The order of this data package is as follows:

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

Comments:

American Radiation

Baton Rouge LA

Chain of Custody/Analysis Request

COC/Lab Request #: 2018-1750

Page 1 of 1

Client Contact:

Lab Agreement #:

Site Name: Los Alamos National Laboratory

Project Number: ADEP

Analysis Turnaround Time:

24 Hour - ☐ Other - ☐

7 Days - ☐

14 Days - ☐

21 Days - ☐

28 Days - ☒

Rad Screening Info: Locals ND

Lab Reporting Limit Type: Method Detection Limit

Field Sample ID	Sample Date	Sample Time	Sample Matrix	WSP-LL-H-3
CAWA-18-46	Feb 9 2018	12:30	W	1
CAPA-18-4	Feb 13 2018	13:47	W	1
CAWA-18-51	Feb 9 2018	14:36	W	1
CAMO-18-10	Feb 14 2018	13:27	W	1
CAWA-18-64	Feb 13 2018	12:50	W	1
CAWA-18-151310	Feb 13 2018	12:50	W	1
CAWA-18-58	Feb 8 2018	13:19	W	1

Special Instructions:

Relinquished by:	Print Name:	Date/Time: 2/15/18	Received by:	Print Name:	Date/Time:
Relinquished by:	Print Name:	Date/Time:	Received by:	Print Name:	Date/Time:
Relinquished by:	Print Name:	Date/Time:	Received by:	Print Name:	Date/Time:

LANL SMO

Los Alamos NM

Chain of Custody/Analysis Request

COC/Lab Request #: 2018-1711

Client Contact:

Lab Agreement #:

Site Name: Los Alamos National Laboratory

Project Number:

Analysis Turnaround Time:

24 Hour - ☐ Other - ☒

7 Days - ☐

14 Days - ☐

21 Days - ☐

28 Days - ☐

Rad Screening Info:

Lab Reporting Limit Type: Method Detection Limit

Field Sample ID	Sample Date	Sample Time	Sample Matrix	MSGP-Hg	WSP-8260B-VOA	WSP-8270C-SVOA	WSP-8330B-NMED HEXMOD	WSP-All Metals	WSP-CN(T)	WSP-EES-Br	WSP-EES-Tracers	WSP-GENINORG+PerChlorate	WSP-GrossA/B	WSP-LL-H-3	WSP-N15/O18-NO3	WSP-NH3+NO3/NO2+PO4	WSP-RAD	WSP-TKN+TOC						
CAWA-18-151309	Feb 13 2018	12:50	W					1				1				1								
CAWA-18-63	Feb 13 2018	12:50	W					1				1			2	1								
CAWA-18-114	Feb 13 2018	12:50	W		~~2~~ 1																			
CAWA-18-151310	Feb 13 2018	12:50	W	1	2	2	3		1				1	1			1	1						
CAWA-18-64	Feb 13 2018	12:50	W	1	2	2	3		1				1	1			1	1						
CAWA-18-65	Feb 13 2018	12:50	W							1	2													

Special Instructions:

Relinquished by:	Print Name:	Date/Time:	Received by:	Print Name:	Date/Time:
[signature]	Tanner Barham	2-13-2018 1415	[signature] Sherwood	[signature] Sherwood	2/13/18 6:14:15

LANL SMO

Los Alamos NM

Chain of Custody/Analysis Request

COC/Lab Request #: 2018-1675

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Client Contact:

Lab Agreement #:

Site Name: Los Alamos National Laboratory

Project Number:

Analysis Turnaround Time:

24 Hour - ☐ Other - ☒

7 Days - ☐

14 Days - ☐

21 Days - ☐

28 Days - ☐

Rad Screening Info:

Lab Reporting Limit Type: Method Detection Limit

Field Sample ID	Sample Date	Sample Time	Sample Matrix	MSGP-Hg	WSP-8260B-VOA	WSP-8270C-SVOA	WSP-8330B-NMED HEXMOD	WSP-All Metals	WSP-CN(T)	WSP-GENINORG+PerChlorate	WSP-GrossA/B	WSP-LL-H-3	WSP-N15/O18-NO3	WSP-NH3+NO3/NO2+PO4	WSP-RAD	WSP-TKN+TOC
CAWA-18-9	Feb 10 2018	09:35	W					1		1			2	1		
CAWA-18-10	Feb 10 2018	09:35	W	1	2	2	3		1		1	1			1	1
CAWA-18-93	Feb 10 2018	09:35	W													

Special Instructions:

Relinquished by:	Print Name: Tanner Bonham	Date/Time: 2-13-2018 0935	Received by: Sherwood	Print Name: Sherrod Norwood	Date/Time: 2/13/18 9:3
Relinquished by:	Print Name:	Date/Time:	Received by:	Print Name:	Date/Time:
Relinquished by:	Print Name:	Date/Time:	Received by:	Print Name:	Date/Time:

LANL SMO

Los Alamos NM

Chain of Custody/Analysis Request

COC/Lab Request #: 2018-1692

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Client Contact:

Lab Agreement #:

Project Number:

Analysis Turnaround Time:

24 Hour - ☐ Other - ☒

7 Days - ☐

14 Days - ☐

21 Days - ☐

28 Days - ☐

Site Name: Los Alamos National Laboratory

Rad Screening Info:

Lab Reporting Limit Type: Method Detection Limit

Field Sample ID	Sample Date	Sample Time	Sample Matrix	MSGP-Hg	WSP-8260B-VOA	WSP-8270C-SVOA	WSP-8330B-NMED HEXMOD	WSP-All Metals	WSP-CN(T)	WSP-GENINORG+PerChlorate	WSP-GrossA/B	WSP-LL-H-3	WSP-NH3+NO3/NO2+PO4	WSP-RAD	WSP-TKN+TOC
CAWA-18-45	Feb 9 2018	12:30	W					1		1			1		
CAWA-18-109	Feb 9 2018	12:30	W		2 TB										
CAWA-18-46	Feb 9 2018	12:30	W	1	2	2	3		1		1	1		1	1

Special Instructions:

Relinquished by: Tanner Bonham	**Print Name:** Tanner Bonham	**Date/Time:** 2-13-2018 1040	**Received by:** Renee Nash	**Print Name:** Renee Nash	**Date/Time:** 2/13/18 1040
Relinquished by:	**Print Name:**	**Date/Time:**	**Received by:**	**Print Name:**	**Date/Time:**
Relinquished by:	**Print Name:**	**Date/Time:**	**Received by:**	**Print Name:**	**Date/Time:**

LANL SMO

Los Alamos NM

Chain of Custody/Analysis Request

COC/Lab Request #: 2018-1661

Client Contact:

Lab Agreement #:

Site Name: Los Alamos National Laboratory

Project Number:

Analysis Turnaround Time:

24 Hour - ☐ Other - ☒

7 Days - ☐

14 Days - ☐

21 Days - ☐

28 Days - ☐

Rad Screening Info:

Lab Reporting Limit Type: Method Detection Limit

Field Sample ID	Sample Date	Sample Time	Sample Matrix	MSGP-Hg	WSP-8260B-VOA	WSP-8270C-SVOA	WSP-8330B-NMED HEXMOD	WSP-All Metals	WSP-CN(T)	WSP-EES-Br	WSP-EES-Tracers	WSP-GENINORG+PerChlorate	WSP-GrossA/B	WSP-LL-H-3	WSP-N15/O18-NO3	WSP-NH3+NO3/NO2+PO4	WSP-RAD	WSP-TKN+TOC						
CAWA-18-59	Feb 8 2018	13:22	W							1	2													
CAWA-18-89	Feb 8 2018	13:22	W		2	2																		
CAWA-18-57	Feb 8 2018	13:19	W					1				1			2	1								
CAWA-18-151312	Feb 8 2018	13:19	W		~~2~~ 1	DJ 2/8/18																		
CAWA-18-58	Feb 8 2018	13:19	W	1	2	2	3		1				1	1			1	1						

Special Instructions:

Relinquished by:	Print Name:	Date/Time:	Received by:	Print Name:	Date/Time:
D Jaramillo	Daniel Jaramillo	1435 2/8/18	Ranee Onstott	Ranee Onstott	2/8/18 1435

LANL SMO

Los Alamos NM

R-25b

Chain of Custody/Analysis Request

COC/Lab Request #: 2018-1702

Client Contact:

Lab Agreement #:

Project Number: ADEP

Analysis Turnaround Time:

24 Hour - ☐ Other - ☐

7 Days - ☐

14 Days - ☐

21 Days - ☐

28 Days - ☒

Site Name: Los Alamos National Laboratory

Rad Screening Info:

Lab Reporting Limit Type: Method Detection Limit

Field Sample ID	Sample Date	Sample Time	Sample Matrix	MSGP-Hg	WSP-8260B-VOA	WSP-8270C-SVOA	WSP-8330B-NMED HEXMOD	WSP-All Metals	WSP-CN(T)	WSP-EES-Br	WSP-EES-Tracers	WSP-GENINORG+PerChlorate	WSP-GrossA/B	WSP-LL-H-3	WSP-NH3+NO3/NO2+PO4	WSP-RAD	WSP-TKN+TOC
CAWA-18-50	Feb 9 2018	14:36	W					1				1			1		
CAWA-18-51	Feb 9 2018	14:36	W	1	2	2	3		1				1	1		1	1
CAWA-18-52	Feb 9 2018	14:36	W							1	2						

Special Instructions:

Relinquished by:	Print Name:	Date/Time:	Received by:	Print Name:	Date/Time:
Tanya VanderVis	Tanya Vander Vis	2-13-18 1301	Ranee Orstott	Ranee Orstott	2/13/18 1301

LANL SMO

Los Alamos NM

Chain of Custody/Analysis Request

COC/Lab Request #: 2018-1715

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Client Contact:

Lab Agreement #:

Site Name: Los Alamos National Laboratory

Project Number:

Analysis Turnaround Time:

24 Hour - ☐ Other - ☒

7 Days - ☐

14 Days - ☐

21 Days - ☐

28 Days - ☐

Rad Screening Info:

Lab Reporting Limit Type: Method Detection Limit

Field Sample ID	Sample Date	Sample Time	Sample Matrix	MSGP-Hg	WSP-8260B-VOA	WSP-8270C-SVOA	WSP-8330B-NMED HEXMOD	WSP-All Metals	WSP-CN(T)	WSP-EES-Br	WSP-EES-Tracers	WSP-GENINORG+PerChlorate	WSP-GrossA/B	WSP-LL-H-3	WSP-N15/O18-NO3	WSP-NH3+NO3/NO2+PO4	WSP-RAD	WSP-TKN+TOC
CAPA-18-3	Feb 13 2018	13:47	W					1				1			2	1		
CAPA-18-7	Feb 13 2018	13:47	W		[illegible]		2/13/18											
CAPA-18-8	Feb 13 2018	13:47	W		2	2												
CAPA-18-4	Feb 13 2018	13:47	W	1	2	2	3		1				1	1			1	1
CAPA-18-5	Feb 13 2018	13:47	W							1	2							

Special Instructions:

Relinquished by: [signature]	**Print Name:** Allison Stanfield	**Date/Time:** 2/13/18 1535	**Received by:** [signature]	**Print Name:** [signature]	**Date/Time:** 2/13/18 1535
Relinquished by:	**Print Name:**	**Date/Time:**	**Received by:**	**Print Name:**	**Date/Time:**
Relinquished by:	**Print Name:**	**Date/Time:**	**Received by:**	**Print Name:**	**Date/Time:**

Shipping Classification Determination Checklist

Sampling Plan ID/Name: 1669 (R-47) **COC:** 2018-1250

TEST - Explosives	YES	NO
Samples collected from a WFO area? (TAs -8, 9, 11, 16, 37, 14, 15, 36, 22, 39, 40, and 49)	X	

Field Test for Explosives Results	YES	NO	NA
HE SPOT test result positive. **If YES - Do not transport.**		X	

TEST - Chemical Preservation	YES	NO
Samples are chemically preserved?	X	

Field Team Member Statement	YES	NO	NA
Chemical preservation exceeds limits given 40 CFR 136, Table II – Required Containers, Preservation Techniques and Holding Times (footnote 3). **If YES - Do not ship.**		X	

TEST - Field Screen	YES	NO
The sample has field screening measurements of alpha and beta activity?		X

Sample Activity (dpm/100cm²)		Shipment Activity (dpm*g/100cm²)		Sampled Location	YES	NO	NA
Alpha detectable	**AND**	Alpha ≥ 160,000	**AT**	TA-1 and adjacent hillsides, TA-21, Acid Canyon, MDA C at TA-50, Area G at TA-54, TA-48, or TA-49			X
Alpha ≥ 125	**AND**	Alpha ≥ 1,250,000	**AT**	other locations			
Beta ≥ 1,500	**AND**	Beta ≥ 15,000,000	**AT**	any location			
The sample Alpha ≥ 16,000,000 dpm*g/100cm² or Beta ≥ 160,000,000 dpm*g/100cm². **If YES - Do not ship.**							
On the external surface of the sample container, alpha activity ≥ 24 dpm/cm², beta activity ≥ 240 dpm/cm², or surface activity ≥ 0.5 mR/hr. **If YES - Do not ship.**							
The sample is tentatively identified as DOT hazard Class 7 (Radioactive). The shipment is labeled *Radioactive Material, Excepted Package - Limited Quantity Material - UN2910*, based on field screening measurements of alpha and beta activity.							

TEST - Location	YES	NO
Prior analytical measurements of radioactive isotopes are available?	X	

Sample Activity (pCi/g)		Shipment Activity (pCi)	YES	NO	NA
Am-241 ≥ 27 pCi/g	**AND**	Am-241 ≥ 270,000 pCi Total		X	
Cs-137 ≥ 270 pCi/g	**AND**	Cs-137 ≥ 270,000 pCi Total			
Ru-238 ≥ 27 pCi/g	**AND**	Pu-238 ≥ 270,000 pCi Total			
Pu-239/240 ≥ 27 pCi/g	**AND**	Pu-239/240 ≥ 270,000 pCi Total			
Th-228 ≥ 27 pCi/g	**AND**	Th-228 ≥ 270,000 pCi Total			
U-234 ≥ 270 pCi/g	**AND**	U-234 ≥ 1,600,000,000 pCi Total			
U-238 ≥ 270 pCi/g	**AND**	U-238 ≥ unlimited			
H-3 ≥ 27,000,000 pCi/g	**AND**	H-3 ≥ 27,000,000,000 pCi Total			
Am-241, Pu-238, Pu-239/240, or Th 228 ≥ 27,000,000 pCi; or Cs-137 ≥ 270,000,000 pCi or U-234 ≥ 160,000,000 pCi; or H-3 ≥ 1 Ci. **If YES - Do not ship.**					
The sample is tentatively identified as DOT hazard Class 7 (Radioactive). The shipment is labeled *Radioactive Material, Excepted Package - Limited Quantity of Material - UN2910*, based on prior analytical measurements of radioactive isotopes.					

TEST - AK	YES	NO	NA
The shippers documented knowledge of the sample positively identifies appropriate labeling.		X	

Documented Field Team Member Statement	YES	NO	NA
The sample is tentatively identified as DOT hazard Class 7 (Radioactive). The shipment is labeled *Radioactive Material, Excepted Package - Limited Quantity of Material - UN2910*, and the sample is submitted to ARS or RP for hazard classification analysis.			X

These samples do not meet the criteria for classification in any hazard class according to regulation OSHA 29 CFR 1910.1200. The sample(s) contained in this shipment have been assigned a tentative proper DOT shipping name, hazard class, identification number, and packing group, based on the shipper's knowledge of the sample:

Hazard Assessment Completed	Date/Time
(Printed Name) Tanner Bonham	2-13-2018
(Signature)	1415

TB

Hazard Assessment Reviewed	Date/Time
(Printed Name)	2/13/18
(Signature)	1415

Shipping Classification Determination Checklist

Sampling Plan ID/Name: 11669 (Burning Ground Spring) **COC:** 2018-1750

TEST - Explosives	YES	NO
Samples collected from a WFO area? (TAs -8, 9, 11, 16, 37, 14, 15, 36, 22, 39, 40, and 49)	X	

Field Test for Explosives Results	YES	NO	NA
HE SPOT test result positive. **If YES - Do not transport.**		X	

TEST - Chemical Preservation	YES	NO
Samples are chemically preserved?	X	

Field Team Member Statement	YES	NO	NA
Chemical preservation exceeds limits given 40 CFR 136, Table II - Required Containers, Preservation Techniques and Holding Times (footnote 3). **If YES - Do not ship.**		X	

TEST - Field Screen	YES	NO
The sample has field screening measurements of alpha and beta activity?		X

Sample Activity (dpm/100cm²)		Shipment Activity (dpm*g/100cm²)		Sampled Location	YES	NO	NA
Alpha detectable	**AND**	Alpha ≥ 160,000	**AT**	TA-1 and adjacent hillsides, TA-21, Acid Canyon, MDA C at TA-50, Area G at TA-54, TA-48, or TA-49			X
Alpha ≥ 125	**AND**	Alpha ≥ 1,250,000	**AT**	other locations			
Beta ≥ 1,500	**AND**	Beta ≥ 15,000,000	**AT**	any location			

The sample Alpha ≥ 16,000,000 dpm*g/100cm² or Beta ≥ 160,000,000 dpm*g/100cm². **If YES - Do not ship.**			
On the external surface of the sample container, alpha activity ≥ 24 dpm/cm², beta activity ≥ 240 dpm/cm², or surface activity ≥ 0.5 mR/hr. **If YES - Do not ship.**			
The sample is tentatively identified as DOT hazard Class 7 (Radioactive). The shipment is labeled *Radioactive Material, Excepted Package - Limited Quantity Material - UN2910*, based on field screening measurements of alpha and beta activity.			

TEST - Location	YES	NO
Prior analytical measurements of radioactive isotopes are available?	X	

Sample Activity (pCi/g)		Shipment Activity (pCi)	YES	NO	NA
Am-241 ≥ 27 pCi/g	**AND**	Am-241 ≥ 270,000 pCi Total		X	
Cs-137 ≥ 270 pCi/g	**AND**	Cs-137 ≥ 270,000 pCi Total			
Pu-238 ≥ 27 pCi/g	**AND**	Pu-238 ≥ 270,000 pCi Total			
Pu-239/240 ≥ 27 pCi/g	**AND**	Pu-239/240 ≥ 270,000 pCi Total			
Th-228 ≥ 27 pCi/g	**AND**	Th-228 ≥ 270,000 pCi Total			
U-234 ≥ 270 pCi/g	**AND**	U-234 ≥ 1,600,000,000 pCi Total			
U-238 ≥ 270 pCi/g	**AND**	U-238 ≥ unlimited			
H-3 ≥ 27,000,000 pCi/g	**AND**	H-3 ≥ 27,000,000,000 pCi Total			

Am-241, Pu-238, Pu-239/240, or Th 228 ≥ 27,000,000 pCi; or Cs-137 ≥ 270,000,000 pCi or U-234 ≥ 160,000,000 pCi; or H-3 ≥ 1 Ci. **If YES - Do not ship.**			
The sample is tentatively identified as DOT hazard Class 7 (Radioactive). The shipment is labeled *Radioactive Material, Excepted Package - Limited Quantity of Material - UN2910*, based on prior analytical measurements of radioactive isotopes.		X	

TEST - AK	YES	NO	NA
The shippers documented knowledge of the sample positively identifies appropriate labeling.			X

Documented Field Team Member Statement	YES	NO	NA
The sample is tentatively identified as DOT hazard Class 7 (Radioactive). The shipment is labeled *Radioactive Material, Excepted Package - Limited Quantity of Material - UN2910*, and the sample is submitted to ARS or RP for hazard classification analysis.			X

These samples do not meet the criteria for classification in any hazard class according to regulation OSHA 29 CFR 1910.1200. The sample(s) contained in this shipment have been assigned a tentative proper DOT shipping name, hazard class, identification number, and packing group, based on the shipper's knowledge of the sample:

Hazard Assessment Completed	Date/Time
(Printed Name) Tanner Bahnsen	2-13-2018
(Signature)	0935

Hazard Assessment Reviewed	Date/Time
(Printed Name) D. Shannon Woodward	2/13/18
(Signature)	9:35

Shipping Classification Determination Checklist

Sampling Plan ID/Name: 11669(cdv-37-1(i)) COC: 2018-1750

TEST - Explosives	YES	NO
Samples collected from a WFO area? (TAs -8, 9, 11, 16, 37, 14, 15, 36, 22, 39, 40, and 49)	X	

Field Test for Explosives Results	YES	NO	NA
HE SPOT test result positive. **If YES - Do not transport.**		X	

TEST - Chemical Preservation	YES	NO
Samples are chemically preserved?	X	

Field Team Member Statement	YES	NO	NA
Chemical preservation exceeds limits given 40 CFR 136, Table II - Required Containers, Preservation Techniques and Holding Times (footnote 3). **If YES - Do not ship.**		X	

TEST - Field Screen	YES	NO
The sample has field screening measurements of alpha and beta activity?		X

Sample Activity (dpm/100cm²)		Shipment Activity (dpm*g/100cm²)		Sampled Location	YES	NO	NA
Alpha detectable	**AND**	Alpha ≥ 160,000	**AT**	TA-1 and adjacent hillsides, TA-21, Acid Canyon, MDA C at TA-50, Area G at TA-54, TA-48, or TA-49			X
Alpha ≥ 125	**AND**	Alpha ≥ 1,250,000	**AT**	other locations			
Beta ≥ 1,500	**AND**	Beta ≥ 15,000,000	**AT**	any location			

The sample Alpha ≥ 16,000,000 dpm*g/100cm² or Beta ≥ 160,000,000 dpm*g/100cm². **If YES - Do not ship.**			
On the external surface of the sample container, alpha activity ≥ 24 dpm/cm², beta activity ≥ 240 dpm/cm², or surface activity ≥ 0.5 mR/hr. **If YES - Do not ship.**			
The sample is tentatively identified as DOT hazard Class 7 (Radioactive). The shipment is labeled *Radioactive Material, Excepted Package - Limited Quantity Material - UN2910*, based on field screening measurements of alpha and beta activity.			

TEST - Location	YES	NO
Prior analytical measurements of radioactive isotopes are available?	X	

Sample Activity (pCi/g)		Shipment Activity (pCi)	YES	NO	NA
Am-241 ≥ 27 pCi/g	**AND**	Am-241 ≥ 270,000 pCi Total		X	
Cs-137 ≥ 270 pCi/g	**AND**	Cs-137 ≥ 270,000 pCi Total			
Pu-238 ≥ 27 pCi/g	**AND**	Pu-238 ≥ 270,000 pCi Total			
Pu-239/240 ≥ 27 pCi/g	**AND**	Pu-239/240 ≥ 270,000 pCi Total			
Th-228 ≥ 27 pCi/g	**AND**	Th-228 ≥ 270,000 pCi Total			
U-234 ≥ 270 pCi/g	**AND**	U-234 ≥ 1,600,000,000 pCi Total			
U-238 ≥ 270 pCi/g	**AND**	U-238 ≥ unlimited			
H-3 ≥ 27,000,000 pCi/g	**AND**	H-3 ≥ 27,000,000,000 pCi Total			

Am-241, Pu-238, Pu-239/240, or Th 228 ≥ 27,000,000 pCi; or Cs-137 ≥ 270,000,000 pCi or U-234 ≥ 160,000,000 pCi; or H-3 ≥ 1 Ci. **If YES - Do not ship.**			
The sample is tentatively identified as DOT hazard Class 7 (Radioactive). The shipment is labeled *Radioactive Material, Excepted Package - Limited Quantity of Material - UN2910*, based on prior analytical measurements of radioactive isotopes.		X	

TEST - AK	YES	NO	NA
The shippers documented knowledge of the sample positively identifies appropriate labeling.			X

Documented Field Team Member Statement	YES	NO	NA
The sample is tentatively identified as DOT hazard Class 7 (Radioactive). The shipment is labeled *Radioactive Material, Excepted Package - Limited Quantity of Material – UN2910*, and the sample is submitted to ARS or RP for hazard classification analysis.			X

These samples do not meet the criteria for classification in any hazard class according to regulation OSHA 29 CFR 1910.1200. The sample(s) contained in this shipment have been assigned a tentative proper DOT shipping name, hazard class, identification number, and packing group, based on the shipper's knowledge of the sample:

Hazard Assessment Completed	Date/Time
(Printed Name) Tanner Barham	2-13-2018
(Signature)	1040

Hazard Assessment Reviewed	Date/Time
(Printed Name) Kayce Ortiz	2/13/18
(Signature) Kayce Ortiz	1040

Shipping Classification Determination Checklist

Sampling Plan ID/Name: 11669 R-47i **COC:** 2018-1750

TEST - Explosives	YES	NO
Samples collected from a WFO area? (TAs -8, 9, 11, 16, 37, 14, 15, 36, 22, 39, 40, and 49)	✓	

Field Test for Explosives Results	YES	NO	NA
HE SPOT test result positive. **If YES - Do not transport.**		✓	

TEST - Chemical Preservation	YES	NO
Samples are chemically preserved?	✓	

Field Team Member Statement	YES	NO	NA
Chemical preservation exceeds limits given 40 CFR 136, Table II - Required Containers, Preservation Techniques and Holding Times (footnote 3). **If YES - Do not ship.**		✓	NA

TEST - Field Screen	YES	NO
The sample has field screening measurements of alpha and beta activity?		✓

Sample Activity (dpm/100cm²)		Shipment Activity (dpm*g/100cm²)		Sampled Location	YES	NO	NA
Alpha detectable	**AND**	Alpha ≥ 160,000	**AT**	TA-1 and adjacent hillsides, TA-21, Acid Canyon, MDA C at TA-50, Area G at TA-54, TA-48, or TA-49			✓
Alpha ≥ 125	**AND**	Alpha ≥ 1,250,000	**AT**	other locations			✓
Beta ≥ 1,500	**AND**	Beta ≥ 15,000,000	**AT**	any location			✓
The sample Alpha ≥ 16,000,000 dpm*g/100cm² or Beta ≥ 160,000,000 dpm*g/100cm². **If YES - Do not ship.**							✓
On the external surface of the sample container, alpha activity ≥ 24 dpm/cm², beta activity ≥ 240 dpm/cm², or surface activity ≥ 0.5 mR/hr. **If YES - Do not ship.**							✓
The sample is tentatively identified as DOT hazard Class 7 (Radioactive). The shipment is labeled *Radioactive Material, Excepted Package - Limited Quantity Material - UN2910*, based on field screening measurements of alpha and beta activity.							✓

TEST - Location	YES	NO
Prior analytical measurements of radioactive isotopes are available?	✓	

Sample Activity (pCi/g)		Shipment Activity (pCi)	YES	NO	NA
Am-241 ≥ 27 pCi/g	**AND**	Am-241 ≥ 270,000 pCi Total			
Cs-137 ≥ 270 pCi/g	**AND**	Cs-137 ≥ 270,000 pCi Total			
Pu-238 ≥ 27 pCi/g	**AND**	Pu-238 ≥ 270,000 pCi Total		✓	
Pu-239/240 ≥ 27 pCi/g	**AND**	Pu-239/240 ≥ 270,000 pCi Total			
Th-228 ≥ 27 pCi/g	**AND**	Th-228 ≥ 270,000 pCi Total			
U-234 ≥ 270 pCi/g	**AND**	U-234 ≥ 1,600,000,000 pCi Total			
U-238 ≥ 270 pCi/g	**AND**	U-238 ≥ unlimited			
H-3 ≥ 27,000,000 pCi/g	**AND**	H-3 ≥ 27,000,000,000 pCi Total			
Am-241, Pu-238, Pu-239/240, or Th 228 ≥ 27,000,000 pCi; or Cs-137 ≥ 270,000,000 pCi or U-234 ≥ 160,000,000 pCi; or H-3 ≥ 1 Ci. **If YES - Do not ship.**				✓	
The sample is tentatively identified as DOT hazard Class 7 (Radioactive). The shipment is labeled *Radioactive Material, Excepted Package - Limited Quantity of Material - UN2910*, based on prior analytical measurements of radioactive isotopes.				✓	

TEST - AK	YES	NO	NA
The shippers documented knowledge of the sample positively identifies appropriate labeling.			✓

Documented Field Team Member Statement	YES	NO	NA
The sample is tentatively identified as DOT hazard Class 7 (Radioactive). The shipment is labeled *Radioactive Material, Excepted Package - Limited Quantity of Material - UN2910*, and the sample is submitted to ARS or RP for hazard classification analysis.			✓

These samples do not meet the criteria for classification in any hazard class according to regulation OSHA 29 CFR 1910.1200. The sample(s) contained in this shipment have been assigned a tentative proper DOT shipping name, hazard class, identification number, and packing group, based on the shipper's knowledge of the sample:

Hazard Assessment Completed	Date/Time
(Printed Name) Katrina Tow	2/8/18
(Signature)	1435

Hazard Assessment Reviewed	Date/Time
(Printed Name) Rana Orski	2/8/18
(Signature)	1435

R-47i

Sampling Plan ID/Name: 11669 R-25b, CdV-16-02656 **COC:** 2018-1750

TEST –Explosives	YES	NO
Samples collected from a WFO area? (TAs -08, 09, 11, 14, 15, 16, 22, 36, 37, 39, 40, and 49)	X	

Field Test for Explosives Results	YES	NO	NA
HE SPOT test result positive. **If YES - Do not transport.**		X	

TEST – Chemical Preservation	YES	NO
Samples are chemically preserved?	X	

Field Team Member Statement	YES	NO	NA
Chemical preservation exceeds limits given 40 CFR 136, Table II – Required Containers, Preservation Techniques and Holding Times (footnote 3). **If YES - Do not ship.**		X	

TEST – Field Screen	YES	NO
The sample has field screening measurements of alpha activity and beta activity?		X

Sample Activity (dpm/100cm²)		Shipment Activity (dpm*g/100cm²)		Sampled Location	YES	NO	NA
Alpha detectable	**AND**	Alpha ≥160,000	**AT**	TA-1 and adjacent hillsides, TA-21, Acid Canyon, MDA C at TA-50, Area G at TA-54, TA-48, or TA-49			
Alpha ≥ 125	**AND**	Alpha ≥1,250,000	**AT**	other locations			
Beta ≥ 1,500	**AND**	Beta ≥15,000,000	**AT**	any location			
The sample Alpha ≥16,000,000 dpm*g/100cm² or Beta ≥ 160,000,000 dpm*g/100cm². **If YES – Do not ship.**							
On the external surface of the sample container, alpha activity ≥ 24 dpm/cm², beta activity ≥ 240 dpm/cm², or surface activity ≥ 0.5 mR/hr. **If YES – Do not ship.**							
The sample is tentatively identified as DOT Hazard Class 7 (Radioactive). The shipment is labeled Radioactive Material, Excepted Package – Limited Quantity of Material – UN2910, based on field screening measurements of alpha and beta activity.							

TEST - Location	YES	NO
Prior analytical measurements of radioactive isotopes are available?	X	

Sample Activity (pCi/g)		Shipment Activity (pCi)	YES	NO	NA
• Am-241 ≥ 27 pCi/g	**AND**	Am-241 ≥ 270,000 pCi Total			
• Cs-137 ≥ 270 pCi/g	**AND**	Cs-137 ≥ 270,000 pCi Total			
• Pu-238 ≥ 27 pCi/g	**AND**	Pu-238 ≥ 270,000 pCi Total			
• Pu-239/240 ≥ 27 pCi/g	**AND**	Pu-239/240 ≥ 270,000 pCi Total			
• Th-228 ≥ 27 pCi/g	**AND**	Th-228 ≥ 270,000 pCi Total			
• U-234 ≥ 270 pCi/g	**AND**	U-234 ≥ 1,600,000,000 pCi Total			
• U-238 ≥ 270 pCi/g	**AND**	U-238 ≥ unlimited			
• H-3 ≥ 27,000,000 pCi/g	**AND**	H-3 ≥ 27,000,000,000 pCi Total			
Am-241, Pu-238, Pu-239/240, or Th-228 ≥ 27,000,000 pCi; or Cs-137 ≥ 270,000,000 pCi or U-234 ≥ 160,000,000 pCi; or H-3 ≥ 1 Ci. **If YES – Do not ship.**					
The sample is tentatively identified as DOT Hazard Class 7 (Radioactive). The shipment is labeled Radioactive Material, Excepted Package – Limited Quantity of Material – UN2910, based on prior analytical measurements of radioactive isotopes.					

TEST –AK	YES	NO
The shippers documented knowledge of the sample positively identifies appropriate labeling.		X

Documented Field Team Member Statement	YES	NO	NA
The sample is tentatively identified as DOT Hazard Class 7 (Radioactive). The shipment is labeled *Radioactive Material, Excepted Package – Limited Quantity of Material – UN2910*, and the sample is submitted to ARS or RP for hazard classification analysis.			X

These samples do not meet the criteria for classification in any hazard class according to regulation OSHA 29 CFR 1910.1200. The sample(s) contained in this shipment have been assigned a tentative proper DOT shipping name, hazard class, identification number, and packing group, based on the shipper's knowledge of the sample:

Hazard Assessment Completed By:	Date/Time
(Printed Name) Tanya VanderVis	2-13-18
(Signature) Tanya VanderVis	1301

Hazard Assessment Reviewed By:	Date/Time
(Printed Name) Renee Onstott	2/13/18
(Signature) Renee Onstott	1301

Sampling Plan ID/Name: 11669 (R-18, Paj Below S+N Ancho E Basin Confluence) **COC:** 2018-1750

TEST – Explosives	YES		NO
Samples collected from a WFO area? (TAs -08, 09, 11, 14, 15, 16, 22, 36, 37, 39, 40, and 49)	X		
Field Test for Explosives Results	**YES**	**NO**	**NA**
HE SPOT test result positive. **If YES - Do not transport.**		✓	

TEST – Chemical Preservation	YES		NO
Samples are chemically preserved?	✓		
Field Team Member Statement	**YES**	**NO**	**NA**
Chemical preservation exceeds limits given 40 CFR 136, Table II – Required Containers, Preservation Techniques and Holding Times (footnote 3). **If YES - Do not ship.**		✓	

TEST – Field Screen				YES		NO
The sample has field screening measurements of alpha activity and beta activity?						✓
Sample Activity (dpm/100cm²)		**Shipment Activity (dpm*g/100cm²)**	**Sampled Location**	**YES**	**NO**	**NA**
Alpha detectable	**AND**	Alpha ≥160,000	**AT** TA-1 and adjacent hillsides, TA-21, Acid Canyon, MDA C at TA-50, Area G at TA-54, TA-48, or TA-49			✓
Alpha ≥ 125	**AND**	Alpha ≥1,250,000	**AT** other locations			
Beta ≥ 1,500	**AND**	Beta ≥15,000,000	**AT** any location			
The sample Alpha ≥16,000,000 dpm*g/100cm² or Beta ≥ 160,000,000 dpm*g/100cm². **If YES – Do not ship.**						
On the external surface of the sample container, alpha activity ≥ 24 dpm/cm², beta activity ≥ 240 dpm/cm², or surface activity ≥ 0.5 mR/hr. **If YES – Do not ship.**						
The sample is tentatively identified as DOT Hazard Class 7 (Radioactive). The shipment is labeled Radioactive Material, Excepted Package – Limited Quantity of Material – UN2910, based on field screening measurements of alpha and beta activity.						

TEST - Location			YES		NO
Prior analytical measurements of radioactive isotopes are available?			✓		
Sample Activity (pCi/g)		**Shipment Activity (pCi)**	**YES**	**NO**	**NA**
• Am-241 ≥ 27 pCi/g	**AND**	Am-241 ≥ 270,000 pCi Total		✓	
• Cs-137 ≥ 270 pCi/g	**AND**	Cs-137 ≥ 270,000 pCi Total			
• Pu-238 ≥ 27 pCi/g	**AND**	Pu-238 ≥ 270,000 pCi Total			
• Pu-239/240 ≥ 27 pCi/g	**AND**	Pu-239/240 ≥ 270,000 pCi Total			
• Th-228 ≥ 27 pCi/g	**AND**	Th-228 ≥ 270,000 pCi Total			
• U-234 ≥ 270 pCi/g	**AND**	U-234 ≥ 1,600,000,000 pCi Total			
• U-238 ≥ 270 pCi/g	**AND**	U-238 ≥ unlimited			
• H-3 ≥ 27,000,000 pCi/g	**AND**	H-3 ≥ 27,000,000,000 pCi Total			
Am-241, Pu-238, Pu-239/240, or Th-228 ≥ 27,000,000 pCi; or Cs-137 ≥ 270,000,000 pCi or U-234 ≥ 160,000,000 pCi; or H-3 ≥ 1 Ci. **If YES – Do not ship.**					
The sample is tentatively identified as DOT Hazard Class 7 (Radioactive). The shipment is labeled Radioactive Material, Excepted Package – Limited Quantity of Material – UN2910, based on prior analytical measurements of radioactive isotopes.					

TEST – AK	YES		NO
The shippers documented knowledge of the sample positively identifies appropriate labeling.			✓
Documented Field Team Member Statement	**YES**	**NO**	**NA**
The sample is tentatively identified as DOT Hazard Class 7 (Radioactive). The shipment is labeled *Radioactive Material, Excepted Package – Limited Quantity of Material – UN2910*, and the sample is submitted to ARS or RP for hazard classification analysis.			✓

These samples do not meet the criteria for classification in any hazard class according to regulation OSHA 29 CFR 1910.1200. The sample(s) contained in this shipment have been assigned a tentative proper DOT shipping name, hazard class, identification number, and packing group, based on the shipper's knowledge of the sample:

Hazard Assessment Completed By:	Date/Time
(Printed Name) Allisyn Stanfield	2/13/18
(Signature) [signature]	1535

Hazard Assessment Reviewed By:	Date/Time
(Printed Name) [signature]	2/13/18
(Signature) [signature]	1535

DATA VALIDATION REPORT

Chain Of Custody No. 2018-1750

1. Distribution Of Samples In EDD.

SDG	Analytical Method	Regular Samples	Field Duplicates	Trip Blanks	Field Blanks	Equipment Blanks
ARS1-18-00506	Generic:Low_Level_Tritium	1				
ARS1-18-00506	Generic:Low_Level_Tritium	1				
ARS1-18-00506	Generic:Low_Level_Tritium	2	1			
ARS1-18-00506	Generic:Low_Level_Tritium	1				

SDG	Analytical Method	Analysis Lot ID	Prep Lot ID	Regular Samples	Field Duplicates	Trip Blanks	Field Blanks	Equipment Blanks	Method Blanks	Matrix Spikes	Matrix Spike Dups	Analytical Spikes	Post-Digestion Spikes	Lab Control Samples	Lab Control Sample Dups	Blank Spike	Blank Spike Dups	Lab Duplicates	Storage Blanks	Preparation Blanks	Reagent Blanks
ARS1-18-00506	Generic:Low_Level_Tritium	ARS1-B18-	ARS1-B18-	5	1				1					1	1						

2. Distribution Of Analytes In EDD.

Analytical Method	Analytical Method Category	Field Sample ID	Lab Sample ID	Sample Purpose	Target Analytes	Surrogates	Spiked Compounds	TICS
Generic:Low_Level_Tritium	RAD	CAMO-18-10	ARS1-B18-00506-07	REG	1	0	0	0
Generic:Low_Level_Tritium	RAD	CAPA-18-4	ARS1-B18-00506-05	REG	1	0	0	0
Generic:Low_Level_Tritium	RAD	CAWA-18-151310	ARS1-B18-00506-09	FD	1	0	0	0
Generic:Low_Level_Tritium	RAD	CAWA-18-46	ARS1-B18-00506-04	REG	1	0	0	0
Generic:Low_Level_Tritium	RAD	CAWA-18-51	ARS1-B18-00506-06	TEST	1	0	0	0
Generic:Low_Level_Tritium	RAD	CAWA-18-58	ARS1-B18-00506-10	REG	1	0	0	0
Generic:Low_Level_Tritium	RAD	CAWA-18-64	ARS1-B18-00506-08	REG	1	0	0	0
Generic:Low_Level_Tritium	RAD	LCS	ARS1-B18-00506-01	LCS	0	0	1	0
Generic:Low_Level_Tritium	RAD	LCSD	ARS1-B18-00506-02	LCSD	0	0	1	0
Generic:Low_Level_Tritium	RAD	MB	ARS1-B18-00506-03	MB	1	0	0	0

3. Are any analytes missing?

No.

4. Were any holding times exceeded?

No.

5. Any contaminants in blanks?

No.

6. Any surrogate recoveries outside the control limits?

No.

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

No.

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

No.

9. Any Field Duplicate RPDs outside the desired limits?

No.

10. Any Lab Duplicate RPDs outside the desired limits?

No.

11. Any required reporting limits exceeded?

No.

12. Additional Validator's Comments.

DATA VALIDATION REPORT

13. Display Flagged Data.

Location ID	COC Number	Field Sample ID	Sample Purpose	Analysis Type Code	Analytical Suite	Analytical Method	Paramter Name	Lab Qualifier	Validation Qualifier	Validation Reason Codes	Detect Flag	Lab Result	Lab Units	Report Result	Report Units	Report MDA	Report Uncertainty	Lab Matrix	Sample Date	Percent	Analysis Lot ID	Validation Status Code	Use Flag
R-18	2018-1750	CAPA-18-4	REG	INIT	RAD	Generic:Low_Level_Tritiu	Tritium	U	U	R5	N	-0.457	pCi/L	-0.457	pCi/L	2.790	0.817	W	02/13/2018		ARS1-B18-00506	VAL	Y
R-47	2018-1750	CAWA-18-151310	FD	INIT	RAD	Generic:Low_Level_Tritiu	Tritium	U	U	R5	N	-1.630	pCi/L	-1.630	pCi/L	3.129	0.924	W	02/13/2018		ARS1-B18-00506	VAL	Y
CDV-37-1(i)	2018-1750	CAWA-18-46	REG	INIT	RAD	Generic:Low_Level_Tritiu	Tritium	U	U	R5	N	-0.306	pCi/L	-0.306	pCi/L	2.629	0.771	W	02/09/2018		ARS1-B18-00506	VAL	Y
R-25b	2018-1750	CAWA-18-51	TEST	INIT	RAD	Generic:Low_Level_Tritiu	Tritium	U	U	R5	N	1.975	pCi/L	1.975	pCi/L	2.900	0.939	W	02/09/2018		ARS1-B18-00506	VAL	Y
R-47i	2018-1750	CAWA-18-58	REG	INIT	RAD	Generic:Low_Level_Tritiu	Tritium	U	U	R5	N	-0.232	pCi/L	-0.232	pCi/L	2.198	0.645	W	02/08/2018		ARS1-B18-00506	VAL	Y
R-47	2018-1750	CAWA-18-64	REG	INIT	RAD	Generic:Low_Level_Tritiu	Tritium	U	U	R5	N	-0.452	pCi/L	-0.452	pCi/L	2.954	0.865	W	02/13/2018		ARS1-B18-00506	VAL	Y

Reason Code	Description
NQ	The analytical laboratory did not qualifiy the analyte as not detected and/or any other standard qualifire. The analyte is detected in the sample.
R5	Analyte is not detected because the amount reported is less than the MDC.

14. Usable Result Count.

Field Sample ID	Location ID	Sample Purpose	Analytical Method	No. Unuseable Records	Total Records
CAMO-18-10	R-45 S2	REG	Generic:Low_Level_Tritium	0	1
CAPA-18-4	R-18	REG	Generic:Low_Level_Tritium	0	1
CAWA-18-151310	R-47	FD	Generic:Low_Level_Tritium	0	1
CAWA-18-46	CDV-37-1(i)	REG	Generic:Low_Level_Tritium	0	1
CAWA-18-51	R-25b	TEST	Generic:Low_Level_Tritium	0	1
CAWA-18-58	R-47i	REG	Generic:Low_Level_Tritium	0	1
CAWA-18-64	R-47	REG	Generic:Low_Level_Tritium	0	1

Only results shown in Section 13 'Display Flagged Data' are current as of this report generation. All other sections are valid for the date the COC data was inserted into EIM, and may have changed due to data updates in the intervening time.

INTERNATIONAL

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American Radiation Services Analytical Reports

for

Los Alamos National Laboratory

Request Number: 2018-1750

SDG: ARS1-18-00506

INTERNATIONAL

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American Radiation Services Analytical Reports

for

Los Alamos National Laboratory Request: 2018-1750

Original COC

American Radiation

Baton Rouge LA

Chain of Custody/Analysis Request

COC/Lab Request #: 2018-1750

Client Contact:

Lab Agreement #:

Site Name: Los Alamos National Laboratory

Project Number: ADEP

Analysis Turnaround Time:

24 Hour - ☐ Other - ☐

7 Days - ☐

14 Days - ☐

21 Days - ☐

28 Days - ☒

Rad Screening Info: Locate ND

Lab Reporting Limit Type: Method Detection Limit

Field Sample ID	Sample Date	Sample Time	Sample Matrix	WSP-LL-H-3
CAWA-18-46	Feb 9 2018	12:30	W	1
CAPA-18-4	Feb 13 2018	13:47	W	1
CAWA-18-51	Feb 9 2018	14:36	W	1
CAMO-18-10	Feb 14 2018	13:27	W	1
CAWA-18-64	Feb 13 2018	12:50	W	1
CAWA-18-151310	Feb 13 2018	12:50	W	1
CAWA-18-58	Feb 8 2018	13:19	W	1

Special Instructions:

Relinquished by:	**Print Name:**	**Date/Time:** 2/15/18 3:00	**Received by:**	**Print Name:** Morgan Cavillion	**Date/Time:** 2-20-18 0920
Relinquished by:	**Print Name:**	**Date/Time:**	**Received by:**	**Print Name:**	**Date/Time:**
Relinquished by:	**Print Name:**	**Date/Time:**	**Received by:**	**Print Name:**	**Date/Time:**

INTERNATIONAL

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American Radiation Services Analytical Reports

for

Los Alamos National Laboratory Request: 2018-1750

Case Narrative

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

ARS Aleut Analytical

ARS International, LLC

Laboratory Analysis Report

ARS1-18-00506

Prepared for:

Los Alamos National Laboratory

Nita Patel
P.O. Box 1663
MS M992
Los Alamos, NM 87545

npatel@lanl.gov
sherwoods@lanl.gov

Phone: 505-665-9273
Fax: 505-665-9972

Project Manager Review

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

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

Project Manager

ProjectManagers@amrad.com

Phone: 225.381.2991
Fax: 225.381.2996

ARS Aleut Analytical

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

April 25, 2018

Nita Patel
Sherri Sherwood
Los Alamos National Laboratory
505-665-9273
npatel@lanl.gov

ARS SDG: **ARS1-18-00506**
Project Description: **2018-1750**
Charge Code: **ADEP**

Dear Nita,

On February 20, 2018, ARS Aleut Analytical, LLC received seven (7) samples to be analyzed for Enriched H-3.

The samples were processed and counted using the appropriate equipment and techniques for these types of analyses. Results of all the analyses 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 255.381.2991 or email ProjectManagers@amrad.com.

Sincerely,

Susan Leese

Susan Leese
Project Management
ARS Aleut Analytical, LLC

ARS Aleut Analytical

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1 (800) 401-4277 • Fax (225) 381-2996

PROJECT SAMPLE IDENTIFICATION CROSS-REFERENCE TO ARS SAMPLE LABORATORY IDs

Client Sample ID	ARS Aleut Analytical Sample ID
CAWA-18-46	ARS1-18-00506-001
CAPA-18-4	ARS1-18-00506-002
CAWA-18-51	ARS1-18-00506-003
CAMO-18-10	ARS1-18-00506-004
CAWA-18-64	ARS1-18-00506-005
CAWA-18-151310	ARS1-18-00506-006
CAWA-18-58	ARS1-18-00506-007

SAMPLE RECEIPT/PREP

The samples arrived in good condition. The samples were screened for radioactive contamination as per procedure **ARS-062 "Sample Receiving"**. Turnaround time was set at 40 calendar days.

ANALYTICAL METHODS

Enriched H-3 analysis was performed using **ARS-040, "Tritium Assay in Water Samples Using Electrolytic Enrichment".**

H-3 screening analysis was performed using **ARS-054, "Tritium in Water (EPA 906.0)".**

ANALYTICAL RESULTS

All QC criteria were met.

ARS Aleut Analytical Laboratory Management'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."

ARS Aleut Analytical

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

Signature	Title	Date
	Laboratory Management, ARS Aleut Analytical	4-26-18

ARS Aleut Analytical

Notes (Case Narrative):

General Comments:

1.0) Soil and Sludge analysis are reported on a wet basis or an as received basis unless otherwise indicated.
2.0) Modified analysis procedures are procedures that are modified to meet the certain specifications. An example may be the use of a water method to analyze a solid matrix due to the lack of an officially recognized procedure for the analysis of the solid matrix. Modified analyses are indicated by the subsequent addition of "m" to the procedure number (i.e. 900.0M).
3.0) All NIOSH method results are reported without blank corrections applied.

Radiochemistry Comments:

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

Definitions:

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

Data Qualifiers:

B	The analyte is found in both the associated method blank and the sample. This flag indicates probable blank contamination.
D	Sample analysis accomplished through dilution.
J	The reported result is an estimated value above the limit of detection but outside of quantitation range (e.g., matrix interference was observed).
Q	One or more quality control criteria failed (e.g., LCS recovery, surrogate spike recovery, or CCV recovery).
U	Activity is below the MDC, MDA, MDL, or LOD
N	The analyte is a tentatively identified compound using mass spectrometry or any non-customer requested compounds that are tentatively identified.
*	LCS/LCSD or MS/MSD fails RPD criteria.
S	Spike
SC	Subcontracted out to another qualified laboratory
H	Holding time exceeded
E	Exceeds MCL
**	Reporting Limit is higher than MCL; Target cannot be detected

INTERNATIONAL

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American Radiation Services Analytical Reports

for

Los Alamos National Laboratory

Low Level Tritium by Low Level Liquid Scintillation Counting

ARS Aleut Analytical

2609 North River Road • Port Allen, Louisiana 70767

1 (800) 401-4277 • FAX (225) 381-2996

ARS Sample Delivery Group: ARS1-18-00506
Client Sample ID: CAWA-18-46
Sample Collection Date: 02/09/18
Sample Matrix: Aqueous
Percent Solids: N/A

Request or PO Number: 2018-1750
ARS Sample ID: ARS1-18-00506-001
Date Received: 02/20/18
Report Date: 04/24/18

Radiochemistry

Analysis Description	Analysis Results	CSU +/-1s	MDC	DLC	CRDL	Qual	Analysis Units	Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	-0.306	0.771	2.629	1.275	3.221	U	pCi/L	ARS-040/	04/21/18 22:32	MMORGAN	N/A

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

LELAP Certificate# 01949

ARS Aleut Analytical

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ARS Sample Delivery Group: ARS1-18-00506
Client Sample ID: CAPA-18-4
Sample Collection Date: 02/13/18
Sample Matrix: Aqueous
Percent Solids: N/A

Request or PO Number: 2018-1750
ARS Sample ID: ARS1-18-00506-002
Date Received: 02/20/18
Report Date: 04/24/18

Radiochemistry

Analysis Description	Analysis Results	CSU +/-1s	MDC	DLC	CRDL	Qual	Analysis Units	Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	-0.457	0.817	2.790	1.353	3.221	U	pCi/L	ARS-040/	04/22/18 4:16	MMORGAN	N/A

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

LELAP Certificate# 01949

ARS Aleut Analytical

2609 North River Road • Port Allen, Louisiana 70767

1 (800) 401-4277 • FAX (225) 381-2996

ARS Sample Delivery Group: ARS1-18-00506
Client Sample ID: CAWA-18-51
Sample Collection Date: 02/09/18
Sample Matrix: Aqueous
Percent Solids: N/A

Request or PO Number: 2018-1750
ARS Sample ID: ARS1-18-00506-003
Date Received: 02/20/18
Report Date: 04/24/18

Radiochemistry

Analysis Description	Analysis Results	CSU +/-1s	MDC	DLC	CRDL	Qual	Analysis Units	Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	1.975	0.939	2.900	1.406	3.221	U	pCi/L	ARS-040/	04/22/18 9:59	MMORGAN	N/A

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LELAP Certificate# 01949

ARS Aleut Analytical

2609 North River Road • Port Allen, Louisiana 70767

1 (800) 401-4277 • FAX (225) 381-2996

ARS Sample Delivery Group: ARS1-18-00506
Client Sample ID: CAMO-18-10
Sample Collection Date: 02/14/18
Sample Matrix: Aqueous
Percent Solids: N/A

Request or PO Number: 2018-1750
ARS Sample ID: ARS1-18-00506-004
Date Received: 02/20/18
Report Date: 04/24/18

Radiochemistry

Analysis Description	Analysis Results	CSU +/-1s	MDC	DLC	CRDL	Qual	Analysis Units	Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	24.125	3.793	2.620	1.271	3.221		pCi/L	ARS-040/	04/22/18 15:41	MMORGAN	N/A

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

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ARS Aleut Analytical

2609 North River Road • Port Allen, Louisiana 70767

1 (800) 401-4277 • FAX (225) 381-2996

ARS Sample Delivery Group: ARS1-18-00506
Client Sample ID: CAWA-18-64
Sample Collection Date: 02/13/18
Sample Matrix: Aqueous
Percent Solids: N/A

Request or PO Number: 2018-1750
ARS Sample ID: ARS1-18-00506-005
Date Received: 02/20/18
Report Date: 04/24/18

Radiochemistry

Analysis Description	Analysis Results	CSU +/-1s	MDC	DLC	CRDL	Qual	Analysis Units	Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	-0.452	0.865	2.954	1.433	3.221	U	pCi/L	ARS-040/	04/22/18 21:24	MMORGAN	N/A

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

LELAP Certificate# 01949

ARS Aleut Analytical

2609 North River Road • Port Allen, Louisiana 70767

1 (800) 401-4277 • FAX (225) 381-2996

ARS Sample Delivery Group: ARS1-18-00506
Client Sample ID: CAWA-18-151310
Sample Collection Date: 02/13/18
Sample Matrix: Aqueous
Percent Solids: N/A

Request or PO Number: 2018-1750
ARS Sample ID: ARS1-18-00506-006
Date Received: 02/20/18
Report Date: 04/24/18

Radiochemistry

Analysis Description	Analysis Results	CSU +/-1s	MDC	DLC	CRDL	Qual	Analysis Units	Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	-1.630	0.924	3.129	1.518	3.221	U	pCi/L	ARS-040/	04/23/18 3:07	MMORGAN	N/A

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

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ARS Aleut Analytical

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ARS Sample Delivery Group: ARS1-18-00506
Client Sample ID: CAWA-18-58
Sample Collection Date: 02/08/18
Sample Matrix: Aqueous
Percent Solids: N/A

Request or PO Number: 2018-1750
ARS Sample ID: ARS1-18-00506-007
Date Received: 02/20/18
Report Date: 04/24/18

Radiochemistry

Analysis Description	Analysis Results	CSU +/-1s	MDC	DLC	CRDL	Qual	Analysis Units	Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	-0.232	0.645	2.198	1.066	3.221	U	pCi/L	ARS-040/	04/23/18 8:50	MMORGAN	N/A

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

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ARS Aleut Analytical

QC Results per Analytical Batch

Analytical Batch	**ARS1-B18-00506**
SDG	**ARS1-18-00506**
Analysis	**Low Level Tritium by Electrolytic Enrichment**
Analysis Test Method	**ARS-040/**
Analysis Code	**LSC-LLH3-AQ**
Report Units	**pCi/L**

Acceptable QC Performance Ranges

QC Sample Type	Performance Items and Ranges		
Laboratory Control Sample	**Recovery (%):**	**> 80**	**< 120**
Matrix Spike	**Recovery (%):**	**> 60**	**< 140**
Duplicate	**Replicate Error Ratio (RER):**		**< 1**
	Duplicate Error Ratio (DER):		**< 3**
	Relative Percent Difference (RPD %):		**≤ 25**

Laboratory Control Sample

Analysis Date	04/21/18 05:23	Analysis Technician	MMORGAN

Analysis Batch Sample ID	QC Type	Analyte	Results	CSU (1s)	Expected Value	LCS Rec (%)	MDC
ARS1-B18-00506-01	**LCS**	ENRICHED H-3	32.327	5.026	31.600	102.3	2.876

Duplicate RER/DER/RPD

Analysis Date	04/21/18 11:07	Analysis Technician	MMORGAN

Analyte	Results LCS	CSU LCS (1s)	Results LCSD	CSU LCSD (1s)	RER	DER	RPD
ENRICHED H-3	32.327	5.026	30.446	4.759	0.192	0.272	6.0

Method Blank

Analysis Date	04/21/18 16:49	Analysis Technician	MMORGAN

Analysis Batch Sample ID	QC Type	Analyte	Results	CSU (1s)	MDC	Qual
ARS1-B18-00506-03	**MBL**	ENRICHED H-3	-0.880	0.906	3.095	U

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

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INTERNATIONAL

2609 North River Road • Port Allen, Louisiana 70767

1 (800) 401-4277 • Fax (225) 381-2996

American Radiation Services Analytical Reports

for

Los Alamos National Laboratory

Low Level Tritium by Low Level Liquid Scintillation Counting

Laboratory Records

Analytical Batch Report

ARS Aleut Analytical

Analysis Batch ID **ARS1-B18-00506**

Method	ARS-040	Analysis	LSC-LLH3-AQ	Matrix	AQ

Description **Low Level Tritium by Electrolytic Enrichment**

ABatch Sample ID	Type	Blind Iso1	Blind Iso2	Blind Iso3	SDG	FR	Run	Prep Code	Filtered	Client ID	Group Name	Lab Deadline
ARS1-B18-00506-01	LCS	B-25087										
ARS1-B18-00506-02	LCSD	B-25088										
ARS1-B18-00506-03	MBL											
ARS1-B18-00506-04	TRG				**ARS1-18-00506**	001	1			CAWA-18-46		03/29/18
ARS1-B18-00506-05	TRG				**ARS1-18-00506**	002	1			CAPA-18-4		03/29/18
ARS1-B18-00506-06	TRG				**ARS1-18-00506**	003	1			CAWA-18-51		03/29/18
ARS1-B18-00506-07	TRG				**ARS1-18-00506**	004	1			CAMO-18-10		03/29/18
ARS1-B18-00506-08	TRG				**ARS1-18-00506**	005	1			CAWA-18-64		03/29/18
ARS1-B18-00506-09	TRG				**ARS1-18-00506**	006	1			CAWA-18-151310		03/29/18
ARS1-B18-00506-10	TRG				**ARS1-18-00506**	007	1			CAWA-18-58		03/29/18
ARS1-B18-00506-11	TRG				**ARS1-18-00556**	001	1			CAWA-18-36		04/01/18
ARS1-B18-00506-12	TRG				**ARS1-18-00556**	002	1			CAWA-18-127		04/01/18
ARS1-B18-00506-13	TRG				**ARS1-18-00556**	003	1			CAWA-18-40		04/01/18
ARS1-B18-00506-14	TRG				**ARS1-18-00556**	004	1			CAWA-18-43		04/01/18
ARS1-B18-00506-15	TRG				**ARS1-18-00556**	005	1			CAWA-18-56		04/01/18

LCS Report
Analytical Batch: ARS1-B18-00506

Blind ID	ABatch Sample ID	Blind Group	Std ID	Isotope	Exp Addition (g)	Expected Value (pCi/g)	Empty Wt (g)	Gross Wt (g)	Net Wt (g)	Expected Value CT (pCi/g)	Mid Point Count Date	Known Value (pCi)	User ID	Mod Date
B-25087	ARS1-B18-00506-01	B-H3	S-0324	H-3	5	2.46675	16.7549	21.7373	4.9824	2.45159	04/21/2018	12.21482	MMORGAN	03/12/2018
B-25088	ARS1-B18-00506-02	B-H3	S-0324	H-3	5	2.46675	17.0807	22.0536	4.9729	2.45159	04/21/2018	12.19153	MMORGAN	03/12/2018

LSC Instrument Data Transfer Report

\\Tricarb\ars\Low Level H3_2\2018042(

Batch Sample ID	Non-BKG Samples Transferred	Samples Eligible To Save
ARS1-B18-00506	15	15

LSC 5

LIMS Batch Sample ID	LSC P#	LSC PID	LSC S#	LSC SMPL_ID	LSC Count Date	LSC CPMA	LSC tSIE	LSC EFF	LSC Count Dur	Analysis Batch	LIMS SDG	LIMS Run
BKG	4		1	BACKGROUND	04/20/18 20:55	1.08	259.63	21.0600	330.00	ARS1-B18-00506		
ARS1-B18-00506-01	4		2	B18-00506-01	04/21/18 02:38	4.17	258.06	20.9900	330.00	ARS1-B18-00506		
ARS1-B18-00506-02	4		3	B18-00506-02	04/21/18 08:21	3.87	258.53	21.0100	330.00	ARS1-B18-00506		
ARS1-B18-00506-03	4		4	B18-00506-03	04/21/18 14:04	1.00	250.31	20.6400	330.00	ARS1-B18-00506		
ARS1-B18-00506-04	4		5	B18-00506-04	04/21/18 19:47	1.05	258.70	21.0200	330.00	ARS1-B18-00506	ARS1-18-00506	1
ARS1-B18-00506-05	4		6	B18-00506-05	04/22/18 01:30	1.04	233.48	19.8600	330.00	ARS1-B18-00506	ARS1-18-00506	1
ARS1-B18-00506-06	4		7	B18-00506-06	04/22/18 07:13	1.27	245.79	20.4400	330.00	ARS1-B18-00506	ARS1-18-00506	1
ARS1-B18-00506-07	4		8	B18-00506-07	04/22/18 12:56	3.61	248.46	20.5600	330.00	ARS1-B18-00506	ARS1-18-00506	1
ARS1-B18-00506-08	4		9	B18-00506-08	04/22/18 18:39	1.04	257.42	20.9600	330.00	ARS1-B18-00506	ARS1-18-00506	1
ARS1-B18-00506-09	4		10	B18-00506-09	04/23/18 00:21	0.94	241.86	20.2600	330.00	ARS1-B18-00506	ARS1-18-00506	1
ARS1-B18-00506-10	4		11	B18-00506-10	04/23/18 06:04	1.05	234.73	19.9200	330.00	ARS1-B18-00506	ARS1-18-00506	1
ARS1-B18-00506-11	4		12	B18-00506-11	04/23/18 11:48	3.55	246.50	20.4700	330.00	ARS1-B18-00506	ARS1-18-00556	1
ARS1-B18-00506-12	4		13	B18-00506-12	04/23/18 17:31	3.95	254.53	20.8300	330.00	ARS1-B18-00506	ARS1-18-00556	1
ARS1-B18-00506-13	4		14	B18-00506-13	04/23/18 23:14	1.61	229.58	19.6700	330.00	ARS1-B18-00506	ARS1-18-00556	1
ARS1-B18-00506-14	4		15	B18-00506-14	04/24/18 04:57	1.98	252.52	20.7400	330.00	ARS1-B18-00506	ARS1-18-00556	1
ARS1-B18-00506-15	4		16	B18-00506-15	04/24/18 10:40	0.95	244.37	20.3700	330.00	ARS1-B18-00506	ARS1-18-00556	1

ARS-040 Calculation Results	
ARS1-B18-00506	
ACF	1
UCF	2.22
Sys Error	0.15

AnalysisCode	ABatchSampleID	Initial_Mass_sample_g	Mass_Na2O2_added_g	Final_mass_electrolyzed_sample_NaOH_g	Mass_equivalent_NaOH_g	Final_Mass_Electrolyzed_sample_g	VolumeFactor_X	Enrichment_Factor_Y
LSC-LLH3-AQ	ARS1-B18-00506-01	386.550	1.500	15.660	1.539	14.121	0.037	21.608
LSC-LLH3-AQ	ARS1-B18-00506-02	377.520	1.500	15.950	1.539	14.411	0.038	20.714
LSC-LLH3-AQ	ARS1-B18-00506-03	375.360	1.500	16.870	1.539	15.331	0.041	19.410
LSC-LLH3-AQ	ARS1-B18-00506-04	378.150	1.500	14.760	1.539	13.221	0.035	22.539
LSC-LLH3-AQ	ARS1-B18-00506-05	375.840	1.500	14.740	1.539	13.201	0.035	22.439
LSC-LLH3-AQ	ARS1-B18-00506-06	376.250	1.500	15.660	1.539	14.121	0.038	21.054
LSC-LLH3-AQ	ARS1-B18-00506-07	378.330	1.500	14.430	1.539	12.891	0.034	23.103
LSC-LLH3-AQ	ARS1-B18-00506-08	375.320	1.500	16.290	1.539	14.751	0.039	20.141
LSC-LLH3-AQ	ARS1-B18-00506-09	376.040	1.500	16.760	1.539	15.221	0.040	19.579
LSC-LLH3-AQ	ARS1-B18-00506-10	380.110	1.500	11.980	1.539	10.441	0.027	28.420
LSC-LLH3-AQ	ARS1-B18-00506-11	380.040	1.500	16.200	1.539	14.661	0.039	20.505
LSC-LLH3-AQ	ARS1-B18-00506-12	383.800	1.500	15.840	1.539	14.301	0.037	21.200
LSC-LLH3-AQ	ARS1-B18-00506-13	380.000	1.500	13.500	1.539	11.961	0.031	24.933
LSC-LLH3-AQ	ARS1-B18-00506-14	378.700	1.500	16.080	1.539	14.541	0.038	20.597
LSC-LLH3-AQ	ARS1-B18-00506-15	375.800	1.500	15.050	1.539	13.511	0.036	21.942

ARS-040 Calculation Results

ARS1-B18-00506

ACF	1
UCF	2.22
Sys Error	0.15

AnalysisCode	ABatchSampleID	Average_Sample_CPM	Bkg_CPM	tSIE	Detector_Eff_decimal	Aliquot	AliqUnits	Activity_reference_date	Start_Date_of_Count	Sample_Count_Duration_min
LSC-LLH3-AQ	ARS1-B18-00506-01	4.167	1.081	258.060	0.210	0.01002	L	4/27/2017	4/21/2018	330.000
LSC-LLH3-AQ	ARS1-B18-00506-02	3.867	1.081	258.530	0.210	0.01001	L	4/27/2017	4/21/2018	330.000
LSC-LLH3-AQ	ARS1-B18-00506-03	1.003	1.081	250.310	0.206	0.01001	L	3/27/2018	4/21/2018	330.000
LSC-LLH3-AQ	ARS1-B18-00506-04	1.049	1.081	258.700	0.210	0.01004	L	2/9/2018	4/21/2018	330.000
LSC-LLH3-AQ	ARS1-B18-00506-05	1.036	1.081	233.480	0.199	0.01005	L	2/13/2018	4/22/2018	330.000
LSC-LLH3-AQ	ARS1-B18-00506-06	1.268	1.081	245.790	0.204	0.01002	L	2/9/2018	4/22/2018	330.000
LSC-LLH3-AQ	ARS1-B18-00506-07	3.609	1.081	248.460	0.206	0.01004	L	2/14/2018	4/22/2018	330.000
LSC-LLH3-AQ	ARS1-B18-00506-08	1.039	1.081	257.420	0.210	0.01002	L	2/13/2018	4/22/2018	330.000
LSC-LLH3-AQ	ARS1-B18-00506-09	0.938	1.081	241.860	0.203	0.01007	L	2/13/2018	4/23/2018	330.000
LSC-LLH3-AQ	ARS1-B18-00506-10	1.052	1.081	234.730	0.199	0.01005	L	2/8/2018	4/23/2018	330.000
LSC-LLH3-AQ	ARS1-B18-00506-11	3.551	1.081	246.500	0.205	0.01005	L	2/16/2018	4/23/2018	330.000
LSC-LLH3-AQ	ARS1-B18-00506-12	3.953	1.081	254.530	0.208	0.01006	L	2/16/2018	4/23/2018	330.000
LSC-LLH3-AQ	ARS1-B18-00506-13	1.612	1.081	229.580	0.197	0.00987	L	2/16/2018	4/23/2018	330.000
LSC-LLH3-AQ	ARS1-B18-00506-14	1.979	1.081	252.520	0.207	0.01018	L	2/16/2018	4/24/2018	330.000
LSC-LLH3-AQ	ARS1-B18-00506-15	0.949	1.081	244.370	0.204	0.01011	L	2/21/2018	4/24/2018	330.000

ARS-040 Calculation Results

ARS1-B18-00506

ACF	1
UCF	2.22
Sys Error	0.15

AnalysisCode	ABatchSampleID	Total_Bkg_Count_Duration_min	DF	Sample_Activity_Conc	Standard_Counting_Uncertainty	CU_1	CSU_1	CU_1_96	CSU_1_96	MDC	DLC	ActivityReportUnits
LSC-LLH3-AQ	ARS1-B18-00506-01	330.000	0.94620	32.327	1.321	1.321	5.026	2.589	9.851	2.876	1.395	pCi
LSC-LLH3-AQ	ARS1-B18-00506-02	330.000	0.94620	30.446	1.338	1.338	4.759	2.623	9.327	3.000	1.455	pCi
LSC-LLH3-AQ	ARS1-B18-00506-03	330.000	0.99616	-0.880	0.896	0.896	0.906	1.756	1.775	3.095	1.501	pCi
LSC-LLH3-AQ	ARS1-B18-00506-04	330.000	0.98897	-0.306	0.769	0.769	0.771	1.508	1.511	2.629	1.275	pCi
LSC-LLH3-AQ	ARS1-B18-00506-05	330.000	0.98958	-0.457	0.814	0.814	0.817	1.596	1.601	2.790	1.353	pCi
LSC-LLH3-AQ	ARS1-B18-00506-06	330.000	0.98897	1.975	0.891	0.891	0.939	1.747	1.841	2.900	1.406	pCi
LSC-LLH3-AQ	ARS1-B18-00506-07	330.000	0.98973	24.125	1.138	1.138	3.793	2.230	7.435	2.620	1.271	pCi
LSC-LLH3-AQ	ARS1-B18-00506-08	330.000	0.98943	-0.452	0.863	0.863	0.865	1.691	1.696	2.954	1.433	pCi
LSC-LLH3-AQ	ARS1-B18-00506-09	330.000	0.98943	-1.630	0.891	0.891	0.924	1.747	1.812	3.129	1.518	pCi
LSC-LLH3-AQ	ARS1-B18-00506-10	330.000	0.98867	-0.232	0.644	0.644	0.645	1.262	1.264	2.198	1.066	pCi
LSC-LLH3-AQ	ARS1-B18-00506-11	330.000	0.98989	26.645	1.278	1.278	4.196	2.505	8.225	2.961	1.436	pCi
LSC-LLH3-AQ	ARS1-B18-00506-12	330.000	0.98989	29.418	1.265	1.265	4.591	2.480	8.997	2.812	1.364	pCi
LSC-LLH3-AQ	ARS1-B18-00506-13	330.000	0.98973	4.993	0.849	0.849	1.132	1.665	2.219	2.581	1.252	pCi
LSC-LLH3-AQ	ARS1-B18-00506-14	330.000	0.98973	9.398	1.008	1.008	1.733	1.975	3.396	2.873	1.393	pCi
LSC-LLH3-AQ	ARS1-B18-00506-15	330.000	0.99050	-1.328	0.789	0.789	0.814	1.547	1.596	2.763	1.340	pCi

ARS-040 Calculation Results	
ARS1-B18-00506	
ACF	1
UCF	2.22
Sys Error	0.15

AnalysisCode	ABatchSampleID	AliquotReportUnits	UserID	ModDate
LSC-LLH3-AQ	ARS1-B18-00506-01	L	AMRAD\ECAMP	4/24/2018
LSC-LLH3-AQ	ARS1-B18-00506-02	L	AMRAD\ECAMP	4/24/2018
LSC-LLH3-AQ	ARS1-B18-00506-03	L	AMRAD\ECAMP	4/24/2018
LSC-LLH3-AQ	ARS1-B18-00506-04	L	AMRAD\ECAMP	4/24/2018
LSC-LLH3-AQ	ARS1-B18-00506-05	L	AMRAD\ECAMP	4/24/2018
LSC-LLH3-AQ	ARS1-B18-00506-06	L	AMRAD\ECAMP	4/24/2018
LSC-LLH3-AQ	ARS1-B18-00506-07	L	AMRAD\ECAMP	4/24/2018
LSC-LLH3-AQ	ARS1-B18-00506-08	L	AMRAD\ECAMP	4/24/2018
LSC-LLH3-AQ	ARS1-B18-00506-09	L	AMRAD\ECAMP	4/24/2018
LSC-LLH3-AQ	ARS1-B18-00506-10	L	AMRAD\ECAMP	4/24/2018
LSC-LLH3-AQ	ARS1-B18-00506-11	L	AMRAD\ECAMP	4/24/2018
LSC-LLH3-AQ	ARS1-B18-00506-12	L	AMRAD\ECAMP	4/24/2018
LSC-LLH3-AQ	ARS1-B18-00506-13	L	AMRAD\ECAMP	4/24/2018
LSC-LLH3-AQ	ARS1-B18-00506-14	L	AMRAD\ECAMP	4/24/2018
LSC-LLH3-AQ	ARS1-B18-00506-15	L	AMRAD\ECAMP	4/24/2018

ARS-040

Tritium Assay in Water Samples Using Electrolytic Enrichment

Preparation Date: 03/27/2018 09:55

Prepared By: MMORGAN

Procedure Data

ABatch Sample ID	Type	SDG/Fraction	Tare Wt of Electrolysis Cell & Electrodes	Tare Wt Reservoir	Gross Weight of Sample Reservoir	Wt Sodium Peroxide	Gross Sample Added	Electrolysis Start Date & Time	Start AMP	Start Bath (C)	Electolysis End Date/Time	End Bath (C)
ARS1-B18-00506-01	LCS		332.0200	278.3400	664.8900	1.5000	386.5500	3/27/2018 12:30:00 PM	5.0000	2.0000	4/12/2018 11:00:00 AM	2.0000
ARS1-B18-00506-02	LCSD		321.3100	222.0300	599.5500	1.5000	377.5200	3/27/2018 12:30:00 PM	5.0000	2.0000	4/12/2018 11:00:00 AM	2.0000
ARS1-B18-00506-03	MBL		327.7300	218.9000	594.2600	1.5000	375.3600	3/27/2018 12:30:00 PM	5.0000	2.0000	4/12/2018 11:00:00 AM	2.0000
ARS1-B18-00506-04	TRG	ARS1-18-00506-001	326.4800	223.7500	601.9000	1.5000	378.1500	3/27/2018 12:30:00 PM	5.0000	2.0000	4/12/2018 11:00:00 AM	2.0000
ARS1-B18-00506-05	TRG	ARS1-18-00506-002	332.4900	264.3100	640.1500	1.5000	375.8400	3/27/2018 12:30:00 PM	5.0000	2.0000	4/12/2018 11:00:00 AM	2.0000
ARS1-B18-00506-06	TRG	ARS1-18-00506-003	330.8900	227.0600	603.3100	1.5000	376.2500	3/27/2018 12:30:00 PM	5.0000	2.0000	4/12/2018 11:00:00 AM	2.0000
ARS1-B18-00506-07	TRG	ARS1-18-00506-004	320.8200	201.7000	580.0300	1.5000	378.3300	3/27/2018 12:30:00 PM	5.0000	2.0000	4/12/2018 11:00:00 AM	2.0000
ARS1-B18-00506-08	TRG	ARS1-18-00506-005	320.6100	209.5000	584.8200	1.5000	375.3200	3/27/2018 12:30:00 PM	5.0000	2.0000	4/12/2018 11:00:00 AM	2.0000
ARS1-B18-00506-09	TRG	ARS1-18-00506-006	321.0100	221.5900	597.6300	1.5000	376.0400	3/27/2018 12:30:00 PM	5.0000	2.0000	4/12/2018 11:00:00 AM	2.0000
ARS1-B18-00506-10	TRG	ARS1-18-00506-007	331.8100	212.1300	592.2400	1.5000	380.1100	3/27/2018 12:30:00 PM	5.0000	2.0000	4/12/2018 11:00:00 AM	2.0000
ARS1-B18-00506-11	TRG	ARS1-18-00556-001	317.0900	220.8000	600.8400	1.5000	380.0400	3/27/2018 12:30:00 PM	5.0000	2.0000	4/12/2018 11:00:00 AM	2.0000
ARS1-B18-00506-12	TRG	ARS1-18-00556-002	325.1500	228.7100	612.5100	1.5000	383.8000	3/27/2018 12:30:00 PM	5.0000	2.0000	4/12/2018 11:00:00 AM	2.0000
ARS1-B18-00506-13	TRG	ARS1-18-00556-003	316.7500	240.1500	620.1500	1.5000	380.0000	3/27/2018 12:30:00 PM	5.0000	2.0000	4/12/2018 11:00:00 AM	2.0000
ARS1-B18-00506-14	TRG	ARS1-18-00556-004	322.7300	220.2700	598.9700	1.5000	378.7000	3/27/2018 12:30:00 PM	5.0000	2.0000	4/12/2018 11:00:00 AM	2.0000
ARS1-B18-00506-15	TRG	ARS1-18-00556-005	321.1500	220.9200	596.7200	1.5000	375.8000	3/27/2018 12:30:00 PM	5.0000	2.0000	4/12/2018 11:00:00 AM	2.0000

Tritium Assay in Water Samples Using Electrolytic Enrichment

Procedure Data

ABatch Sample ID	Type	End Wt of Cell + Resv + Sample	Gross Sample Recovered	Enrichment Factor	Tare Wt Cryo-distil flask	Gross Wt flask + Sample	Recovered Water	Tare Weight of LSC Vial	Vial + Sample	Net Sample	Gross Wt Vial + Dead Water If used	Net Dead Water Added
ARS1-B18-00506-01	LCS	626.0200	15.6600	24.6839	126.3400	138.9500	12.6100	6.7200	16.7400	10.0200	16.7400	0.0000
ARS1-B18-00506-02	LCSD	559.2900	15.9500	23.6690	122.8700	135.7400	12.8700	6.6000	16.6100	10.0100	16.6100	0.0000
ARS1-B18-00506-03	MBL	563.5000	16.8700	22.2501	128.3400	141.4900	13.1500	6.6500	16.6600	10.0100	16.6600	0.0000
ARS1-B18-00506-04	TRG	564.9900	14.7600	25.6199	129.7700	141.2700	11.5000	6.6000	16.6400	10.0400	16.6400	0.0000
ARS1-B18-00506-05	TRG	611.5400	14.7400	25.4980	126.3300	138.3100	11.9800	6.5700	16.6200	10.0500	16.6200	0.0000
ARS1-B18-00506-06	TRG	573.6100	15.6600	24.0262	122.8500	135.2800	12.4300	6.5600	16.5800	10.0200	16.5800	0.0000
ARS1-B18-00506-07	TRG	536.9500	14.4300	26.2183	128.3500	139.5000	11.1500	6.5600	16.6000	10.0400	16.6000	0.0000
ARS1-B18-00506-08	TRG	546.4000	16.2900	23.0399	129.7700	143.2800	13.5100	6.6600	16.6800	10.0200	16.6800	0.0000
ARS1-B18-00506-09	TRG	559.3600	16.7600	22.4368	126.2800	140.3300	14.0500	6.5500	16.6200	10.0700	16.6200	0.0000
ARS1-B18-00506-10	TRG	555.9200	11.9800	31.7287	128.3000	139.1800	10.8800	6.5800	16.6300	10.0500	16.6300	0.0000
ARS1-B18-00506-11	TRG	554.0900	16.2000	23.4593	129.7100	142.7600	13.0500	6.5400	16.5900	10.0500	16.5900	0.0000
ARS1-B18-00506-12	TRG	569.7000	15.8400	24.2298	121.3100	132.5200	11.2100	6.5700	16.6300	10.0600	16.6300	0.0000
ARS1-B18-00506-13	TRG	570.4000	13.5000	28.1481	126.3100	136.2600	9.9500	6.5800	16.4500	9.8700	16.6700	0.2200
ARS1-B18-00506-14	TRG	559.0800	16.0800	23.5510	122.8400	136.0600	13.2200	6.5200	16.7000	10.1800	16.7000	0.0000
ARS1-B18-00506-15	TRG	557.1200	15.0500	24.9701	127.3400	139.0200	11.6800	6.6000	16.7100	10.1100	16.7100	0.0000

Tritium Assay in Water Samples Using Electrolytic Enrichment

Procedure Data

ABatch Sample ID	Type	Tare Wt b/f Cocktail	Gross Wt Vial + Cocktail	Net Wt of Cocktail Added
ARS1-B18-00506-01	LCS	16.7400	27.2600	10.5200
ARS1-B18-00506-02	LCSD	16.6100	26.6400	10.0300
ARS1-B18-00506-03	MBL	16.6600	26.7200	10.0600
ARS1-B18-00506-04	TRG	16.6400	26.6800	10.0400
ARS1-B18-00506-05	TRG	16.6200	26.6600	10.0400
ARS1-B18-00506-06	TRG	16.5800	26.6500	10.0700
ARS1-B18-00506-07	TRG	16.6000	26.6600	10.0600
ARS1-B18-00506-08	TRG	16.6800	26.7300	10.0500
ARS1-B18-00506-09	TRG	16.6200	26.6400	10.0200
ARS1-B18-00506-10	TRG	16.6300	26.6900	10.0600
ARS1-B18-00506-11	TRG	16.5900	26.6300	10.0400
ARS1-B18-00506-12	TRG	16.6300	26.6900	10.0600
ARS1-B18-00506-13	TRG	16.6700	26.7200	10.0500
ARS1-B18-00506-14	TRG	16.7000	26.7500	10.0500
ARS1-B18-00506-15	TRG	16.7100	26.7800	10.0700

Tritium Assay in Water Samples Using Electrolytic Enrichment

Reagent Amounts

ABatch Sample ID	Type	SDG/Fraction	14.3.22 DISTILLATION - Add scint cocktail - Ultima Gold LLT Reagent Grade (mL)
ARS1-B18-00506-01	LCS		10.00
ARS1-B18-00506-02	LCSD		10.00
ARS1-B18-00506-03	MBL		10.00
ARS1-B18-00506-04	TRG	ARS1-18-00506-001	10.00
ARS1-B18-00506-05	TRG	ARS1-18-00506-002	10.00
ARS1-B18-00506-06	TRG	ARS1-18-00506-003	10.00
ARS1-B18-00506-07	TRG	ARS1-18-00506-004	10.00
ARS1-B18-00506-08	TRG	ARS1-18-00506-005	10.00
ARS1-B18-00506-09	TRG	ARS1-18-00506-006	10.00
ARS1-B18-00506-10	TRG	ARS1-18-00506-007	10.00
ARS1-B18-00506-11	TRG	ARS1-18-00556-001	10.00
ARS1-B18-00506-12	TRG	ARS1-18-00556-002	10.00
ARS1-B18-00506-13	TRG	ARS1-18-00556-003	10.00
ARS1-B18-00506-14	TRG	ARS1-18-00556-004	10.00
ARS1-B18-00506-15	TRG	ARS1-18-00556-005	10.00

Tritium Assay in Water Samples Using Electrolytic Enrichment

Reagent Tracking

Procedure Section	Reagent ID
14.2.12 DISTILLAT - Ionize & add O to electrolysis	R17-00926
14.3.22 DISTILLATION - Add scint cocktail	R17-00665

Assay Definition

Assay Description:
LLH3 Assay in DPM Mode
Assay Type: DPM (Single)
Report Name: Report1
Output Data Path: C:\Packard\Tricarb\Results\ARS\Low Level H3_2\20180420_1511
Raw Results Path: C:\Packard\Tricarb\Results\ARS\Low Level H3_2\20180420_1511\20180420_1511.results
RTF File Name: C:\Packard\Tricarb\Results\ARS\Low Level H3_2\20180420_1511\LLH3.rtf
Comma-Delimited File Name: C:\Packard\Tricarb\Results\ARS\Low Level H3_2\20180420_1511\LLH3 Results.csv
Assay File Name: C:\Packard\TriCarb\Assays\Low Level H3_2.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: LLH3 10ml
Count Time (min): 330.00
Count Mode: Low Level
Assay Count Cycles: 1 Repeat Sample Count: 1
Number of Vials/Sample: 1 Calculate % Reference: Off

Background Subtract

Background Subtract: Off
Low CPM Threshold: Off
2 Sigma % Terminator: Off

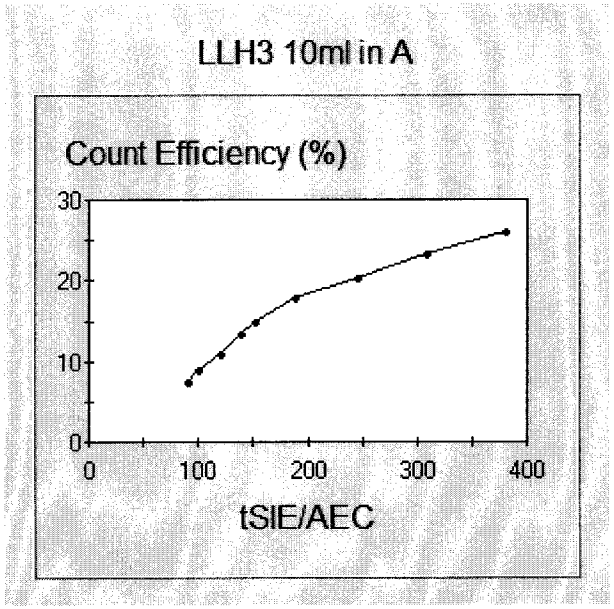
Regions	LL	UL
A	2.0	18.6
B	0.0	2000.0
C	0.0	2000.0

Count Corrections

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

Cycle 1 Results

Quench Curve Block Data



Date Acquired: 08/18/2017
Date Modified:
LLH3 10ml in A

tSIE/AEC	Count Efficiency (%)
380.12	26.09
307.45	23.20
245.66	20.44
188.72	17.73
151.46	14.93
138.74	13.42
120.63	11.00
99.95	9.01
80.27	7.44

P#	S#	SMPL ID	CPMA	DPM1	tSIE	Eff Nuc1 In A	Count Time	DATE	TIME	MESSAGES
4	1	BACKGROUND	1.081	5.14	259.63	21.06	330.00	4/20/2018	8:55:06 PM	

4	2	B18-00506-01	4.167	19.85	258.06	20.99	330.00	4/21/2018	2:38:23 AM
4	3	B18-00506-02	3.867	18.41	258.53	21.01	330.00	4/21/2018	8:21:31 AM
4	4	B18-00506-03	1.003	4.86	250.31	20.64	330.00	4/21/2018	2:04:08 PM
4	5	B18-00506-04	1.049	4.99	258.70	21.02	330.00	4/21/2018	7:47:21 PM
4	6	B18-00506-05	1.036	5.21	233.48	19.86	330.00	4/22/2018	1:30:32 AM
4	7	B18-00506-06	1.268	6.20	245.79	20.44	330.00	4/22/2018	7:13:32 AM
4	8	B18-00506-07	3.609	17.55	248.46	20.56	330.00	4/22/2018	12:56:25 PM
4	9	B18-00506-08	1.039	4.96	257.42	20.96	330.00	4/22/2018	6:39:10 PM
4	10	B18-00506-09	0.938	4.63	241.86	20.26	330.00	4/23/2018	12:21:57 AM
4	11	B18-00506-10	1.052	5.28	234.73	19.92	330.00	4/23/2018	6:04:58 AM
4	12	B18-00506-11	3.551	17.34	246.50	20.47	330.00	4/23/2018	11:48:10 AM
4	13	B18-00506-12	3.953	18.98	254.53	20.83	330.00	4/23/2018	5:31:13 PM
4	14	B18-00506-13	1.612	8.20	229.58	19.67	330.00	4/23/2018	11:14:34 PM
4	15	B18-00506-14	1.979	9.54	252.52	20.74	330.00	4/24/2018	4:57:25 AM
4	16	B18-00506-15	0.949	4.66	244.37	20.37	330.00	4/24/2018	10:40:23 AM

Liquid Scintillation Count Log

Date	Time	ARS Sample I.D. Number	Batch Fraction Number	Liquid Scintillation File Number	Technician Initials	Notes Identifier
4/20/2018	14:00	Background	N/A	1511	SC	
4/20/2018	14:00	B18-00506	1	1511	SC	
4/20/2018	14:00	B18-00506	2	1511	SC	
4/20/2018	14:00	B18-00506	3	1511	SC	
4/20/2018	14:00	B18-00506	4	1511	SC	
4/20/2018	14:00	B18-00506	5	1511	SC	
4/20/2018	14:00	B18-00506	6	1511	SC	
4/20/2018	14:00	B18-00506	7	1511	SC	
4/20/2018	14:00	B18-00506	8	1511	SC	
4/20/2018	14:00	B18-00506	9	1511	SC	
4/20/2018	14:00	B18-00506	10	1511	SC	
4/20/2018	14:00	B18-00506	11	1511	SC	
4/20/2018	14:00	B18-00506	12	1511	SC	
4/20/2018	14:00	B18-00506	13	1511	SC	
4/20/2018	14:00	B18-00506	14	1511	SC	
4/20/2018	14:00	B18-00506	15	1511	SC	
4/20/2018	14:00	SNC163	QA	QA	SC	3

Notes

3	Late entry. SNC Counted before samples of B18-00506. 4/23/2018 11:11	SC

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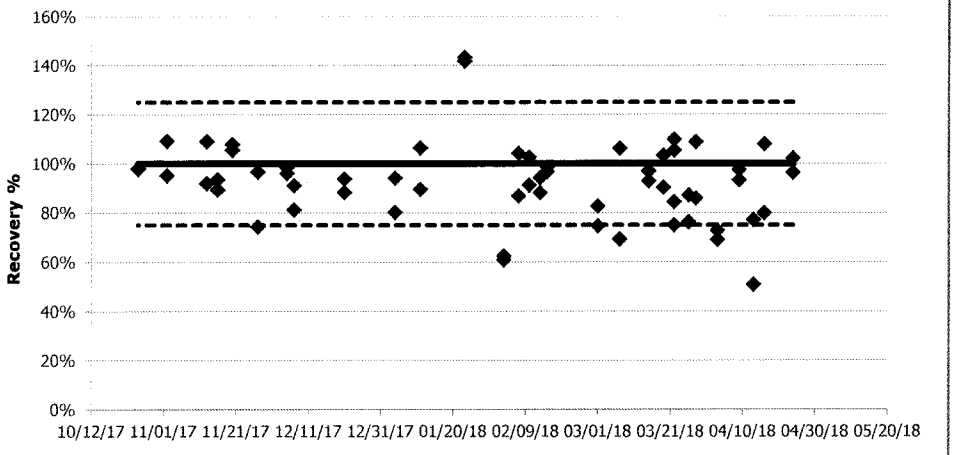
Low Level Tritium by Low Level Liquid Scintillation Counting

Control Charts

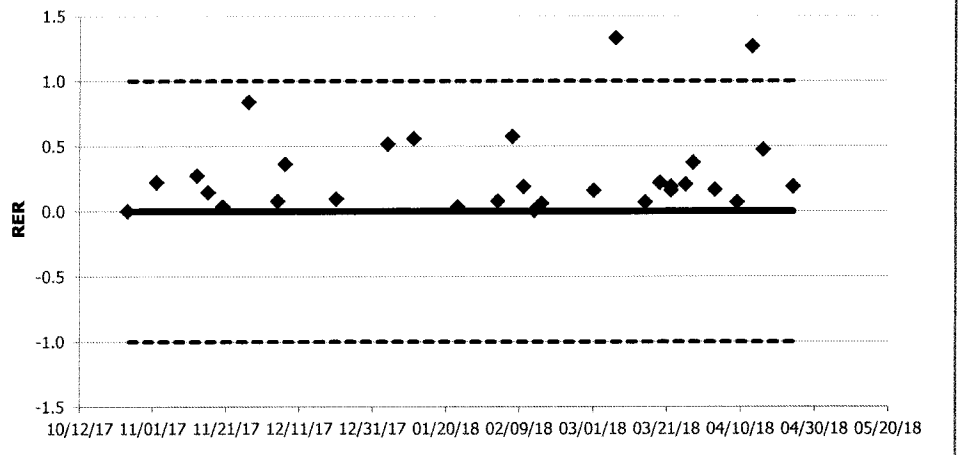
QC Chart

LLH-3 LCS



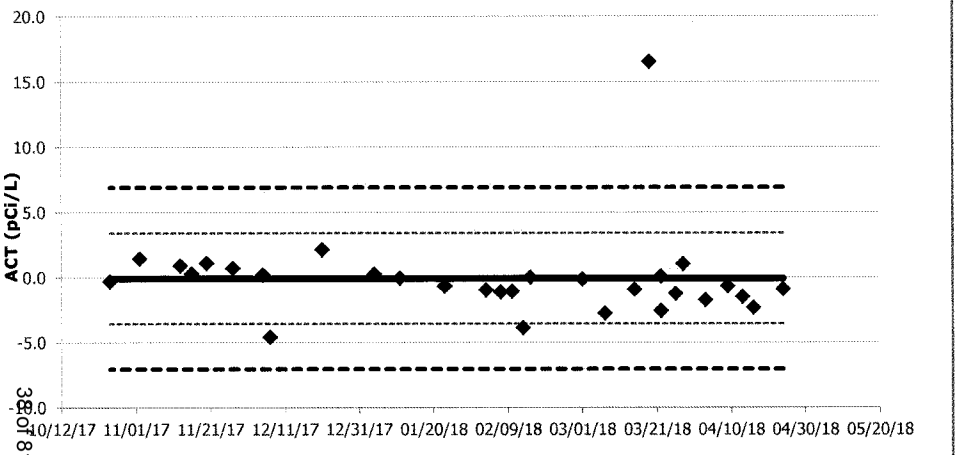
Average	STDEV	n	UCL	LCL
0.9263	0.1612	30	1.2500	0.7500

LLH-3 RER



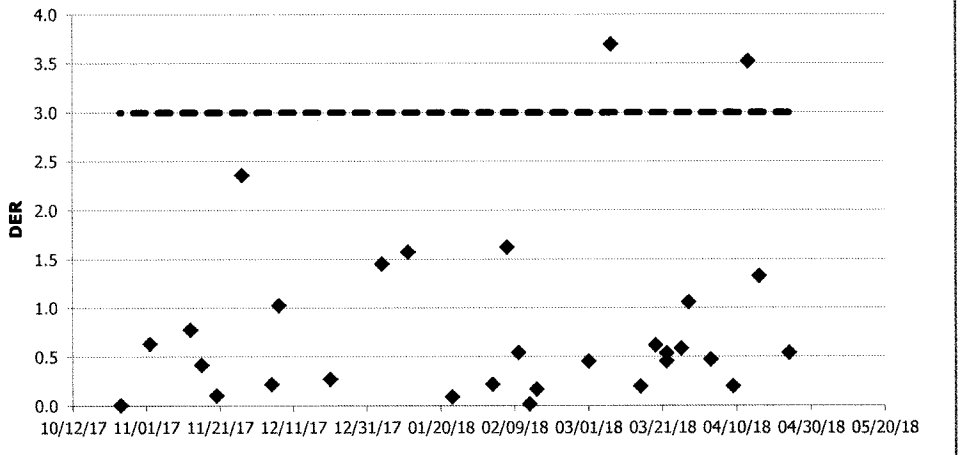
n	UCL	LCL
30	1.0000	-1.0000

LLH-3 Blank



Average	STDEV	n	UCL	LCL
-0.0822	3.4859	30	6.8896	-7.0540

LLH-3 DER



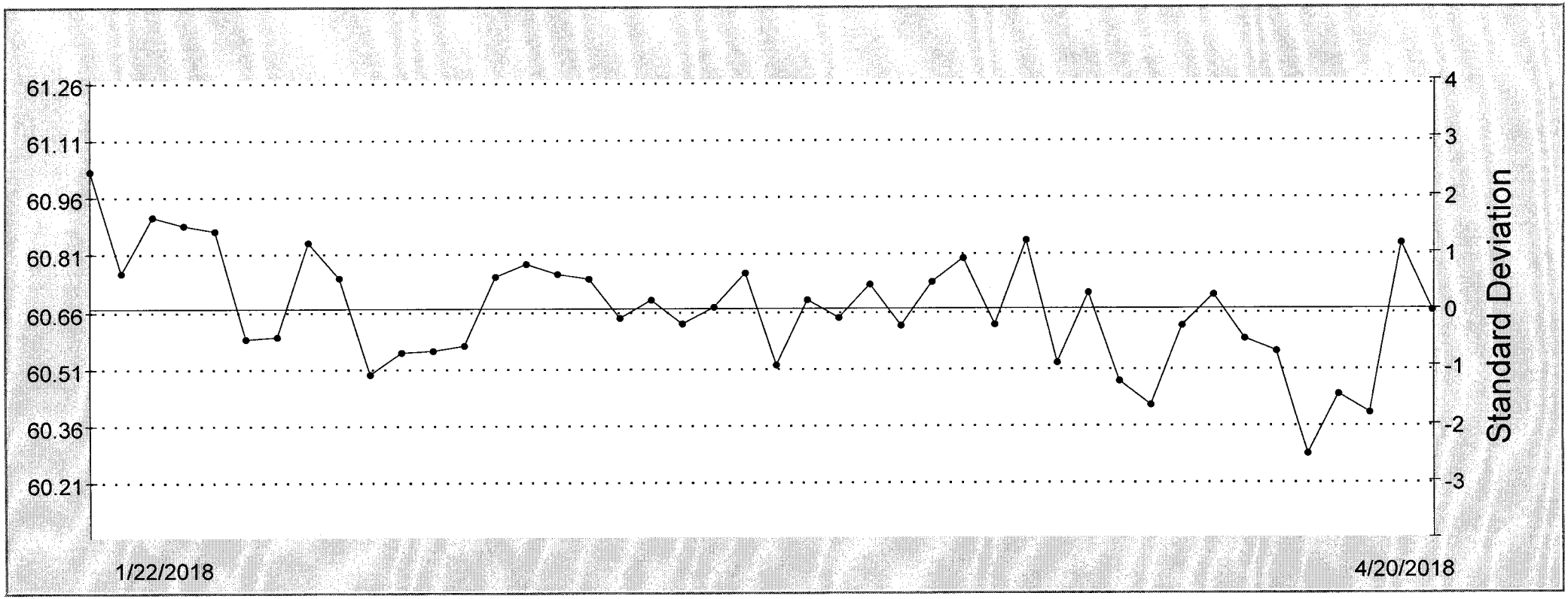
n	UCL
30	3.0000

3H Efficiency
Total # pts : 117
Valid # pts : 44
Mean : 60.67
SD : 0.15

Date	Value	Include
Jan 22, 2018	61.03	X
Jan 26, 2018	60.76	X
Jan 26, 2018	60.91	X
Feb 01, 2018	60.89	X
Feb 02, 2018	60.87	X
Feb 02, 2018	60.59	X
Feb 05, 2018	60.60	X
Feb 06, 2018	60.84	X
Feb 09, 2018	60.75	X
Feb 11, 2018	60.50	X
Feb 12, 2018	60.56	X
Feb 13, 2018	60.56	X
Feb 14, 2018	60.57	X
Feb 14, 2018	60.75	X
Feb 16, 2018	60.79	X
Feb 22, 2018	60.76	X
Feb 25, 2018	60.75	X
Feb 26, 2018	60.65	X
Feb 28, 2018	60.69	X
Mar 03, 2018	60.63	X
Mar 06, 2018	60.67	X
Mar 11, 2018	60.76	X
Mar 12, 2018	60.52	X
Mar 14, 2018	60.69	X
Mar 14, 2018	60.65	X
Mar 17, 2018	60.73	X
Mar 19, 2018	60.63	X
Mar 21, 2018	60.74	X
Mar 22, 2018	60.80	X
Mar 23, 2018	60.63	X
Mar 26, 2018	60.85	X
Mar 28, 2018	60.53	X
Mar 28, 2018	60.71	X
Mar 30, 2018	60.48	X
Apr 01, 2018	60.42	X
Apr 04, 2018	60.63	X
Apr 04, 2018	60.71	X
Apr 07, 2018	60.59	X
Apr 09, 2018	60.56	X
Apr 10, 2018	60.29	X
Apr 13, 2018	60.45	X
Apr 17, 2018	60.40	X

Apr 19, 2018	60.84	X
Apr 20, 2018	60.67	X

3H Efficiency
Total # pts : 117
Valid # pts : 44
Mean : 60.67
SD : 0.15

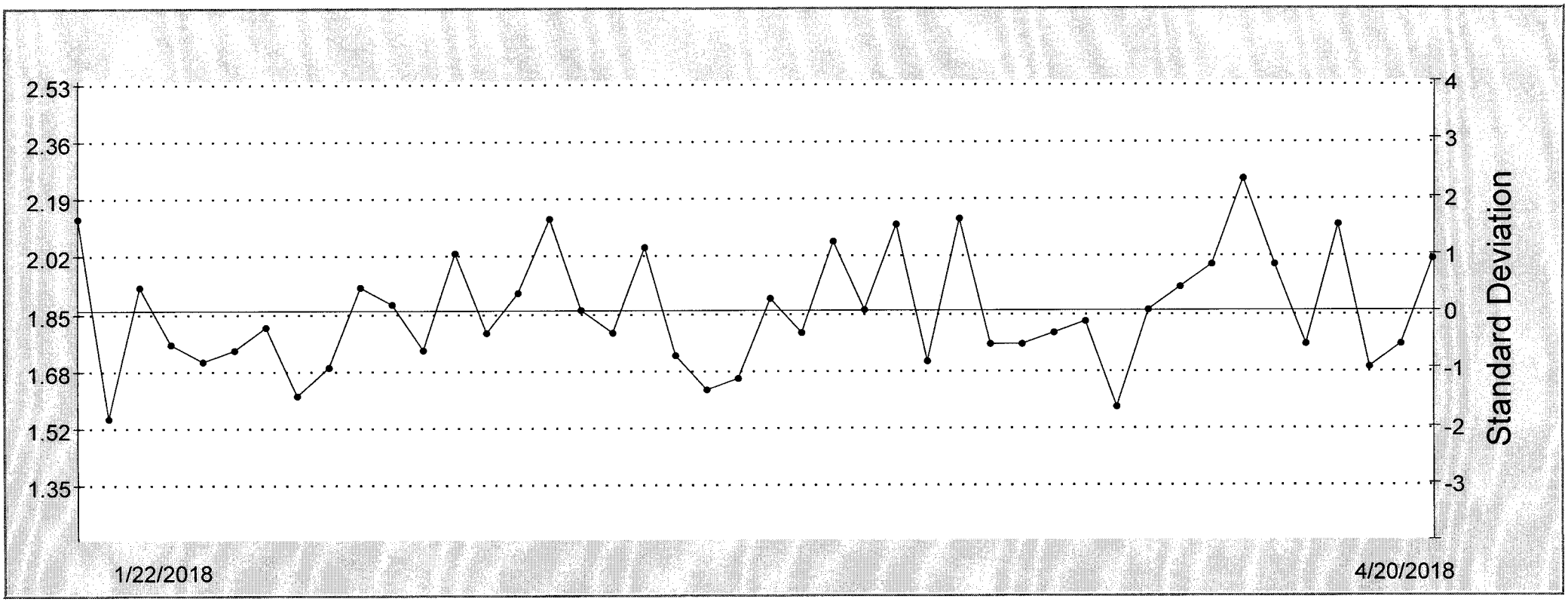


3H Background
Total # pts : 115
Valid # pts : 44
Mean : 1.86
SD : 0.17

Date	Value	Include
Jan 22, 2018	2.13	X
Jan 26, 2018	1.55	X
Jan 26, 2018	1.93	X
Feb 01, 2018	1.77	X
Feb 02, 2018	1.72	X
Feb 02, 2018	1.75	X
Feb 05, 2018	1.82	X
Feb 06, 2018	1.62	X
Feb 09, 2018	1.70	X
Feb 11, 2018	1.93	X
Feb 12, 2018	1.88	X
Feb 13, 2018	1.75	X
Feb 14, 2018	2.03	X
Feb 14, 2018	1.80	X
Feb 16, 2018	1.92	X
Feb 22, 2018	2.13	X
Feb 25, 2018	1.87	X
Feb 26, 2018	1.80	X
Feb 28, 2018	2.05	X
Mar 03, 2018	1.73	X
Mar 06, 2018	1.63	X
Mar 11, 2018	1.67	X
Mar 12, 2018	1.90	X
Mar 14, 2018	1.80	X
Mar 14, 2018	2.07	X
Mar 17, 2018	1.87	X
Mar 19, 2018	2.12	X
Mar 21, 2018	1.72	X
Mar 22, 2018	2.13	X
Mar 23, 2018	1.77	X
Mar 26, 2018	1.77	X
Mar 28, 2018	1.80	X
Mar 28, 2018	1.83	X
Mar 30, 2018	1.58	X
Apr 01, 2018	1.87	X
Apr 04, 2018	1.93	X
Apr 04, 2018	2.00	X
Apr 07, 2018	2.25	X
Apr 09, 2018	2.00	X
Apr 10, 2018	1.77	X
Apr 13, 2018	2.12	X
Apr 17, 2018	1.70	X

Apr 19, 2018	1.77	X
Apr 20, 2018	2.02	X

3H Background
Total # pts : 115
Valid # pts : 44
Mean : 1.86
SD : 0.17



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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

Tritium Screen in Clean Water without Distillation

ARS-040

ARS Batch ID: ARS1-B18-00442
ARS SDG ID(s): ARS1-18-00506; 556

Sample ID:	Count Time	CPMA	Background CPMA	Eff Nucl In A	Aliquot (grams)	ACTIVITY	units	MDA	Sample Must be analyzed as LSC-A-001
B18-00442-04	120	1.425	1.25	20.45	10.00	38.547	pCi/L	133.2812	NO
B18-00442-05	120	1.153	1.25	20.99	10.00	-20.816	pCi/L	129.8523	NO
B18-00442-06	120	1.063	1.25	19.35	10.00	-43.532	pCi/L	140.8579	NO
B18-00442-07	120	1.103	1.25	20.76	10.00	-31.896	pCi/L	131.291	NO
B18-00442-08	120	1.246	1.25	21.11	10.00	-0.854	pCi/L	129.1142	NO
B18-00442-09	120	1.156	1.25	21.07	10.00	-20.096	pCi/L	129.3593	NO
B18-00442-10	120	0.943	1.25	20.75	10.00	-66.645	pCi/L	131.3542	NO
B18-00442-11	120	1.346	1.25	20.88	10.00	20.710	pCi/L	130.5364	NO
B18-00442-12	120	1.353	1.25	20.96	10.00	22.136	pCi/L	130.0382	NO
B18-00442-13	120	1.213	1.25	20.86	10.00	-7.990	pCi/L	130.6616	NO
B18-00442-14	120	1.126	1.25	20.83	10.00	-26.815	pCi/L	130.8498	NO
B18-00442-15	120	1.041	1.25	20.73	10.00	-45.414	pCi/L	131.481	NO
						If activity is > 150 pCi/L, contact client before running by electrolytic enrichment			

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American Radiation Services Analytical Reports

for

Los Alamos National Laboratory

Tritium-Screening by Low Level Liquid Scintillation Counting

Laboratory Records

ARS Aleut Analytical

Analysis Batch ID **ARS1-B18-00442**

Method ARS-054 **Analysis** LSC-LLH3/SC-AQ **Matrix** AQ

Description Low Level Tritium Screening

ABatch Sample ID	Type	Blind Iso1	Blind Iso2	Blind Iso3	SDG	FR	Run	Prep Code	Filtered	Client ID	Group Name	Lab Deadline
ARS1-B18-00442-01	LCS											
ARS1-B18-00442-02	LCSD											
ARS1-B18-00442-03	MBL											
ARS1-B18-00442-04	TRG				**ARS1-18-00506**	001	1			CAWA-18-46		03/29/18
ARS1-B18-00442-05	TRG				**ARS1-18-00506**	002	1			CAPA-18-4		03/29/18
ARS1-B18-00442-06	TRG				**ARS1-18-00506**	003	1			CAWA-18-51		03/29/18
ARS1-B18-00442-07	TRG				**ARS1-18-00506**	004	1			CAMO-18-10		03/29/18
ARS1-B18-00442-08	TRG				**ARS1-18-00506**	005	1			CAWA-18-64		03/29/18
ARS1-B18-00442-09	TRG				**ARS1-18-00506**	006	1			CAWA-18-151310		03/29/18
ARS1-B18-00442-10	TRG				**ARS1-18-00506**	007	1			CAWA-18-58		03/29/18
ARS1-B18-00442-11	TRG				**ARS1-18-00556**	001	1			CAWA-18-36		04/01/18
ARS1-B18-00442-12	TRG				**ARS1-18-00556**	002	1			CAWA-18-127		04/01/18
ARS1-B18-00442-13	TRG				**ARS1-18-00556**	003	1			CAWA-18-40		04/01/18
ARS1-B18-00442-14	TRG				**ARS1-18-00556**	004	1			CAWA-18-43		04/01/18
ARS1-B18-00442-15	TRG				**ARS1-18-00556**	005	1			CAWA-18-56		04/01/18

ARS-054
Tritium in Water

Preparation Date: 02/26/2018 12:57
Prepared By: MMORGAN

Procedure Data

ABatch Sample ID	Client ID	Parent	ICOC ID	Aliquot 1 Vol/Wt	Aliquot 1 Units	Aliquot 2 Vol/Wt	Aliquot 2 Units
ARS1-B18-00442-01				1.0000			
ARS1-B18-00442-02				1.0000			
ARS1-B18-00442-03				1.0000			
ARS1-B18-00442-04	CAWA-18-46		287170	0.0010	L		
ARS1-B18-00442-05	CAPA-18-4		287171	0.0010	L		
ARS1-B18-00442-06	CAWA-18-51		287172	0.0010	L		
ARS1-B18-00442-07	CAMO-18-10		287173	0.0010	L		
ARS1-B18-00442-08	CAWA-18-64		287174	0.0010	L		
ARS1-B18-00442-09	CAWA-18-151310		287175	0.0010	L		
ARS1-B18-00442-10	CAWA-18-58		287176	0.0010	L		
ARS1-B18-00442-11	CAWA-18-36		287177	0.0010	L		
ARS1-B18-00442-12	CAWA-18-127		287178	0.0010	L		
ARS1-B18-00442-13	CAWA-18-40		287179	0.0010	L		
ARS1-B18-00442-14	CAWA-18-43		287180	0.0010	L		
ARS1-B18-00442-15	CAWA-18-56		287181	0.0010	L		

Reagent Amounts

ABatch Sample ID	Client ID	14.1.5 OPTIONAL AQ W/O DIST - Add scint cocktai - Ultima Gold LLT Reagent Grade (mL)	User ID
ARS1-B18-00442-04	CAWA-18-46	10.00	
ARS1-B18-00442-05	CAPA-18-4	10.00	
ARS1-B18-00442-06	CAWA-18-51	10.00	
ARS1-B18-00442-07	CAMO-18-10	10.00	
ARS1-B18-00442-08	CAWA-18-64	10.00	
ARS1-B18-00442-09	CAWA-18-151310	10.00	
ARS1-B18-00442-10	CAWA-18-58	10.00	
ARS1-B18-00442-11	CAWA-18-36	10.00	
ARS1-B18-00442-12	CAWA-18-127	10.00	
ARS1-B18-00442-13	CAWA-18-40	10.00	
ARS1-B18-00442-14	CAWA-18-43	10.00	
ARS1-B18-00442-15	CAWA-18-56	10.00	

Reagent Tracking

Procedure Section	Reagent ID
14.1.5 OPTIONAL AQ W/O DIST - Add scint cocktai	R17-00665

Assay Definition

Assay Description:
LLH3 Assay in DPM Mode
Assay Type: DPM (Single)
Report Name: Report1
Output Data Path: C:\Packard\Tricarb\Results\ARS\Low Level H3\20180228_1606
Raw Results Path: C:\Packard\Tricarb\Results\ARS\Low Level H3\20180228_1606\20180228_1606.results
RTF File Name: C:\Packard\Tricarb\Results\ARS\Low Level H3\20180228_1606\LLH3.rtf
Comma-Delimited File Name: C:\Packard\Tricarb\Results\ARS\Low Level H3\20180228_1606\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: LLH3 10ml
Count Time (min): 120.00
Count Mode: Low Level
Assay Count Cycles: 1 Repeat Sample Count: 1
Number of Vials/Sample: 1 Calculate % Reference: Off

Background Subtract

Background Subtract: Off
Low CPM Threshold: Off
2 Sigma % Terminator: Off

Regions	LL	UL
A	2.0	18.6
B	0.0	2000.0
C	0.0	2000.0

Count Corrections

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

Cycle 1 Results

P#	S#	SMPL ID	CPMA	DPM1	tSIE	Eff Nucl In A	Count Time	DATE	TIME	MESSAGES
8	1	BACKGROUND	1.250	5.93	259.93	21.07	120.00	2/28/2018	6:17:36 PM	
8	2	B18-00442-04	1.425	6.97	245.93	20.45	120.00	2/28/2018	8:29:04 PM	
8	3	B18-00442-05	1.153	5.49	258.16	20.99	120.00	2/28/2018	10:40:25 PM	
8	4	B18-00442-06	1.063	5.49	222.85	19.35	120.00	3/1/2018	12:52:22 AM	
8	5	B18-00442-07	1.103	5.31	253.00	20.76	120.00	3/1/2018	3:03:28 AM	
8	6	B18-00442-08	1.246	5.91	260.70	21.11	120.00	3/1/2018	5:14:50 AM	
8	7	B18-00442-09	1.156	5.49	259.83	21.07	120.00	3/1/2018	7:25:49 AM	
8	8	B18-00442-10	0.943	4.55	252.65	20.75	120.00	3/1/2018	9:36:44 AM	
8	9	B18-00442-11	1.346	6.45	255.67	20.88	120.00	3/1/2018	11:48:04 AM	
8	10	B18-00442-12	1.353	6.46	257.33	20.96	120.00	3/1/2018	1:59:15 PM	
8	11	B18-00442-13	1.213	5.82	255.06	20.86	120.00	3/1/2018	4:10:52 PM	
8	12	B18-00442-14	1.126	5.41	254.42	20.83	120.00	3/1/2018	6:22:26 PM	
8	13	B18-00442-15	1.041	5.02	252.20	20.73	120.00	3/1/2018	8:33:48 PM	

LSC Instrument Data Transfer Report

\\Tricarb\ars\Low Level H3\20180228

Batch Sample ID	Non-BKG Samples Transferred	Samples Eligible To Save	
ARS1-B18-00442	12	12	LSC 5

LIMS Batch Sample ID	LSC P#	LSC PID	LSC S#	LSC SMPL_ID	LSC Count Date	LSC CPMA	LSC tSIE	LSC EFF	LSC Count Dur	Analysis Batch	LIMS SDG	LIMS Run
BKG	8		1	BACKGROUND	02/28/18 18:17	1.25	259.93	21.0700	120.00	ARS1-B18-00442		
ARS1-B18-00442-04	8		2	B18-00442-04	02/28/18 20:29	1.43	245.93	20.4500	120.00	ARS1-B18-00442	ARS1-18-00506	1
ARS1-B18-00442-05	8		3	B18-00442-05	02/28/18 22:40	1.15	258.16	20.9900	120.00	ARS1-B18-00442	ARS1-18-00506	1
ARS1-B18-00442-06	8		4	B18-00442-06	03/01/18 00:52	1.06	222.85	19.3500	120.00	ARS1-B18-00442	ARS1-18-00506	1
ARS1-B18-00442-07	8		5	B18-00442-07	03/01/18 03:03	1.10	253.00	20.7600	120.00	ARS1-B18-00442	ARS1-18-00506	1
ARS1-B18-00442-08	8		6	B18-00442-08	03/01/18 05:14	1.25	260.70	21.1100	120.00	ARS1-B18-00442	ARS1-18-00506	1
ARS1-B18-00442-09	8		7	B18-00442-09	03/01/18 07:25	1.16	259.83	21.0700	120.00	ARS1-B18-00442	ARS1-18-00506	1
ARS1-B18-00442-10	8		8	B18-00442-10	03/01/18 09:36	0.94	252.65	20.7500	120.00	ARS1-B18-00442	ARS1-18-00506	1
ARS1-B18-00442-11	8		9	B18-00442-11	03/01/18 11:48	1.35	255.67	20.8800	120.00	ARS1-B18-00442	ARS1-18-00556	1
ARS1-B18-00442-12	8		10	B18-00442-12	03/01/18 13:59	1.35	257.33	20.9600	120.00	ARS1-B18-00442	ARS1-18-00556	1
ARS1-B18-00442-13	8		11	B18-00442-13	03/01/18 16:10	1.21	255.06	20.8600	120.00	ARS1-B18-00442	ARS1-18-00556	1
ARS1-B18-00442-14	8		12	B18-00442-14	03/01/18 18:22	1.13	254.42	20.8300	120.00	ARS1-B18-00442	ARS1-18-00556	1
ARS1-B18-00442-15	8		13	B18-00442-15	03/01/18 20:33	1.04	252.20	20.7300	120.00	ARS1-B18-00442	ARS1-18-00556	1

Low Level Tritium pH Checks

SDG#	Fraction	pH	Date	Analyst
ARS1-18-00506	001	8	2-27-18	MM
	002	8	2-27-18	MM
	003	8	2-27-18	MM
	004	8	2-27-18	MM
	005	8	2-27-18	MM
	006	8	2-27-18	MM
	007	8	2-27-18	MM
ARS1-18-00556	001	8	2-27-18	MM
	002	8	2-27-18	MM
	003	8	2-27-18	MM
	004	8	2-27-18	MM
	005	8	2-27-18	MM

N/A

2-27-18 MM

Liquid Scintillation Count Log

Date	Time	ARS Sample I.D. Number	Batch Fraction Number	Liquid Scintillation File Number	Technician Initials	Notes Identifier
2/22/2018	15:00	Background	N/A	N/A	MM	
2/22/2018	15:00	B18-00131	1	1600	MM	
2/22/2018	15:00	B18-00131	2	1600	MM	
2/22/2018	15:00	B18-00131	3	1600	MM	
2/22/2018	15:00	B18-00131	4	1600	MM	
2/22/2018	15:00	B18-00131	5	1600	MM	
2/22/2018	15:00	B18-00131	6	1600	MM	
2/22/2018	15:00	B18-00131	7	1600	MM	
2/22/2018	15:00	B18-00131	8	1600	MM	
2/22/2018	15:00	B18-00131	9	1600	MM	
2/22/2018	15:00	B18-00131	10	1600	MM	
2/22/2018	15:00	B18-00131	11	1600	MM	
2/22/2018	15:00	B18-00131	12	1600	MM	
2/26/2018	15:00	SNC163	QA	1638	MM	
2/26/2018	15:00	Background	N/A	1638	MM	
2/26/2018	15:00	B18-00131	1	1638	MM	
2/26/2018	15:00	B18-00131	3	1638	MM	
2/26/2018	15:00	B18-00131	4	1638	MM	
2/26/2018	15:00	B18-00131	5	1638	MM	
2/26/2018	15:00	B18-00131	6	1638	MM	
2/26/2018	15:00	B18-00131	7	1638	MM	
2/26/2018	15:00	B18-00131	11	1638	MM	
2/28/2018	15:00	SNC163	QA	QA	MM	
2/28/2018	15:00	Background	N/A	1606	MM	
2/28/2018	15:00	B18-00442	1	1606	MM	
2/28/2018	15:00	B18-00442	4	1606	MM	
2/28/2018	15:00	B18-00442	5	1606	MM	
2/28/2018	15:00	B18-00442	6	1606	MM	
2/28/2018	15:00	B18-00442	7	1606	MM	
2/28/2018	15:00	B18-00442	8	1606	MM	
2/28/2018	15:00	B18-00442	9	1606	MM	
2/28/2018	15:00	B18-00442	10	1606	MM	
2/28/2018	15:00	B18-00442	11	1606	MM	
2/28/2018	15:00	B18-00442	12	1606	MM	
2/28/2018	15:00	B18-00442	13	1606	MM	
2/28/2018	15:00	B18-00442	14	1606	MM	
2/28/2018	15:00	B18-00442	15	1606	MM	

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American Radiation Services Analytical Reports

for

Los Alamos National Laboratory

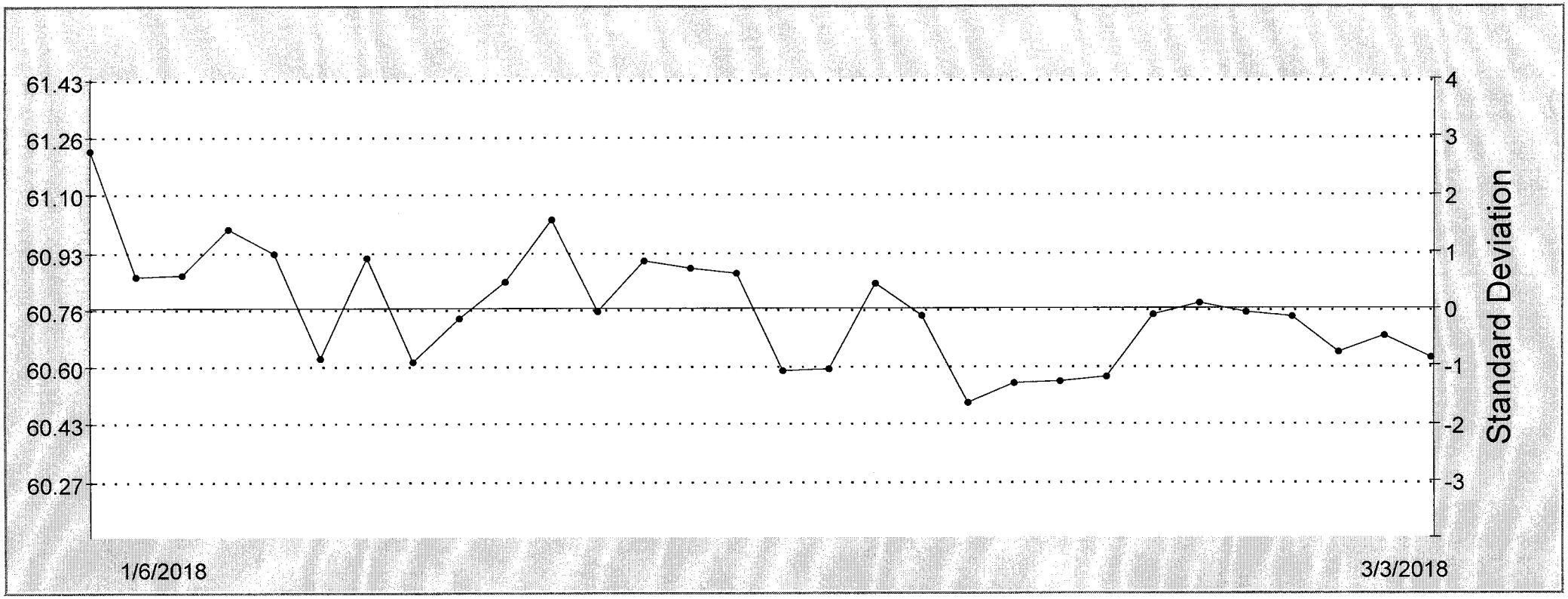
Tritium-Screening by Low Level Liquid Scintillation Counting

Control Charts

3H Efficiency
Total # pts : 93
Valid # pts : 30
Mean : 60.77
SD : 0.17

Date	Value	Include
Jan 06, 2018	61.23	X
Jan 08, 2018	60.86	X
Jan 10, 2018	60.87	X
Jan 11, 2018	61.00	X
Jan 14, 2018	60.93	X
Jan 15, 2018	60.63	X
Jan 15, 2018	60.92	X
Jan 16, 2018	60.62	X
Jan 18, 2018	60.74	X
Jan 20, 2018	60.85	X
Jan 22, 2018	61.03	X
Jan 26, 2018	60.76	X
Jan 26, 2018	60.91	X
Feb 01, 2018	60.89	X
Feb 02, 2018	60.87	X
Feb 02, 2018	60.59	X
Feb 05, 2018	60.60	X
Feb 06, 2018	60.84	X
Feb 09, 2018	60.75	X
Feb 11, 2018	60.50	X
Feb 12, 2018	60.56	X
Feb 13, 2018	60.56	X
Feb 14, 2018	60.57	X
Feb 14, 2018	60.75	X
Feb 16, 2018	60.79	X
Feb 22, 2018	60.76	X
Feb 25, 2018	60.75	X
Feb 26, 2018	60.65	X
Feb 28, 2018	60.69	X
Mar 03, 2018	60.63	X

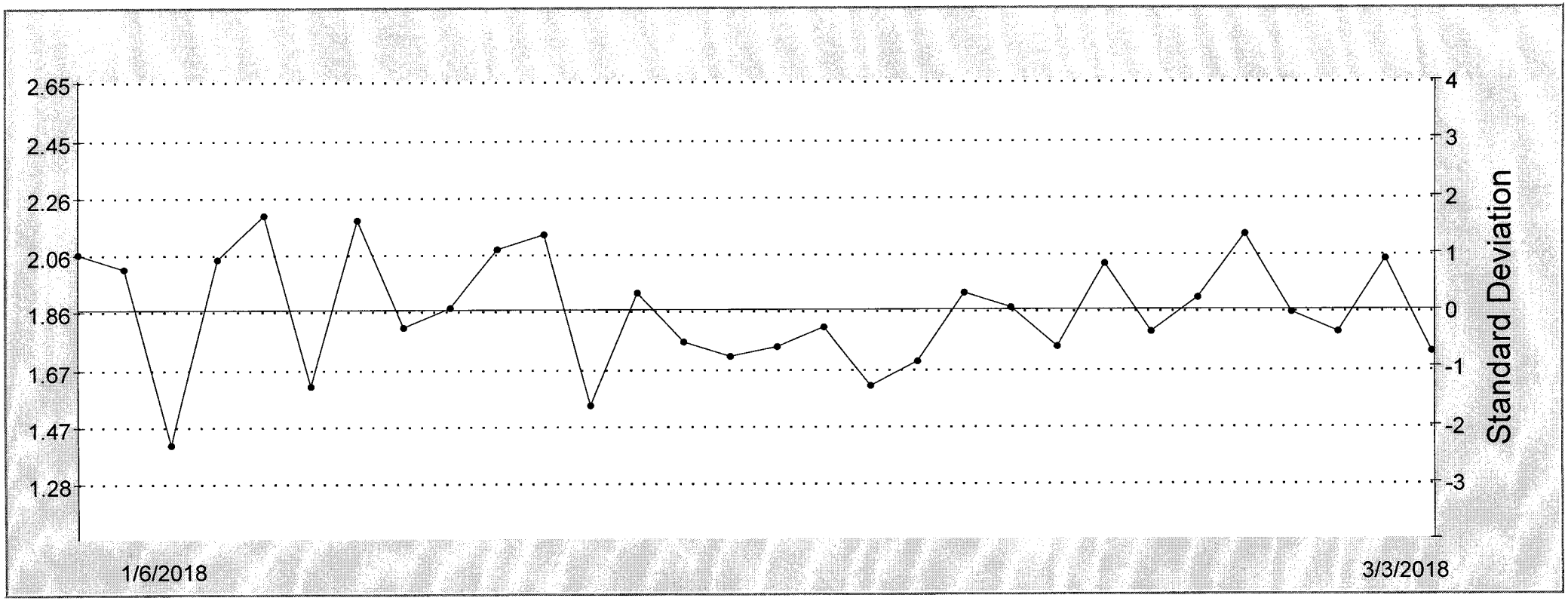
3H Efficiency
Total # pts : 93
Valid # pts : 30
Mean : 60.77
SD : 0.17



3H Background
Total # pts : 91
Valid # pts : 30
Mean : 1.87
SD : 0.20

Date	Value	Include
Jan 06, 2018	2.07	X
Jan 08, 2018	2.02	X
Jan 10, 2018	1.42	X
Jan 11, 2018	2.05	X
Jan 14, 2018	2.20	X
Jan 15, 2018	1.62	X
Jan 15, 2018	2.18	X
Jan 16, 2018	1.82	X
Jan 18, 2018	1.88	X
Jan 20, 2018	2.08	X
Jan 22, 2018	2.13	X
Jan 26, 2018	1.55	X
Jan 26, 2018	1.93	X
Feb 01, 2018	1.77	X
Feb 02, 2018	1.72	X
Feb 02, 2018	1.75	X
Feb 05, 2018	1.82	X
Feb 06, 2018	1.62	X
Feb 09, 2018	1.70	X
Feb 11, 2018	1.93	X
Feb 12, 2018	1.88	X
Feb 13, 2018	1.75	X
Feb 14, 2018	2.03	X
Feb 14, 2018	1.80	X
Feb 16, 2018	1.92	X
Feb 22, 2018	2.13	X
Feb 25, 2018	1.87	X
Feb 26, 2018	1.80	X
Feb 28, 2018	2.05	X
Mar 03, 2018	1.73	X

3H Background
Total # pts : 91
Valid # pts : 30
Mean : 1.87
SD : 0.20



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American Radiation Services Analytical Reports

for

Los Alamos National Laboratory

Low Level Liquid Scintillation Counting

Calibration Information

ARS INTERNATIONAL

QUALITY CONTROL PROGRAM

AMERICAN RADIATION SERVICES
RADIOACTIVE REFERENCE SOLUTIONS

ANNUAL ACTIVITY VERIFICATION

VERIFICATION DATE: 4/27/2017 0:00 *date counted*
STANDARD REFERENCE #: S-0324

Principal Radionuclide		Half Life, Years		Half Life, Days
H-3	*ENTER -->*	1.232E+01	*OR -->*	
		1.232E+01		4.4999E+03

Radionuclide: H-3 Dilution Reference Date: 4/27/2017 0:00

Dilution Activity	2.59	pCi per gram ===> dpm/g	5.75
Verif. Date Decay Corrected	2.59	pCi per gram ===> dpm/g	5.75

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-0324-V2	17.76	1	LSC	0.3007	9.00	5.027	5.79	2.61
S-0324-V3	18.32	1	LSC	0.3033	9.00	5.071	6.06	2.73
S-0324-V4	17.74	1	LSC	0.3041	9.00	5.019	5.73	2.58
S-0324-V5	18.62	1	LSC	0.3036	9.00	5.008	6.33	2.85

		Average	5.98 / 2.69
		Two Sigma Uncertainty	0.54 / 0.24
10% Max	*PASS*	Standard Deviation percent of known concentration	4.77% / 4.77%
		Target Activity	5.75 / 2.59
5% Max	*PASS*	% Diff	3.93% / 3.93%

Verification Expiration Date: April 27, 2018

Prepared & Counted By _____ Date: 4/27/2017 0:00

Verified & Approved By _____ Date: 4-28-17

QC Approval _____ Date: 04-28-17

S-0324	
H-3	Verified 4/28/17
SL	**Expires 4/28/18**
Manufacturer	**NIST SRM 4927F**
Sol Matrix	H2O
Ref No	NIST SRM 4927F
Tech	Unknown
Parent ID	S-0316

ARS INTERNATIONAL

RADIOACTIVE STANDARDS -- BATON ROUGE LABORATORY

Add / Edit *Secondary* Standards

Planning

Planning Comments	Create H-3 LCS standard
Target dpm/g (on dil. date)	6
Target Final Volume mL	2000.00
Appx mass g of Parent Sol'n	5.23779991812081
Appx vol ml of Parent Sol'n	5.24724495904709
Expected Addition for Analysis g	5

Standards Preparation / Dilution

Secondary Solution #	S-0324
Dilution Date (New Ref Date)	04/27/2017 0:00
Ampoule, Empty (g)	
Ampoule/Solution Gross (g)	
Net Wt Removed (g)	
Transfer Container, empty (g)	17.2688
Container Plus Solution(g)	22.2799
Net Wt Transferred (g)	5.0111
DPM Xferred On04/27/2017 0:00	11480.6218145069
Diluent/matrix	DI Water
Diluent Density Cont, empty (g)	1E-05
Test Mass of 5 ml of Diluent (g)	
Diluent Density Test - (g/mL)	
Dilution Empty Container Mass (g)	415.17
Dilution Full Cont g (if measured)	2411.11
Dilution Final Volume ml (if measured)	2000
Final Dilution Density (g/mL)	0.99797
Final Dilution Measured Mass g	1995.94
Comments	
Final Dilution dpm/g	5.75198744176021
Final Dil New Ref Date/Time	04/27/2017 0:00

Parent Standard Data

Parent Solution Reference #	NIST SRM 4927F				
Parent Solution #	S-0316				
Parent Principal Radionuclide	H-3	Half Life (Days)	4499.8		
Parent Reference Date	08/10/2016 14:49				
Parent Certified Act	2384.43044412127	Cert Act/Vol Units	dpm	g	
Parent Cert Act Uncert 1 Sigma	0.0036				
Parent Sp. Gravity G/ML	0.9982				
Parent Supplier	NIST SRM 4927F				
Parent Date Recvd	01/01/00				
Parent Received By	Unknown				
Parent Cert Exp Date					
Parent Matrix	H2O				
Certified dpm/g At Ref Date	607764.948573606				
Certified dpm/g On 04/27/2017 0:00	583960.313234318				
Parent Comments	Intermediate level H-3 standard for creating LCS solutions and matrix spikes, Dilution performed as stated above by Jacob Byrd- JPB 08/10/2016				
Parent Tech	Unknown				
Is Primary	FALSE				
Is LCS	TRUE				
Is Tracer	FALSE				
Is Calib	FALSE				

Assay Definition

Assay Description:
H3 Normal Lvl
Assay Type: DPM (Single)
Report Name: Report1
Output Data Path: C:\Packard\Tricarb\Results\ARS\H3 Normal Lvl 2\20170427_1250
Raw Results Path: C:\Packard\Tricarb\Results\ARS\H3 Normal Lvl 2\20170427_1250\20170427_1250.results
RTF File Name: C:\Packard\Tricarb\Results\ARS\H3 Normal Lvl 2\20170427_1250\H3 Results.rtf
Comma-Delimited File Name: C:\Packard\Tricarb\Results\ARS\H3 Normal Lvl 2\20170427_1250\H3 Results.csv
Assay File Name: C:\Packard\TriCarb\Assays\H3 Normal Lvl 2.lsa

Count Conditions

Nuclide: Standard H3
  Quench Indicator: tSIE/AEC
  External Std Terminator (sec): 0.5 2s%
  Pre-Count Delay (min): 0.00
Quench Set:
  Low Energy: PE UG STD H3
Count Time (min): 120.00
Count Mode: Normal
Assay Count Cycles: 1 Repeat Sample Count: 1
#Vials/Sample: 1 Calculate % Reference: Off

Background Subtract

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

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

Count Corrections

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

Cycle 1 Results

P#	S#	SMPL_ID	CPMA	DPM1	tSIE	Eff Nucl In A	Count Time	DATE	TIME	MESSAGES
11	1	BACKGROUND	9.00	29.71	381.35	30.28	120.00	4/27/2017	12:51:17 PM	
11	2	S-0234-V1	18.75	62.31	378.81	30.09	120.00	4/27/2017	3:03:56 PM	
11	3	S-0234-V2	17.76	59.04	378.52	30.07	120.00	4/27/2017	5:16:35 PM	
11	4	S-0234-V3	18.32	60.43	381.90	30.33	120.00	4/27/2017	7:29:15 PM	
11	5	S-0234-V4	17.74	58.34	382.99	30.41	120.00	4/27/2017	9:41:55 PM	
11	6	S-0234-V5	18.62	61.34	382.40	30.36	120.00	4/27/2017	11:54:37 PM	

0324

DB

04-28-17

0324 JB 04-28-17

S-0234 Verification Weights	
Tech:	JPB
Pippete:	FJ15820
Scale ID:	12332539
Standard ID:	S-0234

Sample ID	Std. Weight(g)
S-0234-V1	5.0073
S-0234-V2	5.0271
S-0234-V3	5.0171
S-0234-V4	5.0189
S-0234-V5	5.0077

JB 0324
04-28-17

INTERNATIONAL

2609 North River Road • Port Allen, Louisiana 70767

1 (800) 401-4277 • Fax (225) 381-2996

American Radiation Services Analytical Reports

for

Los Alamos National Laboratory

Folder Duplicate

Report Compilation Checklist

ARS SDG: 18-00506 Client Name: LANL Sample Matrix: AQ

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

LEVEL 2 COMPONENTS	1st Reviewer	
6) Batch Quality Control Report is Present and Accurate? Include subcontractor QC reports if applicable	Yes No N/A	
7) DQO Report is Present and Accurate?	Yes No N/A	
8) Client Specific Batch QC Components are Present and Complete?	Yes No N/A	

LEVEL 3 COMPONENTS Ensure all original subcontractor information is included, if applicable	1st Reviewer	
9) Efficiencies are Present?	Yes No N/A	
10) Calibrations are Present?	Yes No N/A	
11) Backgrounds are Present?	Yes No N/A	
12) Spectrum Analysis is Present?	Yes No N/A	
13) Spectral Plots are Present?	Yes No N/A	
14) Plateaus are Present?	Yes No N/A	
15) Control Charts are Present?	Yes No N/A	
16) Other:	Yes No N/A	

LEVEL 4 COMPONENTS Ensure all original subcontractor information is included, if applicable	1st Reviewer	
17) Preparation Raw Data Present and Complete?	Yes No N/A	
18) Instrument Raw Data Present and Complete?	Yes No N/A	
19) Calibration Certificates Present?	Yes No N/A	
20) Copies of Log Book Pages Present?	Yes No N/A	
21) Sample Receiving Documentation Present?	Yes No N/A	
22) LIMS Reports Present?	Yes No N/A	
23) Applicable Correspondence Present?	Yes No N/A	
24) Other:	Yes No N/A	

Report Generator Signature 4-25-18 Date

Management Review Signature 4-25-18 Date

LSC
Technical Review Checklist

ARS SDG ARS1-18-00506

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:** B18-00442 **Batch B:** N/A **Batch C:** N/A

Test Method(s): LSC-LLH3/SC-AQ N/A N/A

A. RADIOCHEMICAL PREPARATION REVIEW

	Chemist Review	Verifier Review
1) 100% of Manual Transcriptions Verified?	(Yes) No N/A	(Yes) No N/A
2) 100% of Manual Calculations Verified?	Yes No (N/A)	Yes No (N/A)
3) Blank Composition/Configuration Matches Calibration?	(Yes) No N/A	(Yes) No N/A
4) Deviations from procedure are documented and verified?	Yes No (N/A)	Yes No (N/A)
5) Appropriate Cocktail Selected?	(Yes) No N/A	(Yes) No N/A

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

Melissa Morgan 2-28-18
Chemist Signature **Date**

2-25-18
Verifier Review Signature **Date**

B. ANALYSIS REVIEW

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

3-5-18
QA Officer Signature **Date**

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

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

Melissa Morgan 3-5-2018
Analyst Signature **Date**

NA
Technicial Reviewer Signature **Date**

ARS INTERNATIONAL

Batch A: B18-00442

LSC
Technical Review Checklist

C. BATCH QC VALIDATION

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

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

NA		NA	
Project Manager Signature	Date	QA Officer Signature	Date

GENERAL COMMENTS

LSC
Technical Review Checklist

ARS SDG ARS1-18-00506

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:** B18-00506 **Batch B:** N/A **Batch C:** N/A

Test Method(s): LSC-LLH3-AQ N/A N/A

A. RADIOCHEMICAL PREPARATION REVIEW

	Chemist Review	Verifier Review
1) 100% of Manual Transcriptions Verified?	Yes No N/A	Yes No N/A
2) 100% of Manual Calculations Verified?	Yes No N/A	Yes No N/A
3) Blank Composition/Configuration Matches Calibration?	Yes No N/A	Yes No N/A
4) Deviations from procedure are documented and verified?	Yes No N/A	Yes No N/A
5) Appropriate Cocktail Selected?	Yes No N/A	Yes No N/A

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

Chemist Signature: [signature] 4-20-18 Date

Verifier Review Signature: No verifier present 4-24-18 Date

B. ANALYSIS REVIEW

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

QA Officer Signature: [signature] 4-24-18 Date

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

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

Analyst Signature: [signature] 4-24-18 Date

Technicial Reviewer Signature: [signature] 4-24-18 Date

ARS INTERNATIONAL

Batch A: B18-00506

LSC
Technical Review Checklist

C. BATCH QC VALIDATION

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

SDR 4-25-18
Project Manager Signature Date

4-26-18
QA Officer Signature Date

GENERAL COMMENTS

DQO Report for SDG

ARS1-18-00506

Client Name: Los Alamos National Laboratory Profile Name: Nita Patel (Site Alias) Report Level: 4

Analysis Code	Prep Type	Units	Aliquot	Prep Code	Procedure	Count Time					
LSC-LLH3/SC-AQ	WRAD	pCi	L		ARS-054						
	Analyte			RDL	LCS LL/UL	MS LL/UL	RadY LL/UL	GravY LL/UL	RER	RPD	Surr LL/UL
	H-3			150 pCi/L	75/125	60/140	30/120	40/110	1	25	N/A
LSC-LLH3-AQ	WRAD	pCi	L	N/A	ARS-040						
	Analyte			RDL	LCS LL/UL	MS LL/UL	RadY LL/UL	GravY LL/UL	RER	RPD	Surr LL/UL
	Enriched H-3			3.221 pCi/L	80/120	60/140	30/120	40/110	1	25	N/A

Analysis Code	Fraction	Units	Aliquot	Conductivity	Analyte Count
LSC-LLH3/SC-AQ	001	pCi	L	N/A	1
		Group		Analyte	
				H-3	
LSC-LLH3/SC-AQ	002	pCi	L	N/A	1
		Group		Analyte	
				H-3	
LSC-LLH3/SC-AQ	003	pCi	L	N/A	1
		Group		Analyte	
				H-3	
LSC-LLH3/SC-AQ	004	pCi	L	N/A	1
		Group		Analyte	
				H-3	
LSC-LLH3/SC-AQ	005	pCi	L	N/A	1
		Group		Analyte	
				H-3	
LSC-LLH3/SC-AQ	006	pCi	L	N/A	1
		Group		Analyte	
				H-3	
LSC-LLH3/SC-AQ	007	pCi	L	N/A	1
		Group		Analyte	
				H-3	

User: SLEESE Last Modified: 2/20/2018 4:04:51 PM

LSC-LLH3-AQ	001	pCi	L	N/A	1
		Group		Analyte	
				Enriched H-3	
LSC-LLH3-AQ	002	pCi	L	N/A	1
		Group		Analyte	
				Enriched H-3	
LSC-LLH3-AQ	003	pCi	L	N/A	1
		Group		Analyte	
				Enriched H-3	
LSC-LLH3-AQ	004	pCi	L	N/A	1
		Group		Analyte	
				Enriched H-3	
LSC-LLH3-AQ	005	pCi	L	N/A	1
		Group		Analyte	
				Enriched H-3	
LSC-LLH3-AQ	006	pCi	L	N/A	1
		Group		Analyte	
				Enriched H-3	
LSC-LLH3-AQ	007	pCi	L	N/A	1
		Group		Analyte	
				Enriched H-3	

SDG Report - Samples and Containers

SDG Specific Data

SDG	ARS1-18-00506	TAT Days	40	Project Type	Environmental
Sample Count	7 Rpt Level 4	Date Received	2/20/2018	COC Number	2018-1750
Client	Los Alamos National Laboratory	Client Deadline	4/1/2018	PO Number	
Client Code	114	Internal Deadline	3/31/2018	Job Number	
Profile Number	PN-00094	Lab Deadline	3/29/2018	Job Location	
Comment					

Samples and Containers Checked In Thus Far

FR	Name	Matrix	Start Date	End Date	Disp	Hold	Arch	Storage	Conductivity	Comments
001	CAWA-18-46	AQ	2/9/2018 12:30 PM	2/9/2018 12:30 PM	H	90	5	K6		
	IC_ID	Cnt	Volume (mL)	Container Type	pH Orig	pH Final	CPM	uR Hr	VOA	Head	Temp (C)
	286864	1	1000.00	HDP Container	7	7	80	20	N	N/A	0
002	CAPA-18-4	AQ	2/13/2018 1:47 PM	2/13/2018 1:47 PM	H	90	5	K6		
	IC_ID	Cnt	Volume (mL)	Container Type	pH Orig	pH Final	CPM	uR Hr	VOA	Head	Temp (C)
	286865	1	1000.00	HDP Container	7	7	80	20	N	N/A	0
003	CAWA-18-51	AQ	2/9/2018 2:36 PM	2/9/2018 2:36 PM	H	90	5	K6		
	IC_ID	Cnt	Volume (mL)	Container Type	pH Orig	pH Final	CPM	uR Hr	VOA	Head	Temp (C)
	286866	1	1000.00	HDP Container	7	7	90	20	N	N/A	0
004	CAMO-18-10	AQ	2/14/2018 1:27 PM	2/14/2018 1:27 PM	H	90	5	K6		
	IC_ID	Cnt	Volume (mL)	Container Type	pH Orig	pH Final	CPM	uR Hr	VOA	Head	Temp (C)
	286867	1	1000.00	HDP Container	7	7	80	20	N	N/A	0
005	CAWA-18-64	AQ	2/13/2018 12:50 PM	2/13/2018 12:50 PM	H	90	5	K6		
	IC_ID	Cnt	Volume (mL)	Container Type	pH Orig	pH Final	CPM	uR Hr	VOA	Head	Temp (C)
	286868	1	1000.00	HDP Container	7	7	80	20	N	N/A	0
006	CAWA-18-151310	AQ	2/13/2018 12:50 PM	2/13/2018 12:50 PM	H	90	5	K6		
	IC_ID	Cnt	Volume (mL)	Container Type	pH Orig	pH Final	CPM	uR Hr	VOA	Head	Temp (C)
	286869	1	1000.00	HDP Container	7	7	90	20	N	N/A	0
007	CAWA-18-58	AQ	2/8/2018 1:19 PM	2/8/2018 1:19 PM	H	90	5	K6		
	IC_ID	Cnt	Volume (mL)	Container Type	pH Orig	pH Final	CPM	uR Hr	VOA	Head	Temp (C)
	286870	1	1000.00	HDP Container	7	7	90	20	N	N/A	0

SDG Report - Analysis Assignments

SDG	ARS1-18-00506	Sample Count	7
Client	Los Alamos National Laboratory	Analysis Count	2-14

Sample Count Totals Per Analysis

Analysis Code	Analysis Description	In/Out	Samples Count
LSC-LLH3/SC-AQ	Low Level Tritium Screen in (Aqueous)	I	7
LSC-LLH3-AQ	Low Level Tritium by Enrichment Process in (Aqueous [AQ])	I	7

Analyses Assigned Per Fraction

Fraction	Analysis Code	X = Assigned
001	LSC-LLH3/SC-AQ	X
001	LSC-LLH3-AQ	X
002	LSC-LLH3/SC-AQ	X
002	LSC-LLH3-AQ	X
003	LSC-LLH3/SC-AQ	X
003	LSC-LLH3-AQ	X
004	LSC-LLH3/SC-AQ	X
004	LSC-LLH3-AQ	X
005	LSC-LLH3/SC-AQ	X
005	LSC-LLH3-AQ	X
006	LSC-LLH3/SC-AQ	X
006	LSC-LLH3-AQ	X
007	LSC-LLH3/SC-AQ	X
007	LSC-LLH3-AQ	X

ARS FILE TRACKING SHEET

SDG: ARS1-18-00506

Task	Date / Time	Initials
Date & Time Samples Received	2/20/2018 09:20	MC
ICOC Initiated/Storage Location: K6	2/20/2018 13:11	MC
Technical Checks Performed	See batch	
Report Written / EDD Generated 4-24-18/1448 SDL	4-24-18/1448	SDL
Report / EDD Reviewed for accuracy and completeness	4-25-18 8:25	EDD Load
Quality Assurance Checks Performed on Report	4-26-18	
Management Checks Performed on Report	11:10	
Preliminary Report Scan		
Report E-mailed/Faxed		
Invoice Completed Invoice #:_____		
Requires Report Mailed Yes / No		
Requires Original COC mailed Yes / No		
Report Reviewed and Imaged		

SPECIAL REQUIREMENTS

Requirement	Yes	No
3 Hour Rush		✓
24 Hour Rush		✓
48 Hour Rush		✓
3 Day Rush		✓
5 Day Rush		✓
10 Day Rush		✓
Standard Oil/Gas Client (5 Day)		✓
Standard Turnaround	✓	

NOTES

COMPANY NAME LANL

SDG: ARS1-18-00506

SHIPPING CONTAINER

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

COC PRESENT WITH SAMPLES

COC	Yes	No

SAMPLE CONTAINER(S)

Good Condition	Yes	No
Sec. Seals	Yes	No
Seal Intact	Yes	No N/A
Marked Radioactive	Yes	No
# Samples Rec	7	
Matrix	AF , (AQ) , BI , FE , LT , SI , SO , SF VG]	

External and Internal Surveys

Exposure Rate Meter:	M3 269264	Serial No.:	PR 256427	Calibration Due Date:	3/13/18
Count Rate Meter:	M2 154359	Serial No.:	PR 121649	Calibration Due Date:	3/9/18

Background Exposure Rate (µR/hr)	20	Max. Exposure Rate on Shipping Containers Externals (Plus Bkgd)	20 µR/hr
Background Count Rate (cpm)	90	Max. Removable Count Rate on Shipping Containers Externals (Plus Bkgd)	90 cpm
		Max. Removable Count Rate on Shipping Containers Internals (Plus Bkgd)	90 cpm

pH - 2 is Acceptable

Sample Label Comments/Notes	pH Orig	pH Final	Acid Lot #	Weight(g) / Volume(mL)	Acceptance Limits <500 µR/hr µR/hr	Acceptance Limits <100 cpm/cm² cpm
CAWA-18-46				1000	20	80
CAPA-18-4		MC			20	90
CAWA-18-51					20	90
CAMO-18-10					20	80
CAWA-18-64		2-20-18			20	80
CAWA-18-131310					20	90
CAWA-18-58					20	90

Surveyors' Name: Morgan Cuttler

Date/Time Surveyed: 2-20-18 0920

American Radiation

Baton Rouge LA

Chain of Custody/Analysis Request

COC/Lab Request #: 2018-1750

Page 1 of 1

Client Contact:

Lab Agreement #:

Site Name: Los Alamos National Laboratory

Project Number: ADEP

Analysis Turnaround Time:

24 Hour - ☐ Other - ☐

7 Days - ☐

14 Days - ☐

21 Days - ☐

28 Days - ☒

Rad Screening Info: Locate ND

Lab Reporting Limit Type: Method Detection Limit

Field Sample ID	Sample Date	Sample Time	Sample Matrix	WSP-LL-H-3
CAWA-18-46	Feb 9 2018	12:30	W	1
CAPA-18-4	Feb 13 2018	13:47	W	1
CAWA-18-51	Feb 9 2018	14:36	W	1
CAMO-18-10	Feb 14 2018	13:27	W	1
CAWA-18-64	Feb 13 2018	12:50	W	1
CAWA-18-151310	Feb 13 2018	12:50	W	1
CAWA-18-58	Feb 8 2018	13:19	W	1

Special Instructions:

Relinquished by:	**Print Name:**	**Date/Time:** 2/15/18 3:00	**Received by:**	**Print Name:** Morgan Cavillion	**Date/Time:** 2-20-18 0920
Relinquished by:	**Print Name:**	**Date/Time:**	**Received by:**	**Print Name:**	**Date/Time:**
Relinquished by:	**Print Name:**	**Date/Time:**	**Received by:**	**Print Name:**	**Date/Time:**