

The order of this data package is as follows:

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

Comments:

SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

EVENT ID: 11552

EVENT NAME: Mortandad/Sandia (Cr Inv and MDA C)
MY2018 Q1

SAMPLE ID: CASA-18-147998

WORK ORDER:

	AS PLANNED	AS COLLECTED		AS PLANNED	AS COLLECTED
Date Collected (MM/DD/YYYY):	11/8/17	OK	FIELD MATRIX:	WG	OK
TIME COLLECTED (HH:MM):	1045		MEDIA:	OK	
PRS ID:	OK		SAMPLE TECH CODE:	GSP	
LOCATION ID:	R-11		FIELD PREP:	UF	
LOCATION TYPE:	OK		FIELD QC TYPE:	REG	
TOP DEPTH:	↓		SAMPLE USAGE:	INV	↓
BOTTOM DEPTH:	↓	↓	EXCAVATED:		YES / NO / (NA)

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

SAMPLE COMMENTS: Sampled 40 ft. from running diesel generator

LOCATION COMMENTS: Breezy while sampling

FIELD PARAMETERS:

Sample Time	1045	HH:MM	Discharge Rate	3.06	Dissolved Oxygen	6.95
Groundwater Elevation	5832.29		Oxidation-Reduction Potential	211.4	Period Purge Volume	15.3
pH	8.23		Purge Volume	149.94	Specific Conductance	211.4
Temperature	21.3		Total Volume Pumped	201.96	Turbidity	0.34

SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

EVENT ID: 11552

EVENT NAME: Mortandad/Sandia (Cr Inv and MDA C)
MY2018 Q1

SAMPLE ID: CASA-18-147998

WORK ORDER:

COLLECTED BY (PRINT): D. Hughes, A. Vigil

RELINQUISHED BY (Printed Name) Allizyn Stanfield (Signature) <i>Allizyn Stanfield</i>	Date/Time 11/8/17 1255	RECEIVED BY <i>S. Sherwood</i> (Printed Name) S. Sherwood (Signature) <i>S. Sherwood</i>	Date/Time 11/8/17 1255
RELINQUISHED BY (Printed Name) (Signature)	Date/Time	RECEIVED BY (Printed Name) (Signature)	Date/Time

SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

EVENT ID: 11552

EVENT NAME: Mortandad/Sandia (Cr Inv and MDA C)
MY2018 Q1

SAMPLE ID: CAMO-18-148116

WORK ORDER:

	<u>AS PLANNED</u>	<u>AS COLLECTED</u>		<u>AS PLANNED</u>	<u>AS COLLECTED</u>
Date Collected (MM/DD/YYYY):	11/8/17	OK	FIELD MATRIX:	WG	OK
TIME COLLECTED (HH:MM):	1212		MEDIA:	OK	
PRS ID:	OK		SAMPLE TECH CODE:	GSP	
LOCATION ID:	R-14 S1		FIELD PREP:	UF	
LOCATION TYPE:	OK		FIELD QC TYPE:	REG	
TOP DEPTH:	↓		SAMPLE USAGE:	INV	↓
BOTTOM DEPTH:	↓	↓	EXCAVATED:		YES / NO / <u>NA</u>

PRIORITY	ORDER	CONTAINER	#	PRESERVATIVE	COLLECTED Y/N	SPECIAL INSTRUCTIONS
NA	MSGP-Hg	500 ML POLY	1	HNO3	Y	NA
↓	WSP-8082-PCB	1 LITER AMBER GLASS	3	ICE	↓	↓
	WSP-8260B- VOA	40 ML SEPTUM AMBER GLASS	2	HCL		
	WSP-8270C- SVOA	1 LITER AMBER GLASS	2	ICE		
	WSP-CN(T)	250 ML POLY	1	NAOH		
	WSP-GrossA/B	1 LITER POLY	1	HNO3		
	WSP-LL-H-3	1 LITER POLY	1	NONE		
	WSP-RAD	1 GAL POLY	1	HNO3		
↓	WSP-TKN+TOC	500 ML AMBER GLASS	1	H2SO4	↓	↓

SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

EVENT ID: 11552

EVENT NAME: Mortandad/Sandia (Cr Inv and MDA C)
MY2018 Q1

SAMPLE ID: CAMO-18-148116

WORK ORDER:

SAMPLE COMMENTS: *Sampled 40 ft. from running diesel generator*LOCATION COMMENTS: *None*

FIELD PARAMETERS:

Sample Time	<u>1212</u>	HH:MM	Discharge Rate	<u>7.14</u>	Dissolved Oxygen	<u>5.77</u>
Groundwater Elevation	<u>5870.52</u>		Oxidation-Reduction Potential	<u>181.4</u>	Period Purge Volume	<u>35.7</u>
pH	<u>8.19</u>		Purge Volume	<u>149.94</u>	Specific Conductance	<u>127.0</u>
Temperature	<u>23.2</u>		Total Volume Pumped	<u>271.32</u>	Turbidity	<u>0.22</u>

COLLECTED BY (PRINT): *A. Vigil, D. Hughes*

RELINQUISHED BY (Printed Name) <i>Alizyn Stanfield</i> (Signature) <i>[Signature]</i>	Date/Time <i>11/8/17</i> <i>1255</i>	RECEIVED BY (Printed Name) <i>S. Sherwood</i> (Signature) <i>[Signature]</i>	Date/Time <i>11/8/17</i> <i>1255</i>
RELINQUISHED BY (Printed Name) (Signature)	Date/Time	RECEIVED BY (Printed Name) (Signature)	Date/Time

Samples collected from a WFO area?	YES	NO	NA
COC: 2018-833 Field Test for Explosives Results	YES	NO	NA
Spot test shows presence of explosives residues. If YES - Do not ship.			

TEST - Chemical Preservation			YES	NO	NA
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	NA
The sample has field screening measurements of alpha activity and beta activity?					
Sample Activity (dpm/100cm ²)	Shipment Activity (dpm ^g /100cm ²)	Sampled Location	YES	NO	NA
Alpha detectable	Alpha >160,000	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	Alpha >1,250,000	other locations			
Beta > 1,500	Beta >15,000,000	any location			
The sample Alpha >16,000,000 dpm ^g /100cm ² or Beta > 160,000,000 dpm ^g /100cm ² . If YES - Do not ship.					
On the external surface of the sample container, alpha activity ≥ 24 dpm/cm ² , beta activity ≥ 240 dpm/cm ² , 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	NA
Prior analytical measurements of radioactive isotopes are available?					
Sample Activity (pCi/g)	Shipment Activity (pCi)		YES	NO	NA
<ul style="list-style-type: none"> Am-241 > 27 Cs-137 > 270 Pu-238 > 27 Pu-239/240 > 27 Th-228 > 27 U-234 > 270 U-238 > 270 H-3 > 27,000,000 	<ul style="list-style-type: none"> Am-241 > 270,000 Cs-137 > 270,000 Pu-238 > 270,000 Pu-239/240 > 270,000 Th-228 > 270,000 U-234 > 1,600,000,000 U-238 > unlimited H-3 > 27,000,000,000 				
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.					
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.					

HOLD SAMPLES FOR ANALYSIS	
The samples are held per ER-SOP-10094, Rev. 1, 5.2.2 [7]	

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) MATT ENGLERT	11-9-17
(Signature) <i>M. Engler</i>	1500

Hazard Assessment Reviewed By:	Date/Time
(Printed Name) Ramee Onstott	11/9/17
(Signature) <i>Ramee Onstott</i>	1500

DATA VALIDATION REPORT

Chain Of Custody No. 2018-833

1. Distribution Of Samples In EDD.

SDG	Analytical Method	Regular Samples	Field Duplicates	Trip Blanks	Field Blanks	Equipment Blanks
ARS1-17-03312	Generic:Low_Level_Tritium	2				

SDG	Analytical Method	Analysis Lot ID	Prep Lot ID	Regular Samples	Field Duplicates	Trip Blanks	Field Blanks	Equipment Blanks	Method Blanks	Matrix Spikes	Matrix Spike Dups	Analytical Spikes	Post-Digestion Spikes	Lab Control Samples	Lab Control Sample Dups	Blank Spike	Blank Spike Dups	Lab Duplicates	Storage Blanks	Preparation Blanks	Reagent Blanks
ARS1-17-03312	Generic:Low_Level_Tritium	ARS1-B17-	ARS1-B17-	2					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-18-148116	ARS1-B17-02611-13	REG	1	0	0	0
Generic:Low_Level_Tritium	RAD	CASA-18-147998	ARS1-B17-02611-12	REG	1	0	0	0
Generic:Low_Level_Tritium	RAD	LCS	ARS1-B17-02611-01	LCS	0	0	1	0
Generic:Low_Level_Tritium	RAD	LCSD	ARS1-B17-02611-02	LCSD	0	0	1	0
Generic:Low_Level_Tritium	RAD	MB	ARS1-B17-02611-03	MB	1	0	0	0

3. Are any analytes missing?

No.

4. Were any holding times exceeded?

No.

5. Any contaminants in blanks?

No.

DATA VALIDATION REPORT

6. Any surrogate recoveries outside the control limits?

No.

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

No.

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

LCS Lab Sample	LCSD Lab	Analytical Method	Parameter Name	Lab Lot ID	Analysis	Sample Matrix	LCS Spike Recovery	LCSD Spike Recovery	Upper Limit	Lower Limit	Upper Rejection Limit	Lower Rejection Limit	RPD	RPD Limit
ARS1-B17-02611-01	ARS1-B17-02611-02	Generic:Low_Level_Tritium	Tritium	ARS1-B17-02611	01-23-2018	W	144.00	141.00	120.00	80.000		10	1.0139	

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.

13. Display Flagged Data.

DATA VALIDATION REPORT

Location ID	COC Number	Field Sample ID	Sample Purpose	Analysis Type Code	Analytical Suite	Analytical Method	Paramter Name	Lab Qualifier	Validation Qualifier	Validation Reason Codes	Detect Flag	Lab Result	Lab Units	Report Result	Report Units	Report MDA	Report Uncertainty	Lab Matrix	Sample Date	Percent	Analysis Lot ID	Validation Status Code	Use Flag
R-14 S1	2018-833	CAMO-18-148116	REG	INIT	RAD	Generic:Low_Level_Tritium	Tritium	QU	U	R5	N	2.714	pCi/L	2.714	pCi/L	2.931	0.999	W	11/08/2017		ARS1-B17-02611	VAL	Y
R-11	2018-833	CASA-18-147998	REG	INIT	RAD	Generic:Low_Level_Tritium	Tritium	QU	U	R5	N	-0.098	pCi/L	-0.098	pCi/L	2.816	0.830	W	11/08/2017		ARS1-B17-02611	VAL	Y

Reason Code

Description

R5

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

14. Usable Result Count.

Field Sample ID	Location ID	Sample Purpose	Analytical Method	No. Unuseable Records	Total Records
CAMO-18-148116	R-14 S1	REG	Generic:Low_Level_Tritium	0	1
CASA-18-147998	R-11	REG	Generic:Low_Level_Tritium	0	1



ARS International, LLC

Laboratory Analysis Report

ARS1-17-03312

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**

A handwritten signature in black ink, appearing to read 'Susan Alexe', is written over a horizontal line.

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**



2609 North River Road • Port Allen, Louisiana 70767

1 (800) 401-4277 • FAX (225) 381-2996

ARS Sample Delivery Group: ARS1-17-03312

Client Sample ID: CASA-18-147998

Sample Collection Date: 11/08/17

Sample Matrix: Aqueous

Percent Solids: N/A

Request or PO Number: 2018-833

ARS Sample ID: ARS1-17-03312-001

Date Received: 11/13/17

Report Date: 01/26/18

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	-0.098	0.830	2.816	1.368	3.221	QU	pCi/L	ARS-040/	01/25/18 21:56	MMORGAN	N/A

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

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2609 North River Road • Port Allen, Louisiana 70767

1 (800) 401-4277 • FAX (225) 381-2996

ARS Sample Delivery Group: ARS1-17-03312

Client Sample ID: CAMO-18-148116

Sample Collection Date: 11/08/17

Sample Matrix: Aqueous

Percent Solids: N/A

Request or PO Number: 2018-833

ARS Sample ID: ARS1-17-03312-002

Date Received: 11/13/17

Report Date: 01/26/18

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	2.714	0.999	2.931	1.424	3.221	QU	pCi/L	ARS-040/	01/26/18 3:38	MMORGAN	N/A

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

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QC Results per Analytical Batch

Analytical Batch	ARS1-B17-02611
SDG	ARS1-17-03312
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	01/23/18 12:49	Analysis Technician	MMORGAN	
Analysis Batch Sample ID	QC Type	Analyte	Results	CSU (1s)	Expected Value	LCS Rec (%)	MDC
ARS1-B17-02611-02	LCSD	ENRICHED H-3	47.004	7.217	33.160	141.7	3.105

Duplicate RER/DER/RPD			Analysis Date	01/23/18 12:49	Analysis Technician	MMORGAN	
Analyte	Results LCS	CSU LCS (1s)	Results LCSD	CSU LCSD (1s)	RER	DER	RPD
ENRICHED H-3	47.483	7.267	47.004	7.217	0.033	0.047	1.0

Method Blank			Analysis Date	01/23/18 18:32	Analysis Technician	MMORGAN	
Analysis Batch Sample ID	QC Type	Analyte	Results	CSU (1s)	MDC	Qual	
ARS1-B17-02611-03	MBL	ENRICHED H-3	-0.662	0.832	2.839	U	

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

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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).

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

COC/Lab Request #:
2018-833
Page 1 of 1

Special Instructions:				
Relinquished by: <u>M. Eller</u>	Print Name: <u>MATT ENGLERT</u>	Date/Time: <u>11-9-17 1:50</u>	Received by: <u>Kathleen Daigle</u>	Print Name: <u>Kathleen Daigle</u>
Relinquished by:	Print Name:	Date/Time:	Received by:	Print Name:
Relinquished by:	Print Name:	Date/Time:	Received by:	Print Name: