

Monday, February 06, 2012

REQUEST NUMBER: 12-728

**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: 12-728

Per Agreement Number: 63641-001-10

Project Cost Code: MR1A015AGWH0

Please analyse the enclosed samples
according to the schedule indicated:

SHIP DATE: 2/6/2012**TURNAROUND/REPORT DUE: 3/7/2012****TURNAROUND REQ'D: 30 Days****RAD SCREENING: Yes, Below Background****LAB REQUEST COMMENTS:**

LANL ER SMO CONTACT:

Signature: 

PRIORITY	METHOD CODE	CNTNR	SAMPLE ID	SAMPLE MATRIX	DATE SAMPLED	SPECIAL INSTRUCTIONS
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Generic:Low_Level_Tritium 1

CAWA-12-2023

WG

2/3/2012

Final Page of REQUEST NUMBER 12-728

Monday, February 06, 2012

LAB CHAIN OF CUSTODY DOCUMENT NUMBER: 12-728C

LOS ALAMOS

REQUEST NUMBER: 12-728

NATIONAL LABORATORY

ATTN: Danny Coleman

TURNAROUND/REPORT DUE: 3/7/2012

American Radiation Services - Primary

TURNAROUND REQ'D: 30

1726 Wooddale Court

Baton Rouge, LA 70806

LAB REQUEST COMMENTS:

SAMPLE ID	CTNR	CTNR DESC	ORDER	PRESERV	MATRIX
CAWA-12-2023	1	POLY	WSP-LL-H-3	None	WG

Relinquished By:

Date

Time

Received By:

Date

Time

Signature

Signature

Signature

Signature

Signature

Signature

Received for DISPOSAL By:

Date

Time

Remarks:

Signature

SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

EVENT ID: 3733

EVENT NAME: Water/CdV, MDA AB Mon. Group Sampling Q2, January 2012, 2011
Interim Plan rev. 1

SAMPLE ID: CAWA-12-2023

WORK ORDER:

AS PLANNED		AS COLLECTED		AS PLANNED		AS COLLECTED	
DATE COLLECTED(MM/DD/YYYY):		02/03/12 2012		MEDIA:	WGR		OK
TIME COLLECTED (HH:MM)		1052	02/03/12	SUB-MEDIA:	UA		
PRS ID:	Water	OK		SAMPLE TECH CODE:	6SP		
LOCATION ID:	R-27			FIELD QC TYPE:	NA		
LOCATION TYPE:	MON			FIELD PREP:	UF		
PORT:	SINGLE COMPLETION			SAMPLE USAGE:	INV		
				SCREEN/PORT DESC:			
FIELD MATRIX:	WG			EXCAVATED: YES/NO/NA	NA		
COMPOSITE TYPE:	NA			COMPOSITE TIME INTERVAL:	NA		WATER FLOWING: YES/NO/NA
BOREHOLE: YES/NO/NA	NA			BOREHOLE DECLINATION:	NA		BOREHOLE DIRECTION: NA

#	PRIORITY	ORDER	CNTNR	PRESERVATIVE	COLLECTED Y/N	SPECIAL INSTRUCTIONS
2	NA	WSP-8260B-VOA	40 ML SEPTUM AMBER GLASS	Hydrochloric Acid (HCL)	✓	NA
25		WSP-8270C-SVOA	1 LITER AMBER GLASS	Ice		
25		WSP-8321A-NMED HEXP	1 LITER AMBER GLASS	Ice		
1		WSP-GrossA/B	1 LITER POLY	None		
2		WSP-HEXMOD	1 LITER AMBER GLASS	Ice		
1		WSP-LL-H-3	1 LITER POLY	None		
1		WSP-RAD	1 GAL POLY	Nitric Acid (HNO3)		
1		WSP-TKN+TOC	500 ML AMBER GLASS	Sulfuric Acid (H2SO4)		
1		Ra226+232	1 GAL POLY	Nitric Acid (HNO3)	NA 1/30/12	

SAMPLE DESC:

SAMPLE COMMENTS:

LOCATION DESC:

FIELD SCREENING/MEASUREMENT RESULTS:

See CAWA-12-2022

COLLECTED BY (PRINT) M Green

REVIEWED BY (PRINT) D Woolly

RELINQUISHED BY

Date/Time

RECEIVED BY

Date/Time

SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

EVENT ID: 3733

EVENT NAME: Water/CdV, MDA AB Mon. Group Sampling Q2, January 2012, 2011
Interim Plan rev. 1

(Printed Name) D Woody	02/03/12	(Printed Name) M. Martyn	02/04/12
(Signature) <i>D Woody</i>	1315	(Signature) <i>M. Martyn</i>	1315
RELINQUISHED BY	Date/Time	RECEIVED BY	Date/Time
(Printed Name)		(Printed Name)	
(Signature)		(Signature)	

3733

CWA-12-2023



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: 12-728



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American Radiation Services Analytical Reports

for

**Los Alamos National Laboratory
Request: 12-728**

Original COC

Monday, February 06, 2012

REQUEST NUMBER: 12-728

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: 12-728
Per Agreement Number: 63641-001-10
Project Cost Code: MR1A015AGWH0

Please analyse the enclosed samples
according to the schedule indicated:

SHIP DATE: 2/6/2012
TURNAROUND/REPORT DUE: 3/7/2012
TURNAROUND REQ'D: 30 Days

RAD SCREENING: Yes, Below Background
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 CAWA-12-2023 WG 2/3/2012

Monday, February 06, 2012

LAB CHAIN OF CUSTODY DOCUMENT NUMBER: 12-728C

LOS ALAMOS

REQUEST NUMBER: 12-728

NATIONAL LABORATORY

ATTN: Danny Coleman

TURNAROUND/REPORT DUE: 3/7/2012

American Radiation Services - Primary

TURNAROUND REQ'D: 30

1726 Wooddale Court

Baton Rouge, LA 70806

LAB REQUEST COMMENTS:

SAMPLE ID	CTNR	CTNR DESC	ORDER	PRESERV	MATRIX
CAWA-12-2023	1	POLY	WSP-LL-H-3	None	WG

Relinquished By:

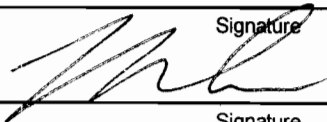

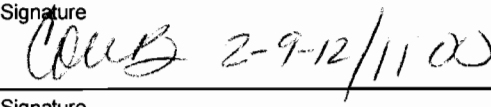
Date

Time

Received By:

Date

Time

 Signature	 2/6/12 3:00	 2-9-12/11 00
Signature		Signature

Signature

Signature

Received for DISPOSAL By:

Date

Time

Remarks:

Signature



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American Radiation Services Analytical Reports

for

**Los Alamos National Laboratory
Request: 12-728**

Case Narrative



2609 North River Road • Port Allen, Louisiana 70767

1 (800) 401-4277 • Fax (225) 381-2996

March 9, 2012

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

Request Number: **12-728**
LANL Sample ID: **CAWA-12-2023**

Dear Mr. Greene;

On February 9, 2012, ARS International received one (1) water sample to be analyzed for Low Level Tritium.

The sample underwent enrichment and was counted using the appropriate counting equipment and QA/QC for this type of analysis. Results of the analysis and QA/QC are attached in the data package.

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

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

Sincerely,

A handwritten signature in cursive script that reads 'Eugene Mulligan'.

Laboratory Management
ARS International



2609 North River Road • Port Allen, Louisiana 70767

1 (800) 401-4277 • Fax (225) 381-2996

COVER PAGE

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

Request Number	LANL PROJECT SAMPLE ID NUMBER	American Radiation Services SAMPLE ID NUMBER(S)
12-728	CAWA-12-2023	ARS1-12-00250-001

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

3-9-12
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: ARS1-12-00250
Client Sample ID: CAWA-12-2023
Sample Collection Date: 02/03/12
Sample Matrix: Aqueous

Request or PO Number: 12-728
ARS Sample ID: ARS1-12-00250-001
Date Received: 02/09/12
Report Date: 03/09/12

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	0.700	0.600	1.970	0.950	U	pCi/L	ARS-040	03/06/12 19:02	RU	NA
NOTES: Project Cost Code MR1A015AGWH0										

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



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

QC Results Report

Sample Delivery Group: ARS1-12-00250

Date Received: 2/9/2012

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-B12-00365	LCS	H3	20.500	3.210	1.940	23.057		pCi/L	ARS-040	3/6/12 2:17	RU	89	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-B12-00365	MBL	H3	0.820	0.620	2.010	NA	U	pCi/L	ARS-040	3/6/12 6:28	RU

Sample RER Duplicate Evaluation

Analysis Batch	QC Type	Analysis Description	Result 1	CSU 1 (1s)	Result 2	CSU 2 (2s)	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	RER	RER Acceptance Range
ARS1-B12-00365	LCSD	H3	20.500	3.210	19.220	3.030		pCi/L	ARS-040	3/6/12 2:17	RU	0.21	< 1

Sample DER Duplicate Evaluation

Analysis Batch	QC Type	Analysis Description	Result 1	CSU 1 (1s)	Result 2	CSU 2 (2s)	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	DER	DER Acceptance Range
ARS1-B12-00365	LCSD	H3	20.500	3.210	19.220	3.030		pCi/L	ARS-040	3/6/12 2:17	RU	0.58	< 3

Project Manager Review

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

LELAP Certificate# 01949

NELAP Certificate # E87558



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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-12-00248, 249, 250, 251, 276
 ARS-1-B12-00365

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)	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	Bkg CPM	QIP	Detector Eff (decimal)	Enter aliquot in final Rep. Units	Activity reference date	Start Date of Count	Total Sample Count Duration (min)	Decay Correction to To	Sample Activity Conc.	Standard Counting Uncertainty	CU	1s CU	Combined Standard Uncertainty	Minimum Detectable Conc.	Decision Level Conc.	Reporting Units
	V_i	m_i	V_f	m_f	X	Y	R_s	R_b	ϵ_{SE}	ϵ_{eff}	Units	T_o	T_c	t cnt (min)	t cnt (min)	DF	AC_i	CU	1s CU	1s CSU	MDC	DLC	Units
ARS1-B12-00365-01	540.93	2.04	17.33	2.093	0.0282	27.74	4.236	1.127	389.89	0.2690	L	9/7/2011	3/5/2012	240	240	0.972642	19.22	0.92	0.92	3.03	2.04	0.99	pCi/L
ARS1-B12-00365-02	544.94	2.09	16.91	2.144	0.0271	28.79	4.614	1.127	397.53	0.2728	L	9/7/2011	3/6/2012	240	240	0.972493	20.50	0.91	0.91	3.21	1.94	0.94	pCi/L
ARS1-B12-00365-03	533.60	2.04	17.31	2.093	0.0285	27.41	1.262	1.127	387.18	0.2677	L	3/5/2012	3/6/2012	240	240	0.999833	0.82	0.61	0.61	0.62	2.01	0.97	pCi/L
ARS1-B12-00365-04	544.62	2.08	16.59	2.134	0.0265	29.37	1.269	1.127	377.55	0.2629	L	2/3/2012	3/6/2012	240	240	0.99507	0.83	0.58	0.58	0.60	1.93	0.93	pCi/L
ARS1-B12-00365-05	537.13	2.07	16.21	2.124	0.0262	29.71	1.310	1.127	375.15	0.2617	L	2/2/2012	3/6/2012	240	240	0.994917	1.06	0.59	0.59	0.61	1.92	0.93	pCi/L
ARS1-B12-00365-06	545.66	2.02	17.13	2.073	0.0276	28.29	1.244	1.127	385.09	0.2667	L	2/3/2012	3/6/2012	240	240	0.99507	0.70	0.59	0.59	0.60	1.97	0.95	pCi/L
ARS1-B12-00365-07	547.28	2.09	16.17	2.144	0.0256	30.38	6.713	1.127	382.93	0.2656	L	2/7/2012	3/6/2012	240	240	0.995684	31.26	1.01	1.01	4.80	1.85	0.89	pCi/L
ARS1-B12-00365-08	541.32	2.09	16.41	2.144	0.0264	29.57	1.471	1.127	383.39	0.2658	L	2/8/2012	3/7/2012	240	240	0.995684	1.97	0.60	0.60	0.67	1.89	0.91	pCi/L

Reviewed 3-7-12
 Gmundese

Reviewed 3-8-12
 DFM

ARS Tritium Enrichment Calculations

Procedures
ARS-040, ARS-060
ARS-12-00248; 249, 250, 251; 276
ARS File ID Number
ARS Batch ID Number

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 1.96
ACF (def. = 1) 1
Reporting Units pCi
UCF 2.22

Sample ID	Initial Mass sample (g)	Mass Na2O2 added (g)	Final mass sample w/ NaOH (g)	Mass equivalent NaOH (g)	Final Mass Electrolyzed sample (g pure H2O)	Volume factor	Enrichment factor	Average Sample CPM	Bkg CPM	QIP	Detector Eff (decimal)	Aliquot	Enter aliqu. in final Rep. Units	Activity reference date	Start Date of Count	Total Sample Count Duration (min)	Total Bkg Count Duration (min)	Decay Correction to To	Sample Activity Conc.	Standard Counting Uncertainty	Counting Uncertainty	Combined Standard Uncertainty	Minimum Detectable Conc.	Decision Level Conc.	Reporting Units
	V_i	m_i	V_f	m_f	V_r	X	Y	R_s	R_b	$tSIE$	Eff	$Aliquot$	$Units$	T_o	T_c	$t \text{ cnt}$ (min)	$t \text{ cnt}$ (min)	DF	AC_i	CU	$1.96s \text{ CU}$	MDC	DLC		
ARS1-B12-00385-01	540.93	2.04	17.33	2.093	15.24	0.0282	27.74	4.236	1.127	389.89	0.2690	0.01004	L	9/7/2011	3/5/2012	240	240	0.972642	19.22	0.92	1.81	5.93	2.04	0.99	pCi/L
ARS1-B12-00385-02	544.94	2.09	16.91	2.144	14.77	0.0271	28.79	4.614	1.127	397.53	0.2728	0.01003	L	9/7/2011	3/6/2012	240	240	0.972483	20.50	0.91	1.78	6.28	1.94	0.94	pCi/L
ARS1-B12-00385-03	533.60	2.04	17.31	2.093	15.22	0.0285	27.41	1.262	1.127	387.18	0.2677	0.01008	L	3/5/2012	3/6/2012	240	240	0.998833	0.82	0.61	1.19	1.22	2.01	0.97	pCi/L
ARS1-B12-00385-04	544.62	2.08	16.59	2.134	14.46	0.0285	29.37	1.269	1.127	377.55	0.2629	0.01003	L	2/3/2012	3/6/2012	240	240	0.99507	0.83	0.58	1.14	1.17	1.93	0.93	pCi/L
ARS1-B12-00385-05	537.13	2.07	16.21	2.124	14.08	0.0262	29.71	1.310	1.127	375.15	0.2617	0.01002	L	2/2/2012	3/6/2012	240	240	0.994917	1.06	0.59	1.15	1.19	1.92	0.93	pCi/L
ARS1-B12-00385-06	545.66	2.02	17.13	2.073	15.06	0.0276	28.29	1.244	1.127	385.09	0.2667	0.01003	L	2/3/2012	3/6/2012	240	240	0.99507	0.70	0.59	1.17	1.18	1.97	0.95	pCi/L
ARS1-B12-00385-07	547.28	2.09	16.17	2.144	14.03	0.0256	30.38	6.713	1.127	382.93	0.2656	0.01002	L	2/7/2012	3/6/2012	240	240	0.995684	31.26	1.01	1.98	9.40	1.85	0.89	pCi/L
ARS1-B12-00385-08	541.32	2.08	16.41	2.144	14.27	0.0264	29.57	1.471	1.127	383.39	0.2658	0.01004	L	2/8/2012	3/7/2012	240	240	0.995684	1.97	0.60	1.17	1.30	1.89	0.91	pCi/L

Reviewed SON
3-7-12
Reviewed 3-8-12
JHM

QC Evaluation

Method: ARS-040

Batch ID: ARS1-B12-00365

SDG's: ARS1-12-00248; 249; 250; 251; 276

LCS	19.2200	CSU (2s)	5.9300
LCSD	20.5000	CSU-D (2s)	6.2800

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

$$DER = \frac{1.28}{4.31866} = 0.296388 < 3$$

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

$$\%RPD = \frac{1.28}{19.86} * 100 = 6.445116 < 25\%$$

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

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

$$RER = \frac{1.28}{12.2100} = 0.104832105 < 1$$

Blank Information

	Act	CSU(2s)	MDA	Act>MDA
AM-241				
U-234				
U-235				
U-238				
Pu-238				
Pu-239/240				
Th-228				
Th-230				
Th-232				
H3	0.82	1.22	2.01	
Ra-226				
Ra-228				
Total U				
Pb-210				
Po-209				
Sr-90				
TC-99				
NI-63				

*MDA should be below RDL

*Blank activity must be below MDA

*Blank activity must be < 1.65*CSU (DOE only)

ACT = 0.82

CSU = 1.22

Is ACT<1.65*CSU? YES

LANL

ARS Batch Number:

ARS1-B12 - 00365

Enter these Values for LCS	Current ACT	5.5693
	NetWt	5.0296
	Aliquot	0.5409

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	5.5693
	NetWt	5.0085
	Aliquot	0.5449

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

LANL

ARS Batch Number:

ARS1-B11 - 00365

LCS	CALCULATED	=	23.326	
	EXPECTED VALUE			
		Range	18.661 - 27.991	
LCSD	CALCULATED	=	23.057	
	EXPECTED VALUE			
		Range	18.446 - 27.669	



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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-B12-00365									
Method		ARS-040		Analysis		LSC-A-022		Matrix	AQ
Description		Low Level Tritium by Electrolytic Enrichment		FR		Run		Client ID	Lab Deadline
Type	Blind Iso1	Blind Iso2	Blind Iso3	SDG	FR	Run	Client ID	Isotope Group	Lab Deadline
ARS1-B12-00365-01	B-13373								
ARS1-B12-00365-02	B-13374								
ARS1-B12-00365-03									
ARS1-B12-00365-04				ARS1-12-00248	001	1	CAWA-12-2018	STD	03/08/12
ARS1-B12-00365-05				ARS1-12-00249	001	1	CAAN-12-2024	STD	03/08/12
ARS1-B12-00365-06				ARS1-12-00250	001	1	CAWA-12-2023	STD	03/08/12
ARS1-B12-00365-07				ARS1-12-00251	001	1	CAMO-12-2229	STD	03/08/12
ARS1-B12-00365-08				ARS1-12-00276	001	1	CAMO-12-2232	STD	03/13/12



108180
12-00248-001-1
WRAD

108182
12-00249-001-1
WRAD

108184
12-00250-001-1
WRAD

108186
12-00251-001-1
WRAD

108188
12-00276-001-1
WRAD

LCS Report
Analytical Batch: ARS1-B12-00365

18 of

BlindID	ABatch	ABatchSampleID	BlindGroup	StdID	Isotope	ExpectedAddition	ExpectedValue	EmptyWt	GrossWt	NetWt	UserID	ModDate	ExpectedValue_CT	MidPointCountDate	KnownValue
B-13373	ARS1-B12-00365	ARS1-B12-00365-01	B-H3	S-0262	H-3	5	2.516841889	13.4938	18.5234	5.0296	BSTEFFENS	2/13/2012	2.508713488	3/5/2012	12.61782536
B-13374	ARS1-B12-00365	ARS1-B12-00365-02	B-H3	S-0262	H-3	5	2.516841889	13.3949	18.4034	5.0085	BSTEFFENS	2/13/2012	2.508327077	3/6/2012	12.56295616

10
0

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\20120305_1746

Raw Results Path: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\20120305_1746\20120305_1746.results

RTF File Name: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\20120305_1746\LLH3.rtf

Comma-Delimited File Name: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\20120305_1746\LLH3 Results.csv

Assay File Name: C:\Packard\Tricarb\Assays\Low Level H3.1lsa

Count Conditions-

Nuclide: Low Level H3

Quench Indicator: tsIE/AEC

External Std Terminator (sec): 0.5 2s%

Pre-Count Delay (min): 0.00

Quench Set:

Low Energy: ARS LL H3 10mL

Count Time (min): 240.00

Count Mode: Low Level

Assay Count Cycles: 1

#Vials/Sample: 1

Repeat Sample Count: 1

Calculate % Reference: Off

Background Subtract: Off

Low CPM Threshold: Off

2 Sigma % Terminator: On - Any Region

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

Count Corrections-

Static Controller: On

Colored Samples: Off

Coincidence Time (nsec): 18

Luminescence Correction: Off

Heterogeneity Monitor: Off

Delay Before Burst (nsec): 75

Half Life-

Half Life Correction: Off

Regions Half Life

Units

Reference Date

Reference Time

20

A0

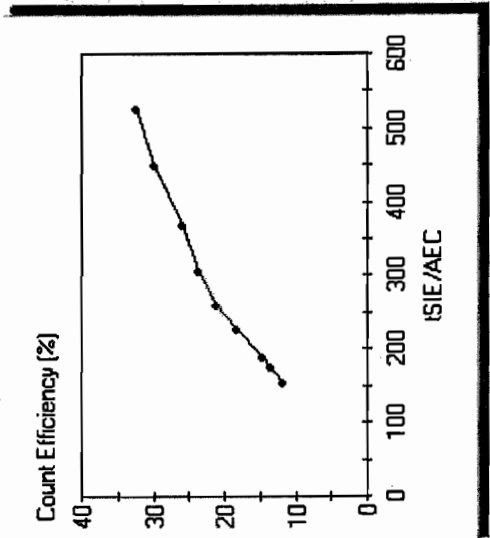
B0

C

Cycle 1 Results

Quench Curve Block Data

ARS LL H3 10mL in A



Date Acquired: 11/18/2011

Date Modified:

ARS LL H3 10mL in A

tSIE/AEC	Count Efficiency (%)
526.29	32.47
450.16	29.90
370.15	25.92
306.68	23.60
260.68	20.99
228.69	18.21
189.46	14.53
177.14	13.64
155.73	11.73

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B#	S#	SMPL_ID	CPMA	DPM1	tSIE	Eff Nucl	In A	Count Time	DATE	TIME	MESSAGES
2	1	BACKGROUND	1.127	4.19	389.56		26.89	240.00	3/5/2012	5:54:56 PM	
2	2	B12-00365-01	4.236	15.74	389.89		26.90	240.00	3/5/2012	10:06:04 PM	
2	3	B12-00365-02	4.614	16.91	397.53		27.28	240.00	3/6/2012	2:17:22 AM	
2	4	B12-00365-03	1.262	4.71	387.18		26.77	240.00	3/6/2012	6:28:41 AM	
2	5	B12-00365-04	1.269	4.83	377.55		26.29	240.00	3/6/2012	10:40:00 AM	
2	6	B12-00365-05	1.310	5.01	375.15		26.17	240.00	3/6/2012	2:51:12 PM	
2	7	B12-00365-06	1.244	4.66	385.09		26.67	240.00	3/6/2012	7:02:28 PM	
2	8	B12-00365-07	6.713	25.28	382.93		26.56	240.00	3/6/2012	11:13:43 PM	
2	9	B12-00365-08	1.471	5.54	383.39		26.58	240.00	3/7/2012	3:25:00 AM	

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30_31001_040	ABatch	AnalysisCode	ABatchSampleID	ClientID	IC_ID	S01_ID	S01_1_EnrichCellNo	S01_2_TareCell	S01_3_TareResv	S02_GrossWtResv	S03_1_WtNa202	C_GrossSampleAdded
121	ARS1-B12-00365	LSC-A-022	ARS1-B12-00365-01			44		329.56	197.86	738.79	2.04	540.93
122	ARS1-B12-00365	LSC-A-022	ARS1-B12-00365-02			39		330.39	202.15	747.09	2.09	544.94
123	ARS1-B12-00365	LSC-A-022	ARS1-B12-00365-03			12		330.46	212.82	746.42	2.04	533.6
124	ARS1-B12-00365	LSC-A-022	ARS1-B12-00365-04	CAWA-12-2018		19		330.08	213.51	758.13	2.08	544.62
125	ARS1-B12-00365	LSC-A-022	ARS1-B12-00365-05	CAAN-12-2024		66		334.95	206.34	743.47	2.07	537.13
126	ARS1-B12-00365	LSC-A-022	ARS1-B12-00365-06	CAWA-12-2023		68		334.94	213.78	759.44	2.02	545.66
127	ARS1-B12-00365	LSC-A-022	ARS1-B12-00365-07	CAMO-12-2229		84		334.65	204.9	752.18	2.09	547.28
128	ARS1-B12-00365	LSC-A-022	ARS1-B12-00365-08	CAMO-12-2232		52		327.9	225.74	767.06	2.09	541.32

[Signature] 3-5-12

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S04_1_ElectroID	S04_2_StartAmp	S04_3_StartBathC	S05_1_ElectroIED	S05_2_EndBathC	S05_3_EndCellWt	C_GrossSmpIRec	C_EnrichmentF	S06_TareWt	S07_GrossWt	C_RecoveredWa	S08_TearWtLSCVial
02/17/2012 15:00:00	5	1.8	03/02/2012 10:31:00	1.8	544.75	17.33	31.2135026	102.86	115.94	13.08	6.62
02/17/2012 15:00:00	5	1.8	03/02/2012 11:56:00	1.8	549.45	16.91	32.22590183	109.67	122.09	12.42	6.62
02/17/2012 15:00:00	5	1.8	03/02/2012 10:33:00	1.8	560.59	17.31	30.82611207	107.45	120.49	13.04	6.55
02/17/2012 15:00:00	5	1.8	03/01/2012 10:18:00	1.8	560.18	16.59	32.82820976	108.53	120.72	12.19	6.61
02/17/2012 15:00:00	5	1.8	03/01/2012 13:50:00	1.8	557.5	16.21	33.13571869	101.65	112.56	10.91	6.52
02/17/2012 15:00:00	5	1.8	03/02/2012 13:06:00	1.8	565.85	17.13	31.85405721	110.63	123.61	12.98	6.58
02/17/2012 15:00:00	5	1.8	03/02/2012 13:08:00	1.8	555.72	16.17	33.8453927	117.6	129.33	11.73	6.61
02/17/2012 15:00:00	5	1.8	03/02/2012 13:04:00	1.8	570.05	16.41	32.98720293	112.01	124.07	12.06	6.47

Raymond 3-5-12

S09_VialPlusSmpl	C_NetSample	S10_1_WtVisISmplDrWatFill	C_NetDeadWaterAdded	C_TareWtBFCocktail	S10_2_GrossWVSC	C_NetWtCocktailAdded	UserID	ModDate
16.66	10.04	0	0	16.66	27.33	10.67	AMRAD\RUSEY	03/05/2012 11:25:28
16.65	10.03	0	0	16.65	27.31	10.66	AMRAD\RUSEY	03/05/2012 11:28:02
16.63	10.08	0	0	16.63	27.29	10.66	AMRAD\RUSEY	03/05/2012 11:30:41
16.64	10.03	0	0	16.64	27.3	10.66	AMRAD\RUSEY	03/05/2012 11:33:59
16.54	10.02	0	0	16.54	27.16	10.62	AMRAD\RUSEY	03/05/2012 15:45:22
16.61	10.03	0	0	16.61	27.3	10.69	AMRAD\RUSEY	03/05/2012 15:48:09
16.63	10.02	0	0	16.63	27.34	10.71	AMRAD\RUSEY	03/05/2012 15:50:29
16.51	10.04	0	0	16.51	27.23	10.72	AMRAD\RUSEY	03/05/2012 15:53:38

[Handwritten signature] 3-5-12



Standards Activity as of: 03/05/12 10:06

Active	Std ID	Isotope	PSLT	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-0262	Fe-55	SU	09/07/11	09/07/12	OK	09/07/11	5.7259E+00	5.592E-03	4.500E+03	S-0267		

Beta Liquid Scintillation Counter Log Book

Date	Time	ARS Sample ID Number	Batch Number	Liquid Scintillation File Number	Technician Initials
2-20-12	1514	B12-00269-01	B12-00269	1648	RJU
↓	↓	B12-00269-02	↓	↓	RJU
↓	↓	B12-00269-10	↓	↓	RJU
↓	↓	B12-00269-11	↓	↓	RJU
↓	↓	B12-00269-12	↓	↓	RJU
2-23-12	0804	SNC-16	QA	QA	RJU
2-23-12	0938	B12-00269-04	B12-00269	0947	RJU
↓	↓	B12-00269-12	↓	0947	RJU
2-23-12	1415	B12-00269-01	B12-00269		RJU
↓	↓	B12-00269-12	↓	12-24-12	RJU
2-24-12	0801	SNC-16	QA	QA	RJU
2-24-12	0802	B12-00269-04	B12-00269	0938	RJU
↓	↓	B12-00269-12	↓		RJU
3-5-12	1610	SNC-16	QA	QA	RJU
3-5-12	1613	Background	B12-00365	1746	RJU
↓	↓	B12-00365-01	↓	↓	RJU
↓	↓	B12-00365-02	↓	↓	RJU
↓	↓	B12-00365-03	↓	↓	RJU
↓	↓	B12-00365-04	↓	↓	RJU
↓	↓	B12-00365-05	↓	↓	RJU

[illegible]



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American Radiation Services Analytical Reports

for

Los Alamos National Laboratory

Low Level Tritium

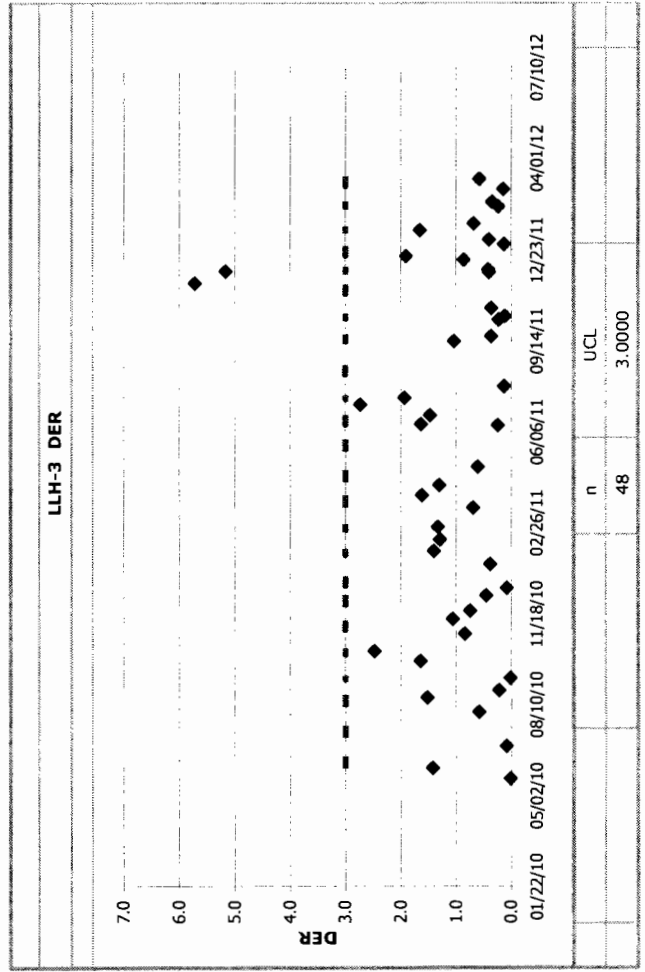
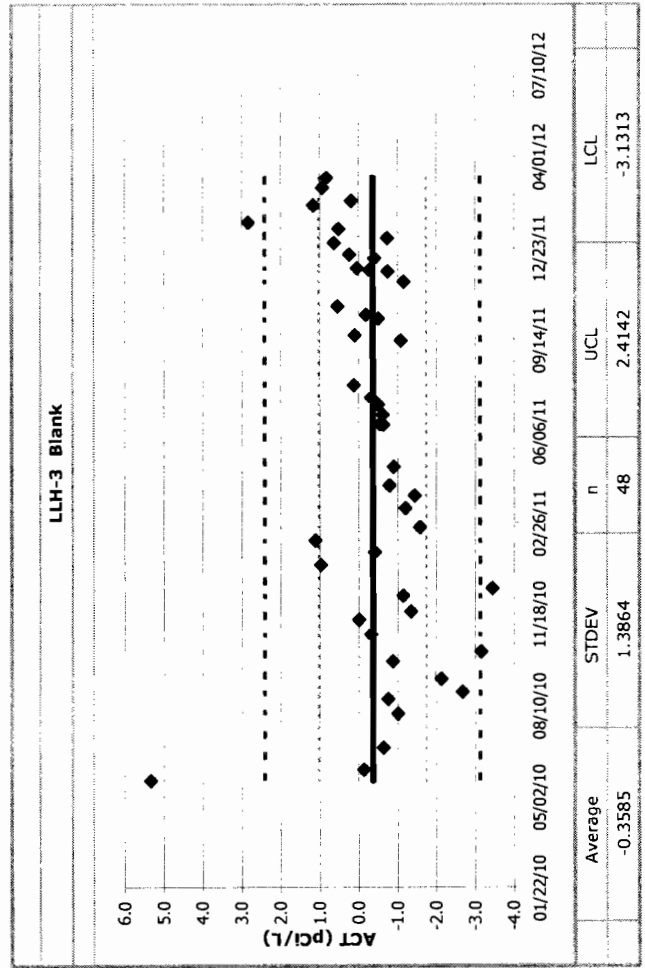
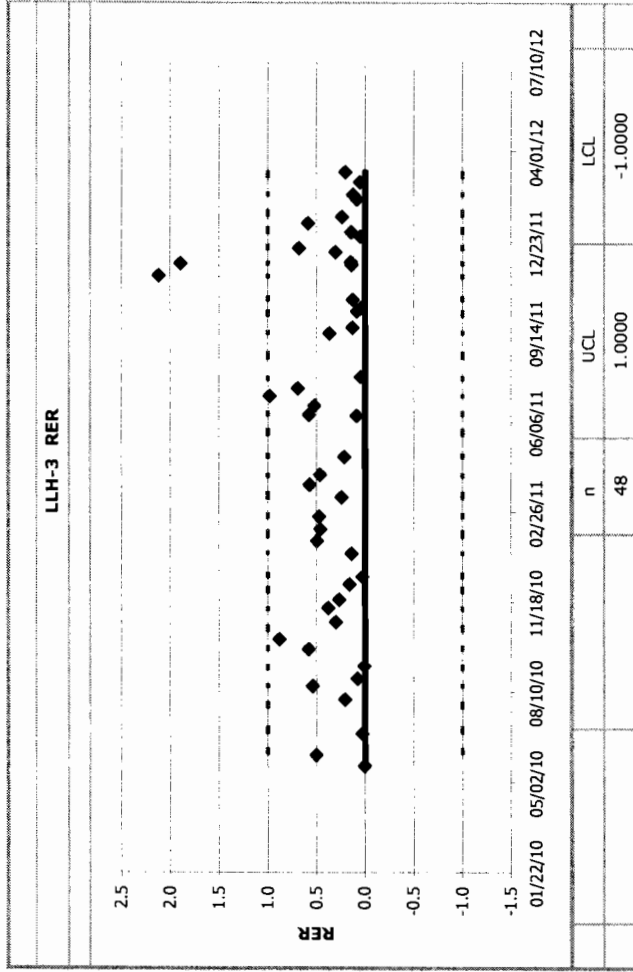
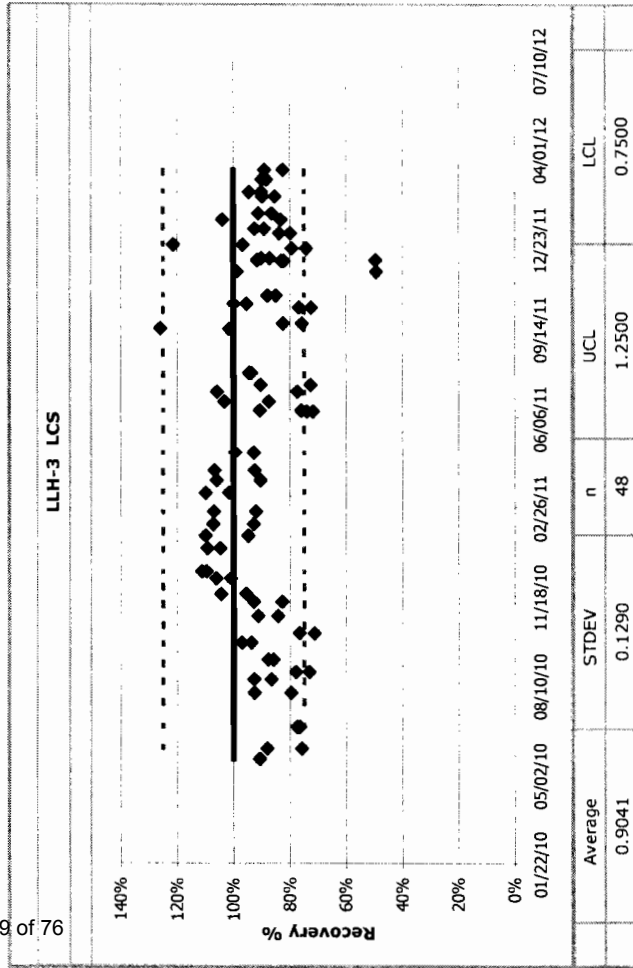
by

Low Level Liquid Scintillation Counting

Control Charts

QC Chart

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3H Efficiency

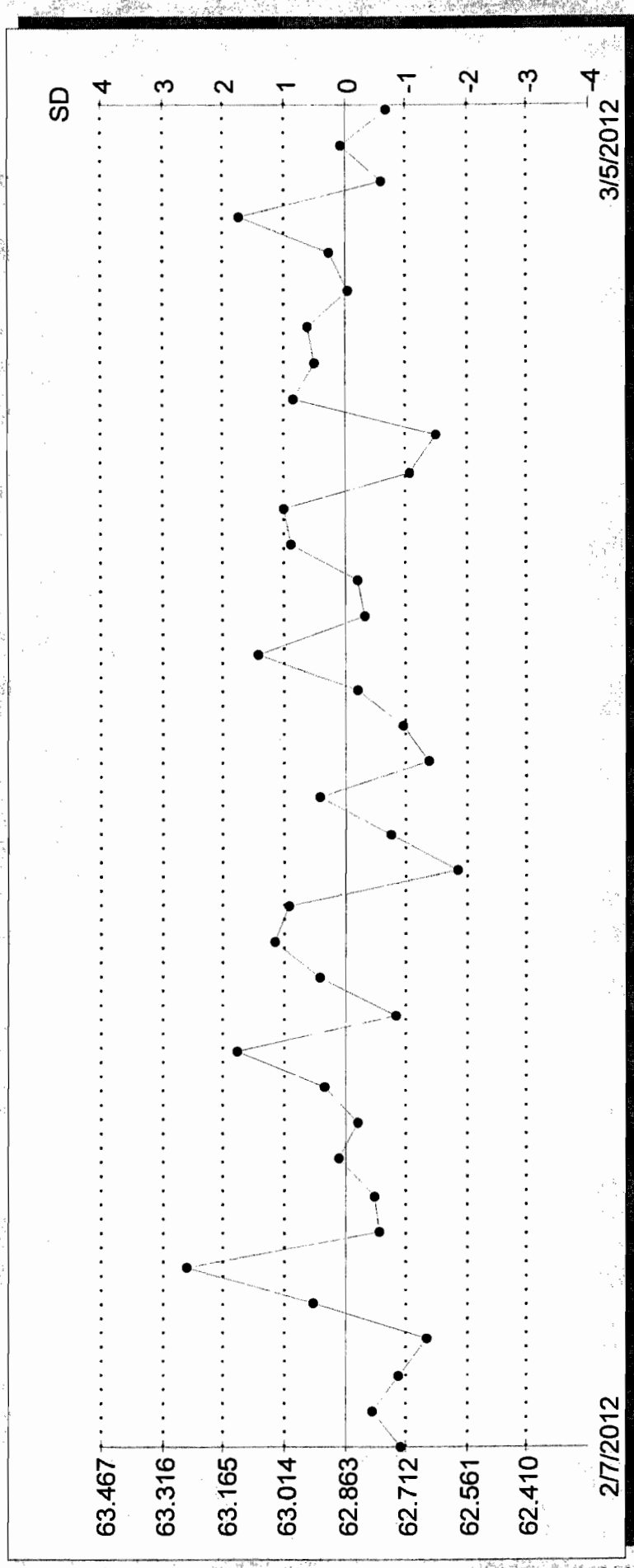
Total # pts : 5455
Valid # pts : 38
Mean : 62.86
SD : 0.15

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Date	Value	Valid Pt
Feb 07, 2012	62.72	X
Feb 07, 2012	62.80	X
Feb 07, 2012	62.73	X
Feb 07, 2012	62.66	X
Feb 07, 2012	62.95	X
Feb 07, 2012	63.26	X
Feb 08, 2012	62.78	X
Feb 08, 2012	62.79	X
Feb 08, 2012	62.88	X
Feb 08, 2012	62.83	X
Feb 08, 2012	62.91	X
Feb 08, 2012	63.13	X
Feb 08, 2012	62.74	X
Feb 08, 2012	62.92	X
Feb 08, 2012	63.04	X
Feb 08, 2012	63.00	X
Feb 08, 2012	62.59	X
Feb 08, 2012	62.75	X
Feb 08, 2012	62.92	X
Feb 08, 2012	62.65	X
Feb 09, 2012	62.72	X
Feb 09, 2012	62.83	X
Feb 09, 2012	63.08	X
Feb 09, 2012	62.81	X
Feb 09, 2012	62.83	X
Feb 09, 2012	62.99	X
Feb 09, 2012	63.02	X
Feb 09, 2012	62.70	X
Feb 09, 2012	62.64	X
Feb 09, 2012	62.99	X
Feb 10, 2012	62.94	X
Feb 15, 2012	62.96	X
Feb 16, 2012	62.86	X
Feb 17, 2012	62.90	X
Feb 20, 2012	63.13	X
Feb 23, 2012	62.77	X
Feb 24, 2012	62.87	X
Mar 05, 2012	62.76	X

3H Efficiency
Total # pts : 5455
Valid # pts : 38
Mean : 62.86
SD : 0.15

1 of 76

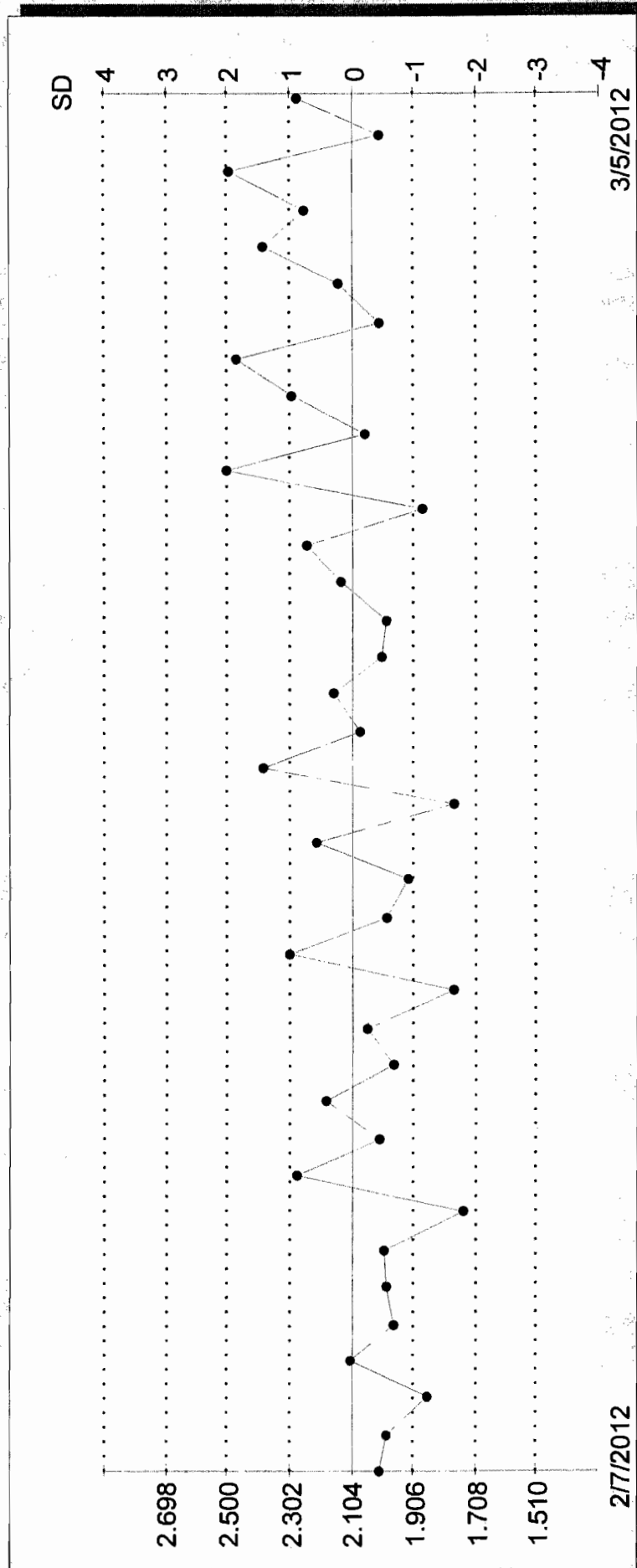


3H Background

Total # pts : 5381
Valid # pts : 38
Mean : 2.10
SD : 0.20

Date	Value	Valid Pt
Feb 07, 2012	2.02	X
Feb 07, 2012	1.99	X
Feb 07, 2012	1.86	X
Feb 07, 2012	2.10	X
Feb 07, 2012	1.97	X
Feb 08, 2012	1.99	X
Feb 08, 2012	2.00	X
Feb 08, 2012	1.74	X
Feb 08, 2012	2.28	X
Feb 08, 2012	2.01	X
Feb 08, 2012	2.19	X
Feb 08, 2012	1.97	X
Feb 08, 2012	2.05	X
Feb 08, 2012	1.78	X
Feb 08, 2012	2.30	X
Feb 08, 2012	1.99	X
Feb 08, 2012	1.92	X
Feb 08, 2012	2.21	X
Feb 08, 2012	1.77	X
Feb 08, 2012	2.39	X
Feb 09, 2012	2.07	X
Feb 09, 2012	2.16	X
Feb 09, 2012	2.01	X
Feb 09, 2012	1.99	X
Feb 09, 2012	2.14	X
Feb 09, 2012	2.24	X
Feb 09, 2012	1.88	X
Feb 09, 2012	2.50	X
Feb 09, 2012	2.06	X
Feb 09, 2012	2.29	X
Feb 10, 2012	2.47	X
Feb 15, 2012	2.01	X
Feb 16, 2012	2.15	X
Feb 17, 2012	2.39	X
Feb 20, 2012	2.25	X
Feb 23, 2012	2.50	X
Feb 24, 2012	2.01	X
Mar 05, 2012	2.28	X

3H Background
Total # pts : 5381
Valid# pts : 38
Mean : 2.10
SD : 0.20





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Tritium- Screening by Low Level Liquid Scintillation Counting



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Tritium-Screening by Low Level Liquid Scintillation Counting Samples

ARS File ID Numbers: ARS1-12-00248; 249; 250; 251
 ARS Batch ID: ARS1-B12-00312

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 ARS1-B12-00312-04	120	1.815	1.29	26.11	10.09	89.765	pCi/L	105.039	NO
2 ARS1-B12-00312-05	120	1.437	1.29	25.99	10.02	25.427	pCi/L	106.2612	NO
3 ARS1-B12-00312-06	120	1.744	1.29	26.53	10.09	76.397	pCi/L	103.3761	NO
4 ARS1-B12-00312-07	120	1.792	1.29	26.03	10.04	86.525	pCi/L	105.8866	NO
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!

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

ARS File ID Numbers: ARS1-12-00276
ARS Batch ID: ARS1-B12-00346

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 ARS1-B12-00346-04	120	1,391	1,239	27.25	10.00	25.126	pCi/L	99.59743	NO
2 ARS1-B12-00346-04 dup	120	1,436	1,239	27.13	10.00	32.709	pCi/L	100.038	NO
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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Tritium-Screening by Low Level Liquid Scintillation Counting Laboratory Records

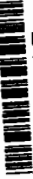
Analysis Batch Report

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Analysis Batch ID ARS1-B12-00312									
ARS INTERNATIONAL		Method		ARS-054		Analysis		LSC-A-021	
Description		Blind Iso2		Blind Iso3		SDG		FR	
Type	Blind Iso1	Blind Iso2	Blind Iso3	SDG	FR	Run	Client ID	Isotope Group	Lab Deadline
ARS1-B12-00312-01									
ARS1-B12-00312-02									
ARS1-B12-00312-03									
ARS1-B12-00312-04				ARS1-12-00248	001	1	CAWA-12-2018	STD	03/06/12
ARS1-B12-00312-05				ARS1-12-00249	001	1	CAAN-12-2024	STD	03/06/12
ARS1-B12-00312-06				ARS1-12-00250	001	1	CAWA-12-2023	STD	03/06/12
ARS1-B12-00312-07				ARS1-12-00251	001	1	CAMO-12-2229	STD	03/06/12


106213
12-00248-001-1
WRAD


106214
12-00249-001-1
WRAD


106215
12-00250-001-1
WRAD


106216
12-00251-001-1
WRAD

40 of 7

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\20120210_1136

Raw Results Path: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\20120210_1136\20120210_1136.results

RTF File Name: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\20120210_1136\LLH3.rtf

Comma-Delimited File Name: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\20120210_1136\LLH3 Results.csv

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 10mL

Count Time (min): 120.00

Count Mode: Low Level

Assay Count Cycles: 1

#Vials/Sample: 1

Repeat Sample Count: 1

Calculate % Reference: Off

Background Subtract: Off

Low CPM Threshold: Off

2 Sigma % Terminator: On - Any Region

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

Count Corrections-

Static Controller: On

Colored Samples: Off

Coincidence Time (nsec): 18

Half Life-

Luminescence Correction: Off

Heterogeneity Monitor: Off

Delay Before Burst (nsec): 75

Half Life Correction: Off

Regions Half Life

Units

Reference Date

Reference Time

41

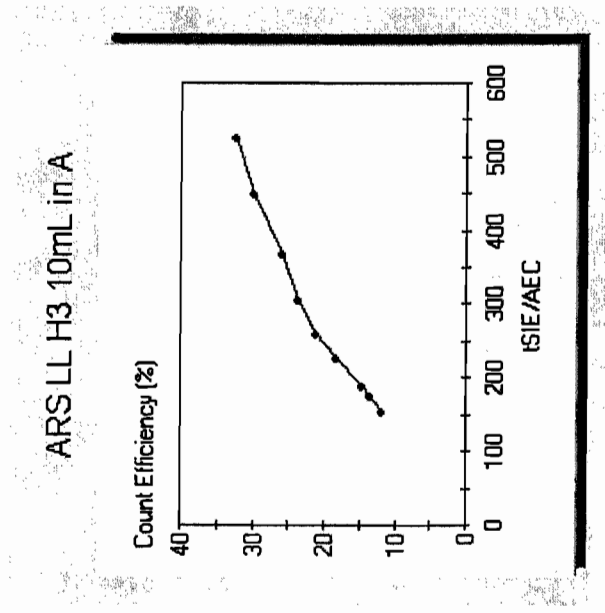
A

B

C

Cycle 1 Results

Quench Curve Block Data



Date Acquired: 11/18/2011

Date Modified:

ARS LL H3 10mL in A

tSIE/AEC	Count Efficiency (%)
526.29	32.47
450.16	29.90
370.15	25.92
306.68	23.60
260.68	20.99
228.69	18.21
189.46	14.53
177.14	13.64
155.73	11.73

ID_31001_054	ABatch	ABatchSampleID	ClientID	Aliquot1	AliquotUnits1	IC_ID1	Aliquot2	AliquotUnits2	IC_ID2	UserID	ModDate
10996	ARS1-B12-00312	ARS1-B12-00312-01		1 g						RUSEY	02/10/2012 09:44:57
10997	ARS1-B12-00312	ARS1-B12-00312-02		1 g						RUSEY	02/10/2012 09:44:58
10998	ARS1-B12-00312	ARS1-B12-00312-03		1 g						RUSEY	02/10/2012 09:44:58
10999	ARS1-B12-00312	ARS1-B12-00312-04	CAWA-12-2018	10.09 g		106213				RUSEY	02/10/2012 09:44:58
11000	ARS1-B12-00312	ARS1-B12-00312-05	CAAN-12-2024	10.02 g		106214				RUSEY	02/10/2012 09:44:58
11001	ARS1-B12-00312	ARS1-B12-00312-06	CAWA-12-2023	10.09 g		106215				RUSEY	02/10/2012 09:44:58
11002	ARS1-B12-00312	ARS1-B12-00312-07	CAMO-12-2229	10.04 g		106216				RUSEY	02/10/2012 09:44:58

Beta Liquid Scintillation Counter Log Book

Date	Time	ARS Sample ID Sample Number	Batch Number	Liquid Scintillation File Number	Technician Initials
1-31-12	1457	B12-00123-05	B12-00123	1638	RJH
2-2-12	0902	SNC-51	QA	QA	RJH
2-2-12	1532	Background	B12-00268	1535	RJH
↓	↓	B12-00268-04	↓	↓	RJH
↓	↓	B12-00268-05	↓	↓	RJH
↓	↓	B12-00268-06	↓	↓	RJH
↓	↓	B12-00268-07	↓	↓	RJH
↓	↓	B12-00268-08	↓	↓	RJH
↓	↓	B12-00268-09	↓	↓	RJH
2-3-12	0736	SNC-51	QA	QA	RJH
2-3-12	0737	B12-00268-09-15	B12-00268	0911	RJH
↓	↓	B12-00268-09	↓	↓	RJH
2-7-12	1401	SNC 16	QA	QA	RJH
2-10-12	1000	SNC 16	QA	QA	RJH
2-10-12	1002	Background	B12-00312	1136	RJH
↓	↓	B12-00312-04	↓	↓	RJH
↓	↓	B12-00312-05	↓	↓	RJH
↓	↓	B12-00312-06	↓	↓	RJH
↓	↓	B12-00312-07	↓	↓	RJH
2-10-12	1410	Background	B12-00202		RJH

Analysis Batch Report

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Analysis Batch ID ARS1-B12-00346																			
ARS INTERNATIONAL		Method		ARS-054		Low Level Tritium Screening		Analysis		LSC-A-021		Matrix		AQ					
Description		Blind Iso1		Blind Iso2		Blind Iso3		SDG		FR		Run		Client ID		Isotope Group		Lab Deadline	
ABatch Sample ID	Type																		
ARS1-B12-00346-01	LCS																		
ARS1-B12-00346-02	LCSD																		
ARS1-B12-00346-03	MBL																		
ARS1-B12-00346-04	TRG							ARS1-12-00276		001		1		CAMO-12-2232		STD		03/13/12	


106548
 12-00276-001-1
WRAD

ID#_31001_054	ABatch	ABatchSampleID	ClientID	Aliquot1	AliquotUnits1	IC_ID1	Aliquot2	AliquotUnits2	IC_ID2	UserID	ModDate
11009	ARS1-B12-00346	ARS1-B12-00346-01		1 g						RUSEY	02/15/2012 12:21:34
11010	ARS1-B12-00346	ARS1-B12-00346-02		1 g						RUSEY	02/15/2012 12:21:34
11011	ARS1-B12-00346	ARS1-B12-00346-03		1 g						RUSEY	02/15/2012 12:21:34
11012	ARS1-B12-00346	ARS1-B12-00346-04	CAMO-12-2232	10 g		106548				RUSEY	02/15/2012 12:21:34

46
of
7

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\20120215_1259

Raw Results Path: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\20120215_1259\20120215_1259.results

RTF File Name: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\20120215_1259\LLH3.rtf

Comma-Delimited File Name: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\20120215_1259\LLH3 Results.csv

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 10mL

Count Time (min): 120.00

Count Mode: Low Level

Assay Count Cycles: 1

#Vials/Sample: 1

Repeat Sample Count: 1

Calculate % Reference: Off

Background Subtract: Off

Low CPM Threshold: Off

2 Sigma % Terminator: On - Any Region

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

Count Corrections-

Static Controller: On

Colored Samples: Off

Coincidence Time (nsec): 18

Half Life-

Half Life Correction: Off

Regions Half Life

Luminescence Correction: Off

Heterogeneity Monitor: Off

Delay Before Burst (nsec): 75

Units	Reference Date	Reference Time
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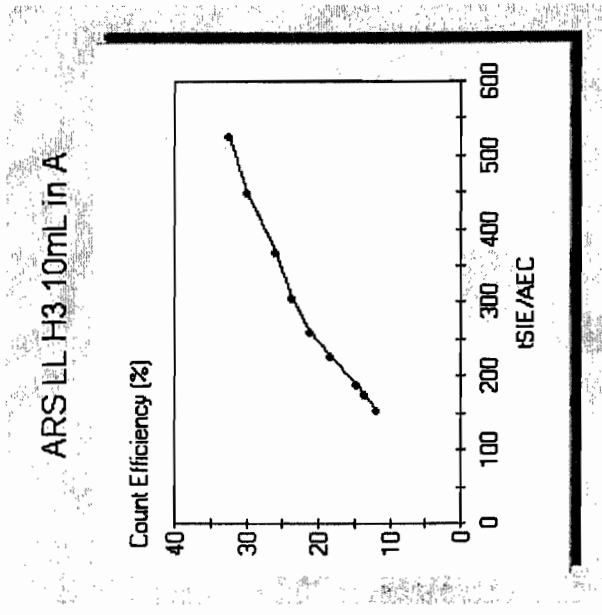
A

B

C

Cycle 1 Results

Quench Curve Block Data



Date Acquired: 11/18/2011

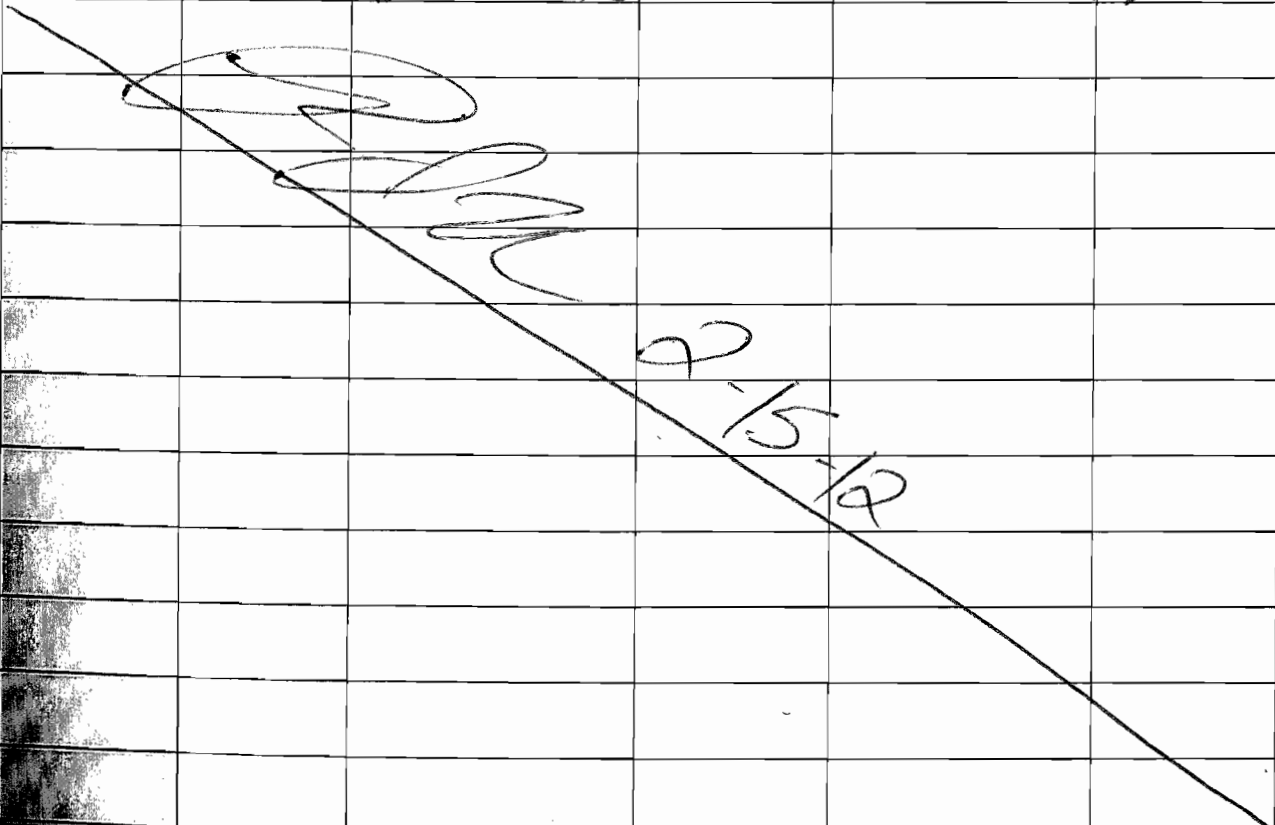
Date Modified:

ARS LL H3 10mL in A

tSIE/AEC	Count Efficiency (%)
526.29	32.47
450.16	29.90
370.15	25.92
306.68	23.60
260.68	20.99
228.69	18.21
189.46	14.53
177.14	13.64
155.73	11.73

S#	SMPL_ID	CPMA	DPM1	tSIE	Eff Nuc1	In A	Count	Time	DATE	TIME	MESSAGES
1	BACKGROUND	1.239	4.43	411.74		27.99	120.00		2/15/2012	1:08:01 PM	
2	B12-00346-04	1.391	5.10	396.86		27.25	120.00		2/15/2012	3:18:10 PM	
3	B12-00346-04-RS	1.436	5.29	394.41		27.13	120.00		2/15/2012	5:28:13 PM	

Beta Liquid Scintillation Counter Log Book

Date	Time	ARS Sample I.D. Number	Batch Number	Liquid Scintillation File Number	Technician Initials
2-10-12	1410	B12-00202-01 B12-00202-01 2-10-12	B12-00202	2228	DFM
↓	↓	B12-00202-02	↓	↓	DFM
↓	↓	B12-00202-03	↓	↓	DFM
↓	↓	B12-00202-04	↓	↓	DFM
↓	↓	B12-00202-05	↓	↓	DFM 2-15-12
2-15-12	1120	SNC-16	QA	QA	DFM
2-15-12	1228	Background	B12-00346	1259	DFM
↓	↓	B12-00346-04	↓	↓	DFM
↓	↓	B12-00346-04-RS	↓	↓	DFM
					



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American Radiation Services Analytical Reports

for

Los Alamos National Laboratory

**Tritium-Screening
by**

**Low Level Liquid
Scintillation Counting**

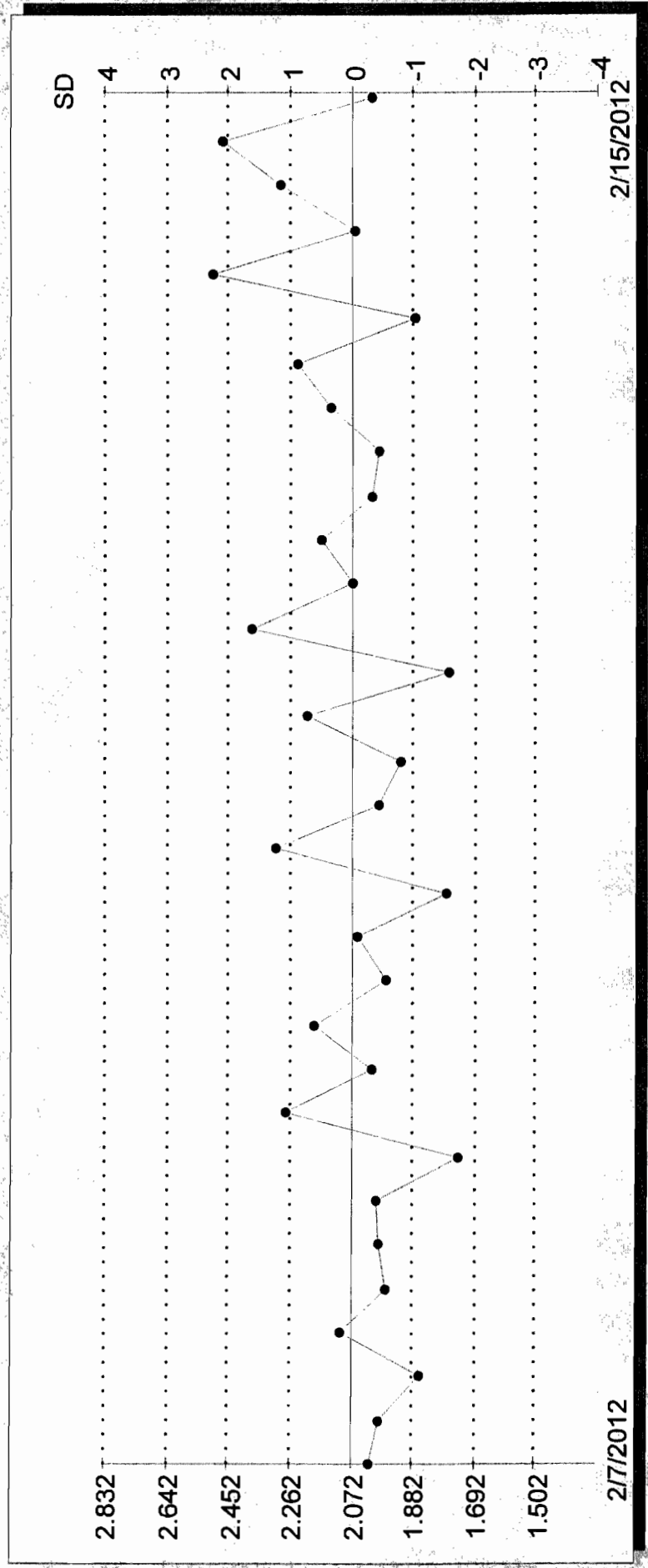
Control Charts

3H Background

Total # pts : 5375
Valid# pts : 32
Mean : 2.07
SD : 0.19

Date	Value	Valid Pt
Feb 07, 2012	2.02	X
Feb 07, 2012	1.99	X
Feb 07, 2012	1.86	X
Feb 07, 2012	2.10	X
Feb 07, 2012	1.97	X
Feb 08, 2012	1.99	X
Feb 08, 2012	2.00	X
Feb 08, 2012	1.74	X
Feb 08, 2012	2.28	X
Feb 08, 2012	2.01	X
Feb 08, 2012	2.19	X
Feb 08, 2012	1.97	X
Feb 08, 2012	2.05	X
Feb 08, 2012	1.78	X
Feb 08, 2012	2.30	X
Feb 08, 2012	1.99	X
Feb 08, 2012	1.92	X
Feb 08, 2012	2.21	X
Feb 08, 2012	1.77	X
Feb 08, 2012	2.39	X
Feb 09, 2012	2.07	X
Feb 09, 2012	2.16	X
Feb 09, 2012	2.01	X
Feb 09, 2012	1.99	X
Feb 09, 2012	2.14	X
Feb 09, 2012	2.24	X
Feb 09, 2012	1.88	X
Feb 09, 2012	2.50	X
Feb 09, 2012	2.06	X
Feb 09, 2012	2.29	X
Feb 10, 2012	2.47	X
Feb 15, 2012	2.01	X

3H Background
Total # pts : 5375
Valid# pts : 32
Mean : 2.07
SD : 0.19

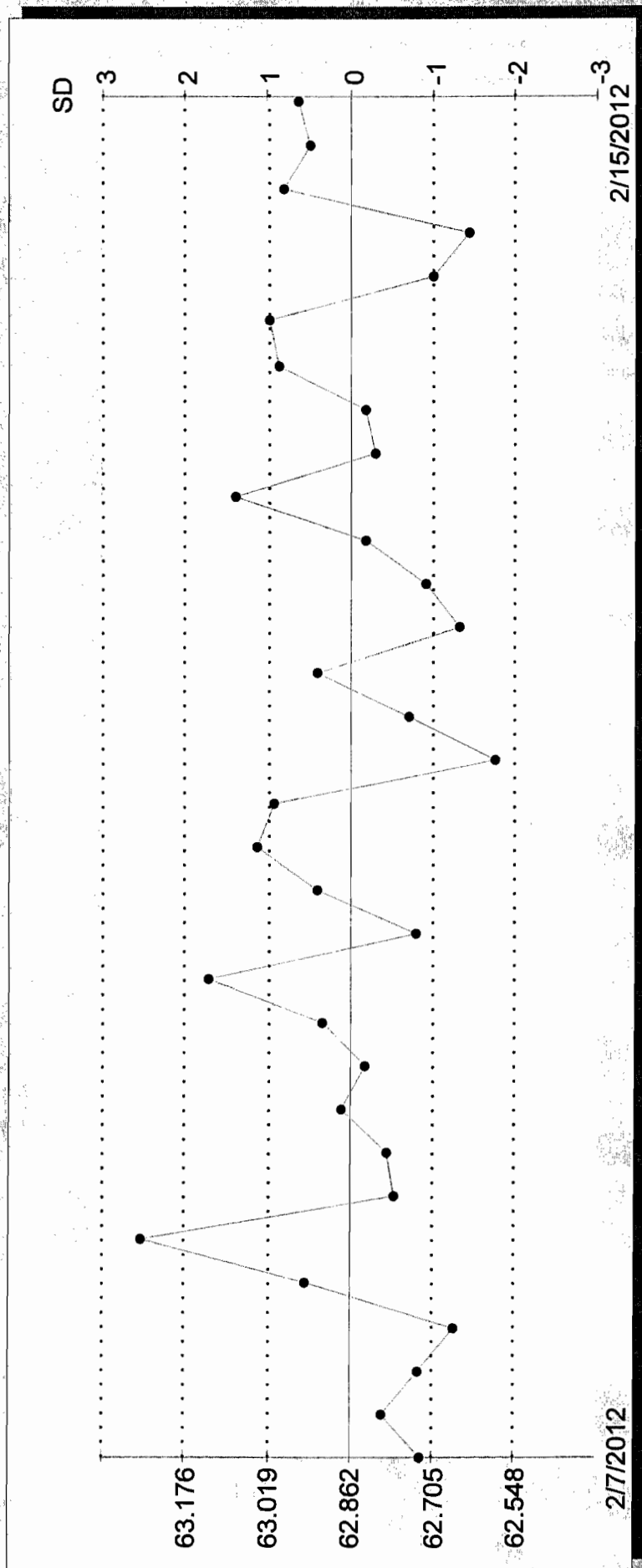


3H Efficiency

Total # pts : 5449
Valid # pts : 32
Mean : 62.86
SD : 0.16

Date	Value	Valid Pt
Feb 07, 2012	62.72	X
Feb 07, 2012	62.80	X
Feb 07, 2012	62.73	X
Feb 07, 2012	62.66	X
Feb 07, 2012	62.95	X
Feb 08, 2012	63.26	X
Feb 08, 2012	62.78	X
Feb 08, 2012	62.79	X
Feb 08, 2012	62.88	X
Feb 08, 2012	62.83	X
Feb 08, 2012	62.91	X
Feb 08, 2012	63.13	X
Feb 08, 2012	62.74	X
Feb 08, 2012	62.92	X
Feb 08, 2012	63.04	X
Feb 08, 2012	63.00	X
Feb 08, 2012	62.59	X
Feb 08, 2012	62.75	X
Feb 08, 2012	62.92	X
Feb 08, 2012	62.65	X
Feb 09, 2012	62.72	X
Feb 09, 2012	62.83	X
Feb 09, 2012	63.08	X
Feb 09, 2012	62.81	X
Feb 09, 2012	62.83	X
Feb 09, 2012	62.99	X
Feb 09, 2012	63.02	X
Feb 09, 2012	62.70	X
Feb 09, 2012	62.64	X
Feb 09, 2012	62.99	X
Feb 10, 2012	62.94	X
Feb 15, 2012	62.96	X

3H Efficiency : 5449
Total # pts : 32
Valid# pts : 62.86
Mean of 76 : 0.16
SD





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American Radiation Services Analytical Reports

for

Los Alamos National Laboratory

Low Level Liquid Scintillation Counting

Calibration Information

STD ID: S-0262

ARS INTERNATIONAL		Add/Edit Secondary Stds	Parent Standard Data			
Planning		Parent Solution Reference # NIST SRM 4927F				
Planning Comments	Create an H3 LCS stock solution.	Parent Solution # S-0237				
Target dpm/g (on dil. date)	5.5	Parent Principal Radionuclide	H-3	Half Life (Days)	4499.8000000	
Target Final volume mL	2000	Parent Reference Date 03/22/2010 10:10				
Approx mass g of Parent Sol'n	3.408750506	Parent Certified Act	3503.682716	Certd Act/Vol Units	dpm	g
Approx vol mL of Parent Sol'n	3.414905335	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-0262	Parent Date Recvd	01/02/00			
Dilution Date (New Ref Date)	09/07/2011 11:47	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)	13.352	Certified dpm/g on 09/07/2011 11:47	3226.981313			
Container Plus Solution (g)	16.889	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)	3.537					
DPM Xferred on 09/07/2011 11:47	11413.83291					
Diluent/matrix	Dead 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)	473.97	Is_Calb	FALSE			
Dilution Full Cont g (if measured)	2467.33					
Dilution Final Volume mL (if measured)	2000					
Final Dilution Density (g/mL)	0.99668					
Final Dilution Measured Mass g	1993.36					
Comments	H3 LCS stock solution dilution performed as stated above by B Steffens. -BJS 9/7/11					
Final Dilution dpm/g	5.725926529					
Final Dil New Ref Date/Time	09/07/2011 11:47					

S-0262

H-3

SL

Manufacturer

Sol Matrix

Ref No

Tech

Parent ID



Verified

9/7/11

Expires

9/7/12

NIST SRM 4927F

H2O

NIST SRM 4927F

Unknown

S-0237



RADIOACTIVE STANDARDS -- BATON ROUGE LABORATORY



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

VERIFICATION DATE **9/13/2011 7:43** date counted
 STANDARD REFERENCE # **S-0262**

Principal Radionuclide
H-3

ENTER → Half Life, Years
1.232E+01

OR → Half Life, Days
4.4998E+03
4.4998E+03

Radionuclide **H-3**

Dilution Reference Date **9/7/2011 11:47**

Dilution Activity **2.58** pCi per gram ==> dpm/g **5.73**
 Verif. Date Decay Corrected **2.58** pCi per gram ==> dpm/g **5.72**

Minimum of 3 Required

Trial ID	Sample Counts	Count Time (min)	Detector	Efficiency	Bkg. (cpm)	Net Weight	Decay Corrected Activity Result (dpm/g)	Decay Corrected Activity Result (pCi/g)
S-0262-V1	16.07	1	LSC	0.3754	5.40	5.050	5.63	2.54
S-0262-V2	16.39	1	LSC	0.3770	5.40	5.037	5.79	2.61
S-0262-V3	15.70	1	LSC	0.3763	5.40	5.035	5.44	2.45
S-0262-V4	15.00	1	LSC	0.3768	5.40	5.022	5.07	2.29
S-0262-V5	15.85	1	LSC	0.3774	5.40	5.019	5.52	2.49

10% Max PASS

Standard Deviation percent of known concentration

5% Max PASS

Average	5.49	2.47
Two Sigma Uncertainty	0.52	0.24
Target Activity	5.72	2.58
% Diff	-4.13%	-4.13%

Verification Expiration Date: **#####**

Prepared & Counted By *[Signature]*

Date: **9/13/2011 7:43**

Verified & Approved By *[Signature]*

Date: **9-13-11**

QC Approval *[Signature]*

Date: **9-13-11**

S-0262



H-3

Verified **9/7/11**

SL

Expires **9/7/12**

Manufacturer

NIST SRM 4927F

Sol Matrix

H2O

Ref No

NIST SRM 4927F

Tech

Unknown

Parent ID

S-0237



RADIOACTIVE STANDARDS - BATON ROUGE LABORATORY

H-3 Standard Verification

Verifier's Name: Brian Steffens

Date: 9/7/2011

Pipettor ID: FJ40469

Pipettor ID: Auto-pipettor

Pipettor ID: na

Standard ID: S-0262

Standard ID: N/A

Standards brought up to ~5g with distilled dead water.

Standards made in glass vials.

Weight of Standard		
15mL of Ultima Gold added to standard	S-0262-V1	5.050 g
	S-0262-V2	5.037 g
	S-0262-V3	5.035 g
	S-0262-V4	5.022 g
	S-0262-V5	5.019 g

Balance ID: H1331122173560P

Assay Definition-

Assay Description:

H-3 Normal Level Assay

Assay Type: DPM (Single)

Report Name: Report1

Output Data Path: C:\Packard\Tricarb\Results\ARS\H-3 Normal Lvl 3\20110912_2059

Raw Results Path: C:\Packard\Tricarb\Results\ARS\H-3 Normal Lvl 3\20110912_2059\20110912_2059.results

RTF File Name: C:\Packard\Tricarb\Results\ARS\H-3 Normal Lvl 3\20110912_2059\H-3 Results.rtf

Comma-Delimited File Name: C:\Packard\Tricarb\Results\ARS\H-3 Normal Lvl 3\20110912_2059\H-3 Results.csv

Assay File Name: C:\Packard\Tricarb\Assays\H-3 Normal Lvl 3.lsa

Count Conditions-

Nuclide: H-3 Normal

Quench Indicator: tSIE/AEC

External Std Terminator (sec): 0.5 2s%

Pre-Count Delay (min): 0.00

Quench Set:

Low Energy: UG STD H-3

Count Time (min): 120.00

Count Mode: Normal

Assay Count Cycles: 1

#Vials/Sample: 1

Repeat Sample Count: 1

Calculate % Reference: Off

Background Subtract: Off

Low CPM Threshold: Off

2 Sigma & Terminator: On - Any Region

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

Count Corrections-

Static Controller: On

Colored Samples: Off

Coincidence Time (nsec): 18

Luminescence Correction: Off

Heterogeneity Monitor: Off

Delay Before Burst (nsec): 75

Half Life-

Half Life Correction: Off

Regions Half Life

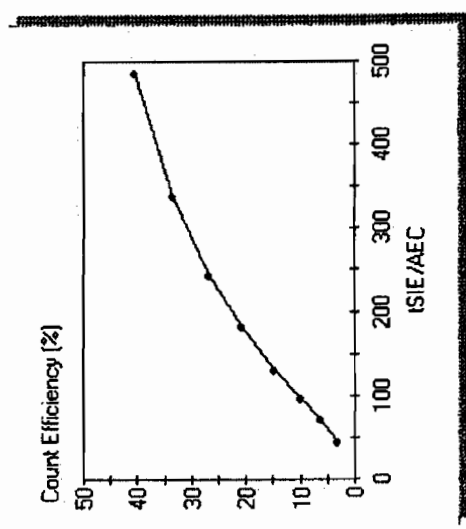
Units Reference Date

Reference Time

60 of 76
A
B
C

Cycle 1 Results
Quench Curve Block Data

UG STD H-3 in A



Date Acquired: 06/15/2011
Date Modified:
UG STD H-3 in A

tSIE/AEC	Count Efficiency (%)
487.53	40.41
339.12	33.51
243.83	26.83
182.60	20.93
130.85	14.63
96.86	9.97
71.30	6.34
46.31	3.09

P#	S#	SMPL_ID	CPMA	DPM1	tsIE	Eff Nucl	In A	Count Time	DATE	TIME	MESSAGES
50	1	BACKGROUND	5.40	14.31	429.68	37.72		120.00	9/12/2011	9:04:58 PM	
50	2	S-0262-V1	16.07	42.82	425.91	37.54		120.00	9/12/2011	11:12:00 PM	
50	3	S-0262-V2	16.39	43.48	429.27	37.70		120.00	9/13/2011	1:19:59 AM	
50	4	S-0262-V3	15.70	41.73	427.79	37.63		120.00	9/13/2011	3:27:57 AM	
50	5	S-0262-V4	15.00	39.81	428.81	37.68		120.00	9/13/2011	5:35:55 AM	
50	6	S-0262-V5	15.85	42.00	430.24	37.74		120.00	9/13/2011	7:43:52 AM	



National Institute of Standards & Technology

Certificate

Standard Reference Material 4927F

Hydrogen-3 Radioactivity Standard

This Standard Reference Material (SRM) consists of tritiated water, having a standardized and certified quantity of radioactive hydrogen-3. It is intended primarily for the calibration of instruments that are used to measure radioactivity and for the monitoring of radiochemical procedures. The solution, whose composition is specified in Table 1, is contained in a flame-sealed, 5 mL, NIST, borosilicate-glass ampoule (see Note 1)*.

The certified **hydrogen-3** massic activity value, at a **Reference Time of 1200 EST, 3 September 1998**, is:

$$(634.7 \pm 4.6) \text{ kBq}\cdot\text{g}^{-1}$$

Additional physical, chemical, and radiological properties for the SRM, as well as details on the standardization method, are given in Table 1. Uncertainty intervals for certified quantities are expanded ($k = 2$) uncertainties calculated according to the ISO and NIST Guidelines (see Note 2). Table 2 contains a specification of the components that comprise the uncertainty analyses.

The certification of this SRM, within the measurement uncertainties specified, is valid for at least five (5) years after receipt. The solution matrix, in an unopened ampoule, is believed to be indefinitely homogeneous and stable, within its half-life-dependent, useful lifetime. NIST will monitor this material and will report any substantive changes in certification to the purchaser. Should any of the certified values change, purchasers of this SRM will be notified of the change by NIST.

This SRM may represent a radiological hazard. Hydrogen-3 decays by beta particle emission. None of the beta particles escape from the SRM vial. During the decay process no photons are emitted. The SRM should be stored and used at a temperature between 5 and 35 °C. See Note 1

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

Lisa R. Karam, Deputy Chief
Ionizing Radiation Division

Gaithersburg, Maryland 20899
May 2008

Robert L. Watters, Jr., Chief
Measurement Services Division

See Certificate Revision History on Last Page

Table 1. Properties of SRM 4927F

Certified values	
Radionuclide	Hydrogen-3
Reference time	1200 EST, 3 September 1998
Massic activity of the solution	634.7 kBq•g ⁻¹
Relative expanded uncertainty ($k = 2$)	0.72 % (see Note 2)*

Uncertified information	
Source description	Liquid in flame-sealed, 5 mL NIST borosilicate ampoule (see Note 1)
Solution composition	Distilled water
Solution density	(0.998 ± 0.002) g•mL ⁻¹ at 20 °C (see Note 3)
Solution mass	Approximately 5.0 g
Radionuclidic impurities	None detected (see Note 4)
Half-lives used	³ H: (4500 ± 8) d (see Note 5)
Calibration method (and instruments)	The certified massic activity for ³ H was obtained by 4πβ gas counting of SRM 4927E using the NIST length-compensated internal gas proportional counters and intercomparison of SRMs 4927E/4927F using two 4πβ liquid-scintillation (LS) counting systems (see Note 6)

Table 2. Uncertainty evaluation for the massic activity for SRM 4927F

Uncertainty component		Assessment Type [†]	Relative standard uncertainty contribution on massic activity of ³ H (%)
1	Massic count rate of SRM 4927E, corrected for background and decay; standard deviation of the mean for 23 sets of gas counting measurements (see Note 6)	A	0.18
2	LS intercomparison of SRM 4927F and SRM 4927E; standard deviation of the mean for 7 sets of LS measurements	A	0.06
3	Decay corrections for ³ H; (for half-life uncertainty of 0.18%)	A	0.002
4	Gram-mole determinations based on pressure, volume and temperature measurements	B	0.20
5	Livetime determinations	B	0.10
6	Extrapolation of count-rate-versus-energy to zero energy	B	0.20
7	Limit for radionuclidic impurities	B	0.05
Relative combined standard uncertainty			0.36
Relative expanded uncertainty (<i>k</i> = 2)			0.72

[†] = (A) denotes evaluation by statistical methods; (B) denotes evaluation by other methods.

NOTES

Note 1. Refer to <http://physics.nist.gov/Divisions/Div846/srm.html> for the standardized ampoule dimensions and for assistance and instructions on how to properly open an ampoule. Information on additional storage and handling requirements is also included in the website.

Note 2. The uncertainties on certified values are expanded uncertainties, $U = ku_c$. The quantity u_c is the combined standard uncertainty calculated according to the ISO and NIST Guides (see references [1] and [2]). The combined standard uncertainty is multiplied by a coverage factor of $k = 2$ and was chosen to obtain an approximate 95 % level of confidence.

Note 3. The stated uncertainty is two times the standard uncertainty. See reference [2]

Note 4. The estimated lower limit of detection for radionuclidic impurities is $300 \text{ Bq} \cdot \text{g}^{-1}$

Note 5. The stated uncertainty is the standard uncertainty. See reference [2] and [3].

Note 6. 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 using LS counting.

REFERENCES

- [1] International Organization for Standardization (ISO), *Guide to the Expression of Uncertainty in Measurement*, 1993 (corrected and reprinted, 1995). Available from Global Engineering Documents, 12 Inverness Way East, Englewood, CO 80112, U.S.A. Telephone 1-800-854-7179.
- [2] B. N. Taylor and C. E. Kuyatt, *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*, NIST Technical Note 1297, 1994. Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20407, U.S.A.
- [3] L.L. Lucas and M.P. Unterweger, *Comprehensive Review and Critical Evaluation of the Half-Life of Tritium*, J. Res. Natl. Inst. Stand. Technol. **105**, 541-549 (2000)

Certificate Revision History: May 2008 (Text revised); February 2007 (Text revised and expiration date extended); October 2000 (Half-life and text revised); June 1999 (Original certificate date).



2609 North River Road • Port Allen, Louisiana 70767

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American Radiation Services Analytical Reports

for

Los Alamos National Laboratory

Folder Duplicate



Report Compilation Checklist

ARS SDG: 12-00250 Client Name: LANL Sample Matrix: AQ

LEVEL 1 COMPONENTS

	1st Reviewer			
1) Cover Page Complete and Accurate (see ARS-059)?	<input checked="" type="checkbox"/> Yes	No	N/A	
2) Technical Review Checklist(s) Complete and Accurate?	<input checked="" type="checkbox"/> Yes	No	N/A	
3) Case Narrative Complete and Accurate (see ARS-059)?	<input checked="" type="checkbox"/> Yes	No	N/A	
4) Form 1s Present for all Samples and Tests?	<input checked="" type="checkbox"/> Yes	No	N/A	
5) Client Specific Components are Present and Complete?	<input checked="" type="checkbox"/> Yes	No	N/A	

LEVEL 2 COMPONENTS

	1st Reviewer			
6) Batch Quality Control Report is Present and Accurate?	<input checked="" type="checkbox"/> Yes	No	N/A	
7) DQO Report is Present and Accurate?	<input checked="" type="checkbox"/> Yes	No	N/A	
8) Client Specific Batch QC Components are Present and Complete?	<input checked="" type="checkbox"/> Yes	No	N/A	

LEVEL 3 COMPONENTS

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

LEVEL 4 COMPONENTS

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

Susan Heese 3-9-12
Report Generator Signature Date

Virginia Mulligan 3-9-12
Management Review Signature Date



LSC Technical Review Checklist

ARS SDG ARS1-12-00250

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

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

ARS A. Batch ID(s): Batch A: ARS1-B12-00365 Batch B: N/A Batch C: N/A

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

A. RADIOCHEMICAL PREPARATION REVIEW

	Chemist Review	Verifier Review
1) 100% of Manual Transcriptions Verified?	Yes No N/A	Yes No N/A
2) 100% of Manual Calculations Verified?	Yes No N/A	Yes No N/A
3) Blank Composition/Configuration Matches Calibration?	Yes No N/A	Yes No N/A
4) Deviations from procedure are documented and verified?	Yes No N/A	Yes No N/A
5) Appropriate Cocktail Selected?	Yes No N/A	Yes No N/A
6) Sample Prep Anomaly? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (See Tech Notes) NCR # (If initiated): _____		
Chemist Signature <u>[Signature]</u> Date <u>3-5-12</u>		Verifier Review Signature <u>[Signature]</u> Date <u>3-5-12</u>

B. ANALYSIS REVIEW

	Analyst Review	QA Officer Review
1) Calibrations Valid and Current?	Yes No N/A	Yes No N/A
2) Backgrounds Valid and Current?	Yes No N/A	Yes No N/A
3) Source Checks Completed and Acceptable?	Yes No N/A	Yes No N/A
QA Officer Signature <u>[Signature]</u> Date <u>3-8-12</u>		
	Analyst Review	Technical Review
4) Background Checks Complete and Acceptable?	Yes No N/A	Yes No N/A
5) 100% of Manually Entered Parameters Verified Accurate?	Yes No N/A	Yes No N/A
6) Appropriate QC samples initiated at required frequency?	Yes No N/A	Yes No N/A
6) Test/Sample Specific Parameters (See ARS-059 for details)		
a) Analysis Parameters Checked and Correct and Peak Shapes are Acceptable?	Yes No N/A	Yes No N/A
b) Spectra show no Evidence of Interferences?	Yes No N/A	Yes No N/A
c) Sample Quench for All Samples within Range of Quench Curve?	Yes No N/A	Yes No N/A
7) Analysis Anomaly? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (See Comments) NCR # (If initiated): _____		
Analyst Signature <u>[Signature]</u> Date <u>3-7-12</u>		Technical Reviewer Signature <u>[Signature]</u> Date <u>3-7-12</u>

Batch A: ARS1-B12-00365

LSC Technical Review Checklist

C. BATCH QC VALIDATION

	Proj. Mgr. Review	QA Officer Review
1) Activity + 3xCSU a Negative Number?	Yes No N/A	Yes No N/A
2) RDL Criteria are Met?	Yes No N/A	Yes No N/A
3) Method Blank Criterion Met?	Yes No N/A	Yes No N/A
4) LCS/LCD Criteria Met?	Yes No N/A	Yes No N/A
5) Duplicate (Sample Duplicate, LCSD, MSD) Criteria Met?	Yes No N/A	Yes No N/A
6) MS/MSD Criteria Met?	Yes No N/A	Yes No N/A
7) Batch QC Anomaly? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (See Tech Notes) NCR # (If initiated): _____		
<u>Suman Leese</u> Project Manager Signature	<u>3-9-12</u> Date	<u>DFM</u> QA Officer Signature
<u>3-9-12</u> Date		

GENERAL COMMENTS



LSC Technical Review Checklist

ARS SDG ARS1-12-00250

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-B12-00312 Batch B: N/A Batch C: N/A

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

A. RADIOCHEMICAL PREPARATION REVIEW

	Chemist Review	Verifier Review
1) 100% of Manual Transcriptions Verified?	Yes No N/A	Yes No N/A
2) 100% of Manual Calculations Verified?	Yes No N/A	Yes No N/A
3) Blank Composition/Configuration Matches Calibration?	Yes No N/A	Yes No N/A
4) Deviations from procedure are documented and verified?	Yes No N/A	Yes No N/A
5) Appropriate Cocktail Selected?	Yes No N/A	Yes No N/A
6) Sample Prep Anomaly? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (See Tech Notes) NCR # (If initiated): _____		
Chemist Signature <u>[Signature]</u> Date <u>2-10-12</u>		Verifier Review Signature <u>[Signature]</u> Date <u>2-10-12</u>

B. ANALYSIS REVIEW

	Analyst Review	QA Officer Review
1) Calibrations Valid and Current?	Yes No N/A	Yes No N/A
2) Backgrounds Valid and Current?	Yes No N/A	Yes No N/A
3) Source Checks Completed and Acceptable?	Yes No N/A	Yes No N/A
QA Officer Signature <u>[Signature]</u> Date <u>3-8-12</u>		
	Analyst Review	Technical Review
4) Background Checks Complete and Acceptable?	Yes No N/A	Yes No N/A
5) 100% of Manually Entered Parameters Verified Accurate?	Yes No N/A	Yes No N/A
6) Appropriate QC samples initiated at required frequency?	Yes No N/A	Yes No N/A
6) Test/Sample Specific Parameters (See ARS-059 for details)		
a) Analysis Parameters Checked and Correct and Peak Shapes are Acceptable?	Yes No N/A	Yes No N/A
b) Spectra show no Evidence of Interferences?	Yes No N/A	Yes No N/A
c) Sample Quench for All Samples within Range of Quench Curve?	Yes No N/A	Yes No N/A
7) Analysis Anomaly? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (See Comments) NCR # (If initiated): _____		
Analyst Signature <u>[Signature]</u> Date <u>2-13-12</u>		Technical Reviewer Signature <u>[Signature]</u> Date _____

Batch A: ARS1-B12-00312

LSC Technical Review Checklist

C. BATCH QC VALIDATION

	Proj. Mgr. Review	QA Officer Review
1) Activity + 3xCSU a Negative Number?	Yes No N/A	Yes No N/A
2) RDL Criteria are Met?	Yes No N/A	Yes No N/A
3) Method Blank Criterion Met?	Yes No N/A	Yes No N/A
4) LCS/LCD Criteria Met?	Yes No N/A	Yes No N/A
5) Duplicate (Sample Duplicate, LCSD, MSD) Criteria Met?	Yes No N/A	Yes No N/A
6) MS/MSD Criteria Met?	Yes No N/A	Yes No N/A
7) Batch QC Anomaly? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (See Tech Notes) NCR # (If initiated): _____		
<u><i>Susan Heerl</i></u> Project Manager Signature	<u>3-9-12</u> Date	<u><i>24M</i></u> <u>3-8-12</u> QA Officer Signature Date

GENERAL COMMENTS

DQO Report for SDG
ARS1-12-00250

72 of 7

Analysis Code	Group	Isotope	Activity Units	Aliquot Units	ProcedureNo	RDL	LCS_LL	LCS_UL	MS_LL	MS_UL	MS_LL	MS_UL	Rdy_LL	Rdy_UL	Grav_LL	Grav_UL	RER	RPD	DilutionReq	RoughPrepReq	BlankCorrectionMDA	BlankCorrectionAll	CountTimeReq	AliquotRequired
LSC-A-021	STC	H-3	pCi	L	ARS-054	0.00E+00	75	125	60	140	30	110	40	110	1.00	25	1.00	25	FALSE	FALSE	FALSE	FALSE		
LSC-A-022	STC	Enriched H-3	pCi	L	ARS-040	0.00E+00	75	125	60	140	30	110	40	110	1.00	25	1.00	25	FALSE	FALSE	FALSE	FALSE		

SDG Specific Data

Samples and Containers (➔) Checked In Thus Far															
FR	ClientID	Matrix	SampleStartDate	SampleEndDate	Disp	Hold	Arch	Storage	X	Units	Y	Units	Z	Units	Comments
001 ➔	CAWA-12-2023	AQ	02/03/12 12:00 PM	02/03/12 12:00 PM	H	90	5	LL3H							
	IC_ID	Cnt	Volume_mL	Wt_g	pH_Orig	pH_Final	CPM	ur_Hr	Storage	VOA	Head Sp	AF Units	AF Rate	AF Mins	AF Total Vol
	106185	1	1000.00				60	24		N	N/A				

SDG Report - Analysis Assignments

Temp SDG	ARS1-12-00250	Sample Count	1
Client	Los Alamos National Laboratory	Analysis Count	2-2

Samples Count Totals per Analysis

Analysis Code	Analysis Description	Samples Count
LSC-A-021	Low Level Tritium Screen in (Aqueous)	1
LSC-A-022	Low Level Tritium by Enrichment Process in (Aqueous [AQ])	1

Analyses Assigned Per Fraction

Fraction	Analysis Code	X = Assigned
001	LSC-A-021	X
001	LSC-A-022	X

ARS FILE TRACKING SHEET

SDG: ARS1-12-00250

Task	Date / Time	Initials
Date & Time Samples Received	02-09-12/11:00	CWB
ICOC Initiated / Storage Location: <u>LL3H</u>	02-09-12/16:26	CWB
Technical Checks Performed	<i>See Batch</i>	<i>_____</i>
Report Written / EDD Generated: <u>3-9-12/1155</u> <u>SDA</u> Date/Time Initials	<u>3-9-12/1152</u>	<u>SDA</u>
Quality Assurance Checks Performed on Report	3-9-12/1322	_____
Management Check Performed on Report	_____	_____
<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 ^{see notes} Mgmt. Approval: _____		✓

NOTES:

SDG: APSH2-00250

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

COC ☒ Yes ☐ No

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

Samples Rcv

Matrix

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

Exposure Rate Meter: <u>M3 202101</u>	Serial No.: <u>44-2 KE264200</u>	Calibration Due Date: <u>4-20-72</u>
Count Rate Meter: <u>M2 154859</u>	Serial No.: <u>44-9 KE184559</u>	Calibration Due Date: <u>4-20-72</u>
Background Exposure Rate (μ R/hr) <u>30</u>	Max. Exposure Rate on Shipping Containers Externals (Plus Bkgd) <u>20</u>	μ R/hr
Background Count Rate (cpm) <u>80</u>	Max. Removable Count Rate on Shipping Containers Externals (Plus Bkgd) <u>40</u>	cpm
	Max. Removable Count Rate on Shipping Containers Internals (Plus Bkgd) <u>40</u>	cpm

[illegible]

Surveyors'
Name:

Date/Time Surveyed: