H	Storage	VOA	Head Sp	AF Rate	AF Mins	AF Total Vol
→	94983	Cnt	Volume_mL			pH_Orig	pH_Final	CPM	uR_Hr		N	N/A			
		1	1000.00				90	30	20						
005	Buckman06-11-26866	AQ	08/31/11 12:00 PM	08/31/11 12:00 PM	WT_g	H	90	5	LL3H	Storage	VOA	Head Sp	AF Rate	AF Mins	AF Total Vol
→	94984	Cnt	Volume_mL			pH_Orig	pH_Final	CPM	uR_Hr		N	N/A			
		1	1000.00				90	30	20						

**SDG Report - Analysis Assignments**

<b>Temp SDG</b>	<b>ARS1-11-01918</b>	<b>Sample Count</b>	
<b>Client</b>	<b>Los Alamos National Laboratory</b>	<b>Analysis Count</b>	<b>2-10</b>

Samples Count Totals per Analysis		
Analysis Code	Analysis Description	Samples Count
LSC-A-021	Low Level Tritium Screen in (Aqueous)	5
LSC-A-022	Low Level Tritium by Enrichment Process in (Aqueous [AQ])	5

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

# ARS FILE TRACKING SHEET

SDG: ARS1-11-01918

Task	Date / Time	Initials
Date & Time Samples Received	09-01-11/08:55	CWP
ICOC Initiated / Storage Location: <u>LL3H</u>	09-01-11/16:32	CWP
Technical Checks Performed	See Batch	—
Report Written / EDD Generated: <u>10-11-11 / 1333</u> <u>SDG</u>		
<small>Date/Time      Initials</small>	10-11-11/1331	SDG
Quality Assurance Checks Performed on Report	<del>10-11-11</del>	<del>SDG</del>
Management Check Performed on Report	<del>850</del>	<del>MM</del>
<i>Preliminary Report Sent</i>		
Report E-mailed		
Report Faxed		
Report Reviewed		
Report Mailed		
Invoice Completed      Invoice #: _____		
Report Imaged		

### SPECIAL REQUIREMENTS

Requirement	Yes	No
3 Hour Rush		✓
24 Hour Rush		✓
48 Hour Rush		✓
Special Invoicing <sup>see notes</sup> Mgmt. Approval: _____		✓

**NOTES:**



Location Name	Start Date	Fld Prep Code	Fld Qc Type Code	Lab Sample Type Code	Anyl Suite Code	Analyte Desc	Analyte	Symbol
Buckman 1	08/31/11	UF		CS	GENINORG	Dissolved C	DO	
Buckman 1	08/31/11	UF		CS	GENINORG	Oxidation I	ORP	
Buckman 1	08/31/11	UF		CS	GENINORG	Specific Co	SPEC_CONDC	
Buckman 1	08/31/11	UF		CS	GENINORG	Temperatu	TEMP	
Buckman 1	08/31/11	UF		CS	GENINORG	Turbidity	TURB	
Buckman 1	08/31/11	UF		CS	GENINORG	pH	pH	
Buckman 1	08/31/11	UF	EQB	CS	RAD	Tritium	H-3	
Buckman 1	08/31/11	UF	FD	CS	RAD	Tritium	H-3	<
Buckman 1	08/31/11	UF		CS	RAD	Tritium	H-3	<
Buckman 6	08/31/11	UF		CS	GENINORG	Dissolved C	DO	
Buckman 6	08/31/11	UF		CS	GENINORG	Oxidation I	ORP	
Buckman 6	08/31/11	UF		CS	GENINORG	Specific Co	SPEC_CONDC	
Buckman 6	08/31/11	UF		CS	GENINORG	Temperatu	TEMP	
Buckman 6	08/31/11	UF		CS	GENINORG	Turbidity	TURB	
Buckman 6	08/31/11	UF		CS	GENINORG	pH	pH	
Buckman 6	08/31/11	UF		CS	RAD	Tritium	H-3	<
Buckman 8	08/31/11	UF		CS	GENINORG	Dissolved C	DO	
Buckman 8	08/31/11	UF		CS	GENINORG	Oxidation I	ORP	
Buckman 8	08/31/11	UF		CS	GENINORG	Specific Co	SPEC_CONDC	
Buckman 8	08/31/11	UF		CS	GENINORG	Temperatu	TEMP	
Buckman 8	08/31/11	UF		CS	GENINORG	Turbidity	TURB	
Buckman 8	08/31/11	UF		CS	GENINORG	pH	pH	
Buckman 8	08/31/11	UF		CS	RAD	Tritium	H-3	<

Std		Std Mdl	Std Mda	Std Uom	Dilution Factor	Fld Matrix Code	Anyl Meth		Lab Qual Code
Std Result	Uncert						Code	Lab Code	
7.06				mg/L		WG	Generic Fi	FLD	
176				mV		WG	Generic Fi	FLD	
453				uS/cm		WG	GENERIC F	FLD	
23.11				deg C		WG	GENERIC F	FLD	
0.52				NTU		WG	GENERIC F	FLD	
8.27				SU		WG	GENERIC F	FLD	
7.152	1.373		2.363	pCi/L	1	WG	Generic:Lo	ARSL	
-0.128	0.607		2.044	pCi/L	1	WG	Generic:Lo	ARSL	U
-0.192	0.702		2.395	pCi/L	1	WG	Generic:Lo	ARSL	U
6.29				mg/L		WG	Generic Fi	FLD	
186.4				mV		WG	Generic Fi	FLD	
639				uS/cm		WG	GENERIC F	FLD	
24.61				deg C		WG	GENERIC F	FLD	
0.25				NTU		WG	GENERIC F	FLD	
6.77				SU		WG	GENERIC F	FLD	
-0.702	0.671		2.299	pCi/L	1	WG	Generic:Lo	ARSL	U
5.18				mg/L		WG	Generic Fi	FLD	
201.8				mV		WG	Generic Fi	FLD	
536				uS/cm		WG	GENERIC F	FLD	
26.18				deg C		WG	GENERIC F	FLD	
0.23				NTU		WG	GENERIC F	FLD	
7.41				SU		WG	GENERIC F	FLD	
1.341	0.734		2.331	pCi/L	1	WG	Generic:Lo	ARSL	U

Concat Flag Code	Concat Reason Code	Sample Id
		Buckman1-11-26862
		Buckman1-11-26863
U	R5	Buckman1-11-26864
U	R5	Buckman1-11-26862
		Buckman06-11-26865
U	R5	Buckman06-11-26865
		Buckman08-11-26866
U	R5	Buckman08-11-26866