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NMED Hazardous Waste Bureau

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Los Alamos Site Office, MS A316
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*Date*: DEC 14 2011
*Refer To*: EP2011-0382

John Kieling, Acting Bureau Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6303

**Subject: Submittal of the Periodic Monitoring Report for Vapor-Sampling Activities at Material Disposal Area V, Consolidated Unit 21-018(a)-99, at Technical Area 21, Fourth Quarter Fiscal Year 2011**

Dear Mr. Kieling:

Enclosed please find two hard copies with electronic files of the Periodic Monitoring Report for Vapor-Sampling Activities at Material Disposal Area V, Consolidated Unit 21-018(a)-99, at Technical Area 21, Fourth Quarter Fiscal Year 2011.

A letter from the New Mexico Environment Department, dated November 10, 2011, approved Los Alamos National Laboratory's request to discontinue vapor monitoring at Material Disposal Area (MDA) V. With this submittal, corrective actions are complete at MDA V, and this will be the last periodic monitoring report submitted unless information becomes available indicating vapor monitoring should be resumed.

If you have any questions, please contact Bruce Wedgeworth at (505) 231-0108 (brucew@lanl.gov) or Woody Woodworth at (505) 665-5820 (lance.woodworth@nnsa.doe.gov).

Sincerely,

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

Sincerely,

Cheryl J Rodriguez for

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



34980

MG/GR/DM/BW:sm

Enclosures: Two hard copies with electronic files – Periodic Monitoring Report for Vapor-Sampling Activities at Material Disposal Area V, Consolidated Unit 21-018(a)-99, at Technical Area 21, Fourth Quarter Fiscal Year 2011 (LA-UR-11-6488)

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LA-UR-11-6488
January 2012
EP2011-0382

# Periodic Monitoring Report for Vapor-Sampling Activities at Material Disposal Area V, Consolidated Unit 21-018(a)-99, at Technical Area 21, Fourth Quarter Fiscal Year 2011

Los Alamos
NATIONAL LABORATORY
EST. 1943

Prepared by the Environmental Programs Directorate

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EP2011-0382

# Periodic Monitoring Report for Vapor-Sampling Activities at Material Disposal Area V, Consolidated Unit 21-018(a)-99, at Technical Area 21, Fourth Quarter Fiscal Year 2011

January 2012

Responsible project manager:

| Printed Name | Signature | Title | Organization | Date |
|---|---|---|---|---|
| Bruce Wedgeworth | | Project Manager | Environmental Programs | 12/12/11 |

Responsible LANS representative:

| Printed Name | Signature | Title | Organization | Date |
|---|---|---|---|---|
| Michael J. Graham | | Associate Director | Environmental Programs | 13 Dec 11 |

Responsible DOE representative:

| Printed Name | Signature | Title | Organization | Date |
|---|---|---|---|---|
| George J. Rael | Cheryl J Rodriguez for | Manager | DOE-LASO | 12/14/2011 |

## EXECUTIVE SUMMARY

This periodic monitoring report summarizes vapor-monitoring activities conducted during the fourth quarter of fiscal year (FY) 2011 at Material Disposal Area (MDA) V, Consolidated Unit 21-018(a)-99, in Technical Area 21, at Los Alamos National Laboratory. The objectives of vapor monitoring at MDA V are to (1) collect additional vapor samples from vapor-monitoring wells at MDA V and (2) compare sampling results with previously detected tritium activities in pore gas beneath and surrounding MDA V.

Vapor monitoring included field screening and collecting vapor samples from two vapor-monitoring wells. Vapor samples were submitted for laboratory analysis of tritium. The results of the detected tritium activities in MDA V during the fourth quarter of FY2011 were similar to previous sampling results.

Additional monitoring of tritium in pore gas is not needed to support corrective action decisions for MDA V. Certificates of completion for MDA V were issued by the New Mexico Environment Department (NMED) on June 3, 2011. Vapor-monitoring activities were performed at MDA V during the fourth quarter of FY2011 to support remediation of MDA B.

Remediation at MDA B has been completed, and Los Alamos National Laboratory (the Laboratory) requested that vapor monitoring at MDA V be discontinued. On November 10, 2011, NMED approved the Laboratory's request to discontinue vapor monitoring at MDA V.

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Appendix C Quality Assurance/Quality Control Program
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# 1.0 INTRODUCTION

This periodic monitoring report (PMR) presents the results of vapor-monitoring activities conducted during the fourth quarter of fiscal year (FY) 2011 at Material Disposal Area (MDA) V, Consolidated Unit 21-018(a)-99, in Technical Area 21 (TA-21), at Los Alamos National Laboratory (LANL or the Laboratory). Vapor monitoring at MDA V has been conducted per the requirements outlined in the approved MDA V well installation work plan (LANL 2009, 106760; NMED 2009, 107304) and the New Mexico Environment Department's (NMED's) November 23, 2010, and March 8, 2011, letters to the Laboratory (NMED 2010, 111393; NMED 2011, 201232).

The objectives of the MDA V vapor-monitoring activities are to (1) collect additional vapor samples from vapor-monitoring wells at MDA V and (2) compare sampling results with previously detected tritium activities in pore gas beneath and surrounding MDA V.

This report discusses the results obtained during the latest quarterly monitoring activities; however, for comparison, vapor data from the previous three quarterly PMRs for MDA V, February 2011, March 2011, and third quarter of FY2011 (LANL 2011, 203600; LANL 2011, 204339; LANL 2011, 206438), are also included in the data evaluation section of this report. Vapor monitoring included field screening and collecting vapor samples from stainless-steel sampling ports in vapor-monitoring wells. All pore-gas samples were submitted for off-site analysis of tritium.

Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is voluntarily provided to NMED in accordance with U.S. Department of Energy policy.

## 1.1 Site Location and Description

MDA V is located within TA-21 on DP Mesa (Figure 1.1-1). This MDA included three cobble- and gravel-filled absorption beds measuring 25 ft × 220 ft × 5–6 ft deep that were removed in 2005 and replaced by soil covered with aggregate-based graveled pavement and native grasses. The entire MDA V site measures approximately 0.88 acres; a haul road for MDA B runs along the northwest perimeter.

The edge of BV Canyon, which is a tributary to Los Alamos Canyon, is approximately 75 ft south of the location of the former absorption beds. The entire site was regraded following sampling and removal activities in 2005, and best management practices have been installed, including straw wattles and revegetation with native grass seed. The top of the regional aquifer is approximately 1270 ft below ground surface (bgs) at MDA V, based on nearby water-level information from regional wells R-64, R-6, R-7, Otowi-4, and R-8 (LANL 2004, 087358; Kleinfelder 2005, 091693).

# 2.0 SCOPE OF ACTIVITIES

The following activities were completed at MDA V during the fourth quarter of FY2011. Vapor-monitoring activities were conducted from September 13, 2011, to September 15, 2011. Table 2.0-1 outlines the NMED-approved vapor-monitoring locations, port depths, and corresponding sampling intervals.

- Samples were field screened and collected in accordance with the current version of Standard Operating Procedure 5074, Sampling Subsurface Vapor.
- Field screening was conducted using a MultiRAE IR Multi-Gas Monitor to measure percent carbon dioxide (%$CO_2$) and percent oxygen (%$O_2$).

- Vapor samples were submitted to off-site analytical laboratories in silica-gel columns for tritium analysis using U.S. Environmental Protection Agency (EPA) Method 906.
- A total of 9 ports in 2 vapor-monitoring wells (Figure 2.0-1) were field screened using a MultiRAE IR Multi-Gas Monitor.
- A total of 11 pore-gas samples (9 characterization and 2 quality assurance [QA]/quality control [QC]) were collected for tritium analysis from 9 ports in 2 vapor-monitoring wells.
- All analytical data were subject to QA/QC and data validation reviews in accordance with Laboratory guidance and procedures. Field duplicate samples were collected at a minimum frequency of 1 for every 10 samples. The QA/QC and data validation reviews for MDA V pore-gas data are presented in Appendix C.

No investigation-derived waste was generated at the time vapor-monitoring activities were conducted at MDA V.

Further discussion of the field methods used for pore-gas field screening and sample collection is presented in Appendix B. Field chain-of-custody forms and sample collection logs are provided in Attachment D-1 of Appendix D (on CD).

The pore-gas field-screening results are discussed in section 4, and the pore-gas analytical results are discussed in section 5. Any deviations from the scope of activities presented in the approved MDA V well installation work plan (LANL 2009, 106760; NMED 2009, 107304) and NMED's letters to the Laboratory (NMED 2010, 111393; NMED 2011, 201232) are presented in the following section.

### 2.1 Deviations

There were no deviations during the fourth quarter of FY2011 sampling event.

## 3.0 REGULATORY CRITERIA

There are no applicable standards for tritium extracted from pore vapor.

## 4.0 FIELD-SCREENING RESULTS

Field screening for the fourth quarter of FY2011 was conducted using a MultiRAE IR Multi-Gas Monitor to measure %$CO_2$ and %$O_2$. Before each port was sampled, it was purged of stagnant air to ensure formation air was being collected. Each sampling port was then monitored until $CO_2$ and $O_2$ readings stabilized at levels representative of subsurface pore-gas conditions. Tables of all field-screening results obtained during the February 2011, March 2011, and third and fourth quarter FY2011 sampling events at MDA V are provided in Appendix D and sorted by vapor-monitoring well ID and depth. The $CO_2$ and $O_2$ field-screening methods and results are discussed further in Appendix B. The $CO_2$ and $O_2$ results for the fourth quarter of FY2011 were within calibration limits.

## 5.0 ANALYTICAL DATA RESULTS

All vapor analytical sampling data presented in this report are available at the Risk Analysis, Communication, Evaluation, and Reduction (RACER) website (http://www.racernm.com/). Samples were submitted to off-site analytical laboratories in silica-gel columns for tritium analysis using EPA Method 906. The tritium sampling results are discussed below.

### 5.1 Tritium Results

Tritium results from the fourth quarter of FY2011 and the previous three vapor-monitoring quarters are summarized in tables and provided in Appendix D. Figure 5.1-1 shows tritium detected during the latest sampling event for vapor-monitoring wells 21-24524W and 21-24524S. Figure 5.1-2 shows a vertical profile of tritium for the fourth quarter of FY2011 sampling event and the previous three vapor-monitoring events; data are presented for one vapor-monitoring well system rather than separately for 21-24524W and 21-24524S. Tritium activities detected during the fourth quarter of FY2011 sampling event are similar to activities reported during previous sampling events. Two peaks in tritium activity are reported, one at 45 ft bgs and a larger peak at 302.5 ft bgs. Tritium activities reported from samples collected below 302.5 ft bgs are considerably lower. For the fourth quarter of FY2011 sampling event, the maximum tritium activity of 71,500 pCi/L was reported from 302.5 ft bgs.

## 6.0 SUMMARY

The objectives of the MDA V vapor-monitoring activities are to (1) collect additional vapor samples from vapor-monitoring wells at MDA V and (2) compare sampling results with previously detected tritium activities in pore gas beneath and surrounding MDA V. The results of the most recent vapor-monitoring activities are similar to results reported during previous vapor-monitoring activities.

Additional monitoring of tritium in pore gas is not needed to support corrective action decisions for MDA V. Certificates of completion for MDA V were issued by NMED on June 3, 2011 (NMED 2011, 203706). Vapor-monitoring activities were performed at MDA V during the fourth quarter of FY2011 to support remediation of MDA B, as described in NMED's November 24, 2010, and March 8, 2011, letters to the Laboratory (NMED 2010, 111393; NMED 2011, 201232).

Remediation at MDA B has been completed (LANL 2011, 207063), and the Laboratory requested that vapor monitoring at MDA V be discontinued (LANL 2011, 207417). On November 10, 2011, NMED approved the Laboratory's request to discontinue vapor monitoring at MDA V (NMED 2011, 207572).

## 7.0 REFERENCES AND MAP DATA SOURCES

### 7.1 References

*The following list includes all documents cited in this report. Parenthetical information following each reference provides the author(s), publication date, and ER ID. This information is also included in text citations. ER IDs are assigned by the Environmental Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.*

*Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau and the Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.*

Kleinfelder, April 2005. "Final Completion Report, Characterization Wells R-6/R-6i," report prepared for Los Alamos National Laboratory, Project No. 37151, Albuquerque, New Mexico. (Kleinfelder 2005, 091693)

LANL (Los Alamos National Laboratory), June 2004. "Investigation Work Plan for Consolidated Unit 21-018(a)-99, Material Disposal Area V, at Technical Area 21," Los Alamos National Laboratory document LA-UR-04-3699, Los Alamos, New Mexico. (LANL 2004, 087358)

LANL (Los Alamos National Laboratory), August 2009. "Vadose Zone Subsurface Characterization and Vapor-Monitoring Well Installation Work Plan for Material Disposal Area V, Consolidated Unit 21-018(a)-99, Revision 1," Los Alamos National Laboratory document LA-UR-09-5021, Los Alamos, New Mexico. (LANL 2009, 106760)

LANL (Los Alamos National Laboratory), June 2011. "Periodic Monitoring Report for Vapor-Sampling Activities at Material Disposal Area V, Consolidated Unit 21-018(a)-99, at Technical Area 21, February 2011," Los Alamos National Laboratory document LA-UR-11-2753, Los Alamos, New Mexico. (LANL 2011, 203600)

LANL (Los Alamos National Laboratory), June 2011. "Periodic Monitoring Report for Vapor-Sampling Activities at Material Disposal Area V, Consolidated Unit 21-018(a)-99, at Technical Area 21, March 2011," Los Alamos National Laboratory document LA-UR-11-3306, Los Alamos, New Mexico. (LANL 2011, 204339)

LANL (Los Alamos National Laboratory), September 2011. "Periodic Monitoring Report for Vapor-Sampling Activities at Material Disposal Area V, Consolidated Unit 21-018(a)-99, at Technical Area 21, Third Quarter Fiscal Year 2011," Los Alamos National Laboratory document LA-UR-11-5338, Los Alamos, New Mexico. (LANL 2011, 206438)

LANL (Los Alamos National Laboratory), September 2011. "Investigation/Remediation Report for Material Disposal Area B, Solid Waste Management Unit 21-015," Los Alamos National Laboratory document LA-UR-11-4845, Los Alamos, New Mexico. (LANL 2011, 207063)

LANL (Los Alamos National Laboratory), November 1, 2011. "Request to Discontinue Vapor Sampling at Material Disposal Area V," Los Alamos National Laboratory letter (EP2011-0357) to J. Kieling (NMED-HWB) from M.J. Graham (LANL) and G.J. Rael (DOE-LASO), Los Alamos, New Mexico. (LANL 2011, 207417)

NMED (New Mexico Environment Department), September 3, 2009. "Approval with Modifications, Vadose Zone Subsurface Characterization and Vapor-Monitoring Well Installation Work Plan for Material Disposal Area V, Consolidated Unit 21-018(a)-99," New Mexico Environment Department letter to D. Gregory (DOE-LASO) and D. McInroy (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2009, 107304)

NMED (New Mexico Environment Department), November 24, 2010. "Periodic Monitoring Report for Vapor-Sampling Activities at Material Disposal Area V, Consolidated Unit 21-018(a)-99, at Technical Area 21, April 2010," New Mexico Environment Department letter to G.J. Rael (DOE-LASO) and M.J. Graham (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2010, 111393)

NMED (New Mexico Environment Department), March 8, 2011. "Extended Tritium Vapor Sampling, Material Disposal Area (MDA) V, Technical Area 21," New Mexico Environment Department letter to G.J. Rael (DOE-LASO) and M.J. Graham (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2011, 201232)

NMED (New Mexico Environment Department), June 3, 2011. "Certificates of Completion, Material Disposal Area V, Technical Area 21," New Mexico Environment Department letter to G.J. Rael (DOE-LASO) and M.J. Graham (LANL) from J.E. Kieling (NMED-HWB), Santa Fe, New Mexico. (NMED 2011, 203706)

NMED (New Mexico Environment Department), November 10, 2011. "Approval, Request to Discontinue Quarterly Vapor Sampling at Material Disposal Area V," New Mexico Environment Department letter to G.J. Rael (DOE-LASO) and M.J. Graham (LANL) from J.E. Kieling (NMED-HWB), Santa Fe, New Mexico. (NMED 2011, 207572)

## 7.2 Map Data Sources

Data sources used in original figures created for this report are described below and identified by legend title.

| Legend Item/Type | Data Source |
|---|---|
| LANL boundary | LANL Areas Used and Occupied; Los Alamos National Laboratory, Site Planning & Project Initiation Group, Infrastructure Planning Office; 19 September 2007; as published 13 August 2010. |
| TA boundary | Technical Area Boundaries; Los Alamos National Laboratory, Site Planning & Project Initiation Group, Infrastructure Planning Office; September 2007; as published 13 August 2010. |
| ER projects | ER Project Locations; Los Alamos National Laboratory, ESH&Q Waste and Environmental Services Division, 2010-2E; 1:2,500 Scale Data; 04 October 2010. |
| MDAs | Materials Disposal Areas; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; ER2004-0221; 1:2,500 Scale Data; 23 April 2004. |
| Paved parking | Paved Parking; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 29 November 2010. |
| Paved road | Paved Road Arcs; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 29 November 2010. |
| Dirt road | Dirt Road Arcs; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 29 November 2010. |
| Road centerlines | Road Centerlines; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 15 December 2005; as published 29 November 2010. |
| Structure | Structures; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 29 November 2010. |
| Contours | Hypsography, 10 and 100 Foot Contour Interval; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; 1991. |
| Fence | Security and Industrial Fences and Gates; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 29 November 2010. |
| Drainage | Modeled Surface Drainage, 1991; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program, ER2002-0591; 1:24,000 Scale Data; Unknown publication date. |

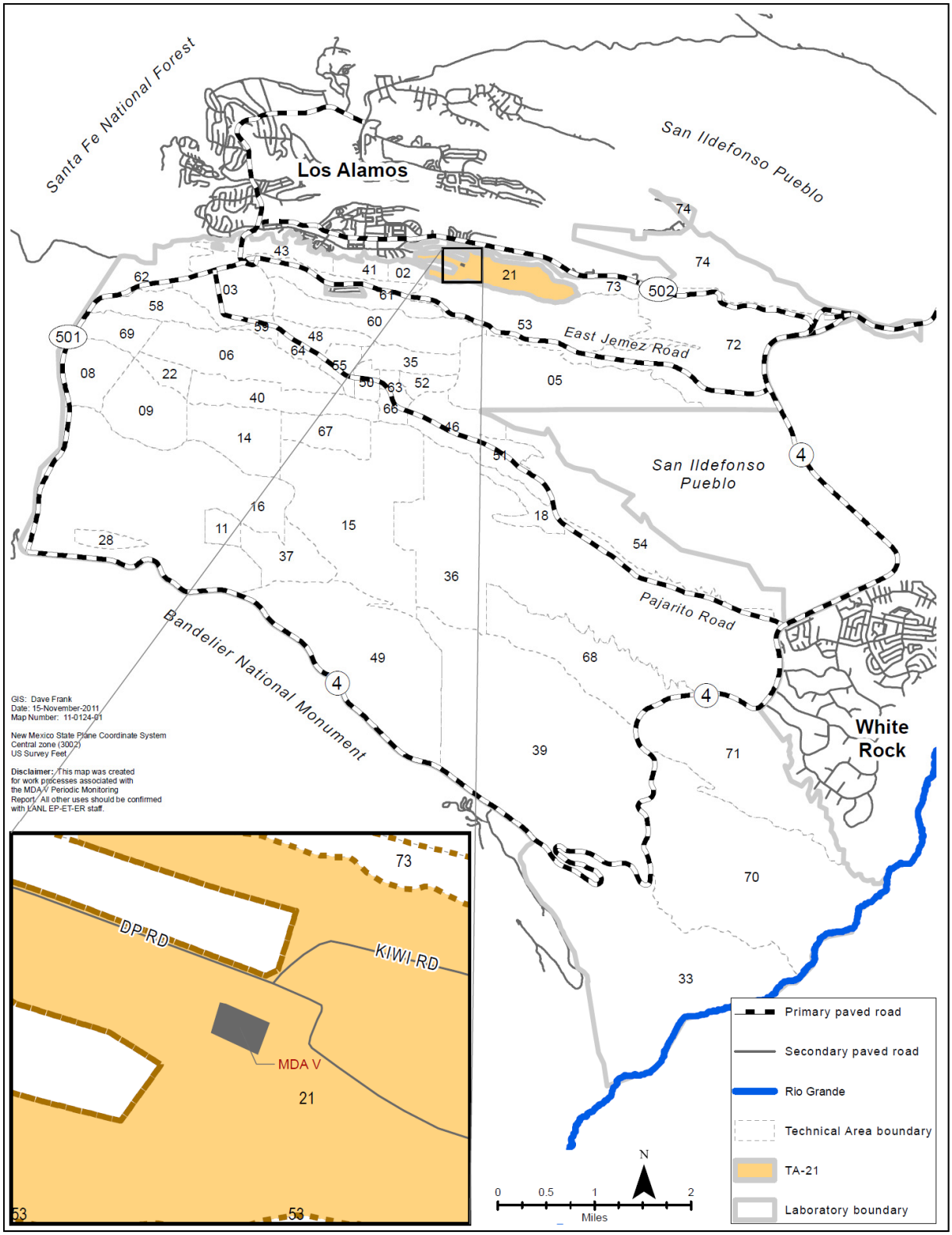


**Figure 1.1-1 Location of MDA V in TA-21 with respect to Laboratory TAs and surrounding landholdings**

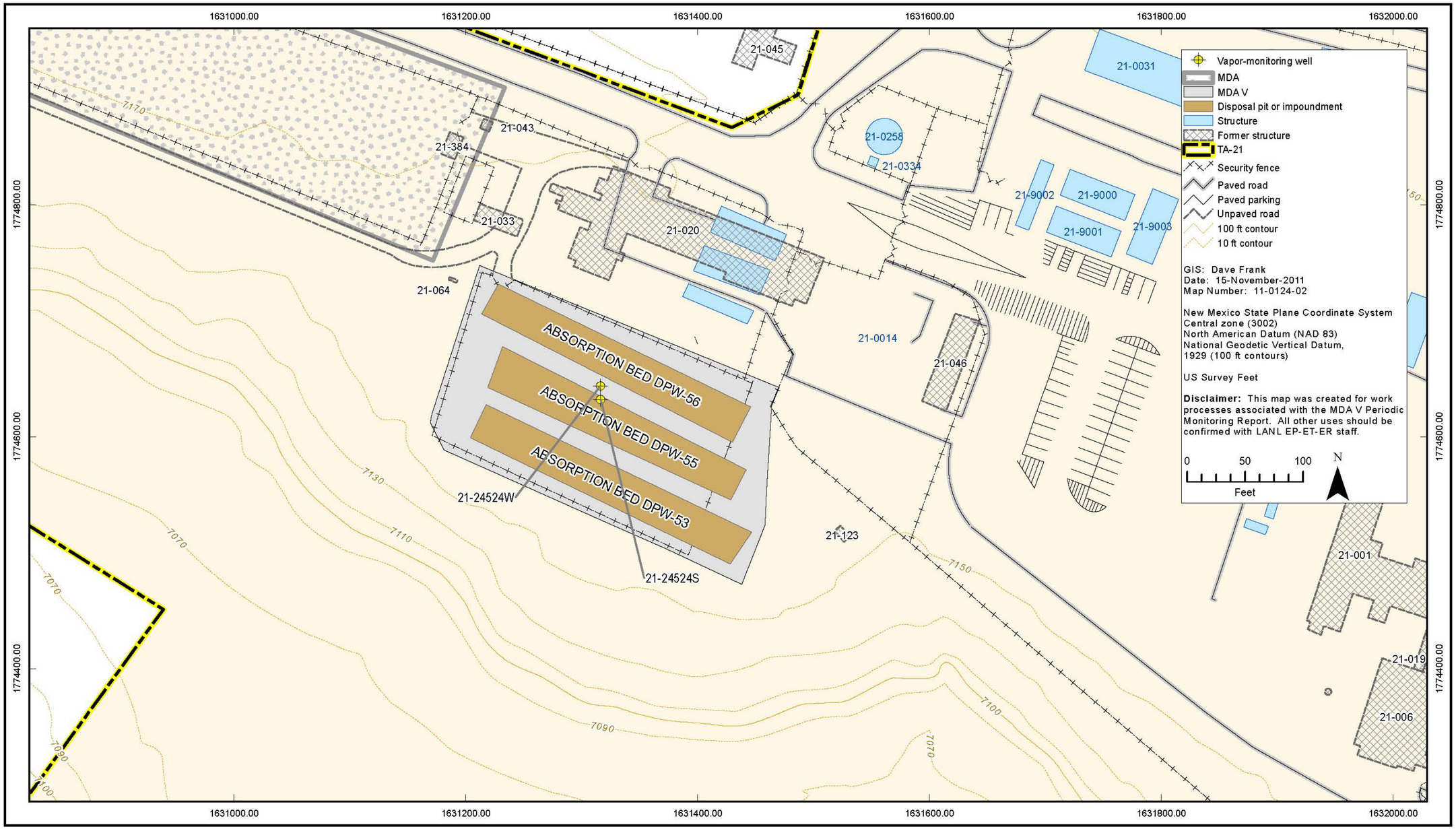


**Figure 2.0-1 Locations of MDA V vapor-monitoring wells and associated structures and features**

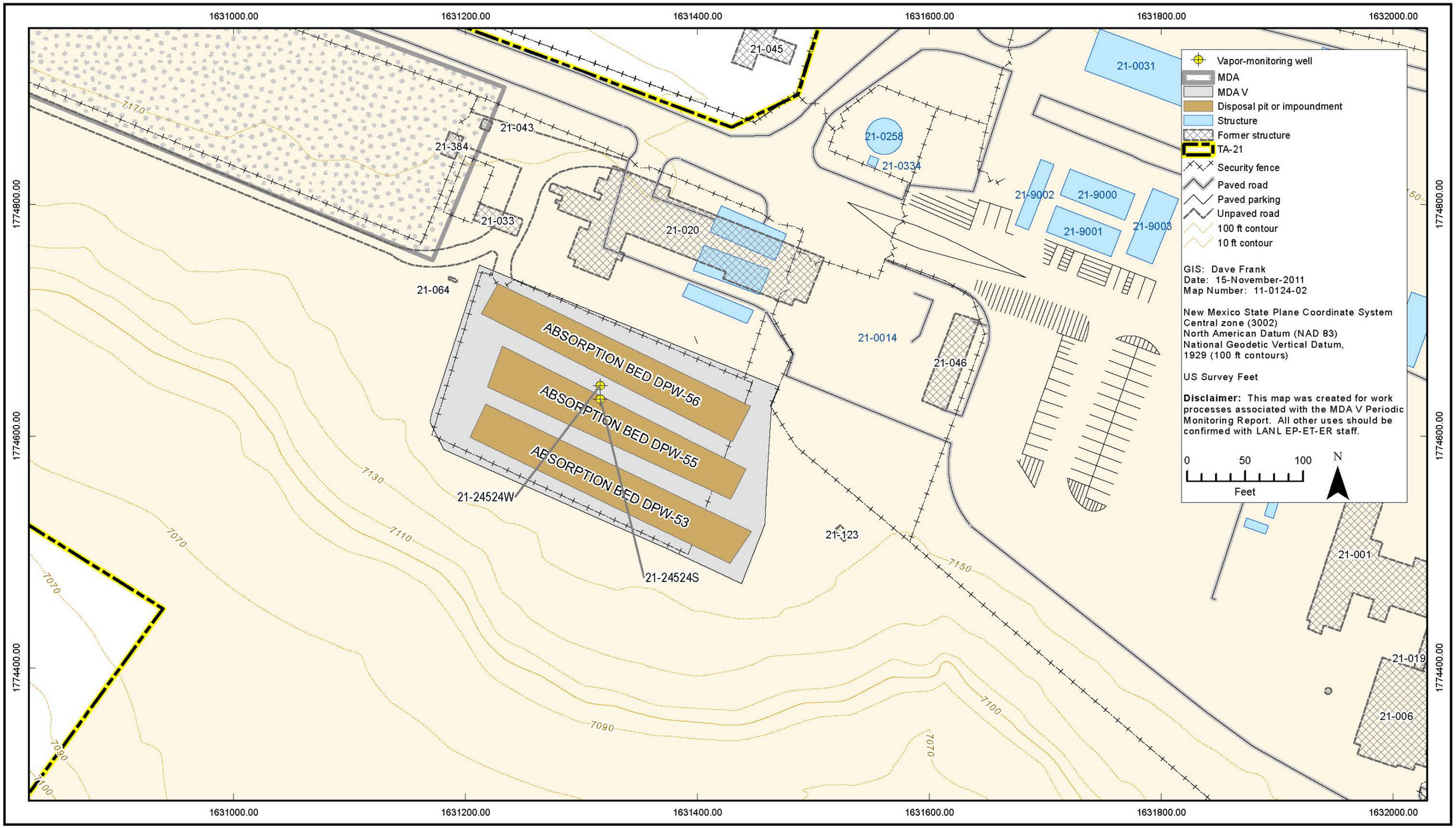


**Figure 5.1-1 Tritium detected in vapor samples at MDA V**

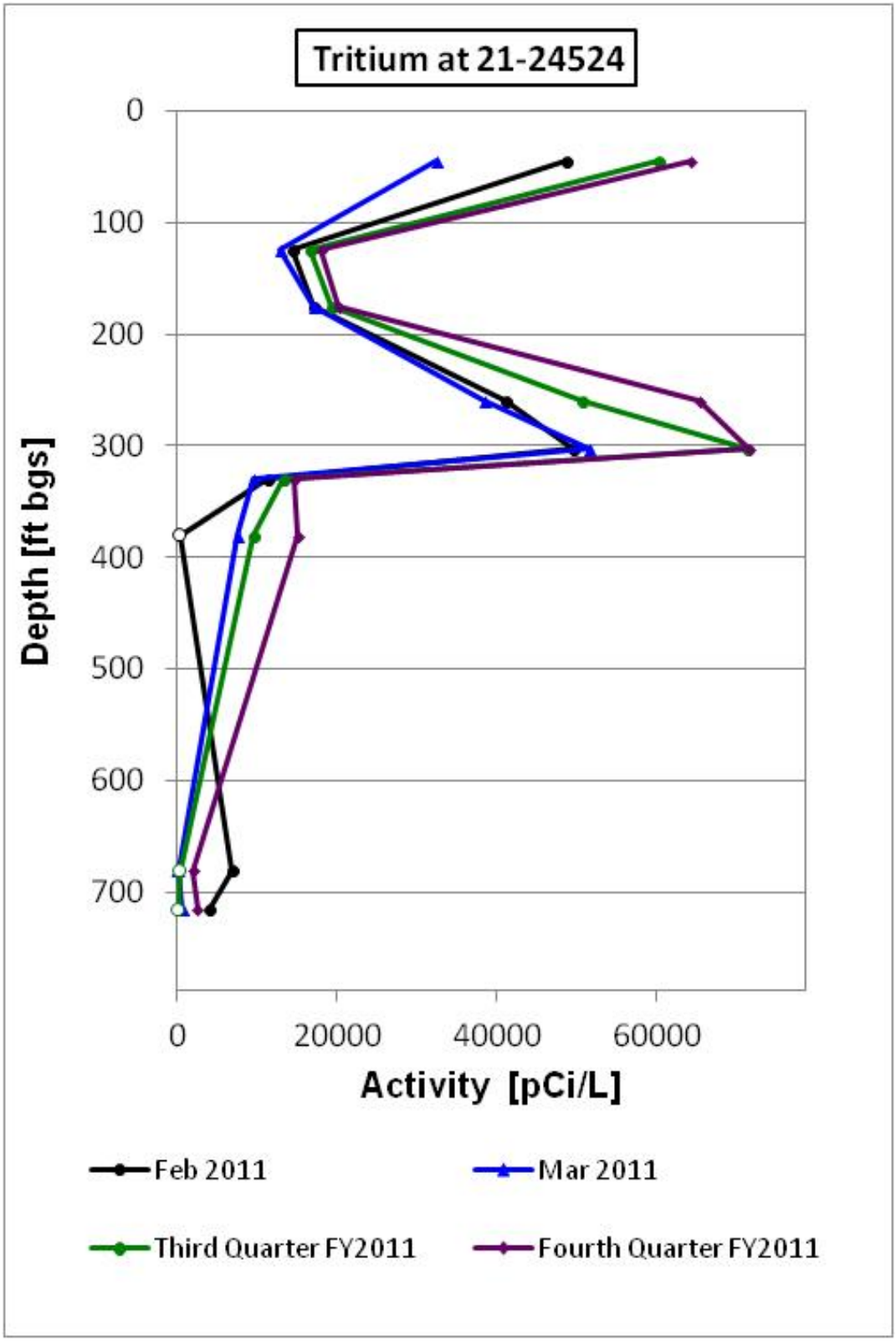


**Figure 5.1-2 Vertical profile of tritium in vapor-monitoring well 21-24524**

**Table 2.0-1**
**NMED-Approved MDA V Subsurface**
**Vapor-Monitoring Locations, Port Depths, and Corresponding Sampling Intervals**

| Vapor-Monitoring Well ID | Tritium Sampling-Port Depths and Intervals (ft bgs) |
|---|---|
| 21-24524W | **45 (42.5–47.5), 125 (122.5–127.5), 175 (172.5–177.5), 260 (257.5–262.5), 302.5 (300–305), 330 (327.5–332.5), 380 (377.5–382.5)** |
| 21-24524S | **680 (677.5–682.5), 715 (712.5–717.5)** |

Note: Depths in bold denote intervals that were field screened and ports where tritium samples were collected.

# Appendix A

*Acronyms and Abbreviations, Metric Conversion Table, and Data Qualifier Definitions*

## A-1.0 ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ADEP | Environmental Programs Directorate |
| bgs | below ground surface |
| COC | chain of custody |
| DER | duplicate error ratio |
| FY | fiscal year |
| EPA | Environmental Protection Agency (U.S.) |
| LANL | Los Alamos National Laboratory |
| LCS | laboratory control sample |
| MDA | material disposal area |
| NMED | New Mexico Environment Department |
| PMR | periodic monitoring report |
| QA | quality assurance |
| QC | quality control |
| RACER | Risk Analysis, Communication, Evaluation, and Reduction |
| RPD | relative percent difference |
| RPF | Records Processing Facility |
| SCL | sample collection log |
| SMO | sample management office |
| SOP | standard operating procedure |
| TA | technical area |
| TPU | total propagated uncertainty |

## A-2.0 METRIC CONVERSION TABLE

| Multiply SI (Metric) Unit | by | To Obtain U.S. Customary Unit |
|---|---|---|
| kilometers (km) | 0.622 | miles (mi) |
| kilometers (km) | 3281 | feet (ft) |
| meters (m) | 3.281 | feet (ft) |
| meters (m) | 39.37 | inches (in.) |
| centimeters (cm) | 0.03281 | feet (ft) |
| centimeters (cm) | 0.394 | inches (in.) |
| millimeters (mm) | 0.0394 | inches (in.) |
| micrometers or microns (µm) | 0.0000394 | inches (in.) |
| square kilometers ($km^2$) | 0.3861 | square miles ($mi^2$) |
| hectares (ha) | 2.5 | acres |
| square meters ($m^2$) | 10.764 | square feet ($ft^2$) |
| cubic meters ($m^3$) | 35.31 | cubic feet ($ft^3$) |
| kilograms (kg) | 2.2046 | pounds (lb) |
| grams (g) | 0.0353 | ounces (oz) |
| grams per cubic centimeter ($g/cm^3$) | 62.422 | pounds per cubic foot ($lb/ft^3$) |
| milligrams per kilogram (mg/kg) | 1 | parts per million (ppm) |
| micrograms per gram (µg/g) | 1 | parts per million (ppm) |
| liters (L) | 0.26 | gallons (gal.) |
| milligrams per liter (mg/L) | 1 | parts per million (ppm) |
| degrees Celsius (°C) | 9/5(°*C*) + 32 | degrees Fahrenheit (°F) |

## A-3.0 DATA QUALIFIER DEFINITIONS

| Data Qualifier | Definition |
|---|---|
| U | The analyte was analyzed for but not detected. |
| J | The analyte was positively identified, and the associated numerical value is estimated to be more uncertain than would normally be expected for that analysis. |
| J+ | The analyte was positively identified, and the result is likely to be biased high. |
| J- | The analyte was positively identified, and the result is likely to be biased low. |
| UJ | The analyte was not positively identified in the sample, and the associated value is an estimate of the sample-specific detection or quantitation limit. |
| R | The data are rejected as a result of major problems with quality assurance/quality control parameters. |

# Appendix B

*Field Methods*

## B-1.0 INTRODUCTION

This appendix summarizes the field methods used during the fourth quarter of fiscal year (FY) 2011 sampling activities at Material Disposal Area (MDA) V, Consolidated Unit 21-018(a)-99, in Technical Area 21, at Los Alamos National Laboratory (LANL or the Laboratory). All activities were conducted in accordance with the applicable standard operating procedures (SOPs), quality procedures, and Laboratory implementation and procedural requirements. Table B-1.0-1 summarizes the field methods used, and Table B-1.0-2 lists the applicable procedures.

## B-2.0 FIELD METHODS

All work was conducted according to site-specific health and safety documents and an integrated work document. The field activities conducted according to SOPs are discussed below.

### B-2.1 Pore-Gas Field Screening

All samples were field screened in accordance with the current version of SOP-5074, Sampling Subsurface Vapor. This procedure covers the use of the MultiRAE IR Multi-Gas Monitor. All field-screening results were recorded on the appropriate sample collection logs (SCLs) and/or in the field logbook and are provided in Attachment D-1 of Appendix D (on CD).

#### B-2.1.1 MultiRAE IR Multi-Gas Monitor

Before each sampling event, each sampling port was purged of stagnant air and then monitored with a MultiRAE IR Multi-Gas Monitor until the percent carbon dioxide (%$CO_2$) and percent oxygen (%$O_2$) levels stabilized at values representative of subsurface pore-gas conditions. Each rented instrument was shipped factory-calibrated to the subcontractor, and the calibration was checked daily.

The MultiRAE IR Multi-Gas Monitor can also be calibrated using a two-point process using “fresh air” and a standard gas. The first point calibration is the fresh air calibration that determines the zero point of the calibration curve for lower explosive limit, volatile organic compound, and toxic gas sensors. The fresh air calibration uses air containing a 20.9% oxygen concentration and is void of toxic gases and other impurities. The standard gas calibration sets the second point of the sensor calibration curve. The CO, $CO_2$, and $O_2$ sensors are zeroed during this two-point calibration process.

Calibration information is reported below for the MultiRAE IR Multi-Gas Monitor used to generate results presented in this periodic monitoring report.

- Unit 2375 was calibrated on September 2, 2011, at Geotech Environmental Equipment, Inc., in Denver, Colorado. The zero points were set for $CO_2$ and $O_2$. Percent oxygen was set to read ambient air at 20.9%.

Oxygen values should be near the zero point for $O_2$. The $CO_2$ reading should be near zero. Readings deviating from the zero points for $O_2$ and $CO_2$ may be because of subsurface conditions or a need for calibration.

The vapor-sample tubing was purged of stagnant air by drawing sufficient air from the sampling interval through the line. To ensure that the sample collected was representative of the subsurface air at depth, every sampling activity included a purge cycle.

The $\%CO_2$ and $\%O_2$ screening levels are presented in Appendix D. The fourth quarter of FY2011 $\%CO_2$ and $\%O_2$ levels ranged from 0.34% to 2.19% and from 15% to 20.5%, respectively. These values are within acceptable limits and are representative of subsurface pore-gas conditions.

### B-2.2 Tritium Pore-Gas Sample Collection

All tritium samples were collected in accordance with the current version of SOP-5074 and were submitted to the Sample Management Office (SMO) for processing and transport to off-site contract analytical laboratories. Water vapor intended for tritium analysis was collected from pore gas by pulling a pore-gas sample through a canister of silica gel (silica-gel column), and the sample information was recorded on the appropriate SCL in Attachment D-1 of Appendix D (on CD). Silica gel was the medium used at the Laboratory to collect moisture from pore-gas samples. The moisture was analyzed for tritium using liquid scintillation counting. Silica-gel column field duplicate samples were also collected at a frequency greater than or equal to 10% per sampling event in accordance with the current version of SOP-5059, Field Quality Control Samples.

Silica gel was prepared for sampling by drying it at a temperature above 100°C. Drying removes moisture from the silica gel but does not remove bound water that is accounted for by measuring the bound water percentage in each batch of silica gel. Before sample collection, the amount of silica gel used in each sample was weighed (typically about 135 g). The sample canister with silica gel was also weighed before sampling. SOP-5074 requires that at least 5 g of moisture be collected. After sampling, the sample canister with silica gel was weighed again to verify that 5 g of water vapor had been collected.

The sample (canister plus silica gel) was shipped to the analytical laboratory where it was weighed again. The silica gel was emptied into a distillation apparatus and heated to 110°C, driving moisture off the silica gel. This moisture was collected and analyzed for tritium by liquid scintillation. The laboratory also weighed the empty canister and calculated the percent moisture of the sample as the amount of moisture collected divided by the calculated weight of the wet silica gel. The value of the tritium activity and the calculated percent moisture were reported to the Laboratory in the analytical data package and the electronic data deliverable.

**Table B-1.0-1**
**Summary of Field Methods**

| Method | Summary |
|---|---|
| General Instructions for Field Investigations | This procedure provides an overview of instructions regarding activities performed before, during, and after field investigations. It is assumed field investigations involve standard sampling equipment, personal protective equipment, waste management, and site-control equipment/materials. The procedure covers premobilization activities, mobilization to the site, documentation and sample collection activities, sample media evaluation, surveillance, and completion of lessons learned. |
| Sample Containers and Preservation | Specific requirements/processes for sample containers, preservation techniques, and holding times are based on the U.S. Environmental Protection Agency guidance for environmental sampling, preservation, and quality assurance. Specific requirements were met for each sample and were printed in the SCLs provided by the Laboratory's SMO (size and type of container, preservatives, etc.). |
| Handling, Packaging, and Transporting Field Samples | Field team members sealed and labeled samples before packing to ensure sample and transport containers were free of external contamination. All environmental samples were collected, preserved, packaged, and transported to the SMO under chain of custody (COC). The SMO arranged for shipping of the samples to analytical laboratories. Any levels of radioactivity (i.e., action-level or limited-quantity ranges) were documented in SCLs submitted to the SMO. |
| Sample Control and Field Documentation | The collection, screening, and transport of samples were documented in standard forms generated by the SMO. These forms include SCLs, COC forms, sample container labels, and custody seals. Collection logs were completed at the time of sample collection and were signed by the sampler and a reviewer who verified the logs for completeness and accuracy. Corresponding labels were initialed and applied to each sample container, and custody seals were placed around container lids or openings. COC forms were completed and signed to verify that the samples were not left unattended. |
| Field Quality Control Samples | Field quality control samples were collected as follows:<br>Field duplicates were collected at a frequency of 10% and at the same time as a regular sample and submitted for the same analyses.<br>Field blanks required for all field events that include collecting samples for tritium analyses were collected. Field blanks were kept with the other sample containers during the sampling process and were submitted for laboratory analyses. |
| Sampling Subsurface Vapor | Vapor sampling was performed at two vapor-monitoring wells in accordance with the current version of SOP-5074, and samples were analyzed for tritium. This SOP describes the process of sampling subsurface air from vapor ports in monitoring wells and boreholes. The procedure covers presampling activities, sampling to detect and quantify gaseous organic concentration in air, SUMMA sampling (a passive collection and containment system of laboratory-quality air samples), adsorbent column sampling, sampling through the packer system (a sampling system that uses inflatable bladders to seal off a desired interval in an open borehole or at the end of a drill casing to obtain a sample from a discrete section), and postsampling activities. |

**Table B-1.0-2**
**List of Applicable General Procedures for MDA V Pore-Gas Monitoring Activities**

| Document Number | LANL Procedure Title |
|---|---|
| SOP-5055 | General Instructions for Field Investigations |
| SOP-5056 | Sample Containers and Preservation |
| SOP-5057 | Handling, Packaging, and Transporting Field Samples |
| WES-EDA-QP-219 | Sample Control and Field Documentation |
| SOP-5059 | Field Quality Control Samples |
| SOP-5061 | Field Decontamination of Equipment |
| SOP-5074 | Sampling Subsurface Vapor |
| P101-6 | Personal Protective Equipment |
| SOP-01.12 | Field Site Closeout Checklist |
| SOP-01.13 | Initiating and Managing Data Set Requests |
| SOP-5181 | Notebook and Logbook Documentation for Environmental Directorate Technical and Field Activities |
| SOP-5228 | ADEP* Reporting Requirements for Abnormal Events |
| SOP-5269 | Chain-of-Custody for Analytical Data Record Packages |

* ADEP = Environmental Program Directorate.

# Appendix C

*Quality Assurance/Quality Control Program*

## C-1.0 INTRODUCTION

This appendix presents the analytical methods and summarizes the data quality review for the fourth quarter of fiscal year (FY) 2011 pore-gas samples collected at Material Disposal Area (MDA) V, Consolidated Unit 21-018(a)-99, in Technical Area 21, at Los Alamos National Laboratory (LANL or the Laboratory).

Quality assurance (QA), quality control (QC), and data validation procedures were implemented in accordance with the Laboratory's "Quality Assurance Project Plan Requirements for Sampling and Analysis" (LANL 1996, 054609) and the Laboratory's scope of work for analytical services (LANL 2008, 109962). The results of the QA/QC activities were used to estimate the accuracy, bias, and precision of the analytical measurements. QC samples, including method blanks, blank spikes, matrix spikes, laboratory control samples (LCSs), internal standards, initial and continuing calibrations, and surrogates, were used to assess laboratory accuracy and bias.

The type and frequency of QC analyses are described in the analytical services scope of work (LANL 2008, 109962). Other QC factors, such as sample preservation and holding times, were also assessed. The requirements for sample preservation and holding times are presented in Standard Operating Procedure (SOP) 5056, Sample Containers and Preservation. Evaluating these QC indicators allows estimates to be made of the accuracy, bias, and precision of the analytical suites. A focused data validation was also performed for all the data packages (identified by request number) that included a more detailed review of the raw data. The SOPs used for data validation are presented in Table C-1.0-1. Copies of the analytical data, laboratory logbooks, and instrument printouts are provided in Attachment D-1 of Appendix D (on CD).

Analytical data were reviewed and evaluated based on U.S. Environmental Protection Agency (EPA) methodologies. As a result of the data validation and assessment efforts, qualifiers have been assigned to the appropriate analytical records. Definitions of the data qualifiers are presented in Appendix A.

### C-1.1 Maintenance of Chain of Custody

To maintain chain of custody is to document or demonstrate the possession of an item by only authorized individuals. The chain-of-custody process, described in SOP-5269, Chain of Custody for Analytical Data Record Packages, provides confidence in, and documentation of, analytical data integrity by establishing the traceability of the sample from the time of collection through processing to final maintenance as a record. The chain-of-custody forms are provided in Attachment D-1 of Appendix D (on CD).

### C-1.2 Sample Documentation

Establishing sample documentation acceptability, as described in WES-EDA-QP-219, Sample Control and Field Documentation, is the first step toward verifying that an analytical system has produced data of known quality. Documentation depends on the accessibility of review items that accurately and completely describe the work performed. In the absence of adequate sample documentation, data quality cannot be independently verified.

### C-1.3 Sample Preservation

Sample preservation is the use of specific types of sample containers and preservation techniques, as described in SOP-5056. Sample preservation is mandatory for hazardous site investigations because the integrity of any sample decreases over time. Physical factors (e.g., light, pressure, or temperature), chemical factors (e.g., changes in pH or volatilization), and biological factors may alter the original quality

of a sample. Because the various target parameters are uniquely altered at varying rates, distinct sample containers, preservation techniques, and holding times have been established to maintain sample integrity for a reasonable and acceptable period of time.

### C-1.4 Holding Time

Holding time, the maximum amount of time a sample can be stored without potential unacceptable changes in analyte concentrations, is described in SOP-5056. Extraction holding time refers to the time that elapses between sample collection and sample preparation; analytical holding time refers to the time that elapses between sample preparation and analysis.

### C-1.5 Initial and Continuing Calibration Verification (Including Interference-Check Standards)

Calibration verification establishes a quantitative relationship between the response of the analytical procedure and the concentration of the target analyte. There are two aspects of calibration verification: initial and continuing. The initial calibration verifies the accuracy of the calibration curve and the individual calibration standards being used to perform the calibration. The continuing calibration ensures that the initial calibration is still holding and correct as the instrument is used to process samples. Interference-check samples are used to determine if a high concentration of a single analyte in a sample interferes with the accurate quantitation of other analytes.

### C-1.6 Analyte Identification (Including Spectra Review and Thermal Ionization Cavity Review)

Analyte identification is the process of associating an instrument signal with a compound or analyte of interest. Evaluation of signal retention times, spectral overlap, multipeak pattern matching, and mass spectral library searches are tools for making analyte identification determinations.

### C-1.7 Analyte Quantitation

Analyte quantitation is the association of an instrument signal with a concentration and the determination that a recorded signal is detected or not detected. Detection limits, instrument calibration linear ranges, internal standards, and carrier recoveries are tools for making analyte quantitation evaluations.

Tritium results reported at less than the minimum detectable concentration are not detected. Each tritium result is also compared with the corresponding 1-sigma total propagated uncertainty (TPU). If the result is not greater than 3 times the TPU, it is also qualified as not detected (U).

### C-1.8 Method Blank

A method blank is an analyte-free matrix to which all reagents are added in the same volumes or proportions as those used in the environmental sample processing and is extracted and analyzed in the same manner as the corresponding environmental samples. Method blanks are used to assess the potential for sample contamination during extraction and analysis. All target analytes should be below the contract-required detection limit in the method blank (LANL 2008, 109962).

### C-1.9 Matrix Spike Recoveries

A matrix spike is an aliquot of a sample spiked with a known concentration of the target analyte(s). Matrix spike samples are used to measure the ability to recover prescribed analytes from a native sample matrix. Spiking typically occurs before sample preparation and analysis. Acceptable percentage recoveries for matrix spikes vary by method but should generally be greater than 10% for an analytical result to be usable (LANL 2008, 109962).

### C-1.10 Surrogate

Surrogates (an organic chemical compound) are similar in composition and behavior to target analytes but are not typically found in environmental samples. Surrogates are added to every blank, sample, and spike to evaluate the efficiency with which target analytes are recovered during extraction and analysis. The recovery percentages of the surrogates vary by method but should generally be greater than 10% for an analytical result to be usable (LANL 2008, 109962).

### C-1.11 Internal Standard Responses and Carrier Recoveries

Internal standards are chemical compounds added to blank, sample, and standard extracts at known concentrations. They are used to compensate for (1) analyte concentration changes that might occur during storage of the extract and (2) quantitation variations that can occur during analysis. Internal standard responses are used to adjust the reported concentrations for the quantitation of target analytes. The response factors for internal standards vary by method but should generally be within the range of ≥50% to ≤200% (LANL 2008, 109962).

### C-1.12 LCS Recoveries

An LCS is a known matrix that has been spiked with compound(s) representative of the target analytes. The LCS is used to document laboratory performance. The acceptance criteria for LCSs are method-specific but should generally be greater than 10% for an analytical result to be usable (LANL 2008, 109962).

### C-1.13 Laboratory and Field Duplicates (Including Serial Dilutions)

Laboratory duplicates are two portions of a sample taken from the same sample container (prepared for analysis and analyzed independently but under identical conditions) that are used to assess or demonstrate acceptable laboratory-method precision at the time of analysis. For radionuclide laboratory duplicates, the duplicate error ratio (DER) is also used to quantify precision. The DER is defined by the equation DER = $|S – D|/\text{sqrt}\ [(2\sigma_S)^2 + (2\sigma_D)^2]$, where S represents the original sample value, D represents the duplicate value, and $2\sigma_s$ and $2\sigma_D$ represent the 2-sigma uncertainties surrounding the original and duplicate samples, respectively. A DER below 3 indicates sample-to-field duplicate precision that is in control.

Field duplicates are samples taken as close as possible to the same time and from the same location. They are analyzed as two separate samples at the laboratory. Each duplicate sample is equally representative of the original material. All relative percent differences (RPDs) between samples and field duplicates should be ±35% (LANL 2008, 109962). The RPD is defined by the equation RPD = [|D1 – D2|/(D1 + D2)/2] × 100%, where D1 and D2 represent analytical measurements on duplicate samples. Field duplicates are collected for radionuclide analytes.

The field duplicate samples were collected at a frequency greater than or equal to 10% per sampling event in accordance with the current version of SOP-5059, Field Quality Control Samples.

### C-1.14 Field Blanks, Equipment Blanks, and Performance Evaluations

A field blank is a sample of analyte-free medium taken to the sampling site and exposed to the atmosphere during sample-collection activities. Field blanks are used to measure contamination introduced during sample collection. The field blank samples were collected at a frequency greater than or equal to 10% per sampling event in accordance with the current version of SOP-5059.

An equipment blank is a sample used to verify cleanliness of the sampling equipment. It is collected after completion of decontamination and before sampling.

## C-2.0 LABORATORY ANALYSIS SUMMARY

During the fourth quarter of FY2011, 9 tritium samples, 1 field blank sample, and 1 field duplicate sample were collected. Analysis of pore gas was conducted for tritium using EPA Method 906.0. Table C-2.0-1 lists the analytical methods used for tritium analyses. All QC procedures were followed, as required by the analytical services scope of work (LANL 2008, 109962).

Sampling locations, sampling ports, and validated analytical results for tritium are presented in Appendix D of this periodic monitoring report. The entire data set meets the standards for use in this report.

The tritium analyses are summarized in the following sections. The required minimum detectable concentration or estimated quantitation limit is prescribed in the analytical services scope of work (LANL 2008, 109962).

## C-3.0 RADIONUCLIDE ANALYSES

No tritium results were rejected during the fourth quarter of FY2011. Chain of custody, field documentation, and holding times were properly maintained for all samples. No sample preservation is required for tritium. The LCS recoveries were within acceptable limits for all tritium analyses.

No tritium samples were qualified during the fourth quarter of FY2011.

The field duplicate and its associated sample had a RPD <35%.

The field blank had a detectable level of tritium at 547 pCi/L.

## C-4.0 REFERENCES

*The following list includes all documents cited in this appendix. Parenthetical information following each reference provides the author(s), publication date, and ER ID. This information is also included in text citations. ER IDs are assigned by the Environmental Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.*

*Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau and the Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.*

LANL (Los Alamos National Laboratory), March 1996. "Quality Assurance Project Plan Requirements for Sampling and Analysis," Los Alamos National Laboratory document LA-UR-96-441, Los Alamos, New Mexico. (LANL 1996, 054609)

LANL (Los Alamos National Laboratory), June 30, 2008. "Exhibit 'D' Scope of Work and Technical Specifications, Analytical Laboratory Services for General Inorganic, Organic, Radiochemical, Asbestos, Low-Level Tritium, Particle Analysis, Bioassay, Dissolved Organic Carbon Fractionation, and PCB Congeners," Los Alamos National Laboratory document RFP No. 63639-RFP-08, Los Alamos, New Mexico. (LANL 2008, 109962)

**Table C-1.0-1**
**Data Validation Procedures**

| Procedure | Title | Effective Date |
|---|---|---|
| SOP-5166, R0 | Routine Validation of Gamma Spectroscopy, Chemical Separation Alpha Spectrometry, Gas Proportional Counting, and Liquid Scintillation Analytical Data | 6/30/2008 |

**Table C-2.0-1**
**Analytical Methods Used for Sample Analyses**

| Analytical Method | Analytical Description | Target Compound List |
|---|---|---|
| EPA Method 906.0 | Tritium in pore gas | Tritium |

# Appendix D

*Field-Screening Results and*
*Detected Volatile Organic Compounds and Tritium*

## D-1.0 INTRODUCTION

This appendix summarizes the field-screening results as well as detected tritium activities for the fourth quarter of fiscal year (FY) 2011 at Material Disposal Area (MDA) V. The tables listed below are included in this appendix and are organized by vapor-monitoring well ID and depth.

- Table D-1.0-1, Field-Screening Results Using a MultiRAE IR Multi-Gas Monitor at MDA V
- Table D-1.0-2, Summary of Tritium Results at MDA V

Data qualifiers used in these tables are defined in Appendix A of this periodic monitoring report.

Attachment D-1 (on CD included with this document) presents the analytical suites and results and analytical reports for the current and previous three monitoring periods.

**Table D-1.0-1**
**Field-Screening Results Using a MultiRAE IR Multi-Gas Monitor at MDA V**

| Vapor-Monitoring Well ID | Begin Depth (ft bgs[a]) | End Depth (ft bgs) | Analyte | February 2011 | | March 2011 | | 3rd Quarter FY2011 | | 4th Quarter FY2011 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Date | Result (%) | Date | Result (%) | Date | Result (%) | Date | Result (%) |
| 21-24524W | Ambient | Ambient | $CO_2$ | 02/07/11 | NS[b] | 03/08/11 | NS | 06/14/11 | NS | 09/13/11 | NS |
| | | | $O_2$ | 02/07/11 | NS | 03/08/11 | NS | 06/14/11 | NS | 09/13/11 | NS |
| | 42.5 | 47.5 | $CO_2$ | 02/07/11 | 1.56 | 03/08/11 | 2.90 | 06/14/11 | 3.36 | 09/13/11 | 2.19 |
| | | | $O_2$ | 02/07/11 | 15.9 | 03/08/11 | 15.9 | 06/14/11 | 16.2 | 09/13/11 | 15 |
| | 122.5 | 127.5 | $CO_2$ | 02/07/11 | 0.32 | 03/08/11 | 0.45 | 06/14/11 | 0.42 | 09/13/11 | 0.51 |
| | | | $O_2$ | 02/07/11 | 20.9 | 03/08/11 | 20.2 | 06/14/11 | 19.9 | 09/13/11 | 20.0 |
| | 172.5 | 177.5 | $CO_2$ | 02/07/11 | 0.46 | 03/08/11 | 0.40 | 06/14/11 | 0.44 | 09/13/11 | 0.46 |
| | | | $O_2$ | 02/07/11 | 20.9 | 03/08/11 | 20.4 | 06/14/11 | 19.9 | 09/13/11 | 20.1 |
| | 257.5 | 262.5 | $CO_2$ | 02/07/11 | 0.37 | 03/08/11 | 0.44 | 06/14/11 | 0.47 | 09/13/11 | 0.51 |
| | | | $O_2$ | 02/07/11 | 20.9 | 03/08/11 | 20.5 | 06/14/11 | 20.2 | 09/13/11 | 20.2 |
| | 300 | 305 | $CO_2$ | 02/07/11 | 0.36 | 03/08/11 | 0.37 | 06/14/11 | 0.45 | 09/13/11 | 0.51 |
| | | | $O_2$ | 02/07/11 | 20.9 | 03/08/11 | 20.9 | 06/14/11 | 20.1 | 09/13/11 | 20.3 |
| | 327.5 | 332.5 | $CO_2$ | 02/07/11 | 0.40 | 03/08/11 | 0.37 | 06/14/11 | 0.42 | 09/13/11 | 0.48 |
| | | | $O_2$ | 02/07/11 | 20.9 | 03/08/11 | 20.9 | 06/14/11 | 20.1 | 09/13/11 | 20.4 |
| | 377.5 | 382.5 | $CO_2$ | 02/07/11 | 0.34 | 03/08/11 | 0.33 | 06/14/11 | 0.36 | 09/13/11 | 0.45 |
| | | | $O_2$ | 02/07/11 | 20.9 | 03/08/11 | 20.9 | 06/14/11 | 20.3 | 09/13/11 | 20.4 |
| 21-24524S | 677.5 | 682.5 | $CO_2$ | 02/07/11 | 0.30 | 03/08/11 | 0.18 | 06/14/11 | 0.24 | 09/13/11 | 0.35 |
| | | | $O_2$ | 02/07/11 | 20.9 | 03/08/11 | 20.9 | 06/14/11 | 20.5 | 09/13/11 | 20.4 |
| | 712.5 | 717.5 | $CO_2$ | 02/07/11 | 0.29 | 03/08/11 | 0.23 | 06/14/11 | 0.15 | 09/13/11 | 0.34 |
| | | | $O_2$ | 02/07/11 | 20.9 | 03/08/11 | 20.9 | 06/14/11 | 20.6 | 09/13/11 | 20.5 |

[a] bgs = Below ground surface.

[b] NS = Not sampled.

**Table D-1.0-2**
**Summary of Tritium Results at MDA V**

| Vapor-Monitoring Well ID | Begin Depth (ft bgs[a]) | End Depth (ft bgs) | February 2011 | | March 2011 | | 3rd Quarter FY2011 | | 4th Quarter FY2011 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Collection Date | Result (pCi/L) | Collection Date | Result (pCi/L) | Collection Date | Result (pCi/L) | Collection Date | Result (pCi/L) |
| 21-24524 | 42.5 | 47.5 | 02/08/11 | 48,600 | 03/09/11 | 32,400 | 06/15/11 | 60,200 | 09/15/11 | 64,300 |
| | 122.5 | 127.5 | 02/08/11 | 14,300 (J) | 03/09/11 | 12,700 | 06/15/11 | 16,600 | 09/15/11 | 17,900 |
| | 172.5 | 177.5 | 02/08/11 | 17,100 (J) | 03/09/11 | 17,000 | 06/15/11 | 19,300 | 09/15/11 | 20,100 |
| | 257.5 | 262.5 | 02/08/11 | 41,100 | 03/09/11 | 38,400 | 06/15/11 | 50,600 | 09/15/11 | 65,300 |
| | 300 | 305 | 02/08/11 | 49,600 | 03/10/11 | 51,600 | 06/15/11 | 71,300 | 09/15/11 | 71,500 |
| | 327.5 | 332.5 | 02/08/11 | 11,200 (J) | 03/09/11 | 9400 | 06/15/11 | 13,300 | 09/15/11 | 14,600 |
| | 377.5 | 382.5 | 02/08/11 | ND[b] | 03/09/11 | 7470 | 06/15/11 | 9390 | 09/15/11 | 15,100 |
| | 677.5 | 682.5 | 02/08/11 | 6830 (J) | 03/09/11 | ND | 06/15/11 | ND | 09/15/11 | 1870 |
| | 712.5 | 717.5 | 02/08/11 | 3940 (J) | 03/09/11 | 507 | 06/15/11 | ND | 09/15/11 | 2480 |

[a] bgs = Below ground surface.

[b] ND = Not detected.

# Attachment D-1

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*Analytical Suites and Results and Analytical Reports*
*(on CD included with this document)*

Monday, September 19, 2011

REQUEST NUMBER: 11-3626

# LOS ALAMOS
## NATIONAL LABORATORY

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

These Samples are on:
LANL Request Number:11-3626
Per Agreement Number:63641-001-10
Project Cost Code: MR8R032NFM00

Please analyse the enclosed samples according to the schedule indicated:

**SHIP DATE: 9/19/2011**
**TURNAROUND/REPORT DUE: 10/19/2011**
**TURNAROUND REQ'D: 30 Days**

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

LANL ER SMO CONTACT:
Signature:

| PRIORITY | METHOD CODE | CNTNR | SAMPLE ID | SAMPLE MATRIX | DATE SAMPLED | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| | EPA:906.0 | 1 | MD21-11-26384 | GAS | 9/15/2011 | |
| | | 1 | MD21-11-26385 | GAS | 9/15/2011 | |
| | | 1 | MD21-11-26386 | GAS | 9/15/2011 | |
| | | 1 | MD21-11-26387 | GAS | 9/15/2011 | |
| | | 1 | MD21-11-26388 | GAS | 9/15/2011 | |
| | | 1 | MD21-11-26389 | GAS | 9/15/2011 | |
| | | 1 | MD21-11-26390 | GAS | 9/15/2011 | |
| | | 1 | MD21-11-26391 | GAS | 9/15/2011 | |
| | | 1 | MD21-11-26392 | GAS | 9/15/2011 | |
| | | 1 | MD21-11-26393 | GAS | 9/15/2011 | |

Final Page of REQUEST NUMBER 11-3626

Monday, September 19, 2011

# LAB CHAIN OF CUSTODY DOCUMENT NUMBER: 11-3626C

**REQUEST NUMBER: 11-3626**

## LOS ALAMOS
**NATIONAL LABORATORY**

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

TURNAROUND/REPORT DUE: 10/19/2011
TURNAROUND REQ'D: 30

| SAMPLE ID | CTNR | CTNR DESC | ORDER | PRESERV | MATRIX |
|---|---|---|---|---|---|
| MD21-11-26384 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-26391 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-26388 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-26389 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-26385 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-26386 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-26393 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-26387 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-26390 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-26392 | 1 | SILICA GEL TUBE | H3 | None | GAS |

| Relinquished By: | Date | Time | Received By: | Date | Time |
|---|---|---|---|---|---|
| Signature | | | Signature | | |
| Signature | 9/19/11 | 1400 | Signature | | |
| Signature | | | Signature | | |

**Received for DISPOSAL By:** **Date** **Time** **Remarks:**

Signature

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3592 **EVENT NAME:** MDA V Pore Gas Sampling - CU 21-018(a)-99

**SAMPLE ID:** MD21-11-26384 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 9/15/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 1100 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | 21-24524W | ok | FIELD QC TYPE: | NA | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | 42.5 | ok | SAMPLE USAGE: | INV | |
| BOTTOM DEPTH: | 47.5 | ok | SCREEN/PORT DESC: | | |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO (NA) | Port 1 | |

COMPOSITE TYPE: NA COMPOSITE TIME INTERVAL: NA WATER FLOWING: YES / NO (NA)

BOREHOLE: (YES) / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90°

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |
| ~~1~~ | | ~~TO15~~ | ~~6 LITER SUMMA~~ CANISTER | ~~None~~ | Not collected, not sampled for RO 8/19/11 | |

**SAMPLE DESC:**
column # 221 initial wt ~~603.63g~~ RO 9/15/11 602.52g Final wt ~~622.22g~~ RO 9/15/11 654.13g
Silica wt ~~151.92g~~ RO 9/15/11 146.96g Vapor wt 51.61g

**SAMPLE COMMENTS:**
weather data @ 1055 T = 55°F RH - 77% BP = 30.29 in

**LOCATION DESC:**

**FIELD SCREENING/MEASUREMENT RESULTS:**
atm $O_2$ 20.9% $CO_2$ 530 ppm
Subatm $O_2$ ~~21.9~~ RO 9/15/11 15.0% $CO_2$ 2.19%

**COLLECTED BY (PRINT)** R Orsoff M Gorgi **REVIEWED BY (PRINT)** M Gorgi

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) Ranae Orsoff | 9/16/11 | (Printed Name) Sherri Sherwood | 9/16/11 |
| (Signature) Ranae Orsoff | 1500 | (Signature) Sherri Sherwood | 1500 |
| **RELINQUISHED BY** | **Date/Time** | **RECEIVED BY** | **Date/Time** |
| (Printed Name) | | (Printed Name) | |
| (Signature) | | (Signature) | |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3592 **EVENT NAME:** MDA V Pore Gas Sampling - CU 21-018(a)-99

**SAMPLE ID:** MD21-11-26385 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 9/15/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 1100 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | 21-24524W | ok | FIELD QC TYPE: | NA | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | 122.5 | ok | SAMPLE USAGE: | INV | |
| BOTTOM DEPTH: | 127.5 | ok | SCREEN/PORT DESC: | | Prt 2 |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: NA COMPOSITE TIME INTERVAL: NA WATER FLOWING: YES / NO / NA

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90°

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |
| 1 | | TO15 | 6 LITER SUMMA CANISTER | None | no 8/19/11 | Not collected, not sampled for |

**SAMPLE DESC:** column # 198 initial wt 599.20g silica wt = 152.22g Final wt 649.10g vapor wt 49.90g

**SAMPLE COMMENTS:** weather data @ 1055 T=55°F RH=77% BP=30.29 in

**LOCATION DESC:** NA

**FIELD SCREENING/MEASUREMENT RESULTS:**
atm $O_2$ 20.9% $CO_2$ 530 ppm
sub atm $O_2$ 20.0% $CO_2$ 5110 ppm

**COLLECTED BY (PRINT)** K Onstott M Giorgi **REVIEWED BY (PRINT)** MV Brown

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) Karee Onstott | 9/16/11 | (Printed Name) Sherri Sherwood | 9/16/11 |
| (Signature) Karee Onstott | 1500 | (Signature) Sherri Sherwood | 1500 |
| **RELINQUISHED BY** | **Date/Time** | **RECEIVED BY** | **Date/Time** |
| (Printed Name) | | (Printed Name) | |
| (Signature) | | (Signature) | |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3592 **EVENT NAME:** MDA V Pore Gas Sampling - CU 21-018(a)-99

**SAMPLE ID:** MD21-11-26386 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 9/15/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 1100 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | 21-24524W | ok | FIELD QC TYPE: | NA | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | 172.5 | ok | SAMPLE USAGE: | INV | |
| BOTTOM DEPTH: | 177.5 | ok | SCREEN/PORT DESC: | | port 3 |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: ~~9/15/11 ok~~ NA COMPOSITE TIME INTERVAL: NA WATER FLOWING: YES / ~~NO / NA~~

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90°

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |
| ~~1~~ | | ~~TO15~~ | ~~6 LITER SUMMA~~ CANISTER | ~~None~~ | | RO 8/19/11 Not collected, not sampled |

**SAMPLE DESC:**

column 209 initial wt 603.68g Silica wt 151.92g Final wt = 622.23g vapor = 18.60g

**SAMPLE COMMENTS:**

weather data @ 1055 T = 55°F RH = 77% BP = 30.29in

**LOCATION DESC:**

NA

**FIELD SCREENING/MEASUREMENT RESULTS:**

atm $O_2$ 20.9% $CO_2$ 530 ppm
subatm $O_2$ 20.1% $CO_2$ 4560 ppm

**COLLECTED BY (PRINT)** R Onstott M Gorski **REVIEWED BY (PRINT)** M Gorski

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) Raven Onstott | 9/16/11 | (Printed Name) SHERRY SHERWOOD | 9/16/11 |
| (Signature) Raven Onstott | 1500 | (Signature) Sherri Sherwood | 1800 |
| **RELINQUISHED BY** | **Date/Time** | **RECEIVED BY** | **Date/Time** |
| (Printed Name) | | (Printed Name) | |
| (Signature) | | (Signature) | |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3592 **EVENT NAME:** MDA V Pore Gas Sampling - CU 21-018(a)-99

**SAMPLE ID:** MD21-11-26387 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 9/10/11 | MEDIA: | NA | OK |
| TIME COLLECTED (HH:MM) | | 1100 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | OK | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | 21-24524W | OK | FIELD QC TYPE: | NA | |
| LOCATION TYPE: | BH | OK | FIELD PREP: | NA | |
| TOP DEPTH: | 257.5 | OK | SAMPLE USAGE: | INV | |
| BOTTOM DEPTH: | 262.5 | OK | SCREEN/PORT DESC: | | port 4 |
| FIELD MATRIX: | GAS | OK | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: NA ~~COMPOSITE TIME INTERVAL:~~ ~~WATER FLOWING: YES / NO / NA~~

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90°

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |
| ~~1~~ | | TO15 | ~~6 LITER SUMMA CANISTER~~ | ~~None~~ | ~~NO 8/19/11 Not collected Not sampled for~~ | |

**SAMPLE DESC:**

column # 213 initial wt 582.57g Final wt 627.68g silica wt 146.04g vapor wt 45.11g

**SAMPLE COMMENTS:**

weather data @ 1055 T = 55°F RH 77% BP = 30.29 in

**LOCATION DESC:**

NA

**FIELD SCREENING/MEASUREMENT RESULTS:**

atm $O_2$ 20.9% $CO_2$ 530ppm

Sub atm $O_2$ 5110ppm $CO_2$ 20.2%

**COLLECTED BY (PRINT)** R. Onskit M Borgia **REVIEWED BY (PRINT)** dl V Gory

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) Karen Onskit | 9/16/11 | (Printed Name) Sherri Sherwood | 9/16/11 |
| (Signature) Karen Onskit | 1500 | (Signature) Sherri Sherwood | 1800 |
| **RELINQUISHED BY** | **Date/Time** | **RECEIVED BY** | **Date/Time** |
| (Printed Name) | | (Printed Name) | |
| (Signature) | | (Signature) | |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3592 **EVENT NAME:** MDA V Pore Gas Sampling - CU 21-018(a)-99

**SAMPLE ID:** MD21-11-26388 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 9/15/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 1100 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | 21-24524W | ok | FIELD QC TYPE: | NA | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | 300 | ok | SAMPLE USAGE: | INV | |
| BOTTOM DEPTH: | 305 | ok | SCREEN/PORT DESC: | | port 5 |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: NA COMPOSITE TIME INTERVAL: WATER FLOWING: ~~YES / NO / NA~~

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90°

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |
| 1 | | TO15 | 6 LITER SUMMA CANISTER | None | | |

RO 8/19/11 Not collected Not sampled for

SAMPLE DESC:
column # 230 initial wt 602.91g Final wt 645.04g
Silica wt 151.77g Vapor wt 42.13g

SAMPLE COMMENTS:
weather data @ 1055 T=55°F RH=77% BP=30.29in

LOCATION DESC:
NA

FIELD SCREENING/MEASUREMENT RESULTS:
atm $O_2$ 20.9% $CO_2$ 530ppm
sub atm $O_2$ 20.3% $CO_2$ 5050ppm

COLLECTED BY (PRINT) Ronald M Gray REVIEWED BY (PRINT) M N Gray

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) Kanee Onstott | 9/16/11 | (Printed Name) SHERRI SHERWOOD | 9/16/11 |
| (Signature) Kanee Onstott | 1500 | (Signature) Sherri Sherwood | 1800 |
| **RELINQUISHED BY** | **Date/Time** | **RECEIVED BY** | **Date/Time** |
| (Printed Name) | | (Printed Name) | |
| (Signature) | | (Signature) | |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3592 **EVENT NAME:** MDA V Pore Gas Sampling - CU 21-018(a)-99

**SAMPLE ID:** MD21-11-26389 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 9/15/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 1100 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | 21-24524W | ok | FIELD QC TYPE: | NA | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | 327.5 | ok | SAMPLE USAGE: | INV | |
| BOTTOM DEPTH: | 332.5 | ok | SCREEN/PORT DESC: | | port 6 |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: NA COMPOSITE TIME INTERVAL: ~~WATER FLOWING: YES / NO / NA~~

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90°

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |
| ~~1~~ | | ~~TO15~~ | ~~6 LITER SUMMA CANISTER~~ | ~~None~~ | | |

KO 8/19/11 Not collected Not sampled for

**SAMPLE DESC:**
column 21B initial wt 598.58g Final wt 636.13g
silica wt 151.92g vapor wt 37.55g

**SAMPLE COMMENTS:**
weather data @ 1055 T=55°F RH 77% BP=30.29in

**LOCATION DESC:**
NA

**FIELD SCREENING/MEASUREMENT RESULTS:**
atm $O_2$ 20.9% KO 9/15/11 $CO_2$ 530 ppm
sub atm $O_2$ ~~20.3%~~ 20.4% $CO_2$ ~~5050~~ 4750 ppm KO 9/15/11

**COLLECTED BY (PRINT)** K Onstott Mabry **REVIEWED BY (PRINT)** MN Gonz

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) Karen Onstott | 9/16/11 | (Printed Name) Sherri Sherwood | 9/16/11 |
| (Signature) Karen Onstott | 1500 | (Signature) Sherri Sherwood | 1500 |
| **RELINQUISHED BY** | **Date/Time** | **RECEIVED BY** | **Date/Time** |
| (Printed Name) | | (Printed Name) | |
| (Signature) | | (Signature) | |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3592 **EVENT NAME:** MDA V Pore Gas Sampling - CU 21-018(a)-99

**SAMPLE ID:** MD21-11-26390 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 9/15/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 1100 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | 21-24524W | ok | FIELD QC TYPE: | NA | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | 377.5 | ok | SAMPLE USAGE: | INV | |
| BOTTOM DEPTH: | 382.5 | ok | SCREEN/PORT DESC: | | port 7 |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: NA COMPOSITE TIME INTERVAL: WATER FLOWING: YES / NO / NA

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90°

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |
| ~~1~~ | | ~~TO15~~ | ~~6 LITER SUMMA~~ CANISTER | None | no 8/19/11 Not collected, Not sampled for | |

**SAMPLE DESC:**
Column 226 Initial wt = 587.40g Final wt 620.47g
Silica wt = 146.02g Vapor wt = 33.07g

**SAMPLE COMMENTS:**
weather data @ 1055 T = 55°F RH = 77% BP = 30.29in

**LOCATION DESC:**
NA

**FIELD SCREENING/MEASUREMENT RESULTS:**
atm $O_2$ 20.9% $CO_2$ 530 ppm
Silica atm $O_2$ 20.4% $CO_2$ 4500 ppm

**COLLECTED BY (PRINT)** R Onstott M Gray **REVIEWED BY (PRINT)** M Gray

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) Karee Onstott | 9/16/11 | (Printed Name) SIERRA SHERWOOD | 9/16/11 |
| (Signature) Karee Onstott | 1500 | (Signature) Sherwood | 1500 |
| **RELINQUISHED BY** | **Date/Time** | **RECEIVED BY** | **Date/Time** |
| (Printed Name) | | (Printed Name) | |
| (Signature) | | (Signature) | |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3592 **EVENT NAME:** MDA V Pore Gas Sampling - CU 21-018(a)-99

**SAMPLE ID:** MD21-11-26391 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 9/15/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 1100 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | 21-24524S | ok | FIELD QC TYPE: | NA | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | 677.5 | ok | SAMPLE USAGE: | INV | |
| BOTTOM DEPTH: | 682.5 | ok | SCREEN/PORT DESC: | port 10 | |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: NA COMPOSITE TIME INTERVAL: WATER FLOWING: YES / NO / NA

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90°

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |
| ~~1~~ | | TO15 | 6 LITER SUMMA CANISTER | None | KO 8/19/11 Not collected Not sampled for | |

**SAMPLE DESC:**

#224 initial wt 612.07g Final wt 650.33g
silica wt 153.32g vapor wt = 38.26g

**SAMPLE COMMENTS:**

weather data @ 1055 T=55°F RH 77% BP=30.29 9/15/11 M

**LOCATION DESC:**

NA

**FIELD SCREENING/MEASUREMENT RESULTS:**

atm $O_2$ 20.9% $CO_2$ 530ppm
sub atm $O_2$ 20.4% $CO_2$ 3500 ppm

**COLLECTED BY (PRINT)** Randall M Gorg **REVIEWED BY (PRINT)** M V Gorg

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) Karen Onstott | 9/16/11 | (Printed Name) SHERRI SHERWOOD | 9/16/11 |
| (Signature) Karen Onstott | 1500 | (Signature) Sherri Sherwood | 1500 |
| **RELINQUISHED BY** | **Date/Time** | **RECEIVED BY** | **Date/Time** |
| (Printed Name) | | (Printed Name) | |
| (Signature) | | (Signature) | |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3592 **EVENT NAME:** MDA V Pore Gas Sampling - CU 21-018(a)-99

**SAMPLE ID:** MD21-11-26392 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 9/15/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 1100 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | 21-24524S | ok | FIELD QC TYPE: | NA | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | 712.5 | ok | SAMPLE USAGE: | INV | |
| BOTTOM DEPTH: | 717.5 | ok | SCREEN/PORT DESC: | port 11 | |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: NA ~~COMPOSITE TIME INTERVAL:~~ ~~WATER FLOWING: YES / NO / NA~~

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 900

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |
| ~~1~~ | | ~~TO15~~ | ~~6 LITER SUMMA~~ CANISTER | ~~None~~ | KO 8/19/11 Not collected, Not sampled for | |

**SAMPLE DESC:** #26 initial wt = 591.39g silica wt = 151.02g final wt 625.88g vapor wt 34.49g

**SAMPLE COMMENTS:** weather data @ 1055 T = 55°F RH 77% BP 30.29in

**LOCATION DESC:**

**FIELD SCREENING/MEASUREMENT RESULTS:** atm $O_2$ 20.9% $CO_2$ 530ppm sub atm $O_2$ 20.5% $CO_2$ 3400ppm

**COLLECTED BY (PRINT)** Ronald Mazzi **REVIEWED BY (PRINT)** [illegible]

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) Kamee Dorsett | 9/16/11 | (Printed Name) SHERRY SHERWOOD | 9/16/11 |
| (Signature) Kamee Dorsett | 1500 | (Signature) Sherry Sherwood | 1500 |
| **RELINQUISHED BY** | **Date/Time** | **RECEIVED BY** | **Date/Time** |
| (Printed Name) | | (Printed Name) | |
| (Signature) | | (Signature) | |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3592 **EVENT NAME:** MDA V Pore Gas Sampling - CU 21-018(a)-99

**SAMPLE ID:** MD21-11-26393 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 9/15/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 1100 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | UNK 21-24524w | | FIELD QC TYPE: | FD | |
| LOCATION TYPE: | GENERIC | | FIELD PREP: | NA | |
| TOP DEPTH: | 0 | 172.5 | SAMPLE USAGE: | QC | |
| BOTTOM DEPTH: | 0 | 177.5 | SCREEN/PORT DESC: | | FD 3 |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: NA COMPOSITE TIME INTERVAL: ~~WATER FLOWING: YES / NO / NA~~

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90°

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |
| ~~1~~ | | ~~TO15~~ | ~~6 LITER SUMMA~~ CANISTER | ~~None~~ | ko 8/19/11 Not collected, Not sampled for | |

SAMPLE DESC: QC Sample of MD21-11-26386

column 212 initial wt 600.96g Final 640.67g

silica wt 152.22g vapor 39.71g

SAMPLE COMMENTS:

weather @ 1055 T=55°F RH 77% BP=30.29 in

LOCATION DESC:

NA

FIELD SCREENING/MEASUREMENT RESULTS:

atm $O_2$ 20.9% $CO_2$ 530ppm

subatm $O_2$ 20.1% $CO_2$ 4560 ppm

COLLECTED BY (PRINT) Karen Onstott REVIEWED BY (PRINT) [illegible]

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) Karen Onstott | 9/16/11 | (Printed Name) SHERRY SHERWOOD | 9/16/11 |
| (Signature) Karen Onstott | 1500 | (Signature) Sherry Sherwood | 1500 |
| **RELINQUISHED BY** | **Date/Time** | **RECEIVED BY** | **Date/Time** |
| (Printed Name) | | (Printed Name) | |
| (Signature) | | (Signature) | |

# DATA VALIDATION COVER SHEET

**5119-1**

Data Validation Cover Sheet

Records Use only

Los Alamos NATIONAL LABORATORY EST. 1943

**Section I.**

REQUEST NUMBER: 11-3626 VALIDATION DATE: 11/01/11 LAB CODE: ARS

CONTRACT LABORATORY NAME: American Radiation Services

VALIDATOR: Kris Chupka ORGANIZATION: Analytical Quality Associates, Inc.

ANALYTICAL SUITE (CHECK ALL THAT APPLY):

- ☐ **TPH-GRO**
- ☐ **TPH-DRO**
- ☐ **GENERAL CHEMISTRY**
- ☐ **HIGH EXPLOSIVES**
- ☐ **METALS**
- ☒ **RADIOCHEMISTRY**
- ☐ **DIOXIN FURANS**
- ☐ **PCB CONGENERS**
- ☐ **LCMSMS HIGH EXPLOSIVES**
- ☐ **LCMSMS PERCHLORATES**
- ☐ **ORGANOCHLORINE PESTICIDES/POLYCHLORINATED BIPHENYLS**
- ☒ **OTHER (DESCRIBE):** tritium only

**Section II. Completeness Check**

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

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

1. An MS was not analyzed. However, an LCS was analyzed and met acceptance criteria; thus, no sample data were qualified.
2. An LCSD was analyzed instead of a sample duplicate. Acceptance criteria were met and, thus, no sample data were qualified.
3. The LCS/LCSD RER was hand-calculated using the 2-sigma TPU values and was found to be within specifications. No sample data were qualified as a result.

**Reviewed by:** Susan Ball **Level:** I **Date:** 11/02/11

VALIDATOR'S SIGNATURE: DATE: 11/01/11

| RAD ANALYTICAL DATA VALIDATION CHECKLIST | |
|---|---|
| **5119-2**<br>Rad Analytical Data Validation Checklist | Records Use only<br>Los Alamos NATIONAL LABORATORY EST. 1943 |

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

| RAD ANALYTICAL DATA VALIDATION CHECKLIST | |
|---|---|
| **5119-2**<br>Rad Analytical Data Validation Checklist | Records Use only<br>Los Alamos NATIONAL LABORATORY EST. 1943 |

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

| RAD ANALYTICAL DATA VALIDATION CHECKLIST | |
|---|---|
| **5119-2**<br>Rad Analytical Data Validation Checklist | Records Use only<br>Los Alamos NATIONAL LABORATORY EST. 1943 |

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

ARS INTERNATIONAL

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

| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-02028 | **Request or PO Number:** | 11-3626 |
| **Client Sample ID:** | MD21-11-26384 | **ARS Sample ID:** | ARS1-11-02028-001 |
| **Sample Collection Date:** | 09/15/11 | **Date Received:** | 09/20/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 10/13/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 54381.479 | 2856.445 | 202.197 | 99.287 | | pCi/L | ARS-054/EPA:906.0 | 09/30/11 02:22 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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11/1/11

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-02028 | **Request or PO Number:** | 11-3626 |
| **Client Sample ID:** | MD21-11-26391 | **ARS Sample ID:** | ARS1-11-02028-002 |
| **Sample Collection Date:** | 09/15/11 | **Date Received:** | 09/20/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 10/13/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 1485.604 | 107.798 | 201.302 | 98.847 | | pCi/L | ARS-054/EPA:906.0 | 09/30/11 05:32 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-02028 | **Request or PO Number:** | 11-3626 |
| **Client Sample ID:** | MD21-11-26388 | **ARS Sample ID:** | ARS1-11-02028-003 |
| **Sample Collection Date:** | 09/15/11 | **Date Received:** | 09/20/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 10/13/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 58095.031 | 3050.570 | 202.490 | 99.431 | | pCi/L | ARS-054/EPA:906.0 | 09/30/11 08:41 | BS | NA |

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-02028 | **Request or PO Number:** | 11-3626 |
| **Client Sample ID:** | MD21-11-26389 | **ARS Sample ID:** | ARS1-11-02028-004 |
| **Sample Collection Date:** | 09/15/11 | **Date Received:** | 09/20/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 10/13/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 11568.904 | 620.326 | 201.183 | 98.789 | | pCi/L | ARS-054/EPA:906.0 | 09/30/11 11:50 | BS | NA |

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|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-02028 | **Request or PO Number:** | 11-3626 |
| **Client Sample ID:** | MD21-11-26385 | **ARS Sample ID:** | ARS1-11-02028-005 |
| **Sample Collection Date:** | 09/15/11 | **Date Received:** | 09/20/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 10/13/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 14968.277 | 797.240 | 199.003 | 97.718 | | pCi/L | ARS-054/EPA:906.0 | 09/30/11 15:00 | BS | NA |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**NOTES: Project Cost Code MR8R032NFM00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-02028 | **Request or PO Number:** | 11-3626 |
| **Client Sample ID:** | MD21-11-26386 | **ARS Sample ID:** | ARS1-11-02028-006 |
| **Sample Collection Date:** | 09/15/11 | **Date Received:** | 09/20/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 10/13/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 13223.349 | 706.626 | 202.868 | 99.616 | | pCi/L | ARS-054/EPA:906.0 | 09/30/11 18:09 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-02028 | **Request or PO Number:** | 11-3626 |
| **Client Sample ID:** | MD21-11-26393 | **ARS Sample ID:** | ARS1-11-02028-007 |
| **Sample Collection Date:** | 09/15/11 | **Date Received:** | 09/20/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 10/13/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 16513.216 | 878.066 | 202.053 | 99.216 | | pCi/L | ARS-054/EPA:906.0 | 09/30/11 21:19 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-02028 | **Request or PO Number:** | 11-3626 |
| **Client Sample ID:** | MD21-11-26387 | **ARS Sample ID:** | ARS1-11-02028-008 |
| **Sample Collection Date:** | 09/15/11 | **Date Received:** | 09/20/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 10/13/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 54101.284 | 2841.871 | 203.215 | 99.787 | | pCi/L | ARS-054/EPA:906.0 | 10/01/11 00:28 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-02028 | **Request or PO Number:** | 11-3626 |
| **Client Sample ID:** | MD21-11-26390 | **ARS Sample ID:** | ARS1-11-02028-009 |
| **Sample Collection Date:** | 09/15/11 | **Date Received:** | 09/20/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 10/13/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 11778.117 | 631.320 | 202.350 | 99.362 | | pCi/L | ARS-054/EPA:906.0 | 10/01/11 03:37 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-02028 | **Request or PO Number:** | 11-3626 |
| **Client Sample ID:** | MD21-11-26392 | **ARS Sample ID:** | ARS1-11-02028-010 |
| **Sample Collection Date:** | 09/15/11 | **Date Received:** | 09/20/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 10/13/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 1936.298 | 128.396 | 202.326 | 99.350 | | pCi/L | ARS-054/EPA:906.0 | 10/01/11 06:47 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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LELAP Certificate# 01949 NELAP Certificate # E87558



KWC
11/1/11

Monday, September 19, 2011

REQUEST NUMBER: 11-3626

# LOS ALAMOS
## NATIONAL LABORATORY

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

These Samples are on:
LANL Request Number:11-3626
Per Agreement Number:63641-001-10
Project Cost Code: MR8R032NFM00

Please analyse the enclosed samples according to the schedule indicated:

**SHIP DATE: 9/19/2011**
**TURNAROUND/REPORT DUE: 10/19/2011**
**TURNAROUND REQ'D: 30 Days**

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

LANL ER SMO CONTACT:
Signature:

| PRIORITY | METHOD CODE | CNTNR | SAMPLE ID | SAMPLE MATRIX | DATE SAMPLED | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| | EPA:906.0 | 1 | MD21-11-26384 | GAS | 9/15/2011 | |
| | | 1 | MD21-11-26385 | GAS | 9/15/2011 | |
| | | 1 | MD21-11-26386 | GAS | 9/15/2011 | |
| | | 1 | MD21-11-26387 | GAS | 9/15/2011 | |
| | | 1 | MD21-11-26388 | GAS | 9/15/2011 | |
| | | 1 | MD21-11-26389 | GAS | 9/15/2011 | |
| | | 1 | MD21-11-26390 | GAS | 9/15/2011 | |
| | | 1 | MD21-11-26391 | GAS | 9/15/2011 | |
| | | 1 | MD21-11-26392 | GAS | 9/15/2011 | |
| | | 1 | MD21-11-26393 | GAS | 9/15/2011 | |

Monday, September 19, 2011

# LAB CHAIN OF CUSTODY DOCUMENT NUMBER: 11-3626C

**REQUEST NUMBER: 11-3626**

## LOS ALAMOS
**NATIONAL LABORATORY**

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

TURNAROUND/REPORT DUE: 10/19/2011
TURNAROUND REQ'D: 30

| SAMPLE ID | CTNR | CTNR DESC | ORDER | PRESERV | MATRIX |
|---|---|---|---|---|---|
| MD21-11-26384 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-26391 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-26388 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-26389 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-26385 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-26386 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-26393 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-26387 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-26390 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-26392 | 1 | SILICA GEL TUBE | H3 | None | GAS |

| Relinquished By: | Date | Time | Received By: | Date | Time |
|---|---|---|---|---|---|
| Signature | | | Signature | | |
| [illegible] | 9/19/11 | 1400 | [illegible] | 9-2011 | 10:14 |
| Signature | | | Signature | | |
| Signature | | | Signature | | |

| Received for DISPOSAL By: | Date | Time | Remarks: |
|---|---|---|---|
| Signature | | | |

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1 (800) 401-4277 • Fax (225) 381-2996

# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Request Number: 11-3626

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

# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory Request Number: 11-3626

# Original COC

Monday, September 19, 2011

REQUEST NUMBER: 11-3626

# LOS ALAMOS
## NATIONAL LABORATORY

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

These Samples are on:
LANL Request Number:11-3626
Per Agreement Number:63641-001-10
Project Cost Code: MR8R032NFM00

Please analyse the enclosed samples according to the schedule indicated:

**SHIP DATE: 9/19/2011**
**TURNAROUND/REPORT DUE: 10/19/2011**
**TURNAROUND REQ'D: 30 Days**

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

LANL ER SMO CONTACT:
Signature:

| PRIORITY | METHOD CODE | CNTNR | SAMPLE ID | SAMPLE MATRIX | DATE SAMPLED | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| | EPA:906.0 | 1 | MD21-11-26384 | GAS | 9/15/2011 | |
| | | 1 | MD21-11-26385 | GAS | 9/15/2011 | |
| | | 1 | MD21-11-26386 | GAS | 9/15/2011 | |
| | | 1 | MD21-11-26387 | GAS | 9/15/2011 | |
| | | 1 | MD21-11-26388 | GAS | 9/15/2011 | |
| | | 1 | MD21-11-26389 | GAS | 9/15/2011 | |
| | | 1 | MD21-11-26390 | GAS | 9/15/2011 | |
| | | 1 | MD21-11-26391 | GAS | 9/15/2011 | |
| | | 1 | MD21-11-26392 | GAS | 9/15/2011 | |
| | | 1 | MD21-11-26393 | GAS | 9/15/2011 | |

Monday, September 19, 2011

# LAB CHAIN OF CUSTODY DOCUMENT NUMBER: 11-3626C

**REQUEST NUMBER: 11-3626**

## LOS ALAMOS
**NATIONAL LABORATORY**

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

TURNAROUND/REPORT DUE: 10/19/2011
TURNAROUND REQ'D: 30

| SAMPLE ID | CTNR | CTNR DESC | ORDER | PRESERV | MATRIX |
|---|---|---|---|---|---|
| MD21-11-26384 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-26391 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-26388 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-26389 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-26385 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-26386 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-26393 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-26387 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-26390 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-26392 | 1 | SILICA GEL TUBE | H3 | None | GAS |

| Relinquished By: | Date | Time | Received By: | Date | Time |
|---|---|---|---|---|---|
| Signature | | | Signature | | |
| [illegible] | 9/19/11 | 1400 | [illegible] | 9-2011 | 10:14 |
| Signature | | | Signature | | |
| Signature | | | Signature | | |

| Received for DISPOSAL By: | Date | Time | Remarks: |
|---|---|---|---|
| Signature | | | |

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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory Request Number: 11-3626

# Case Narrative

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October 13, 2011

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

Request Number: **11-3626**
LANL Sample ID: MD21-11-26384; MD21-11-26391; MD21-11-26388; MD21-11-26389; MD21-11-26385; MD21-11-26386; MD21-11-26393; MD21-11-26387; MD21-11-26390; MD21-11-26392.

Dear Mr. Greene;

On September 20, 2011, ARS International received ten (10) Silica Gel samples to be analyzed for Tritium.

The samples were received in good condition. They were processed and counted using the appropriate counting equipment and QA/QC for this type of analysis. Results of the analysis and QA/QC are attached in the data package.

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

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

Sincerely,

Eugene Mulligan

Laboratory Management
**ARS International**

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

| Request Number | LANL PROJECT SAMPLE ID NUMBER | American Radiation Services SAMPLE ID NUMBER(S) |
|---|---|---|
| 11-3626 | MD21-11-26384 | ARS1-11-02028-001 |
| 11-3626 | MD21-11-26391 | ARS1-11-02028-002 |
| 11-3626 | MD21-11-26388 | ARS1-11-02028-003 |
| 11-3626 | MD21-11-26389 | ARS1-11-02028-004 |
| 11-3626 | MD21-11-26385 | ARS1-11-02028-005 |
| 11-3626 | MD21-11-26386 | ARS1-11-02028-006 |
| 11-3626 | MD21-11-26393 | ARS1-11-02028-007 |
| 11-3626 | MD21-11-26387 | ARS1-11-02028-008 |
| 11-3626 | MD21-11-26390 | ARS1-11-02028-009 |
| 11-3626 | MD21-11-26392 | ARS1-11-02028-010 |

**ANALYTICAL METHODS**
Tritium analyses were performed using **EPA 906.0.**

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

**American Radiation Services Project Manager/Laboratory Director's Comments:**
*"I certify that this sample data package is in compliance with SOW requirements, both technically and for completeness, other than the conditions detailed above. Release of the data contained in this sample data package and the computer-readable EDD, as applicable, submitted on diskette or by modem, has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature."*

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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 the LANL specific requirements, both technically and for completeness, other than the conditions detailed above or in the sample data package narrative. Release, by submission through email, the data contained in this electronic image and the computer-readable EDD (as applicable), has been authorized by the laboratory Manager/Technical Director or the Manager's designee."*

| Signature | Title | Date |
|---|---|---|
| Eugene McLegan | Laboratory Management, ARS International | 10-13-11 |

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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Tritium by Low Level Liquid Scintillation Counting

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-02028 | **Request or PO Number:** | 11-3626 |
| **Client Sample ID:** | MD21-11-26384 | **ARS Sample ID:** | ARS1-11-02028-001 |
| **Sample Collection Date:** | 09/15/11 | **Date Received:** | 09/20/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 10/13/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 54381.479 | 2856.445 | 202.197 | 99.287 | | pCi/L | ARS-054/EPA:906.0 | 09/30/11 02:22 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-02028 | **Request or PO Number:** | 11-3626 |
| **Client Sample ID:** | MD21-11-26391 | **ARS Sample ID:** | ARS1-11-02028-002 |
| **Sample Collection Date:** | 09/15/11 | **Date Received:** | 09/20/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 10/13/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 1485.604 | 107.798 | 201.302 | 98.847 | | pCi/L | ARS-054/EPA:906.0 | 09/30/11 05:32 | BS | NA |

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-02028 | **Request or PO Number:** | 11-3626 |
| **Client Sample ID:** | MD21-11-26388 | **ARS Sample ID:** | ARS1-11-02028-003 |
| **Sample Collection Date:** | 09/15/11 | **Date Received:** | 09/20/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 10/13/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 58095.031 | 3050.570 | 202.490 | 99.431 | | pCi/L | ARS-054/EPA:906.0 | 09/30/11 08:41 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-02028 | **Request or PO Number:** | 11-3626 |
| **Client Sample ID:** | MD21-11-26389 | **ARS Sample ID:** | ARS1-11-02028-004 |
| **Sample Collection Date:** | 09/15/11 | **Date Received:** | 09/20/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 10/13/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 11568.904 | 620.326 | 201.183 | 98.789 | | pCi/L | ARS-054/EPA:906.0 | 09/30/11 11:50 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-02028 | **Request or PO Number:** | 11-3626 |
| **Client Sample ID:** | MD21-11-26385 | **ARS Sample ID:** | ARS1-11-02028-005 |
| **Sample Collection Date:** | 09/15/11 | **Date Received:** | 09/20/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 10/13/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 14968.277 | 797.240 | 199.003 | 97.718 | | pCi/L | ARS-054/EPA:906.0 | 09/30/11 15:00 | BS | NA |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**NOTES: Project Cost Code MR8R032NFM00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-02028 | **Request or PO Number:** | 11-3626 |
| **Client Sample ID:** | MD21-11-26386 | **ARS Sample ID:** | ARS1-11-02028-006 |
| **Sample Collection Date:** | 09/15/11 | **Date Received:** | 09/20/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 10/13/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 13223.349 | 706.626 | 202.868 | 99.616 | | pCi/L | ARS-054/EPA:906.0 | 09/30/11 18:09 | BS | NA |

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-02028 | **Request or PO Number:** | 11-3626 |
| **Client Sample ID:** | MD21-11-26393 | **ARS Sample ID:** | ARS1-11-02028-007 |
| **Sample Collection Date:** | 09/15/11 | **Date Received:** | 09/20/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 10/13/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 16513.216 | 878.066 | 202.053 | 99.216 | | pCi/L | ARS-054/EPA:906.0 | 09/30/11 21:19 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-02028 | **Request or PO Number:** | 11-3626 |
| **Client Sample ID:** | MD21-11-26387 | **ARS Sample ID:** | ARS1-11-02028-008 |
| **Sample Collection Date:** | 09/15/11 | **Date Received:** | 09/20/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 10/13/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 54101.284 | 2841.871 | 203.215 | 99.787 | | pCi/L | ARS-054/EPA:906.0 | 10/01/11 00:28 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-02028 | **Request or PO Number:** | 11-3626 |
| **Client Sample ID:** | MD21-11-26390 | **ARS Sample ID:** | ARS1-11-02028-009 |
| **Sample Collection Date:** | 09/15/11 | **Date Received:** | 09/20/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 10/13/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 11778.117 | 631.320 | 202.350 | 99.362 | | pCi/L | ARS-054/EPA:906.0 | 10/01/11 03:37 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-02028 | **Request or PO Number:** | 11-3626 |
| **Client Sample ID:** | MD21-11-26392 | **ARS Sample ID:** | ARS1-11-02028-010 |
| **Sample Collection Date:** | 09/15/11 | **Date Received:** | 09/20/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 10/13/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 1936.298 | 128.396 | 202.326 | 99.350 | | pCi/L | ARS-054/EPA:906.0 | 10/01/11 06:47 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

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# QC Results per Analytical Batch

| | |
|---|---|
| Analytical Batch | ARS1-B11-03628 |
| SDG | ARS1-11-02028 |
| Analysis | Tritium (Aqueous) |
| Analysis Test Method | ARS-054/Liquid Scintillation Counter |
| Analysis Code | LSC-A-001 |
| Report Units | pCi/L |

## Acceptable QC Performance Ranges

| QC Sample Type | Performance Items and Ranges | | |
|---|---|---|---|
| Laboratory Control Sample | Recovery (%): | > 80 | < 120 |
| Matrix Spike | Recovery (%): | > 75 | < 125 |
| Duplicate | Replicate Error Ratio (RER): | | < 1 |
| | Duplicate Error Ratio (DER): | | < 3 |
| | Relative Percent Difference (RPD %): | | ≤ 25 |

## Laboratory Control Sample

Analysis Date: 09/29/11 16:34 — Analysis Technician: BSTEFFENS

| Analysis Batch Sample ID | QC Type | Analyte | Results | CSU (1s) | Expected Value | LCS Rec (%) | MDC |
|---|---|---|---|---|---|---|---|
| ARS1-B11-03628-01 | LCS | H-3 | 2440 | 150 | 2571 | 95 | 200 |

## Duplicate RER/DER/RPD

Analysis Date: 09/29/11 19:43 — Analysis Technician: BSTEFFENS

| Analyte | Result LCS | CSU LCS (1s) | Results LCSD | CSU LCSD (1s) | RER | DER | RPD |
|---|---|---|---|---|---|---|---|
| H-3 | 2440 | 152 | 2420 | 151 | 0.03 | 0.09 | 0.8 |

## Method Blank

Analysis Date: 09/29/11 22:52 — Analysis Technician: BSTEFFENS

| Analysis Batch Sample ID | QC Type | Analyte | Results | CSU (1s) | MDC | Qual |
|---|---|---|---|---|---|---|
| ARS1-B11-03628-03 | MBL | H-3 | 66 | 60 | 200 | U |

Susan Leese

Susan Leese

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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Tritium by Low Level Liquid Scintillation Counting

# Samples

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 15.900000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.660000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.373600 |
| Sample Aliquot | 5.060800 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 9/29/11 4:34 PM |
| Count Date (t2) | 9/29/11 4:34 PM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.9600 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| **Variables Intact Test** | OK |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| ACT | 2439.613006 | 2439.613006 | OK |
| CU | 161.608865 | 161.608865 | OK |
| TPU | 297.672403 | 297.672403 | OK |
| MDA | 200.150825 | 200.150825 | OK |
| DL | 98.281969 | 98.281969 | OK |
| Net Count Rate | 10.240000 | 10.240000 | OK |
| D t 1 (t2 - t1) | 0.000000 | 0.000000 | OK |
| DF | 1.000000 | 1.000000 | OK |
| Sys Err | 0.052280 | 0.052280 | OK |
| K | 0.004197 | 0.004197 | OK |
| K MDA | 0.755530 | 0.755530 | OK |

| Batch Identifiers and Other Related Information | |
|---|---|
| Batch | ARS1-B11-03628 |
| Batch ID | ARS1-B11-03628-01 |
| Analysis Code | |
| SDG | QC Sample |
| Fraction | N/A QC Sample |
| Run Number | |
| Client | QC Sample |
| Client Profile | |
| Client ID | N/A QC Sample |
| Instr File Name | 71 |
| Instr Detector | P-54-S-2 |
| Instr keV | |
| Version/Date | 1.0 -- 11/18/2005 |

Reviewed by: SDL Date: 10-12-11

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 15.880000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.660000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.375600 |
| Sample Aliquot | 5.056300 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 9/29/11 7:43 PM |
| Count Date (t2) | 9/29/11 7:43 PM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.9600 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| **Variables Intact Test** | **OK** |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| **ACT** | **2424.038449** | **2424.038449** | **OK** |
| **CU** | **160.816748** | **160.816748** | **OK** |
| **TPU** | **295.902203** | **295.902203** | **OK** |
| **MDA** | **199.262240** | **199.262240** | **OK** |
| **DL** | **97.845638** | **97.845638** | **OK** |
| **Net Count Rate** | **10.220000** | **10.220000** | **OK** |
| **D t 1 (t2 - t1)** | **0.000000** | **0.000000** | **OK** |
| **DF** | **1.000000** | **1.000000** | **OK** |
| **Sys Err** | **0.052280** | **0.052280** | **OK** |
| **K** | **0.004216** | **0.004216** | **OK** |
| **K MDA** | **0.758899** | **0.758899** | **OK** |

| Batch Identifiers and Other Related Information | |
|---|---|
| **Batch** | ARS1-B11-03628 |
| **Batch ID** | ARS1-B11-03628-02 |
| **Analysis Code** | |
| **SDG** | QC Sample |
| **Fraction** | N/A QC Sample |
| **Run Number** | |
| **Client** | QC Sample |
| **Client Profile** | |
| **Client ID** | N/A QC Sample |
| **Instr File Name** | 71 |
| **Instr Detector** | P-54-S-3 |
| **Instr keV** | |
| **Version/Date** | 1.0 -- 11/18/2005 |

**Reviewed by:** SDL **Date:** 10-12-11

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 5.940000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.660000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.375100 |
| Sample Aliquot | 5.067200 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 9/29/11 10:52 PM |
| Count Date (t2) | 9/29/11 10:52 PM |
| Activity Units = pCi -- UCF = | 2.2200 |
| CF | 1.9600 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| **Variables Intact Test** | **OK** |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| **ACT** | **66.357489** | **66.357489** | **OK** |
| **CU** | **117.918169** | **117.918169** | **OK** |
| **TPU** | **118.114048** | **118.114048** | **OK** |
| **MDA** | **199.098650** | **199.098650** | **OK** |
| **DL** | **97.765309** | **97.765309** | **OK** |
| **Net Count Rate** | **0.280000** | **0.280000** | **OK** |
| **D t 1 (t2 - t1)** | **0.000000** | **0.000000** | **OK** |
| **DF** | **1.000000** | **1.000000** | **OK** |
| **Sys Err** | **0.052280** | **0.052280** | **OK** |
| **K** | **0.004220** | **0.004220** | **OK** |
| **K MDA** | **0.759522** | **0.759522** | **OK** |

| Batch Identifiers and Other Related Information | |
|---|---|
| **Batch** | ARS1-B11-03628 |
| **Batch ID** | ARS1-B11-03628-03 |
| **Analysis Code** | |
| **SDG** | QC Sample |
| **Fraction** | N/A QC Sample |
| **Run Number** | |
| | |
| **Client** | QC Sample |
| **Client Profile** | |
| **Client ID** | N/A QC Sample |
| **Instr File Name** | 71 |
| **Instr Detector** | P-54-S-4 |
| **Instr keV** | |
| **Version/Date** | 1.0 -- 11/18/2005 |

**Reviewed by:** SDL **Date:** 10-12-11

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 231.610000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.660000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.372100 |
| Sample Aliquot | 5.041100 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 9/15/11 12:00 PM |
| Count Date (t2) | 9/30/11 2:22 AM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
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| | |
| **Variables Intact Test** | OK |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| **ACT** | **54381.478922** | **54381.478914** | **OK** |
| **CU** | **276.327324** | **276.327324** | **OK** |
| **TPU** | **2856.445493** | **2856.445492** | **OK** |
| **MDA** | **202.197168** | **202.197168** | **OK** |
| **DL** | **99.286804** | **99.286804** | **OK** |
| **Net Count Rate** | **225.950000** | **225.950000** | **OK** |
| **D t 1 (t2 - t1)** | **14.598611** | **14.598611** | **OK** |
| **DF** | **0.997754** | **0.997754** | **OK** |
| **Sys Err** | **0.052280** | **0.052280** | **OK** |
| **K** | **0.004155** | **0.004155** | **OK** |
| **K MDA** | **0.747883** | **0.747883** | **OK** |
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| **Batch Identifiers and Other Related Information** | | | |
| **Batch** | ARS1-B11-03628 | | |
| **Batch ID** | ARS1-B11-03628-07 | | |
| **Analysis Code** | LSC-A-001 | | |
| **SDG** | ARS1-11-02028 | | |
| **Fraction** | 001 | | |
| **Run Number** | 1 | | |
| | | | |
| **Client** | Los Alamos National Laboratory | | |
| **Client Profile** | Keith Greene | | |
| **Client ID** | MD21-11-26384 | | |
| **Instr File Name** | 71 | | |
| **Instr Detector** | P-54-S-8 | | |
| **Instr keV** | | | |
| **Version/Date** | 1.0 -- 11/18/2005 | | |

**Reviewed by:** SDR **Date:** 10-12-11

| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 11.860000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.660000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.373200 |
| Sample Aliquot | 5.048700 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 9/15/11 12:00 PM |
| Count Date (t2) | 9/30/11 5:32 AM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
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| **Variables Intact Test** | OK |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| **ACT** | **1485.603683** | **1485.603682** | **OK** |
| **CU** | **74.755315** | **74.755315** | **OK** |
| **TPU** | **107.798474** | **107.798474** | **OK** |
| **MDA** | **201.301809** | **201.301809** | **OK** |
| **DL** | **98.847147** | **98.847147** | **OK** |
| **Net Count Rate** | **6.200000** | **6.200000** | **OK** |
| **D t 1 (t2 - t1)** | **14.730556** | **14.730556** | **OK** |
| **DF** | **0.997733** | **0.997733** | **OK** |
| **Sys Err** | **0.052280** | **0.052280** | **OK** |
| **K** | **0.004173** | **0.004173** | **OK** |
| **K MDA** | **0.751210** | **0.751210** | **OK** |
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| Batch Identifiers and Other Related Information | |
|---|---|
| **Batch** | ARS1-B11-03628 |
| **Batch ID** | ARS1-B11-03628-08 |
| **Analysis Code** | LSC-A-001 |
| **SDG** | ARS1-11-02028 |
| **Fraction** | 002 |
| **Run Number** | 1 |
| | |
| **Client** | Los Alamos National Laboratory |
| **Client Profile** | Keith Greene |
| **Client ID** | MD21-11-26391 |
| **Instr File Name** | 71 |
| **Instr Detector** | P-54-S-9 |
| **Instr keV** | |
| **Version/Date** | 1.0 -- 11/18/2005 |

**Reviewed by:** SDL **Date:** 10-12-11

| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 246.690000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.660000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.372500 |
| Sample Aliquot | 5.028600 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 9/15/11 12:00 PM |
| Count Date (t2) | 9/30/11 8:41 AM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| **Variables Intact Test** | OK |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| ACT | 58095.031444 | 58095.031435 | OK |
| CU | 285.386413 | 285.386413 | OK |
| TPU | 3050.570399 | 3050.570398 | OK |
| MDA | 202.490331 | 202.490331 | OK |
| DL | 99.430759 | 99.430759 | OK |
| Net Count Rate | 241.030000 | 241.030000 | OK |
| D t 1 (t2 - t1) | 14.861806 | 14.861806 | OK |
| DF | 0.997713 | 0.997713 | OK |
| Sys Err | 0.052280 | 0.052280 | OK |
| K | 0.004149 | 0.004149 | OK |
| K MDA | 0.746801 | 0.746801 | OK |

| Batch Identifiers and Other Related Information | |
|---|---|
| Batch | ARS1-B11-03628 |
| Batch ID | ARS1-B11-03628-09 |
| Analysis Code | LSC-A-001 |
| SDG | ARS1-11-02028 |
| Fraction | 003 |
| Run Number | 1 |
| | |
| Client | Los Alamos National Laboratory |
| Client Profile | Keith Greene |
| Client ID | MD21-11-26388 |
| Instr File Name | 71 |
| Instr Detector | P-54-S-10 |
| Instr keV | |
| Version/Date | 1.0 -- 11/18/2005 |

Reviewed by: SDL Date: 10-12-11

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 53.970000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.660000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.371500 |
| Sample Aliquot | 5.075000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 9/15/11 12:00 PM |
| Count Date (t2) | 9/30/11 11:50 AM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| **Variables Intact Test** | **OK** |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| **ACT** | **11568.903852** | **11568.903850** | **OK** |
| **CU** | **137.832403** | **137.832403** | **OK** |
| **TPU** | **620.325583** | **620.325583** | **OK** |
| **MDA** | **201.183137** | **201.183136** | **OK** |
| **DL** | **98.788874** | **98.788874** | **OK** |
| **Net Count Rate** | **48.310000** | **48.310000** | **OK** |
| **D t 1 (t2 - t1)** | **14.993056** | **14.993056** | **OK** |
| **DF** | **0.997693** | **0.997693** | **OK** |
| **Sys Err** | **0.052280** | **0.052280** | **OK** |
| **K** | **0.004176** | **0.004176** | **OK** |
| **K MDA** | **0.751653** | **0.751653** | **OK** |

| Batch Identifiers and Other Related Information | |
|---|---|
| **Batch** | ARS1-B11-03628 |
| **Batch ID** | ARS1-B11-03628-10 |
| **Analysis Code** | LSC-A-001 |
| **SDG** | ARS1-11-02028 |
| **Fraction** | 004 |
| **Run Number** | 1 |
| | |
| **Client** | Los Alamos National Laboratory |
| **Client Profile** | Keith Greene |
| **Client ID** | MD21-11-26389 |
| **Instr File Name** | 71 |
| **Instr Detector** | P-54-S-11 |
| **Instr keV** | |
| **Version/Date** | 1.0 -- 11/18/2005 |

**Reviewed by:** SDL **Date:** 10-12-11

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 68.850000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.660000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.376200 |
| Sample Aliquot | 5.066600 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 9/15/11 12:00 PM |
| Count Date (t2) | 9/30/11 3:00 PM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| **Variables Intact Test** | OK |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| **ACT** | **14968.276987** | **14968.276984** | **OK** |
| **CU** | **152.403340** | **152.403340** | **OK** |
| **TPU** | **797.239864** | **797.239864** | **OK** |
| **MDA** | **199.003107** | **199.003107** | **OK** |
| **DL** | **97.718394** | **97.718394** | **OK** |
| **Net Count Rate** | **63.190000** | **63.190000** | **OK** |
| **D t 1 (t2 - t1)** | **15.125000** | **15.125000** | **OK** |
| **DF** | **0.997673** | **0.997673** | **OK** |
| **Sys Err** | **0.052280** | **0.052280** | **OK** |
| **K** | **0.004222** | **0.004222** | **OK** |
| **K MDA** | **0.759887** | **0.759887** | **OK** |

| Batch Identifiers and Other Related Information | |
|---|---|
| **Batch** | ARS1-B11-03628 |
| **Batch ID** | ARS1-B11-03628-11 |
| **Analysis Code** | LSC-A-001 |
| **SDG** | ARS1-11-02028 |
| **Fraction** | 005 |
| **Run Number** | 1 |
| | |
| **Client** | Los Alamos National Laboratory |
| **Client Profile** | Keith Greene |
| **Client ID** | MD21-11-26385 |
| **Instr File Name** | 71 |
| **Instr Detector** | P-54-S-12 |
| **Instr keV** | |
| **Version/Date** | 1.0 -- 11/18/2005 |

**Reviewed by:** SDR **Date:** 10-12-11

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 60.420000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.660000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.371400 |
| Sample Aliquot | 5.034400 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 9/15/11 12:00 PM |
| Count Date (t2) | 9/30/11 6:09 PM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| **Variables Intact Test** | **OK** |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| **ACT** | **13223.349220** | **13223.349218** | **OK** |
| **CU** | **146.310937** | **146.310937** | **OK** |
| **TPU** | **706.626144** | **706.626144** | **OK** |
| **MDA** | **202.868411** | **202.868411** | **OK** |
| **DL** | **99.616411** | **99.616411** | **OK** |
| **Net Count Rate** | **54.760000** | **54.760000** | **OK** |
| **D t 1 (t2 - t1)** | **15.256250** | **15.256250** | **OK** |
| **DF** | **0.997653** | **0.997653** | **OK** |
| **Sys Err** | **0.052280** | **0.052280** | **OK** |
| **K** | **0.004141** | **0.004141** | **OK** |
| **K MDA** | **0.745409** | **0.745409** | **OK** |

| Batch Identifiers and Other Related Information | |
|---|---|
| **Batch** | ARS1-B11-03628 |
| **Batch ID** | ARS1-B11-03628-12 |
| **Analysis Code** | LSC-A-001 |
| **SDG** | ARS1-11-02028 |
| **Fraction** | 006 |
| **Run Number** | 1 |
| | |
| **Client** | Los Alamos National Laboratory |
| **Client Profile** | Keith Greene |
| **Client ID** | MD21-11-26386 |
| **Instr File Name** | 71 |
| **Instr Detector** | P-54-S-13 |
| **Instr keV** | |
| **Version/Date** | 1.0 -- 11/18/2005 |

**Reviewed by:** SDR **Date:** 10-12-11

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 74.320000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.660000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.373100 |
| Sample Aliquot | 5.031800 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 9/15/11 12:00 PM |
| Count Date (t2) | 9/30/11 9:19 PM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| **Variables Intact Test** | OK |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| **ACT** | **16513.215645** | **16513.215643** | **OK** |
| **CU** | **160.318005** | **160.318005** | **OK** |
| **TPU** | **878.065802** | **878.065802** | **OK** |
| **MDA** | **202.052512** | **202.052512** | **OK** |
| **DL** | **99.215772** | **99.215772** | **OK** |
| **Net Count Rate** | **68.660000** | **68.660000** | **OK** |
| **D t 1 (t2 - t1)** | **15.388194** | **15.388194** | **OK** |
| **DF** | **0.997632** | **0.997632** | **OK** |
| **Sys Err** | **0.052280** | **0.052280** | **OK** |
| **K** | **0.004158** | **0.004158** | **OK** |
| **K MDA** | **0.748419** | **0.748419** | **OK** |

| Batch Identifiers and Other Related Information | |
|---|---|
| **Batch** | ARS1-B11-03628 |
| **Batch ID** | ARS1-B11-03628-13 |
| **Analysis Code** | LSC-A-001 |
| **SDG** | ARS1-11-02028 |
| **Fraction** | 007 |
| **Run Number** | 1 |
| | |
| **Client** | Los Alamos National Laboratory |
| **Client Profile** | Keith Greene |
| **Client ID** | MD21-11-26393 |
| **Instr File Name** | 71 |
| **Instr Detector** | P-54-S-14 |
| **Instr keV** | |
| **Version/Date** | 1.0 -- 11/18/2005 |

**Reviewed by:** Sdk **Date:** 10-12-11

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 229.320000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.660000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.369900 |
| Sample Aliquot | 5.046400 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 9/15/11 12:00 PM |
| Count Date (t2) | 10/1/11 12:28 AM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| **Variables Intact Test** | OK |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| **ACT** | **54101.283836** | **54101.283827** | **OK** |
| **CU** | **276.374804** | **276.374804** | **OK** |
| **TPU** | **2841.870647** | **2841.870646** | **OK** |
| **MDA** | **203.214948** | **203.214948** | **OK** |
| **DL** | **99.786574** | **99.786574** | **OK** |
| **Net Count Rate** | **223.660000** | **223.660000** | **OK** |
| **D t 1 (t2 - t1)** | **15.519444** | **15.519444** | **OK** |
| **DF** | **0.997612** | **0.997612** | **OK** |
| **Sys Err** | **0.052280** | **0.052280** | **OK** |
| **K** | **0.004134** | **0.004134** | **OK** |
| **K MDA** | **0.744138** | **0.744138** | **OK** |

| Batch Identifiers and Other Related Information | |
|---|---|
| **Batch** | ARS1-B11-03628 |
| **Batch ID** | ARS1-B11-03628-14 |
| **Analysis Code** | LSC-A-001 |
| **SDG** | ARS1-11-02028 |
| **Fraction** | 008 |
| **Run Number** | 1 |
| | |
| **Client** | Los Alamos National Laboratory |
| **Client Profile** | Keith Greene |
| **Client ID** | MD21-11-26387 |
| **Instr File Name** | 71 |
| **Instr Detector** | P-54-S-15 |
| **Instr keV** | |
| **Version/Date** | 1.0 -- 11/18/2005 |

**Reviewed by:** SDL **Date:** 10-12-11

| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 54.560000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.660000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.372300 |
| Sample Aliquot | 5.035400 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 9/15/11 12:00 PM |
| Count Date (t2) | 10/1/11 3:37 AM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| **Variables Intact Test** | **OK** |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| **ACT** | **11778.117465** | **11778.117464** | **OK** |
| **CU** | **139.316048** | **139.316048** | **OK** |
| **TPU** | **631.320222** | **631.320222** | **OK** |
| **MDA** | **202.350100** | **202.350100** | **OK** |
| **DL** | **99.361900** | **99.361899** | **OK** |
| **Net Count Rate** | **48.900000** | **48.900000** | **OK** |
| **D t 1 (t2 - t1)** | **15.650694** | **15.650694** | **OK** |
| **DF** | **0.997592** | **0.997592** | **OK** |
| **Sys Err** | **0.052280** | **0.052280** | **OK** |
| **K** | **0.004152** | **0.004152** | **OK** |
| **K MDA** | **0.747318** | **0.747318** | **OK** |

| Batch Identifiers and Other Related Information | |
|---|---|
| **Batch** | ARS1-B11-03628 |
| **Batch ID** | ARS1-B11-03628-15 |
| **Analysis Code** | LSC-A-001 |
| **SDG** | ARS1-11-02028 |
| **Fraction** | 009 |
| **Run Number** | 1 |
| | |
| **Client** | Los Alamos National Laboratory |
| **Client Profile** | Keith Greene |
| **Client ID** | MD21-11-26390 |
| **Instr File Name** | 71 |
| **Instr Detector** | P-54-S-16 |
| **Instr keV** | |
| **Version/Date** | 1.0 -- 11/18/2005 |

**Reviewed by:** SDh **Date:** 10-12-11

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 13.700000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.660000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.372100 |
| Sample Aliquot | 5.038800 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 9/15/11 12:00 PM |
| Count Date (t2) | 10/1/11 6:47 AM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| **Variables Intact Test** | OK |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| **ACT** | **1936.297652** | **1936.297652** | **OK** |
| **CU** | **78.982794** | **78.982794** | **OK** |
| **TPU** | **128.396306** | **128.396306** | **OK** |
| **MDA** | **202.326361** | **202.326361** | **OK** |
| **DL** | **99.350243** | **99.350243** | **OK** |
| **Net Count Rate** | **8.040000** | **8.040000** | **OK** |
| **D t 1 (t2 - t1)** | **15.782639** | **15.782639** | **OK** |
| **DF** | **0.997572** | **0.997572** | **OK** |
| **Sys Err** | **0.052280** | **0.052280** | **OK** |
| **K** | **0.004152** | **0.004152** | **OK** |
| **K MDA** | **0.747406** | **0.747406** | **OK** |

| Batch Identifiers and Other Related Information | |
|---|---|
| **Batch** | ARS1-B11-03628 |
| **Batch ID** | ARS1-B11-03628-16 |
| **Analysis Code** | LSC-A-001 |
| **SDG** | ARS1-11-02028 |
| **Fraction** | 010 |
| **Run Number** | 1 |
| | |
| **Client** | Los Alamos National Laboratory |
| **Client Profile** | Keith Greene |
| **Client ID** | MD21-11-26392 |
| **Instr File Name** | 71 |
| **Instr Detector** | P-54-S-17 |
| **Instr keV** | |
| **Version/Date** | 1.0 -- 11/18/2005 |

**Reviewed by:** SDL **Date:** 10-12-11

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

# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Tritium by Low Level Liquid Scintillation Counting

# Laboratory Records

# Analysis Batch Report



ARS INTERNATIONAL

**Analysis Batch ID** **ARS1-B11-03628**

| Method | ARS-054 | Analysis | LSC-A-001 | Matrix | SI |
|---|---|---|---|---|---|
| Description | Tritium (Aqueous) | | | | |

| ABatch Sample ID | Type | Blind Iso1 | Blind Iso2 | Blind Iso3 | SDG | FR | Run | Client ID | Isotope Group | Lab Deadline |
|---|---|---|---|---|---|---|---|---|---|---|
| ARS1-B11-03628-01 | LCS | B-12511 | | | | | | | | |
| ARS1-B11-03628-02 | LCSD | B-12512 | | | | | | | | |
| ARS1-B11-03628-03 | MBL | | | | | | | | | |
| ARS1-B11-03628-04 | TRG | | | | **ARS1-11-01989** | 001 | 1 | MD54-11-23141 | STD | 10/11/11 |
| ARS1-B11-03628-05 | TRG | | | | **ARS1-11-01989** | 002 | 1 | MD54-11-23140 | STD | 10/11/11 |
| ARS1-B11-03628-06 | TRG | | | | **ARS1-11-01989** | 003 | 1 | MD54-11-23142 | STD | 10/11/11 |
| ARS1-B11-03628-07 | TRG | | | | **ARS1-11-02028** | 001 | 1 | MD21-11-26384 | STD | 10/17/11 |
| ARS1-B11-03628-08 | TRG | | | | **ARS1-11-02028** | 002 | 1 | MD21-11-26391 | STD | 10/17/11 |
| ARS1-B11-03628-09 | TRG | | | | **ARS1-11-02028** | 003 | 1 | MD21-11-26388 | STD | 10/17/11 |
| ARS1-B11-03628-10 | TRG | | | | **ARS1-11-02028** | 004 | 1 | MD21-11-26389 | STD | 10/17/11 |
| ARS1-B11-03628-11 | TRG | | | | **ARS1-11-02028** | 005 | 1 | MD21-11-26385 | STD | 10/17/11 |
| ARS1-B11-03628-12 | TRG | | | | **ARS1-11-02028** | 006 | 1 | MD21-11-26386 | STD | 10/17/11 |
| ARS1-B11-03628-13 | TRG | | | | **ARS1-11-02028** | 007 | 1 | MD21-11-26393 | STD | 10/17/11 |
| ARS1-B11-03628-14 | TRG | | | | **ARS1-11-02028** | 008 | 1 | MD21-11-26387 | STD | 10/17/11 |
| ARS1-B11-03628-15 | TRG | | | | **ARS1-11-02028** | 009 | 1 | MD21-11-26390 | STD | 10/17/11 |
| ARS1-B11-03628-16 | TRG | | | | **ARS1-11-02028** | 010 | 1 | MD21-11-26392 | STD | 10/17/11 |
| ARS1-B11-03628-17 | TRG | | | | **ARS1-11-02029** | 001 | 1 | MD54-11-23144 | STD | 10/17/11 |
| ARS1-B11-03628-18 | TRG | | | | **ARS1-11-02029** | 002 | 1 | MD54-11-23143 | STD | 10/17/11 |
| ARS1-B11-03628-19 | TRG | | | | **ARS1-11-02029** | 003 | 1 | MD54-11-23145 | STD | 10/17/11 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 96839 | 96840 | 96841 | 96843 | 96844 | 96845 | 96847 | 96848 | 96850 |
| 11-01989-001-1 | 11-01989-002-1 | 11-01989-003-1 | 11-02028-001-1 | 11-02028-002-1 | 11-02028-003-1 | 11-02028-004-1 | 11-02028-005-1 | 11-02028-006-1 |
| WRAD | WRAD | WRAD | XRAD | XRAD | XRAD | XRAD | XRAD | XRAD |

| | | | | | | |
|---|---|---|---|---|---|---|
| 96851 | 96853 | 96854 | 96855 | 96857 | 96858 | 96860 |
| 11-02028-007-1 | 11-02028-008-1 | 11-02028-009-1 | 11-02028-010-1 | 11-02029-001-1 | 11-02029-002-1 | 11-02029-003-1 |
| XRAD | XRAD | XRAD | XRAD | XRAD | XRAD | XRAD |

American Radiation Services
Baton Rouge Laboratory

# LCS Report
## Analytical Batch: ARS1-B11-03628



| BlindID | ABatch | ABatchSampleID | BlindGroup | StdID | Isotope | ExpectedAddition | ExpectedValue | EmptyWt | GrossWt | NetWt | UserID | ModDate | ExpectedValue_CT | MidPointCountDate | KnownValue |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B-12511 | ARS1-B11-03628 | ARS1-B11-03628-01 | B-H3 | S-0262 | H-3 | 5 | 2.573293477 | 0 | 1 | 1 | BSTEFFENS | 9/22/2011 | 2.57052025 | 9/29/2011 | 2.57052025 |
| B-12512 | ARS1-B11-03628 | ARS1-B11-03628-02 | B-H3 | S-0262 | H-3 | 5 | 2.573293477 | 0 | 1 | 1 | BSTEFFENS | 9/22/2011 | 2.57052025 | 9/29/2011 | 2.57052025 |

# ARS-054



| ID_31001_054 | ABatch | ABatchSampleID | ClientID | Aliquot1 | AliquotUnits1 | IC_ID1 | Aliquot2 | AliquotUnits2 | IC_ID2 | UserID | ModDate |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10075 | ARS1-B11-03628 | ARS1-B11-03628-01 | | | | | 5.0608 | g | | BSTEFFENS | 10/04/2011 15:54:53 |
| 10076 | ARS1-B11-03628 | ARS1-B11-03628-02 | | | | | 5.0563 | g | | BSTEFFENS | 10/04/2011 15:54:53 |
| 10077 | ARS1-B11-03628 | ARS1-B11-03628-03 | | | | | 5.0672 | g | | BSTEFFENS | 10/04/2011 15:54:53 |
| 10078 | ARS1-B11-03628 | ARS1-B11-03628-04 | MD54-11-23141 | | | | 5.0612 | g | 96839 | BSTEFFENS | 10/04/2011 15:54:53 |
| 10079 | ARS1-B11-03628 | ARS1-B11-03628-05 | MD54-11-23140 | | | | 5.0544 | g | 96840 | BSTEFFENS | 10/04/2011 15:54:53 |
| 10080 | ARS1-B11-03628 | ARS1-B11-03628-06 | MD54-11-23142 | | | | 5.0479 | g | 96841 | BSTEFFENS | 10/04/2011 15:54:53 |
| 10081 | ARS1-B11-03628 | ARS1-B11-03628-07 | MD21-11-26384 | | | | 5.0411 | g | 96843 | BSTEFFENS | 10/04/2011 15:54:54 |
| 10082 | ARS1-B11-03628 | ARS1-B11-03628-08 | MD21-11-26391 | | | | 5.0487 | g | 96844 | BSTEFFENS | 10/04/2011 15:54:54 |
| 10083 | ARS1-B11-03628 | ARS1-B11-03628-09 | MD21-11-26388 | | | | 5.0286 | g | 96845 | BSTEFFENS | 10/04/2011 15:54:54 |
| 10084 | ARS1-B11-03628 | ARS1-B11-03628-10 | MD21-11-26389 | | | | 5.075 | g | 96847 | BSTEFFENS | 10/04/2011 15:54:54 |
| 10085 | ARS1-B11-03628 | ARS1-B11-03628-11 | MD21-11-26385 | | | | 5.0666 | g | 96848 | BSTEFFENS | 10/04/2011 15:54:54 |
| 10086 | ARS1-B11-03628 | ARS1-B11-03628-12 | MD21-11-26386 | | | | 5.0344 | g | 96850 | BSTEFFENS | 10/04/2011 15:54:54 |
| 10087 | ARS1-B11-03628 | ARS1-B11-03628-13 | MD21-11-26393 | | | | 5.0318 | g | 96851 | BSTEFFENS | 10/04/2011 15:54:54 |
| 10088 | ARS1-B11-03628 | ARS1-B11-03628-14 | MD21-11-26387 | | | | 5.0464 | g | 96853 | BSTEFFENS | 10/04/2011 15:54:54 |
| 10089 | ARS1-B11-03628 | ARS1-B11-03628-15 | MD21-11-26390 | | | | 5.0354 | g | 96854 | BSTEFFENS | 10/04/2011 15:54:54 |
| 10090 | ARS1-B11-03628 | ARS1-B11-03628-16 | MD21-11-26392 | | | | 5.0388 | g | 96855 | BSTEFFENS | 10/04/2011 15:54:54 |
| 10091 | ARS1-B11-03628 | ARS1-B11-03628-17 | MD54-11-23144 | | | | 5.0375 | g | 96857 | BSTEFFENS | 10/04/2011 15:54:54 |
| 10092 | ARS1-B11-03628 | ARS1-B11-03628-18 | MD54-11-23143 | | | | * 5.0373 | g | 96858 | BSTEFFENS | 10/04/2011 15:54:54 |
| 10093 | ARS1-B11-03628 | ARS1-B11-03628-19 | MD54-11-23145 | | | | 5.0359 | g | 96860 | BSTEFFENS | 10/04/2011 15:54:55 |

* Recounted using 1.0058 g 10-10-11

Assay Definition-

Assay Description:
H3 Normal Lvl

Assay Type: DPM (Single)
Report Name: Report1
Output Data Path: C:\Packard\Tricarb\Results\ARS\H-3 Normal 3\20110929_1320
Raw Results Path: C:\Packard\Tricarb\Results\ARS\H-3 Normal 3\20110929_1320\20110929_1320.results
RTF File Name: C:\Packard\Tricarb\Results\ARS\H-3 Normal 3\20110929_1320\H3 Results.rtf
Comma-Delimited File Name: C:\Packard\Tricarb\Results\ARS\H-3 Normal 3\20110929_1320\H3 Results.csv
Assay File Name: C:\Packard\TriCarb\Assays\H-3 Normal 3.lsa

Count Conditions-

Nuclide: H-3 Normal
Quench Indicator: tSIE/AEC
External Std Terminator (sec): 0.5 2s%
Pre-Count Delay (min): 0.00
Quench Set:
Low Energy: UG STD H-3
Count Time (min): 180.00
Count Mode: Normal
Assay Count Cycles: 1 Repeat Sample Count: 1
#Vials/Sample: 1 Calculate % Reference: Off

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

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

Count Corrections-

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

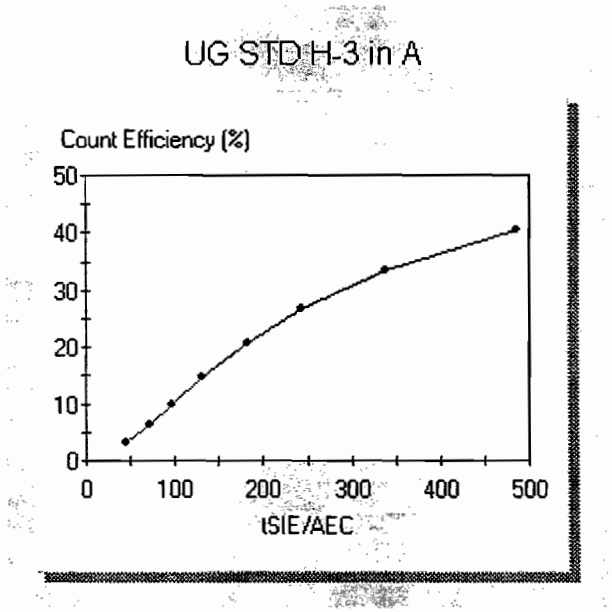
Half Life-

Half Life Correction: Off

| Regions | Half Life | Units | Reference Date | Reference Time |
|---|---|---|---|---|

A
B
C

Cycle 1 Results
Quench Curve Block Data




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

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

Protocol# 54 - H-3 Normal 3.1sa User: ARS

| P# | S# | SMPL_ID | CPMA | DPM1 | tSIE | Eff Nucl In A | Count Time | DATE | TIME | MESSAGES |
|---|---|---|---|---|---|---|---|---|---|---|
| 54 | 1 | BACKGROUND | 5.66 | 15.13 | 422.82 | 37.40 | 180.00 | 9/29/2011 | 1:25:00 PM | |
| 54 | 2 | B11-03628-01 | 15.90 | 42.55 | 422.12 | 37.36 | 180.00 | 9/29/2011 | 4:33:36 PM | |
| 54 | 3 | B11-03628-02 | 15.88 | 42.27 | 426.35 | 37.56 | 180.00 | 9/29/2011 | 7:42:58 PM | |
| 54 | 4 | B11-03628-03 | 5.94 | 15.83 | 425.28 | 37.51 | 180.00 | 9/29/2011 | 10:52:19 PM | |
| 54 | 5 | B11-03628-04 | 13038.45 | 35331.54 | 412.20 | 36.90 | 12.28 | 9/30/2011 | 2:01:09 AM | |
| 54 | 6 | B11-03628-05 | 158929.70 | 417901.41 | 436.45 | 38.03 | 1.01 | 9/30/2011 | 2:15:08 AM | |
| 54 | 7 | B11-03628-06 | 483629.28 | 16202229.50 | 45.50 | 2.98 | 0.34 | 9/30/2011 | 2:16:50 AM | E |
| 54 | 8 | B11-03628-07 | 231.61 | 622.41 | 418.86 | 37.21 | 180.00 | 9/30/2011 | 2:22:19 AM | |
| 54 | 9 | B11-03628-08 | 11.86 | 31.78 | 421.11 | 37.32 | 180.00 | 9/30/2011 | 5:31:42 AM | |
| 54 | 10 | B11-03628-09 | 246.69 | 662.17 | 419.75 | 37.25 | 180.00 | 9/30/2011 | 8:41:03 AM | |
| 54 | 11 | B11-03628-10 | 53.97 | 145.28 | 417.49 | 37.15 | 180.00 | 9/30/2011 | 11:50:25 AM | |
| 54 | 12 | B11-03628-11 | 68.85 | 183.02 | 427.63 | 37.62 | 180.00 | 9/30/2011 | 2:59:45 PM | |
| 54 | 13 | B11-03628-12 | 60.42 | 162.67 | 417.36 | 37.14 | 180.00 | 9/30/2011 | 6:09:12 PM | |
| 54 | 14 | B11-03628-13 | 74.32 | 199.16 | 421.05 | 37.31 | 180.00 | 9/30/2011 | 9:18:35 PM | |
| 54 | 15 | B11-03628-14 | 229.32 | 620.00 | 414.02 | 36.99 | 180.00 | 10/1/2011 | 12:27:57 AM | |
| 54 | 16 | B11-03628-15 | 54.56 | 146.57 | 419.16 | 37.23 | 180.00 | 10/1/2011 | 3:37:19 AM | |
| 54 | 17 | B11-03628-16 | 13.70 | 36.83 | 418.70 | 37.21 | 180.00 | 10/1/2011 | 6:46:39 AM | |
| 54 | 18 | B11-03628-17 | 39.74 | 107.21 | 415.63 | 37.06 | 180.00 | 10/1/2011 | 9:55:59 AM | |
| 54 | 19 | B11-03628-18 | 0.00 | 0.00 | 0.00 | -2.94 | 180.00 | 10/1/2011 | 1:00:54 PM | E |
| 54 | 20 | B11-03628-19 | 93.13 | 253.13 | 409.81 | 36.79 | 180.00 | 10/2/2011 | 10:25:21 AM | |

Recount

Assay Definition-

Assay Description:
H3 Normal Lvl

Assay Type: DPM (Single)
Report Name: Report1
Output Data Path: C:\Packard\Tricarb\Results\ARS\H-3 Normal 3\20111003_0917
Raw Results Path: C:\Packard\Tricarb\Results\ARS\H-3 Normal 3\20111003_0917\20111003_0917.results
RTF File Name: C:\Packard\Tricarb\Results\ARS\H-3 Normal 3\20111003_0917\H3 Results.rtf
Comma-Delimited File Name: C:\Packard\Tricarb\Results\ARS\H-3 Normal 3\20111003_0917\H3 Results.csv
Assay File Name: C:\Packard\TriCarb\Assays\H-3 Normal 3.lsa

Count Conditions-

Nuclide: H-3 Normal
Quench Indicator: tSIE/AEC
External Std Terminator (sec): 0.5 2s%
Pre-Count Delay (min): 0.00
Quench Set:
Low Energy: UG STD H-3
Count Time (min): 60.00
Count Mode: Normal
Assay Count Cycles: 1 Repeat Sample Count: 1
#Vials/Sample: 1 Calculate % Reference: Off

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

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

Count Corrections-

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

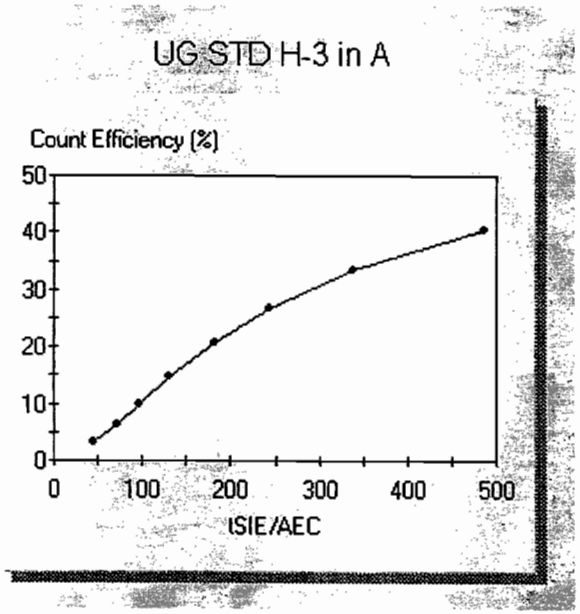
Half Life-

Half Life Correction: Off

| Regions | Half Life | Units | Reference Date | Reference Time |
|---|---|---|---|---|

A
B
C

Cycle 1 Results
Quench Curve Block Data




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

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

| P# | S# | SMPL_ID | CPMA | DPM1 | tSIE | Eff Nucl In A | Count Time | DATE | TIME | MESSAGES |
|---|---|---|---|---|---|---|---|---|---|---|
| 54 | 1 | BACKGROUND | 5.63 | 15.14 | 418.10 | 37.18 | 60.00 | 10/3/2011 | 9:22:11 AM | |
| 54 | 2 | B11-03628-18 | 0.00 | 0.00 | 0.00 | -2.94 | 11.27 | 10/3/2011 | 11:44:01 AM | E |

Recounted on the 2900

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\20111003_1235
Raw Results Path: C:\Packard\Tricarb\Results\ARS\H3 Normal Lvl\20111003_1235\20111003_1235.results
RTF File Name: C:\Packard\Tricarb\Results\ARS\H3 Normal Lvl\20111003_1235\H3 Results.rtf
Comma-Delimited File Name: C:\Packard\Tricarb\Results\ARS\H3 Normal Lvl\20111003_1235\H3 Results.csv
Assay File Name: C:\Packard\TriCarb\Assays\H3 Normal Lvl.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): 10.00
Count Mode: Normal
Assay Count Cycles: 1 Repeat Sample Count: 1
#Vials/Sample: 1 Calculate % Reference: Off

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

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

Count Corrections-

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

Half Life-

Half Life Correction: Off

| Regions | Half Life | Units | Reference Date | Reference Time |
|---|---|---|---|---|

A
B
C

Cycle 1 Results

| P# | S# | SMPL_ID | CPMA | DPM1 | tSIE | Eff Nucl In A | Count Time | DATE | TIME | MESSAGES |
|---|---|---|---|---|---|---|---|---|---|---|
| 23 | 1 | B11-03628-18 | 0.00 | 0.00 | 0.00 | -3.79 | 10.00 | 10/3/2011 | 12:36:14 PM | E |

Recounted using 1.0058g aliq. JS 10-4-11

Assay Definition-

Assay Description:
H3 Normal Lvl

Assay Type: DPM (Single)
Report Name: Report1
Output Data Path: C:\Packard\Tricarb\Results\ARS\H-3 Normal 3\20111004_1023
Raw Results Path: C:\Packard\Tricarb\Results\ARS\H-3 Normal 3\20111004_1023\20111004_1023.results
RTF File Name: C:\Packard\Tricarb\Results\ARS\H-3 Normal 3\20111004_1023\H3 Results.rtf
Comma-Delimited File Name: C:\Packard\Tricarb\Results\ARS\H-3 Normal 3\20111004_1023\H3 Results.csv
Assay File Name: C:\Packard\TriCarb\Assays\H-3 Normal 3.lsa

Count Conditions-

Nuclide: H-3 Normal
Quench Indicator: tSIE/AEC
External Std Terminator (sec): 0.5 2s%
Pre-Count Delay (min): 0.00
Quench Set:
Low Energy: UG STD H-3
Count Time (min): 60.00
Count Mode: Normal
Assay Count Cycles: 1 Repeat Sample Count: 1
#Vials/Sample: 1 Calculate % Reference: Off

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

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

Count Corrections-

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

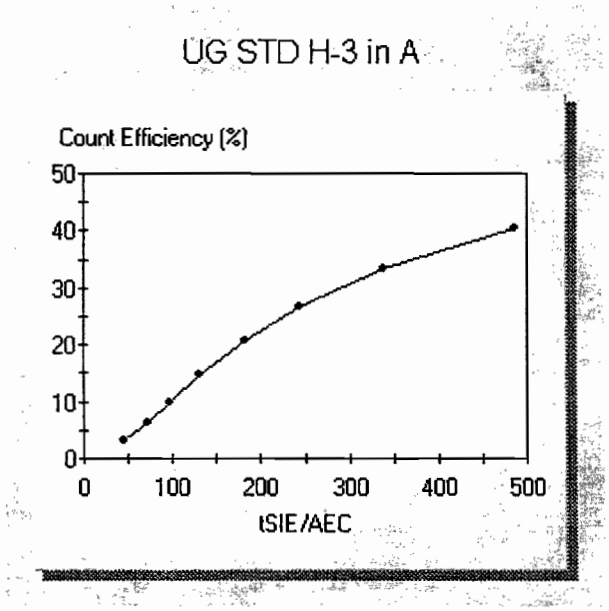
Half Life-

Half Life Correction: Off

| Regions | Half Life | Units | Reference Date | Reference Time |
|---|---|---|---|---|

A
B
C

Cycle 1 Results
Quench Curve Block Data




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

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

| P# | S# | SMPL_ID | CPMA | DPM1 | tSIE | Eff Nucl In A | Count Time | DATE | TIME |
|---|---|---|---|---|---|---|---|---|---|
| MESSAGES | | | | | | | | | |
| 54 | 1 | B11-03628-18 | 1288249.99 | 147567242.51 | 29.27 | 0.87 | 0.13 | 10/4/2011 | 10:23:48 AM |
| E | | | | | | | | | |

QuantaSmart (TM) - [SpectraView]

File Run View Libraries Tools IPA Diagnostics Window Help

Protocol: Cassette: 11 Sample: 12 Instrument idle Error:

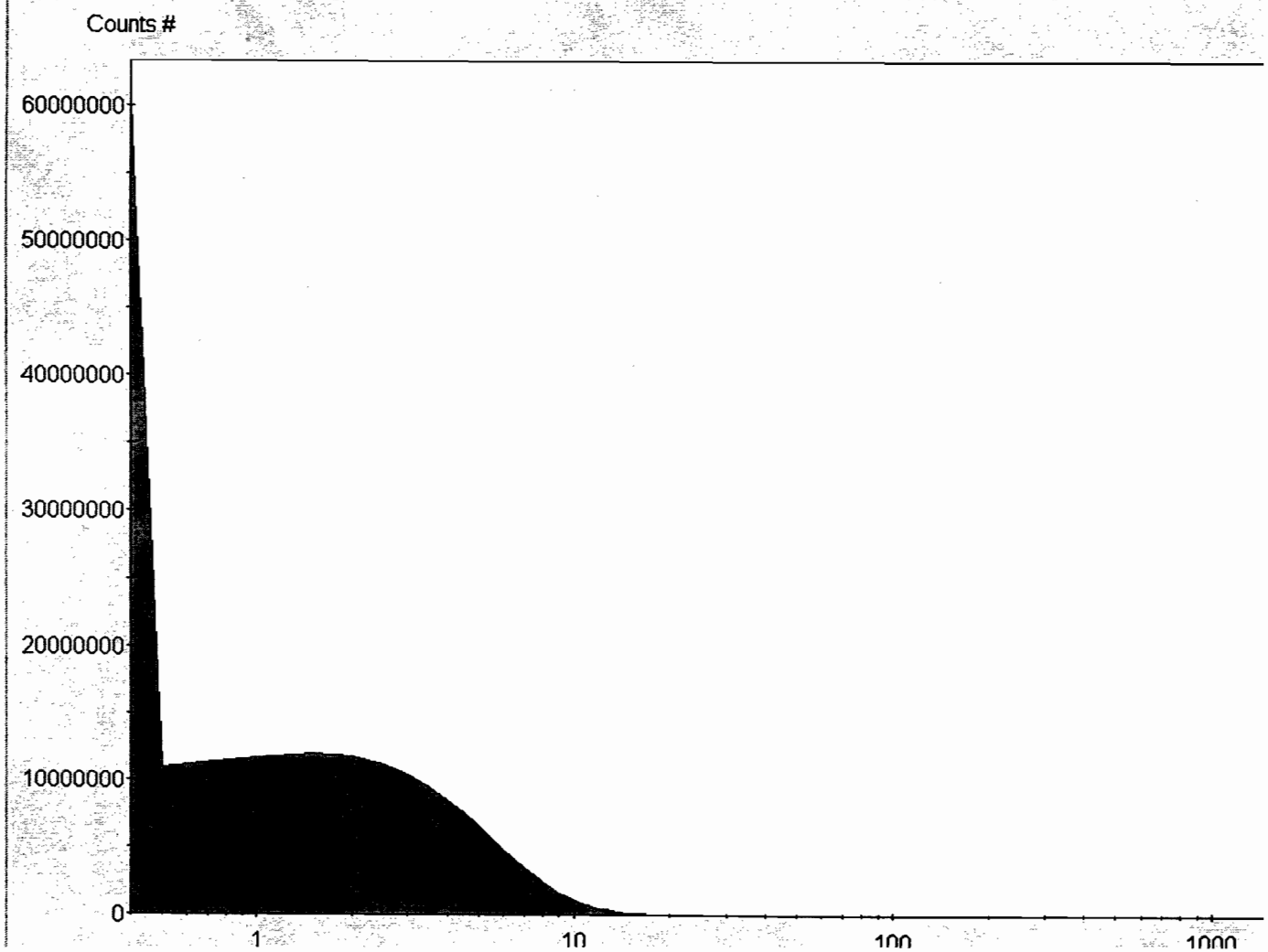
- Protocols
  - SNC
    - Output Windows
      - Report1
  - Priostat (group) - 3h_dp
  - Flag 1 - H3-Quench 01M
  - Flag 2 - Tritium_Sample_
  - Flag 3 - Contamination_
  - Flag 4 - H3 Low Lvl Que
    - Output Windows
      - Report1
  - Flag 5 - Low Level H3
    - Output Windows
      - Report1
  - Flag 6 - H3_Quench_07.
  - Flag 7 -
  - Flag 8 - Eds Test
  - Flag 9 - Eds Test
  - Flag 10 - dpm test
  - Flag 11 - 3h_dpm
  - Flag 12 - H3_Quench_0
  - Flag 13 -
  - Flag 14 -
  - Flag 15 -
  - Flag 16 -
  - Flag 17 - Ni-63 CPM
    - Output Windows
      - Report1
  - Flag 18 -
  - Flag 19 - Contamination
  - Flag 20 - H3 Normal Lvl2
    - Output Windows
      - Report1
  - Flag 21 -
  - Flag 22 - Tritium_Sample
  - Flag 23 - H3 Normal Lvl
    - Output Windows
      - Report1
  - Flag 24 - DOC_Tritium_2
  - Flag 25 -
  - Flag 26 -
  - Flag 27 -
  - Flag 28 -
  - Flag 29 -
  - Flag 30 -

Sample # 1
Count Time: 10.00
Pre-count Delay: 0.00
Acquisition Time: 10.00
Apply AEC ☑

Scale
keV Full Scale: Auto
Counts Full Scale: Auto
Log keV Scale
Linear keV Scale

| Regions | Lower Level | Upper Level | CPM | 2S% |
|---|---|---|---|---|
| A | 2.0 | 18.6 | 0.0 | 0.00 |
| B | 0.0 | 2000.0 | 0.0 | 0.00 |
| C | 0.0 | 2000.0 | 0.0 | 0.00 |

Restore Print...

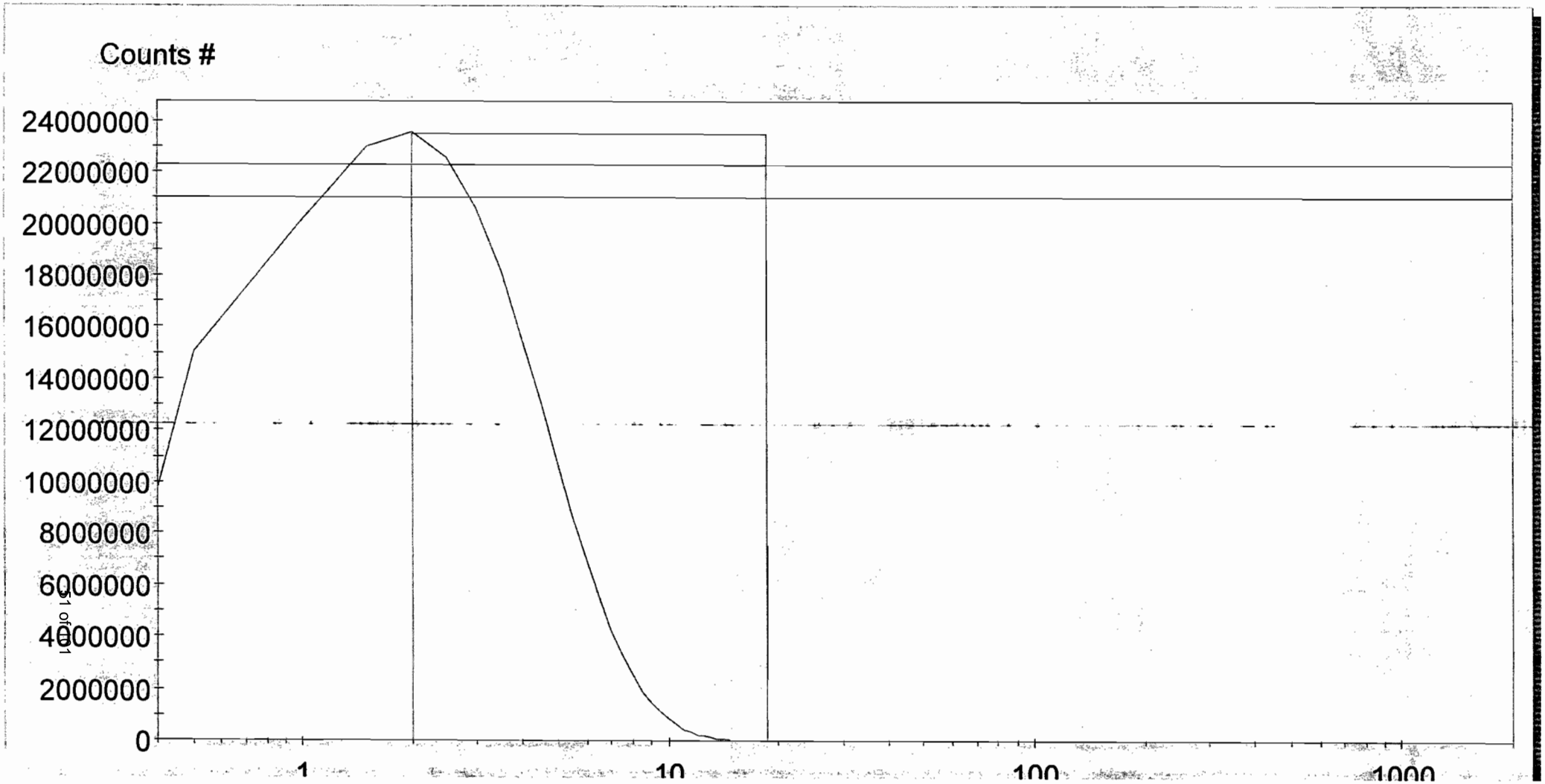


Protocol # 54

SpectraView - H-3 Normal 3.1sa

Sample #: 2
Count Time: 60.00
Pre-count Delay: 0.00
Acquisition Time: 11.06

| REGION | LL | UL | CPM | 2S% |
|---|---|---|---|---|
| A | 2.0 | 18.6 | 14696317.5 | 0.02 |
| B | 0.0 | 2000.0 | 20833110.3 | 0.01 |
| C | 0.0 | 2000.0 | 20833110.3 | 0.01 |



# Batch Result Verification Report



| ABatchSampleID | SDG | Fraction | ClientID | Run | Isotope | ACT | TPU | TPU1s | TPU2s | MDA | DL | CU | CU1s | CU2s | ActivityReportUnits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARS1-B11-03628-01 | | | | 1 | H-3 | 2439.613006 | 297.6724033 | 151.8736751 | 297.6724033 | 200.1508247 | 98.28196853 | 161.6088651 | 82.45350261 | 161.6088651 | pCi |
| ARS1-B11-03628-02 | | | | 1 | H-3 | 2424.038449 | 295.902203 | 150.9705117 | 295.902203 | 199.2622403 | 97.84563849 | 160.8167484 | 82.04936142 | 160.8167484 | pCi |
| ARS1-B11-03628-03 | | | | 1 | H-3 | 66.35748945 | 118.1140482 | 60.26226949 | 118.1140482 | 199.0986502 | 97.76530929 | 117.9181695 | 60.16233138 | 117.9181695 | pCi |
| ARS1-B11-03628-04 | ARS1-11-01989 | 001 | MD54-11-23141 | 1 | H-3 | 3153904.197 | 165073.6745 | 165073.6745 | 323544.402 | 612.0640569 | 279.3295221 | 7885.538019 | 7885.538019 | 15455.65452 | pCi |
| ARS1-B11-03628-05 | ARS1-11-01989 | 002 | MD54-11-23140 | 1 | H-3 | 37366745.86 | 1955748.184 | 1955748.184 | 3833266.44 | 2467.219829 | 918.1722104 | 93269.05357 | 93269.05357 | 182807.345 | pCi |
| ARS1-B11-03628-06 | ARS1-11-01989 | 003 | MD54-11-23142 | 1 | H-3 | 1453022050 | 76048049.69 | 76048049.69 | 149054177.4 | 64315.39535 | 20184.08847 | 3583286.562 | 3583286.562 | 7023241.662 | pCi |
| ARS1-B11-03628-07 | ARS1-11-02028 | 001 | MD21-11-26384 | 1 | H-3 | 54381.47891 | 2856.445492 | 2856.445492 | 5598.633165 | 202.1971682 | 99.2868041 | 276.3273239 | 276.3273239 | 541.6015548 | pCi |
| ARS1-B11-03628-08 | ARS1-11-02028 | 002 | MD21-11-26391 | 1 | H-3 | 1485.603682 | 107.7984736 | 107.7984736 | 211.2850083 | 201.3018092 | 98.84714746 | 74.75531505 | 74.75531505 | 146.5204175 | pCi |
| ARS1-B11-03628-09 | ARS1-11-02028 | 003 | MD21-11-26388 | 1 | H-3 | 58095.03144 | 3050.570398 | 3050.570398 | 5979.117981 | 202.4903312 | 99.43075874 | 285.3864126 | 285.3864126 | 559.3573687 | pCi |
| ARS1-B11-03628-10 | ARS1-11-02028 | 004 | MD21-11-26389 | 1 | H-3 | 11568.90385 | 620.3255834 | 620.3255834 | 1215.838143 | 201.1831365 | 98.78887445 | 137.8324025 | 137.8324025 | 270.1515089 | pCi |
| ARS1-B11-03628-11 | ARS1-11-02028 | 005 | MD21-11-26385 | 1 | H-3 | 14968.27698 | 797.2398637 | 797.2398637 | 1562.590133 | 199.0031066 | 97.71839358 | 152.40334 | 152.40334 | 298.7105464 | pCi |
| ARS1-B11-03628-12 | ARS1-11-02028 | 006 | MD21-11-26386 | 1 | H-3 | 13223.34922 | 706.6261443 | 706.6261443 | 1384.987243 | 202.8684114 | 99.61641108 | 146.3109373 | 146.3109373 | 286.7694372 | pCi |
| ARS1-B11-03628-13 | ARS1-11-02028 | 007 | MD21-11-26393 | 1 | H-3 | 16513.21564 | 878.0658019 | 878.0658019 | 1721.008972 | 202.0525118 | 99.21577209 | 160.3180053 | 160.3180053 | 314.2232903 | pCi |
| ARS1-B11-03628-14 | ARS1-11-02028 | 008 | MD21-11-26387 | 1 | H-3 | 54101.28383 | 2841.870646 | 2841.870646 | 5570.066467 | 203.2149482 | 99.78657435 | 276.3748041 | 276.3748041 | 541.694616 | pCi |
| ARS1-B11-03628-15 | ARS1-11-02028 | 009 | MD21-11-26390 | 1 | H-3 | 11778.11746 | 631.3202222 | 631.3202222 | 1237.387636 | 202.3500996 | 99.36189949 | 139.3160476 | 139.3160476 | 273.0594534 | pCi |
| ARS1-B11-03628-16 | ARS1-11-02028 | 010 | MD21-11-26392 | 1 | H-3 | 1936.297652 | 128.3963062 | 128.3963062 | 251.6567602 | 202.326361 | 99.3502429 | 78.98279423 | 78.98279423 | 154.8062767 | pCi |
| ARS1-B11-03628-17 | ARS1-11-02029 | 001 | MD54-11-23144 | 1 | H-3 | 8243.103506 | 447.7402421 | 447.7402421 | 877.5708744 | 203.2018079 | 99.78012192 | 121.4738625 | 121.4738625 | 238.0887705 | pCi |
| * ARS1-B11-03628-18 | ARS1-11-02029 | 002 | MD54-11-23143 | 1 | H-3 | 17258.04195 | 1051.851227 | 1051.851227 | 2061.628404 | -2561.601032 | -1257.847388 | -540.6883998 | -540.6883998 | -1059.749264 | pCi |
| ARS1-B11-03628-19 | ARS1-11-02029 | 003 | MD54-11-23145 | 1 | H-3 | 21322.20567 | 1129.252362 | 1129.252362 | 2213.33463 | 204.7903094 | 100.560139 | 180.5898103 | 180.5898103 | 353.9560282 | pCi |

* Recounted using 1.0058g. JK 10-10-11

# Batch Result Verification Report



| ABatchSampleID | SDG | Fraction | AliquotReportUnits | ChemRecovery | TracerRecovery | SampleCounts | SampleCountMins | BKG_Counts | BKG_CountMins | EFF | ALIQ | SampleCollDate | MidPointCountDate | BP_DL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARS1-B11-03628-01 | | | L | | | 0.088333333 | 180 | 0.031444444 | 180 | 0.3736 | 5.0608 | 10/4/2011 | 9/29/2011 | |
| ARS1-B11-03628-02 | | | L | | | 0.088222222 | 180 | 0.031444444 | 180 | 0.3756 | 5.0563 | 10/4/2011 | 9/29/2011 | |
| ARS1-B11-03628-03 | | | L | | | 0.033 | 180 | 0.031444444 | 180 | 0.3751 | 5.0672 | 10/4/2011 | 9/29/2011 | |
| ARS1-B11-03628-04 | ARS1-11-01989 | 001 | L | | | 1061.763029 | 12.28 | 0.031444444 | 180 | 0.369 | 5.0612 | 9/8/2011 | 9/30/2011 | |
| ARS1-B11-03628-05 | ARS1-11-01989 | 002 | L | | | 157356.1386 | 1.01 | 0.031444444 | 180 | 0.3803 | 5.0544 | 9/8/2011 | 9/30/2011 | |
| ARS1-B11-03628-06 | ARS1-11-01989 | 003 | L | | | 1422439.059 | 0.34 | 0.031444444 | 180 | 0.0298 | 5.0479 | 9/8/2011 | 9/30/2011 | |
| ARS1-B11-03628-07 | ARS1-11-02028 | 001 | L | | | 1.286722222 | 180 | 0.031444444 | 180 | 0.3721 | 5.0411 | 9/15/2011 | 9/30/2011 | |
| ARS1-B11-03628-08 | ARS1-11-02028 | 002 | L | | | 0.065888889 | 180 | 0.031444444 | 180 | 0.3732 | 5.0487 | 9/15/2011 | 9/30/2011 | |
| ARS1-B11-03628-09 | ARS1-11-02028 | 003 | L | | | 1.3705 | 180 | 0.031444444 | 180 | 0.3725 | 5.0286 | 9/15/2011 | 9/30/2011 | |
| ARS1-B11-03628-10 | ARS1-11-02028 | 004 | L | | | 0.299833333 | 180 | 0.031444444 | 180 | 0.3715 | 5.075 | 9/15/2011 | 9/30/2011 | |
| ARS1-B11-03628-11 | ARS1-11-02028 | 005 | L | | | 0.3825 | 180 | 0.031444444 | 180 | 0.3762 | 5.0666 | 9/15/2011 | 9/30/2011 | |
| ARS1-B11-03628-12 | ARS1-11-02028 | 006 | L | | | 0.335666667 | 180 | 0.031444444 | 180 | 0.3714 | 5.0344 | 9/15/2011 | 9/30/2011 | |
| ARS1-B11-03628-13 | ARS1-11-02028 | 007 | L | | | 0.412888889 | 180 | 0.031444444 | 180 | 0.3731 | 5.0318 | 9/15/2011 | 9/30/2011 | |
| ARS1-B11-03628-14 | ARS1-11-02028 | 008 | L | | | 1.274 | 180 | 0.031444444 | 180 | 0.3699 | 5.0464 | 9/15/2011 | 10/1/2011 | |
| ARS1-B11-03628-15 | ARS1-11-02028 | 009 | L | | | 0.303111111 | 180 | 0.031444444 | 180 | 0.3723 | 5.0354 | 9/15/2011 | 10/1/2011 | |
| ARS1-B11-03628-16 | ARS1-11-02028 | 010 | L | | | 0.076111111 | 180 | 0.031444444 | 180 | 0.3721 | 5.0388 | 9/15/2011 | 10/1/2011 | |
| ARS1-B11-03628-17 | ARS1-11-02029 | 001 | L | | | 0.220777778 | 180 | 0.031444444 | 180 | 0.3706 | 5.0375 | 9/15/2011 | 10/1/2011 | |
| ARS1-B11-03628-18 | ARS1-11-02029 | 002 | L | | | 0 | 180 | 0.031444444 | 180 | -0.0294 | 5.0373 | 9/15/2011 | 10/1/2011 | |
| ARS1-B11-03628-19 | ARS1-11-02029 | 003 | L | | | 0.517388889 | 180 | 0.031444444 | 180 | 0.3679 | 5.0359 | 9/15/2011 | 10/2/2011 | |

# Batch Result Verification Report



| ABatchSampleID | SDG | Fraction | BP_MDA | Sb_Val | UCF | CF | GrossCountRate | BKGCountRate | NetCountRate | PlatingRecovery | InstFileName | DetectorID | InstrumentkeV | NuclideAbd | TracerMeasACT | TracerKnownACT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARS1-B11-03628-01 | | | | | 2.22 | 1.96 | 15.9 | 5.66 | 10.24 | | 71 | P-54-S-2 | | | | |
| ARS1-B11-03628-02 | | | | | 2.22 | 1.96 | 15.88 | 5.66 | 10.22 | | 71 | P-54-S-3 | | | | |
| ARS1-B11-03628-03 | | | | | 2.22 | 1.96 | 5.94 | 5.66 | 0.28 | | 71 | P-54-S-4 | | | | |
| ARS1-B11-03628-04 | ARS1-11-01989 | 001 | | | 2.22 | 1 | 13038.45 | 5.66 | 13032.79 | | 71 | P-54-S-5 | | | | |
| ARS1-B11-03628-05 | ARS1-11-01989 | 002 | | | 2.22 | 1 | 158929.7 | 5.66 | 158924.04 | | 71 | P-54-S-6 | | | | |
| ARS1-B11-03628-06 | ARS1-11-01989 | 003 | | | 2.22 | 1 | 483629.28 | 5.66 | 483623.62 | | 71 | P-54-S-7 | | | | |
| ARS1-B11-03628-07 | ARS1-11-02028 | 001 | | | 2.22 | 1 | 231.61 | 5.66 | 225.95 | | 71 | P-54-S-8 | | | | |
| ARS1-B11-03628-08 | ARS1-11-02028 | 002 | | | 2.22 | 1 | 11.86 | 5.66 | 6.2 | | 71 | P-54-S-9 | | | | |
| ARS1-B11-03628-09 | ARS1-11-02028 | 003 | | | 2.22 | 1 | 246.69 | 5.66 | 241.03 | | 71 | P-54-S-10 | | | | |
| ARS1-B11-03628-10 | ARS1-11-02028 | 004 | | | 2.22 | 1 | 53.97 | 5.66 | 48.31 | | 71 | P-54-S-11 | | | | |
| ARS1-B11-03628-11 | ARS1-11-02028 | 005 | | | 2.22 | 1 | 68.85 | 5.66 | 63.19 | | 71 | P-54-S-12 | | | | |
| ARS1-B11-03628-12 | ARS1-11-02028 | 006 | | | 2.22 | 1 | 60.42 | 5.66 | 54.76 | | 71 | P-54-S-13 | | | | |
| ARS1-B11-03628-13 | ARS1-11-02028 | 007 | | | 2.22 | 1 | 74.32 | 5.66 | 68.66 | | 71 | P-54-S-14 | | | | |
| ARS1-B11-03628-14 | ARS1-11-02028 | 008 | | | 2.22 | 1 | 229.32 | 5.66 | 223.66 | | 71 | P-54-S-15 | | | | |
| ARS1-B11-03628-15 | ARS1-11-02028 | 009 | | | 2.22 | 1 | 54.56 | 5.66 | 48.9 | | 71 | P-54-S-16 | | | | |
| ARS1-B11-03628-16 | ARS1-11-02028 | 010 | | | 2.22 | 1 | 13.7 | 5.66 | 8.04 | | 71 | P-54-S-17 | | | | |
| ARS1-B11-03628-17 | ARS1-11-02029 | 001 | | | 2.22 | 1 | 39.74 | 5.66 | 34.08 | | 71 | P-54-S-18 | | | | |
| ARS1-B11-03628-18 | ARS1-11-02029 | 002 | | | 2.22 | 1 | 0 | 5.66 | -5.66 | | 71 | P-54-S-19 | | | | |
| ARS1-B11-03628-19 | ARS1-11-02029 | 003 | | | 2.22 | 1 | 93.13 | 5.66 | 87.47 | | 71 | P-54-S-20 | | | | |

# Batch Result Verification Report



| ABatchSampleID | SDG | Fraction | TracerIsotope | TracerRefDate | TracerRefACT | TracerKnown | Halflife1 | Halflife2 | Halflife3 | TPUF_1 | TPUF_2 | TPUF_3 | TPUF_4 | TPUF_5 | TPUF_6 | DeltaT1 | DeltaT2 | DeltaT3 | DeltaT4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARS1-B11-03628-01 | | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 0 | | | |
| ARS1-B11-03628-02 | | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 0 | | | |
| ARS1-B11-03628-03 | | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 0 | | | |
| ARS1-B11-03628-04 | ARS1-11-01989 | 001 | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 21.58402778 | | | |
| ARS1-B11-03628-05 | ARS1-11-01989 | 002 | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 21.59375 | | | |
| ARS1-B11-03628-06 | ARS1-11-01989 | 003 | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 21.59513889 | | | |
| ARS1-B11-03628-07 | ARS1-11-02028 | 001 | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 14.59861111 | | | |
| ARS1-B11-03628-08 | ARS1-11-02028 | 002 | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 14.73055556 | | | |
| ARS1-B11-03628-09 | ARS1-11-02028 | 003 | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 14.86180556 | | | |
| ARS1-B11-03628-10 | ARS1-11-02028 | 004 | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 14.99305556 | | | |
| ARS1-B11-03628-11 | ARS1-11-02028 | 005 | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 15.125 | | | |
| ARS1-B11-03628-12 | ARS1-11-02028 | 006 | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 15.25625 | | | |
| ARS1-B11-03628-13 | ARS1-11-02028 | 007 | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 15.38819444 | | | |
| ARS1-B11-03628-14 | ARS1-11-02028 | 008 | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 15.51944444 | | | |
| ARS1-B11-03628-15 | ARS1-11-02028 | 009 | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 15.65069444 | | | |
| ARS1-B11-03628-16 | ARS1-11-02028 | 010 | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 15.78263889 | | | |
| ARS1-B11-03628-17 | ARS1-11-02029 | 001 | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 15.91388889 | | | |
| ARS1-B11-03628-18 | ARS1-11-02029 | 002 | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 16.04236111 | | | |
| ARS1-B11-03628-19 | ARS1-11-02029 | 003 | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 16.93402778 | | | |

# Batch Result Verification Report



| ABatchSampleID | SDG | Fraction | DeltaT5 | DeltaT6 | DF1 | DF2 | DF3 | IF1 | IF2 | SysErr | K_Val | K_MDA | AnalysisCode | UserID | ModDate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARS1-B11-03628-01 | | | | | 1 | | | | | 0.052279718 | 0.004197387 | 0.755529666 | | BSTEFFENS | 10/4/2011 |
| ARS1-B11-03628-02 | | | | | 1 | | | | | 0.052279718 | 0.004216105 | 0.758898853 | | BSTEFFENS | 10/4/2011 |
| ARS1-B11-03628-03 | | | | | 1 | | | | | 0.052279718 | 0.004219569 | 0.759522405 | | BSTEFFENS | 10/4/2011 |
| ARS1-B11-03628-04 | ARS1-11-01989 | 001 | | | 0.996680727 | | | | | 0.052279718 | 0.004132272 | 0.0507443 | LSC-A-001 | BSTEFFENS | 10/4/2011 |
| ARS1-B11-03628-05 | ARS1-11-01989 | 002 | | | 0.996679235 | | | | | 0.052279718 | 0.004253088 | 0.004295618 | LSC-A-001 | BSTEFFENS | 10/4/2011 |
| ARS1-B11-03628-06 | ARS1-11-01989 | 003 | | | 0.996679021 | | | | | 0.052279718 | 0.00033284 | 0.000113166 | LSC-A-001 | BSTEFFENS | 10/4/2011 |
| ARS1-B11-03628-07 | ARS1-11-02028 | 001 | | | 0.997753763 | | | | | 0.052279718 | 0.004154907 | 0.747883302 | LSC-A-001 | BSTEFFENS | 10/4/2011 |
| ARS1-B11-03628-08 | ARS1-11-02028 | 002 | | | 0.997733484 | | | | | 0.052279718 | 0.004173388 | 0.75120977 | LSC-A-001 | BSTEFFENS | 10/4/2011 |
| ARS1-B11-03628-09 | ARS1-11-02028 | 003 | | | 0.997713313 | | | | | 0.052279718 | 0.004148892 | 0.746800525 | LSC-A-001 | BSTEFFENS | 10/4/2011 |
| ARS1-B11-03628-10 | ARS1-11-02028 | 004 | | | 0.997693141 | | | | | 0.052279718 | 0.004175849 | 0.751652889 | LSC-A-001 | BSTEFFENS | 10/4/2011 |
| ARS1-B11-03628-11 | ARS1-11-02028 | 005 | | | 0.997672864 | | | | | 0.052279718 | 0.004221595 | 0.759887061 | LSC-A-001 | BSTEFFENS | 10/4/2011 |
| ARS1-B11-03628-12 | ARS1-11-02028 | 006 | | | 0.997652693 | | | | | 0.052279718 | 0.00414116 | 0.745408734 | LSC-A-001 | BSTEFFENS | 10/4/2011 |
| ARS1-B11-03628-13 | ARS1-11-02028 | 007 | | | 0.997632417 | | | | | 0.052279718 | 0.004157882 | 0.748418737 | LSC-A-001 | BSTEFFENS | 10/4/2011 |
| ARS1-B11-03628-14 | ARS1-11-02028 | 008 | | | 0.997612247 | | | | | 0.052279718 | 0.004134098 | 0.744137609 | LSC-A-001 | BSTEFFENS | 10/4/2011 |
| ARS1-B11-03628-15 | ARS1-11-02028 | 009 | | | 0.997592078 | | | | | 0.052279718 | 0.004151767 | 0.747318069 | LSC-A-001 | BSTEFFENS | 10/4/2011 |
| ARS1-B11-03628-16 | ARS1-11-02028 | 010 | | | 0.997571802 | | | | | 0.052279718 | 0.004152254 | 0.747405751 | LSC-A-001 | BSTEFFENS | 10/4/2011 |
| ARS1-B11-03628-17 | ARS1-11-02029 | 001 | | | 0.997551634 | | | | | 0.052279718 | 0.004134365 | 0.74418573 | LSC-A-001 | BSTEFFENS | 10/4/2011 |
| ARS1-B11-03628-18 | ARS1-11-02029 | 002 | | | 0.997531893 | | | | | 0.052279718 | -0.000327963 | -0.059033348 | LSC-A-001 | BSTEFFENS | 10/4/2011 |
| ARS1-B11-03628-19 | ARS1-11-02029 | 003 | | | 0.997394889 | | | | | 0.052279718 | 0.004102296 | 0.738413288 | LSC-A-001 | BSTEFFENS | 10/4/2011 |

# Beta Liquid Scintillation Counter Log Book

| Date | Time | ARS Sample I.D. Number | Batch Number | Liquid Scintillation File Number | Technician Initials |
|---|---|---|---|---|---|
| 1-29-11 | 1019 | SNC 117 | QA | QA | [illegible] |
| ↓ | ↓ | Background | B11-03628 | 1320 | [illegible] |
| ↓ | ↓ | B11-03628-01 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-03628-02 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-03628-03 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-03628-04 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-03628-05 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-03628-06 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-03628-07 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-03628-08 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-03628-09 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-03628-10 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-03628-11 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-03628-12 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-03628-13 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-03628-14 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-03628-15 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-03628-16 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-03628-17 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-03628-18 | ↓ | ↓ | [illegible] |



Reviewed By: SDh Date: 10-13-11
Initials

# Beta Liquid Scintillation Counter Log Book

| Date | Time | ARS Sample I.D. Number | Batch Number | Liquid Scintillation File Number | Technician Initials |
|---|---|---|---|---|---|
| 9-29-11 | 1019 | B11-03628-19 | B11-03628 | 1320 | [illegible] |
| 10-3-11 | 0738 | SNC117 | ~~B1~~ QA | QA | [illegible] |
| ↓ | ↓ | Background | B11-03625 ↓ | 0917 | [illegible] |
| ↓ | ↓ | B11-03628-18 | ↓ | ↓ | [illegible] |
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[illegible] 10-3-11



Reviewed By: SOL Date: 10-13-11
Initials

# Technical Notes



| | |
|---|---|
| Batch | ARS1-B11-03628 |
| Analysis Code | LSC-A-001 |
| Procedure No | ARS-054 |
| Matrix | SI |

| # | Date | Dept | Batch Technical Notes | User ID |
|---|---|---|---|---|
| 1 | 10/10/11 08:55 | COUNTROOM | Sample ARS1-B11-03628-18 (ARS1-11-02029-002) had extremely high activity and interference. This prevented the instrument from counting the sample properly. After counting the instrument printout showed a CPM of 0.00, a DPM of 0.00, a tSIE of 0.00, and an efficiency of -2.094 which calculated a very high activity and a very low MDA. The sample was recounted on the same instrument and a different instrument with the same result. The sample was then recounted using a 1.0058g aliquot which still had an extremely high CPM which timed out after 13 sec. The tSIE was 29.27 (outside range of the quench curve) with an efficiency of .87 indicating extreme interference . The data was manually entered into the V/V report and saved as a different file. | BSTEFFENS |

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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

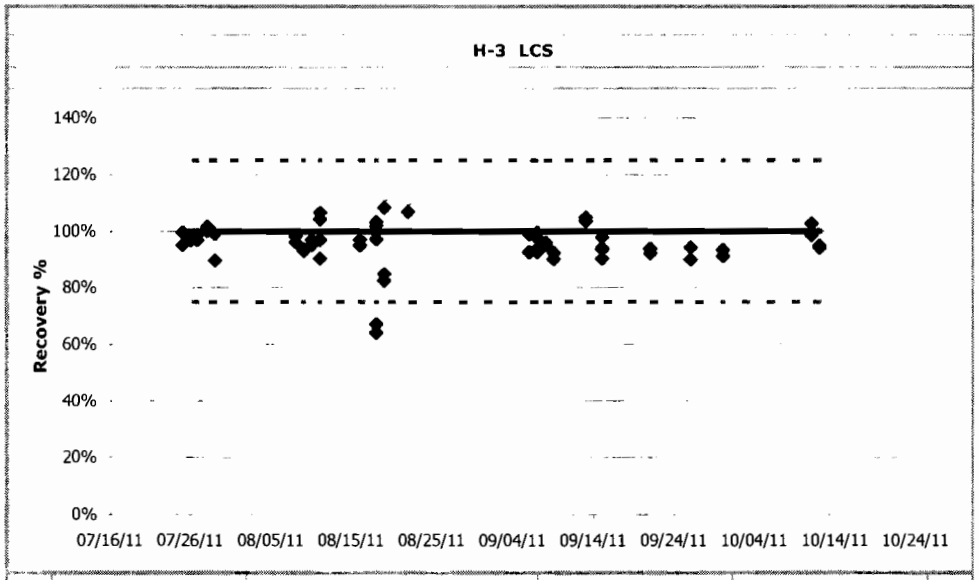
# Tritium by Low Level Liquid Scintillation Counting

# Control Charts

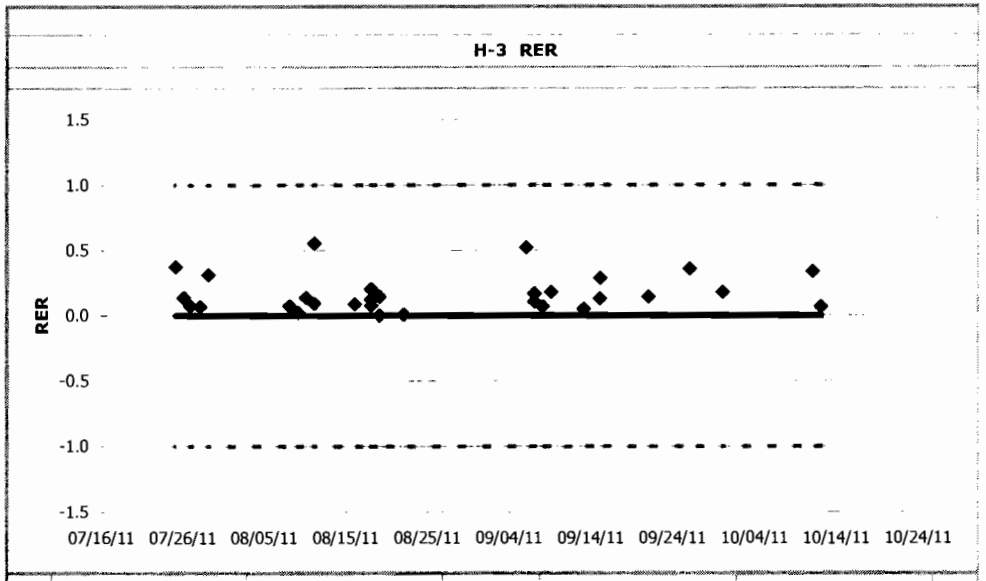
American Radiation Services
Baton Rouge Laboratory

# QC Chart

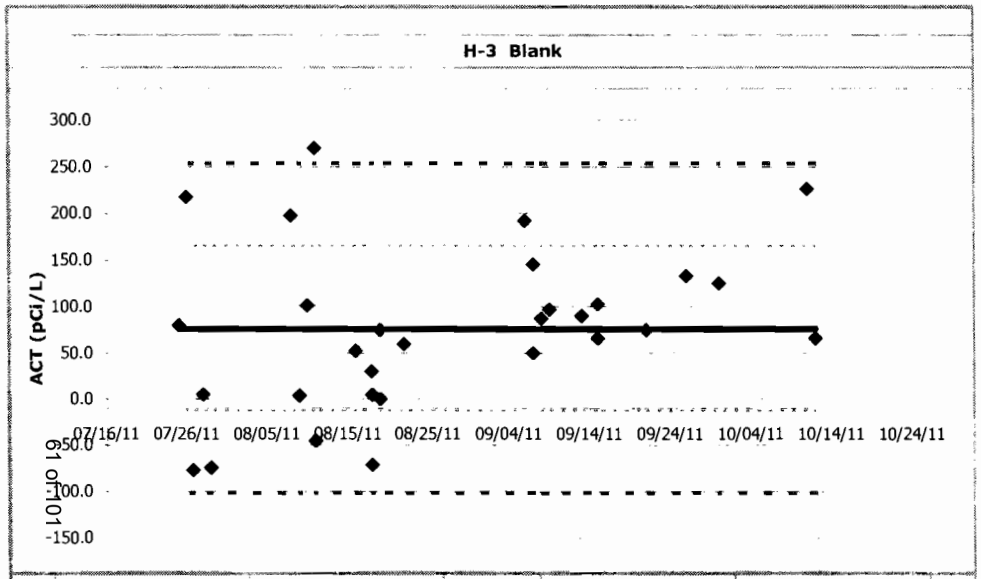




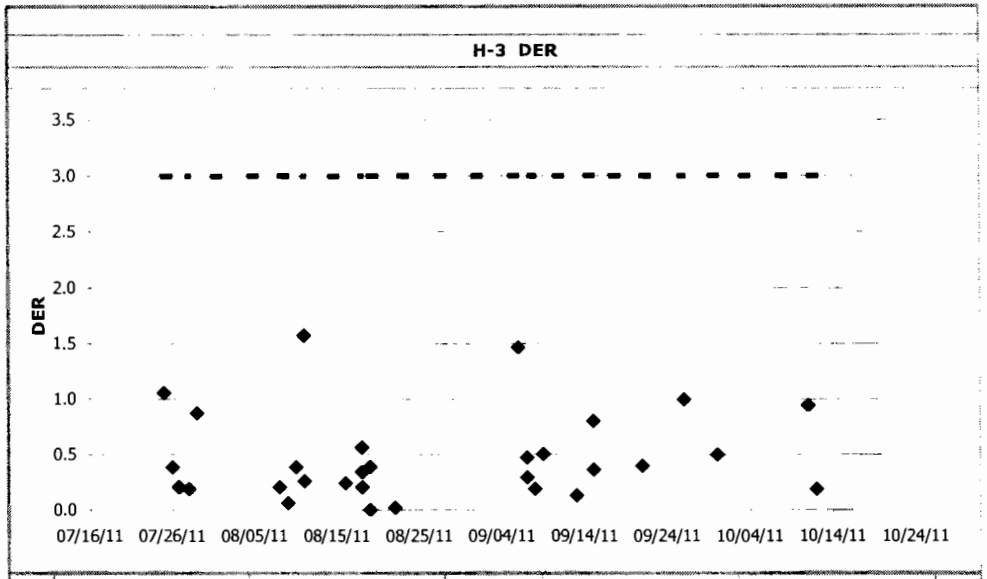

| Average | STDEV | n | UCL | LCL |
|---|---|---|---|---|
| 0.9583 | 0.0780 | 30 | 1.2500 | 0.7500 |




| | | n | UCL | LCL |
|---|---|---|---|---|
| | | 30 | 1.0000 | -1.0000 |




| Average | STDEV | n | UCL | LCL |
|---|---|---|---|---|
| 76.1929 | 88.7481 | 30 | 253.6890 | -101.3032 |

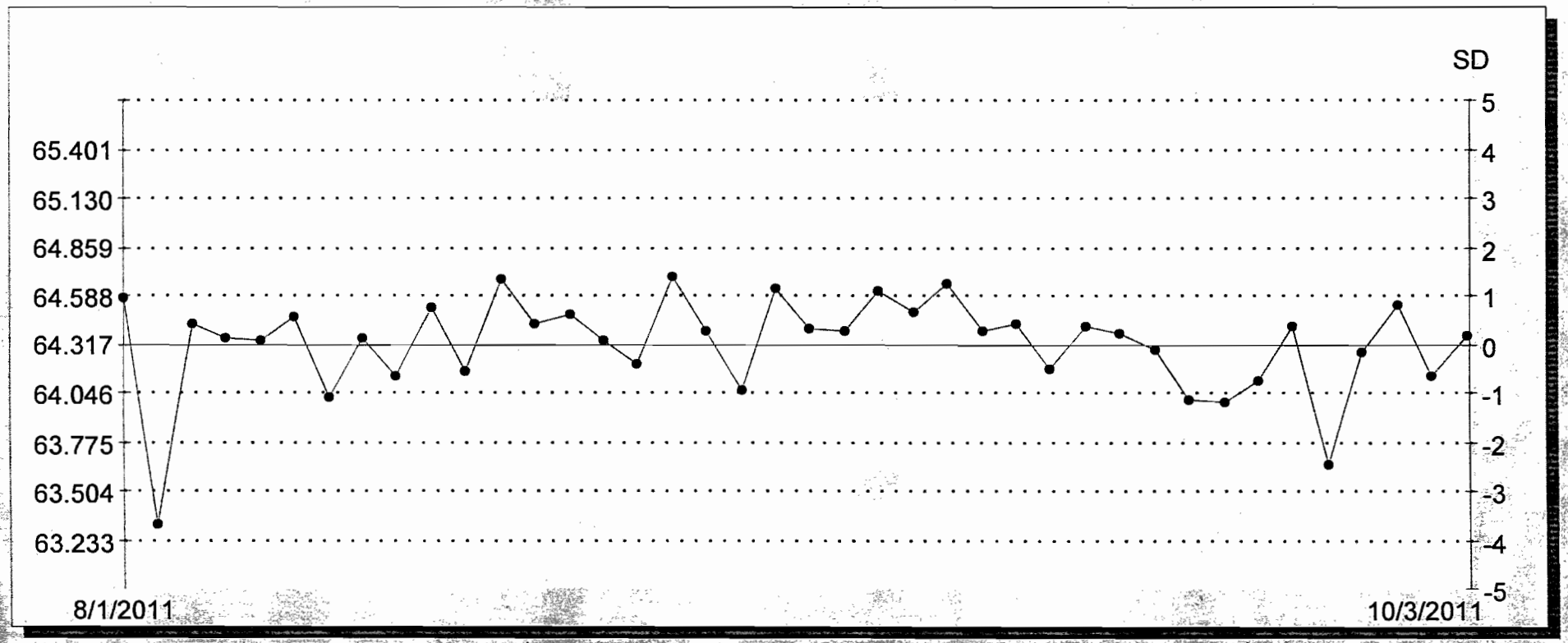



| | | n | UCL | |
|---|---|---|---|---|
| | | 30 | 3.0000 | |

3H Efficiency
Total # pts : 1687
Valid # pts : 40
Mean : 64.32
SD : 0.27

| Date | Value | Valid Pt |
|---|---|---|
| Aug 01, 2011 | 64.58 | X |
| Aug 04, 2011 | 63.32 | X |
| Aug 04, 2011 | 64.42 | X |
| Aug 04, 2011 | 64.35 | X |
| Aug 09, 2011 | 64.34 | X |
| Aug 16, 2011 | 64.46 | X |
| Aug 19, 2011 | 64.01 | X |
| Aug 22, 2011 | 64.35 | X |
| Aug 24, 2011 | 64.14 | X |
| Aug 26, 2011 | 64.52 | X |
| Aug 29, 2011 | 64.17 | X |
| Aug 29, 2011 | 64.69 | X |
| Aug 29, 2011 | 64.43 | X |
| Sep 01, 2011 | 64.48 | X |
| Sep 03, 2011 | 64.33 | X |
| Sep 06, 2011 | 64.21 | X |
| Sep 10, 2011 | 64.69 | X |
| Sep 14, 2011 | 64.39 | X |
| Sep 17, 2011 | 64.06 | X |
| Sep 19, 2011 | 64.62 | X |
| Sep 21, 2011 | 64.41 | X |
| Sep 24, 2011 | 64.38 | X |
| Sep 25, 2011 | 64.61 | X |
| Sep 25, 2011 | 64.50 | X |
| Sep 25, 2011 | 64.65 | X |
| Sep 25, 2011 | 64.39 | X |
| Sep 25, 2011 | 64.44 | X |
| Sep 25, 2011 | 64.18 | X |
| Sep 25, 2011 | 64.41 | X |
| Sep 25, 2011 | 64.38 | X |
| Sep 25, 2011 | 64.28 | X |
| Sep 26, 2011 | 64.00 | X |
| Sep 26, 2011 | 63.99 | X |
| Sep 26, 2011 | 64.12 | X |
| Sep 26, 2011 | 64.41 | X |
| Sep 26, 2011 | 63.64 | X |
| Sep 26, 2011 | 64.28 | X |
| Sep 27, 2011 | 64.53 | X |
| Sep 29, 2011 | 64.14 | X |
| Oct 03, 2011 | 64.36 | X |

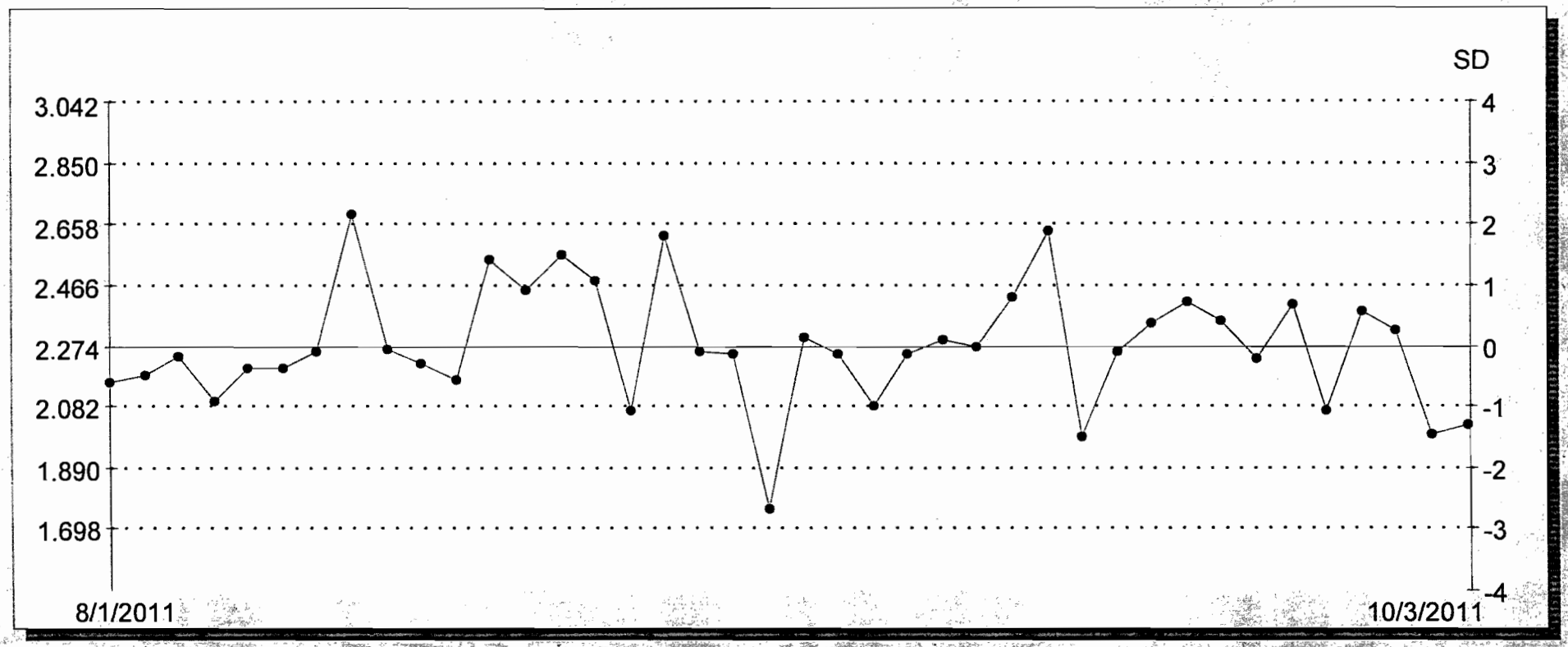
3H Efficiency
Total # pts : 1687
Valid # pts : 40
Mean : 64.32
SD : 0.27



3H Background
Total # pts : 1643
Valid # pts : 40
Mean : 2.28
SD : 0.19

| Date | Value | Valid Pt |
|---|---|---|
| Aug 01, 2011 | 2.16 | X |
| Aug 04, 2011 | 2.18 | X |
| Aug 04, 2011 | 2.25 | X |
| Aug 04, 2011 | 2.10 | X |
| Aug 09, 2011 | 2.20 | X |
| Aug 16, 2011 | 2.20 | X |
| Aug 19, 2011 | 2.26 | X |
| Aug 22, 2011 | 2.69 | X |
| Aug 24, 2011 | 2.26 | X |
| Aug 26, 2011 | 2.22 | X |
| Aug 29, 2011 | 2.17 | X |
| Aug 29, 2011 | 2.55 | X |
| Aug 29, 2011 | 2.45 | X |
| Sep 01, 2011 | 2.57 | X |
| Sep 03, 2011 | 2.48 | X |
| Sep 06, 2011 | 2.07 | X |
| Sep 10, 2011 | 2.63 | X |
| Sep 14, 2011 | 2.25 | X |
| Sep 17, 2011 | 2.25 | X |
| Sep 19, 2011 | 1.76 | X |
| Sep 21, 2011 | 2.30 | X |
| Sep 24, 2011 | 2.25 | X |
| Sep 25, 2011 | 2.09 | X |
| Sep 25, 2011 | 2.25 | X |
| Sep 25, 2011 | 2.29 | X |
| Sep 25, 2011 | 2.28 | X |
| Sep 25, 2011 | 2.43 | X |
| Sep 25, 2011 | 2.64 | X |
| Sep 25, 2011 | 1.99 | X |
| Sep 25, 2011 | 2.26 | X |
| Sep 25, 2011 | 2.35 | X |
| Sep 26, 2011 | 2.41 | X |
| Sep 26, 2011 | 2.35 | X |
| Sep 26, 2011 | 2.24 | X |
| Sep 26, 2011 | 2.41 | X |
| Sep 26, 2011 | 2.07 | X |
| Sep 26, 2011 | 2.39 | X |
| Sep 27, 2011 | 2.32 | X |
| Sep 29, 2011 | 1.99 | X |
| Oct 03, 2011 | 2.03 | X |

3H Background
Total # pts : 1643
Valid # pts : 40
Mean : 2.28
SD : 0.19



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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Low Level Liquid Scintillation Counting

# Calibration Information

# STD ID: S-0262

ARS INTERNATIONAL

## Add/Edit *Secondary Stds*

| Planning | |
|---|---|
| Planning Comments | Create an H3 LCS stock solution. |
| Target dpm/g (on dil. date) | 5.5 |
| Target Final volume mL | 2000 |
| Appx mass g of Parent Sol'n | 3.408758506 |
| Appx vol ml of Parent Sol'n | 3.414985335 |
| Expected Addition for Analysis g | 5 |

| Standards Preparation / Dilution | |
|---|---|
| Secondary Solution # | S-0262 |
| Dilution Date (New Ref Date) | 09/07/2011 11:47 |
| Ampoule, Empty (g) | |
| Ampoule /Solution Gross (g) | |
| Net Wt Removed (g) | |
| Transfer Container, empty (g) | 13.352 |
| Container Plus Solution (g) | 16.889 |
| Net Wt Transferred (g) | 3.537 |
| DPM Xferred on 09/07/2011 11:47 | 11413.83291 |
| Diluent/matrix | Dead H2O |
| Diluent Density Cont, empty (g) | |
| Test Mass of 5 ml of Diluent (g) | |
| Diluent Density Test - (g/mL) | |
| Dilution Empty Container Mass (g) | 473.97 |
| Dilution Full Cont g (if measured) | 2467.33 |
| Dilution Final Volume ml (if measured) | 2000 |
| Final Dilution Density (g/mL) | 0.99668 |
| Final Dilution Measured Mass g | 1993.36 |
| Comments | H3 LCS stock solution dilution performed as stated above by B Staffens. -BJS 9/7/11 |
| Final Dilution dpm/g | 5.725926529 |
| Final Dil New Ref Date/Time | 09/07/2011 11:47 |

## Parent Standard Data

| | | | | |
|---|---|---|---|---|
| Parent Solution Reference # | NIST SRM 4927F | | | |
| Parent Solution # | S-0237 | | | |
| Parent Principal Radionuclide | H-3 | Half Life (Days) | 4499.8000000 | |
| Parent Reference Date | 03/22/2010 10:10 | | | |
| Parent Certified Act | 3503.682716 | Certi Act/Vol Units | dpm | g |
| Parent Cert Act Uncert 1 Sigma | 0.0036 | | | |
| Parent Sp. Gravity G/Ml | 0.9982 | | | |
| Parent Supplier | NIST SRM 4927F | | | |
| Parent Date Recvd | 01/02/00 | | | |
| Parent Received By | Unknown | | | |
| Parent Cert Exp Date | | | | |
| Parent Matrix | H2O | | | |
| Certified dpm/g At Ref Date | 3503.682716 | | | |
| Certified dpm/g on 09/07/2011 11:47 | 3226.981313 | | | |
| Parent Comments | Intermediate level H-3 standard for creating LCS solutions and matrix spikes. Dilution performed as stated above by B Staffens. -BJS 3/22/10 | | | |
| Parent Tech | Unknown | | | |
| Is_Primary | FALSE | | | |
| Is_LCS | TRUE | | | |
| Is_Tracer | FALSE | | | |
| Is_Calib | FALSE | | | |

| | | | |
|---|---|---|---|
| S-0262 | | | |
| H-3 | Verified | 9/7/11 | |
| SL | Expires | 9/7/12 | |
| Manufactuer | NIST SRM 4927F | | |
| Sol Matrix | H2O | | |
| Ref No | NIST SRM 4927F | | |
| Tech | Unknown | | |
| Parent ID | S-0237 | | |

ARS INTERNATIONAL

RADIOACTIVE STANDARDS -- BATON ROUGE LABORATORY

ARS INTERNATIONAL

## QUALITY CONTROL PROGRAM

AMERICAN RADIATION SERVICES
RADIOACTIVE REFERENCE SOLUTIONS

# ANNUAL ACTIVITY VERIFICATION

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

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

Radionuclide: H-3 Dilution Reference Date: 9/7/2011 11:47

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

***Minimum of 3 Required***

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

| | | |
|---|---|---|
| Average | 5.49 | 2.47 |
| Two Sigma Uncertainty | 0.52 | 0.24 |
| Standard Deviation percent of known concentration | 4.66% | 4.66% |
| Target Activity | 5.72 | 2.58 |
| % Diff | -4.13% | -4.13% |

***10% Max*** ***PASS***

***5% Max*** ***PASS***

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

Prepared & Counted By: [signature] Date: 9/13/2011 7:43

Verified & Approved By: Dwayne Mulligan Date: 9-13-11

QC Approval: DH Mulligan Date: 9-13-11

| S-0262 | | |
|---|---|---|
| H-3 | Verified | 9/7/11 |
| SL | **Expires** | **9/7/12** |
| **Manufactuer** | **NIST SRM 4927F** | |
| **Sol Matrix** | H2O | |
| **Ref No** | NIST SRM 4927F | |
| **Tech** | Unknown | |
| **Parent ID** | S-0237 | |

ARS INTERNATIONAL

RADIOACTIVE STANDARDS -- BATON ROUGE LABORATORY

**H-3 Standard Verification**

**Verifier's Name:** Brian Steffens **Date:** 9/7/2011

**Pipettor ID:** FJ40469

**Pipettor ID:** Auto-pipettor

**Pipettor ID:** na

**Standard ID:** S-0262

**Standard ID:** N/A

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

15mL of Ultima Gold added to standard

| | Weight of Standard |
|---|---|
| S-0262-V1 | 5.050 g |
| S-0262-V2 | 5.037 g |
| S-0262-V3 | 5.035 g |
| S-0262-V4 | 5.022 g |
| S-0262-V5 | 5.019 g |
| | |
| | |
| | |
| | |
| | |

**Balance ID:** H1331122173560P

Assay Definition-

Assay Description:
H-3 Normal Level Assay

Assay Type: DPM (Single)
Report Name: Report1
Output Data Path: C:\Packard\Tricarb\Results\ARS\H-3 Normal Lvl 3\20110912_2059
Raw Results Path: C:\Packard\Tricarb\Results\ARS\H-3 Normal Lvl 3\20110912_2059\20110912_2059.results
RTF File Name: C:\Packard\Tricarb\Results\ARS\H-3 Normal Lvl 3\20110912_2059\H-3 Results.rtf
Comma-Delimited File Name: C:\Packard\Tricarb\Results\ARS\H-3 Normal Lvl 3\20110912_2059\H-3 Results.csv
Assay File Name: C:\Packard\TriCarb\Assays\H-3 Normal Lvl 3.lsa

Count Conditions-

Nuclide: H-3 Normal
Quench Indicator: tSIE/AEC
External Std Terminator (sec): 0.5 2s%
Pre-Count Delay (min): 0.00
Quench Set:
Low Energy: UG STD H-3
Count Time (min): 120.00
Count Mode: Normal
Assay Count Cycles: 1 Repeat Sample Count: 1
#Vials/Sample: 1 Calculate % Reference: Off

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

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

Count Corrections-

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

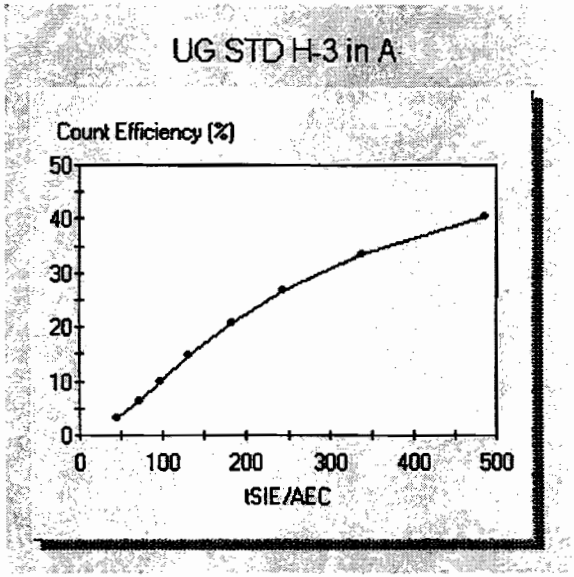
Half Life-

Half Life Correction: Off

| Regions | Half Life | Units | Reference Date | Reference Time |
|---|---|---|---|---|

A
B
C

Cycle 1 Results
Quench Curve Block Data




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

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

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

# National Institute of Standards & Technology

# Certificate

## Standard Reference Material 4927F

### Hydrogen-3 Radioactivity Standard

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

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

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

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

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

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

This Standard Reference Material was prepared in the Physics Laboratory, Ionizing Radiation Division, Radioactivity Group, Dr. M.P Unterweger, Acting Group Leader. The overall technical direction and physical measurements leading to certification were provided by Drs. L.L. Lucas and M.P Unterweger of the Radioactivity Group. The support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program.

Lisa R. Karam, Deputy Chief
Ionizing Radiation Division

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

Gaithersburg, Maryland 20899
May 2008
*See Certificate Revision History on Last Page*



*Notes and references are on page 4

Table 1. Properties of SRM 4927F

**Certified values**

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

Uncertified information

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



*Notes and references are on page 4

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

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

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

## NOTES

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

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

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

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

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

Note 6. Extensive gas-counting measurements were made on the SRM 4927E solution during 1998 and 1999. The SRM 4927F solution was intercompared with the SRM 4927E using LS counting.

## REFERENCES


[1] International Organization for Standardization (ISO), *Guide to the Expression of Uncertainty in Measurement*, 1993 (corrected and reprinted, 1995). Available from Global Engineering Documents, 12 Inverness Way East, Englewood, CO 80112, U.S.A. Telephone 1-800-854-7179.

[2] B. N. Taylor and C. E. Kuyatt, *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*, NIST Technical Note 1297, 1994. Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20407, U.S.A.

[3] L.L Lucas and M.P. Unterweger, *Comprehensive Review and Critical Evaluation of the Half-Life of Tritium*, J. Res. Natl. Inst. Stand. Technol. **105**, 541-549 (2000)



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

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# American Radiation Services Analytical Reports

## for

## Los Alamos National Laboratory

# Percent Moisture

ARS INTERNATIONAL

2609 North River Road, Port Allen, Louisiana 70767

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

| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-02028 | **Request or PO Number:** | 11-3626 |
| **Client Sample ID:** | MD21-11-26384 | **ARS Sample ID:** | ARS1-11-02028-001 |
| **Sample Collection Date:** | 09/15/11 | **Date Received:** | 09/20/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 10/13/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 26.929 | NA | NA | NA | | % | Percent Moisture | 09/30/11 02:22 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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

LELAP Certificate# 01949 NELAP Certificate # E87558

ARS INTERNATIONAL

2609 North River Road, Port Allen, Louisiana 70767

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

| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-02028 | **Request or PO Number:** | 11-3626 |
| **Client Sample ID:** | MD21-11-26391 | **ARS Sample ID:** | ARS1-11-02028-002 |
| **Sample Collection Date:** | 09/15/11 | **Date Received:** | 09/20/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 10/13/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 21.895 | NA | NA | NA | | % | Percent Moisture | 09/30/11 05:32 | BS | NA |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-02028 | **Request or PO Number:** | 11-3626 |
| **Client Sample ID:** | MD21-11-26388 | **ARS Sample ID:** | ARS1-11-02028-003 |
| **Sample Collection Date:** | 09/15/11 | **Date Received:** | 09/20/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 10/13/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 23.598 | NA | NA | NA | | % | Percent Moisture | 09/30/11 08:41 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-02028 | **Request or PO Number:** | 11-3626 |
| **Client Sample ID:** | MD21-11-26389 | **ARS Sample ID:** | ARS1-11-02028-004 |
| **Sample Collection Date:** | 09/15/11 | **Date Received:** | 09/20/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 10/13/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 21.832 | NA | NA | NA | | % | Percent Moisture | 09/30/11 11:50 | BS | NA |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-02028 | **Request or PO Number:** | 11-3626 |
| **Client Sample ID:** | MD21-11-26385 | **ARS Sample ID:** | ARS1-11-02028-005 |
| **Sample Collection Date:** | 09/15/11 | **Date Received:** | 09/20/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 10/13/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 25.626 | NA | NA | NA | | % | Percent Moisture | 09/30/11 15:00 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-02028 | **Request or PO Number:** | 11-3626 |
| **Client Sample ID:** | MD21-11-26386 | **ARS Sample ID:** | ARS1-11-02028-006 |
| **Sample Collection Date:** | 09/15/11 | **Date Received:** | 09/20/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 10/13/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 13.106 | NA | NA | NA | | % | Percent Moisture | 09/30/11 18:09 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-02028 | **Request or PO Number:** | 11-3626 |
| **Client Sample ID:** | MD21-11-26393 | **ARS Sample ID:** | ARS1-11-02028-007 |
| **Sample Collection Date:** | 09/15/11 | **Date Received:** | 09/20/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 10/13/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 22.896 | NA | NA | NA | | % | Percent Moisture | 09/30/11 21:19 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-02028 | **Request or PO Number:** | 11-3626 |
| **Client Sample ID:** | MD21-11-26387 | **ARS Sample ID:** | ARS1-11-02028-008 |
| **Sample Collection Date:** | 09/15/11 | **Date Received:** | 09/20/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 10/13/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 24.348 | NA | NA | NA | | % | Percent Moisture | 10/01/11 00:28 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-02028 | **Request or PO Number:** | 11-3626 |
| **Client Sample ID:** | MD21-11-26390 | **ARS Sample ID:** | ARS1-11-02028-009 |
| **Sample Collection Date:** | 09/15/11 | **Date Received:** | 09/20/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 10/13/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 19.925 | NA | NA | NA | | % | Percent Moisture | 10/01/11 03:37 | BS | NA |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**NOTES: Project Cost Code MR8R032NFM00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-02028 | **Request or PO Number:** | 11-3626 |
| **Client Sample ID:** | MD21-11-26392 | **ARS Sample ID:** | ARS1-11-02028-010 |
| **Sample Collection Date:** | 09/15/11 | **Date Received:** | 09/20/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 10/13/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 22.825 | NA | NA | NA | | % | Percent Moisture | 10/01/11 06:47 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Percent Moisture Laboratory Records

**AMERICAN RADIATION SERVICES**
**Port Allen, LA**
**PERCENT MOISTURE DETERMINATION IN SOILS**

SDG Number ARS1-11-01989, 02028, 02029
Client LANL

| LANL ID | ARS ID | weight of cylinder with gel (g) | weight of empty cylinder (g) | Weight of gel (g) | amount of liquid collected (ml) | amount of liquid tested (ml) | % moisture |
|---|---|---|---|---|---|---|---|
| MD54-11-23141 | ARS1-11-01989-001 | 607 | 439 | 167 | 23.6264 | 5.0612 | **14.14754491** |
| MD54-11-23140 | ARS1-11-01989-002 | 624 | 457 | 168 | 20.4232 | 5.0544 | **12.15666667** |
| MD54-11-23142 | ARS1-11-01989-003 | 601 | 438 | 162 | 20.8783 | 5.0479 | **12.88783951** |
| MD21-11-26384 | ARS1-11-02028-001 | 655 | 450 | 205 | 55.2041 | 5.0411 | **26.92882927** |
| MD21-11-26391 | ARS1-11-02028-002 | 651 | 460 | 190 | 41.5996 | 5.0487 | **21.89452632** |
| MD21-11-26388 | ARS1-11-02028-003 | 645 | 452 | 193 | 45.5444 | 5.0286 | **23.59813472** |
| MD21-11-26389 | ARS1-11-02028-004 | 637 | 447 | 189 | 41.262 | 5.075 | **21.83174603** |
| MD21-11-26385 | ARS1-11-02028-005 | 650 | 447 | 202 | 51.7645 | 5.0666 | **25.6259901** |
| MD21-11-26386 | ARS1-11-02028-006 | 623 | 452 | 170 | 22.28 | 5.0344 | **13.10588235** |
| MD21-11-26393 | ARS1-11-02028-007 | 641 | 449 | 192 | 43.9604 | 5.0318 | **22.89604167** |
| MD21-11-26387 | ARS1-11-02028-008 | 629 | 438 | 190 | 46.2604 | 5.0464 | **24.34757895** |
| MD21-11-26390 | ARS1-11-02028-009 | 621 | 441 | 180 | 35.8654 | 5.0354 | **19.92522222** |
| MD21-11-26392 | ARS1-11-02028-010 | 626 | 439 | 189 | 43.1401 | 5.0388 | **22.82544974** |
| MD54-11-23144 | ARS1-11-02029-001 | 656 | 452 | 202 | 53.86 | 5.0375 | **26.66336634** |
| MD54-11-23143 | ARS1-11-02029-002 | 641 | 440 | 201 | 55.3571 | 5.0373 | **27.54084577** |
| MD54-11-23145 | ARS1-11-02029-003 | 661 | 454 | 207 | 59.8238 | 5.0359 | **28.90038647** |

Balance ID: 0102/H1331122173560P
Pipettor ID: FJ40469

Signature _____ Date 9-30-11

**AMERICAN RADIATION SERVICES**
**Port Allen, LA**
**PERCENT MOISTURE DETERMINATION IN SOILS**

SDG Number ARS1-11-01989, 02028, 02029
Client LANL

LCS - 5.0608
LCSD - 5.0563
BLK - 5.0672

| LANL ID | ARS ID | weight of cylinder with gel (g) | weight of empty cylinder (g) | Weight of gel (g) | amount of liquid collected (ml) | amount of liquid tested (ml) | % moisture |
|---|---|---|---|---|---|---|---|
| MD54-11-23141 | ARS1-11-01989-001 | 607 | 439 | 167 | 23.6264 | 5.0612 | #DIV/0! |
| MD54-11-23140 | ARS1-11-01989-002 | 624 | 457 | 168 | 20.4232 | 5.0544 | #DIV/0! |
| MD54-11-23142 | ARS1-11-01989-003 | 601 | 438 | 162 | 20.8783 | 5.0479 | #DIV/0! |
| MD21-11-26384 | ARS1-11-02028-001 | 655 | 450 | 205 | 55.2041 | 5.0411 | #DIV/0! |
| MD21-11-26391 | ARS1-11-02028-002 | 651 | 460 | 190 | 41.5996 | 5.0487 | #DIV/0! |
| MD21-11-26388 | ARS1-11-02028-003 | 645 | 452 | 193 | 45.5444 | 5.0286 | #DIV/0! |
| MD21-11-26389 | ARS1-11-02028-004 | 637 | 447 | 189 | 41.2620 | 5.0756 | #DIV/0! |
| MD21-11-26385 | ARS1-11-02028-005 | 650 | 447 | 202 | 51.7645 | 5.0666 | #DIV/0! |
| MD21-11-26386 | ARS1-11-02028-006 | 623 | 452 | 170 | 22.2800 | 5.0344 | #DIV/0! |
| MD21-11-26393 | ARS1-11-02028-007 | 641 | 449 | 192 | 43.9604 | 5.0318 | #DIV/0! |
| MD21-11-26387 | ARS1-11-02028-008 | 629 | 438 | 190 | ~~39.3246~~ 46.2604 JK 9-25-11 | 5.0464 | #DIV/0! |
| MD21-11-26390 | ARS1-11-02028-009 | 621 | 441 | 180 | 35.8654 | 5.0354 | #DIV/0! |
| MD21-11-26392 | ARS1-11-02028-010 | 626 | 439 | 189 | 43.1401 | 5.0388 | #DIV/0! |
| MD54-11-23144 | ARS1-11-02029-001 | 656 | 452 | 202 | 53.8600 | 5.0375 | #DIV/0! |
| MD54-11-23143 | ARS1-11-02029-002 | 641 | 440 | 201 | 55.3571 | 5.0373 | #DIV/0! |
| MD54-11-23145 | ARS1-11-02029-003 | 661 | 454 | 207 | 59.8238 | 5.0359 | #DIV/0! |

Balance ID: 0102/H1331122173560P
Pipettor ID: FJ40469

Signature _____ Date 9-28-11

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

# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Folder Duplicate

ARS INTERNATIONAL

# Report Compilation Checklist

**ARS SDG:** 11-02028 **Client Name:** LANL **Sample Matrix:** SI

| LEVEL 1 COMPONENTS | 1st Reviewer | |
|---|---|---|
| 1) Cover Page Complete and Accurate (see ARS-059)? | ~~Yes~~ No N/A | |
| 2) Technical Review Checklist(s) Complete and Accurate? | ~~Yes~~ No N/A | |
| 3) Case Narrative Complete and Accurate (see ARS-059)? | ~~Yes~~ No N/A | |
| 4) Form 1s Present for all Samples and Tests? | ~~Yes~~ No N/A | |
| 5) Client Specific Components are Present and Complete? | ~~Yes~~ No N/A | |

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

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

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

Susan Reese ~~10-12-11~~ 10-13-11 SDR
Report Generator Signature Date

MJM 10-13-11
Management Review Signature Date

# LSC
# Technical Review Checklist

**ARS SDG** 11-02028

**Sample Matrix:** SI **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:** B11-03628 **Batch B:** N/A **Batch C:** N/A

**Test Method(s):** LSC-A-001 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 | Date | Verifier Review Signature | Date |
|---|---|---|---|
| [signature] | 9-29-11 | [signature] | 9-29-11 |

## 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 | Date |
|---|---|
| [signature] | 10-13-11 |

| | 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 | Date | Technicial Reviewer Signature | Date |
|---|---|---|---|
| [signature] | 10-10-11 | N/A | |

Batch A: B11-03628

# 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): _____

Suzan Reese 10-13-11
Project Manager Signature Date

YYM 10-13-11
QA Officer Signature Date

## GENERAL COMMENTS

# SDG Report - Samples and Containers

SDG Specific Data

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| SDG | ARS1-11-02028 | | | TAT Days | 30 | Project Type | Environmental |
| Sample Count | 10 | Rpt Level | 4 | Date Received | 9/20/2011 | COC Number | 11-3626 |
| Client | Los Alamos National Laboratory | | | Client Deadline | 10/19/2011 | PO Number | 63641-001-10 |
| Client Code | 114 | | | Internal Deadline | 10/19/2011 | Job Number | MR8R032NFM00 |
| Profile Number | PN-00094 | | | Lab Deadline | 10/17/2011 | Job Location | |
| Comments | | | | | | | |

Samples and Containers (→) Checked In Thus Far

| FR | ClientID | Matrix | SampleStartDate | SampleEndDate | Disp | Hold | Arch | Storage | X | Units | Y | Units | Z | Units | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 001 | MD21-11-26384 | SI | 09/15/11 12:00 PM | 09/15/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| → | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 95925 | 1 | | 1.00 | | | 35 | 18 | | Y | N/A | | | | |
| 002 | MD21-11-26391 | SI | 09/15/11 12:00 PM | 09/15/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| → | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 95926 | 1 | | 1.00 | | | 35 | 18 | | Y | N/A | | | | |
| 003 | MD21-11-26388 | SI | 09/15/11 12:00 PM | 09/15/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| → | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 95927 | 1 | | 1.00 | | | 40 | 20 | | Y | N/A | | | | |
| 004 | MD21-11-26389 | SI | 09/15/11 12:00 PM | 09/15/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| → | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 95928 | 1 | | 1.00 | | | 45 | 22 | | N | N/A | | | | |
| 005 | MD21-11-26385 | SI | 09/15/11 12:00 PM | 09/15/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| → | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 95929 | 1 | | 1.00 | | | 40 | 20 | | N | N/A | | | | |
| 006 | MD21-11-26386 | SI | 09/15/11 12:00 PM | 09/15/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| → | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 95930 | 1 | | 1.00 | | | 40 | 20 | | N | N/A | | | | |
| 007 | MD21-11-26393 | SI | 09/15/11 12:00 PM | 09/15/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| → | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 95931 | 1 | | 1.00 | | | 40 | 18 | | N | N/A | | | | |
| 008 | MD21-11-26387 | SI | 09/15/11 12:00 PM | 09/15/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| → | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 95932 | 1 | | 1.00 | | | 40 | 18 | | N | N/A | | | | |
| 009 | MD21-11-26390 | SI | 09/15/11 12:00 PM | 09/15/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| → | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 95933 | 1 | | 1.00 | | | 40 | 20 | | N | N/A | | | | |
| 010 | MD21-11-26392 | SI | 09/15/11 12:00 PM | 09/15/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| → | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 95934 | 1 | | 1.00 | | | 40 | 20 | | N | N/A | | | | |

# SDG Report - Analysis Assignments

| | | | |
|---|---|---|---|
| Temp SDG | ARS1-11-02028 | Sample Count | 10 |
| Client | Los Alamos National Laboratory | Analysis Count | 1-10 |

**Samples Count Totals per Analysis**

| Analysis Code | Analysis Description | Samples Count |
|---|---|---|
| LSC-A-001 | Tritium in (Water [Aqueous, AQ, SI]) | 10 |

**Analyses Assigned Per Fraction**

| Fraction | Analysis Code | X = Assigned |
|---|---|---|
| 001 | LSC-A-001 | X |
| 002 | LSC-A-001 | X |
| 003 | LSC-A-001 | X |
| 004 | LSC-A-001 | X |
| 005 | LSC-A-001 | X |
| 006 | LSC-A-001 | X |
| 007 | LSC-A-001 | X |
| 008 | LSC-A-001 | X |
| 009 | LSC-A-001 | X |
| 010 | LSC-A-001 | X |

# DQO Report for SDG
ARS1-11-02028



| Analysis Code | Group | Isotope | Activity Units | Aliquot Units | ProcedureNo | RDL | LCS_LL | LCS_UL | MS_LL | MS_UL | RadY_LL | RadY_UL | GravY_LL | GravY_LL | RER | RPD | DiltionReq | RoughPrepReq | BlankCorrectionMDA | BlankCorrectionAll | CountTimeReq | AliquotRequired |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LSC-A-001 | STD | H-3 | pCi | L | ARS-054 | 2.50E+02 | 80 | 120 | 75 | 125 | 30 | 110 | 40 | 110 | 1.00 | 25 | FALSE | FALSE | FALSE | FALSE | | |

# ARS FILE TRACKING SHEET

SDG: ARS1-11-02028

| Task | Date / Time | Initials |
|---|---|---|
| Date & Time Samples Received | 09-20-11/10:14 | CWB |
| ICOC Initiated / Storage Location: Q6 | 09-20-11/14:25 | CWB |
| Technical Checks Performed | See Batch | |
| Report Written / EDD Generated: 10-13-11 / 1445 \| SDL (Date/Time, Initials) | 10-13-11/1441 | SDL |
| Quality Assurance Checks Performed on Report | 10-13-11 1518 | VYM |
| Management Check Performed on Report | | |
| *Preliminary Report Sent* | na | |
| Report E-mailed | 10-14-11/8:45 | SDL |
| Report Faxed | na | |
| Report Reviewed | | |
| Report Mailed | | |
| Invoice Completed Invoice #: | | |
| Report Imaged | | |

***SPECIAL REQUIREMENTS***

| Requirement | Yes | No |
|---|---|---|
| 3 Hour Rush | | ✓ |
| 24 Hour Rush | | ✓ |
| 48 Hour Rush | | ✓ |
| Special Invoicing *see notes* Mgmt. Approval: | | ✓ |

**NOTES:**

ARS-062
04/23/2010

**COMPANY NAME:** Los Alamos National Lab **SDG:** ARSH1020290

**SHIPPING CONTAINER**

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

**COC PRESENT WITH SAMPLES**

| | | |
|---|---|---|
| COC | ☑ Yes | ☐ No |

**SAMPLE CONTAINER(S)**

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

# Samples Rcv 10

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

**External and Internal Surveys**

| | | | | | |
|---|---|---|---|---|---|
| Exposure Rate Meter: | M3 2412801 | Serial No.: | PR2642266 (4/1-2) | Calibration Due Date: | 4/2012 |
| Count Rate Meter: | M2 1548459 (4/5-2011) | Serial No.: | PR154559 (4/1-9) | Calibration Due Date: | 4/2012 |

| | | | | |
|---|---|---|---|---|
| Background Exposure Rate (µR/hr) | 26 | Max. Exposure Rate on Shipping Containers Externals (Plus Bkgd) | 20 | µR/hr |
| Background Count Rate (cpm) | 60 | Max. Removable Count Rate on Shipping Containers Externals (Plus Bkgd) | 30 | cpm |
| | | Max. Removable Count Rate on Shipping Containers Internals (Plus Bkgd) | 30 | cpm |

| Sample Label/Comments/Notes | pH Orig (pH ≤ 2 is Acceptable) | pH Final | Mark if Preserve | Acid Lot # | Weight(g) / Volume(mL) | µR/hr (Acceptance Limits <500 µR/hr) | cpm (Acceptance Limits <100 cpm/cm²) |
|---|---|---|---|---|---|---|---|
| MD21-11-26384 | | | | | 1 sample | 18 | 35 |
| ↓ 26391 | | | | | ↓ | 18 | 35 |
| ↓ 26388 | | | | | ↓ | 20 | 40 |
| ↓ 26389 | | | | | ↓ | 22 | 45 |
| ↓ 26385 | | | | | ↓ | 20 | 40 |
| ↓ 26386 | | | | | ↓ | 20 | 40 |
| ↓ 26393 | | | | | ↓ | 18 | 40 |
| ↓ 26387 | | | | | ↓ | 18 | 40 |
| ↓ 26390 | | | | | ↓ | 20 | 40 |
| ↓ 26392 | | | | | ↓ | 20 | 40 |

9-2011

Surveyors Name: [signature]

Date/Time Surveyed: 9-2011 / 11:59

Thursday, June 16, 2011

REQUEST NUMBER: 11-2668

# LOS ALAMOS
## NATIONAL LABORATORY

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

These Samples are on:
LANL Request Number:11-2668
Per Agreement Number:63641-001-10
Project Cost Code: MR8R032NFM00

Please analyse the enclosed samples according to the schedule indicated:

**SHIP DATE: 6/16/2011**
**TURNAROUND/REPORT DUE: 7/16/2011**
**TURNAROUND REQ'D: 30 Days**

**RAD SCREENING: Yes, Below Background**
**LAB REQUEST COMMENTS:**

LANL ER SMO CONTACT:
Signature: Sheri Sherwood

| PRIORITY | METHOD CODE | CNTNR | SAMPLE ID | SAMPLE MATRIX | DATE SAMPLED | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| | EPA:906.0 | 1 | MD21-11-14524 | GAS | 6/15/2011 | |
| | | 1 | MD21-11-14525 | GAS | 6/15/2011 | |
| | | 1 | MD21-11-14526 | GAS | 6/15/2011 | |
| | | 1 | MD21-11-14527 | GAS | 6/15/2011 | |
| | | 1 | MD21-11-14528 | GAS | 6/15/2011 | |
| | | 1 | MD21-11-14529 | GAS | 6/15/2011 | |
| | | 1 | MD21-11-14530 | GAS | 6/15/2011 | |
| | | 1 | MD21-11-14531 | GAS | 6/15/2011 | |
| | | 1 | MD21-11-14532 | GAS | 6/15/2011 | |
| | | 1 | MD21-11-14533 | GAS | 6/15/2011 | |

Thursday, June 16, 2011

REQUEST NUMBER: 11-2668

| PRIORITY | METHOD CODE | CNTNR | SAMPLE ID | SAMPLE MATRIX | DATE SAMPLED | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| | EPA:906.0 | 1 | MD21-11-14534 | GAS | 6/15/2011 | |

**Final Page of REQUEST NUMBER 11-2668**

Thursday, June 16, 2011

**LOS ALAMOS**
**NATIONAL LABORATORY**

## LAB CHAIN OF CUSTODY DOCUMENT NUMBER: 11-2668C

**REQUEST NUMBER: 11-2668**

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

TURNAROUND/REPORT DUE: 7/16/2011
TURNAROUND REQ'D: 30

| SAMPLE ID | CTNR | CTNR DESC | ORDER | PRESERV | MATRIX |
|---|---|---|---|---|---|
| MD21-11-14527 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-14524 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-14531 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-14525 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-14534 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-14532 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-14526 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-14529 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-14533 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-14528 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-14530 | 1 | SILICA GEL TUBE | H3 | None | GAS |

| Relinquished By: | Date | Time | Received By: | Date | Time |
|---|---|---|---|---|---|
| SHERRI SHERWOOD Signature | 6/17/11 | 3pm | Signature | | |
| Signature | | | Signature | | |
| Signature | | | Signature | | |

| Received for DISPOSAL By: | Date | Time | Remarks: |
|---|---|---|---|
| Signature | | | |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3515 **EVENT NAME:** FY11 - MDA T - CU 21-018(a)-99 - Pore Gas Sampling

**SAMPLE ID:** MD21-11-14524 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 6/15/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 1020 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | 21-24524W | ok | FIELD QC TYPE: | NA | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | 42.5 | ok | SAMPLE USAGE: | INV | |
| BOTTOM DEPTH: | 47.5 | ok | SCREEN/PORT DESC: | | Port 1 |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: NA ~~COMPOSITE TIME INTERVAL:~~ ~~WATER FLOWING: YES / NO / NA~~

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90°

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |
| ~~1~~ | | ~~TO15~~ | ~~6 LITER SUMMA~~ CANISTER | ~~None~~ | N | Not collected to 6/15/11 Not sampled for |

**SAMPLE DESC:** column # 6 initial wt = 587.36g silica wt = 141.66g Final wt 608.18g vapor wt 20.82g

**SAMPLE COMMENTS:** to 6/15/11 ~~NA~~ weather @ 1010 T = 73°F RH = 12% BP = 30.23 in

**LOCATION DESC:** NA

**FIELD SCREENING/MEASUREMENT RESULTS:**

atm $O_2$ 20.9% $CO_2$ = 440 ppm

subatm $O_2$ 16.2% $CO_2$ = 3.36%

**COLLECTED BY (PRINT)** R Onsth to 6/15/11 M Giorgi **REVIEWED BY (PRINT)** MW Gorger

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) MW Gorger | 6/15/11 | (Printed Name) J Valdez | 6/15/11 |
| (Signature) MW G | 1445 | (Signature) | 1445 |
| **RELINQUISHED BY** | **Date/Time** | **RECEIVED BY** | **Date/Time** |
| (Printed Name) | | (Printed Name) | |
| (Signature) | | (Signature) | |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3515 **EVENT NAME:** FY11 - MDA T - CU 21-018(a)-99 - Pore Gas Sampling

**SAMPLE ID:** MD21-11-14525 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 6/15/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 1020 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | 21-24524W | ok | FIELD QC TYPE: | NA | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | 122.5 | ok | SAMPLE USAGE: | INV | |
| BOTTOM DEPTH: | 127.5 | ok | SCREEN/PORT DESC: | | port 2 |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: NA COMPOSITE TIME INTERVAL: NA WATER FLOWING: YES / NO / NA

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |
| 1 | | TO15 | 6 LITER SUMMA CANISTER | None | N | Not collected per 6/15/11 |

**SAMPLE DESC:** column # 15 initial wt = 596.13g silica = 147.14g Final wt 619.30g Vapor wt 23.17g

**SAMPLE COMMENTS:** weather @ 1010 T = 73°F RH = 12% BP = 30.23 in

**LOCATION DESC:** NA

**FIELD SCREENING/MEASUREMENT RESULTS:**

atm $O_2$ 20.9% $CO_2$ 420 ppm

subatm $O_2$ 19.9% $CO_2$ 4220 ppm

**COLLECTED BY (PRINT)** R Onstott M Gorski **REVIEWED BY (PRINT)** M Gorski

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) M Gorski | 6/15/11 | (Printed Name) J Valdez | 6/15/11 |
| (Signature) | 1445 | (Signature) | 1445 |
| **RELINQUISHED BY** | **Date/Time** | **RECEIVED BY** | **Date/Time** |
| (Printed Name) | | (Printed Name) | |
| (Signature) | | (Signature) | |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3515 **EVENT NAME:** FY11 - MDA T - CU 21-018(a)-99 - Pore Gas Sampling

**SAMPLE ID:** MD21-11-14526 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 6/15/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 1020 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | 21-24524W | ok | FIELD QC TYPE: | NA | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | 172.5 | ok | SAMPLE USAGE: | INV | |
| BOTTOM DEPTH: | 177.5 | ok | SCREEN/PORT DESC: | | port 3 |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: NA COMPOSITE TIME INTERVAL: NA WATER FLOWING: YES / NO / NA

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90°

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | |
| 1 | | TO15 | 6 LITER SUMMA CANISTER | None | N | Not sampled for |

**SAMPLE DESC:** column # 1B initial wt = 603.21g silica wt = 148.90g Final wt 624.95g vapor wt 21.74g

**SAMPLE COMMENTS:** NA weather @ 1010 T = 73°F RH = 12% BP = 30.23 in

**LOCATION DESC:** NA

**FIELD SCREENING/MEASUREMENT RESULTS:**

atm $O_2$ 20.9% $CO_2$ 340 ppm
sub atm $O_2$ 19.9% $CO_2$ 4440 ppm

**COLLECTED BY (PRINT)** R Anstoff M Giorgi **REVIEWED BY (PRINT)** M Giorgi

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) M Giorgi | 6/15/11 | (Printed Name) J Valdez | 6/15/11 |
| (Signature) M Giorgi | 1445 | (Signature) | 1445 |
| **RELINQUISHED BY** | **Date/Time** | **RECEIVED BY** | **Date/Time** |
| (Printed Name) | | (Printed Name) | |
| (Signature) | | (Signature) | |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3515 **EVENT NAME:** FY11 - MDA T - CU 21-018(a)-99 - Pore Gas Sampling

**SAMPLE ID:** MD21-11-14527 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 6/15/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 1020 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | 21-24524W | ok | FIELD QC TYPE: | NA | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | 257.5 | ok | SAMPLE USAGE: | INV | |
| BOTTOM DEPTH: | 262.5 | ok | SCREEN/PORT DESC: | | port 4 |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: NA COMPOSITE TIME INTERVAL: NA WATER FLOWING: YES / NO / NA

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90°

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |
| 1 | | TO15 | 6 LITER SUMMA CANISTER | None | N | Not sampled for VOC 6/15/11 |

**SAMPLE DESC:** column # 26 initial wt 596.83g final wt 614.28g silica wt 148.48g vapor wt 17.45g

**SAMPLE COMMENTS:**

VOC 6/15/11 NA weather @ 1010 T = 73°F RH = 12% BP = 30.23in

**LOCATION DESC:**

NA

**FIELD SCREENING/MEASUREMENT RESULTS:**

atm $O_2$ 20.9% $CO_2$ 310 ppm

sub atm $O_2$ 20.2% $CO_2$ 4660 ppm

**COLLECTED BY (PRINT)** K Onsted M Borger **REVIEWED BY (PRINT)** M Borger

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) M Borger | 6/15/11 | (Printed Name) J Valdez | 6/15/11 |
| (Signature) | 1425 | (Signature) | 1425 |
| **RELINQUISHED BY** | **Date/Time** | **RECEIVED BY** | **Date/Time** |
| (Printed Name) | | (Printed Name) | |
| (Signature) | | (Signature) | |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3515 **EVENT NAME:** FY11 - MDA T - CU 21-018(a)-99 - Pore Gas Sampling

**SAMPLE ID:** MD21-11-14528 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 6/15/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 1020 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | 21-24524W | ok | FIELD QC TYPE: | NA | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | 300 | ok | SAMPLE USAGE: | INV | |
| BOTTOM DEPTH: | 305 | ok | SCREEN/PORT DESC: | | port 5 |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: NA COMPOSITE TIME INTERVAL: NO 6/15/11 NA WATER FLOWING: YES / NO / NA

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90°

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |
| ~~1~~ | | ~~TO15~~ | ~~6 LITER SUMMA CANISTER~~ | ~~None~~ | N | ~~Not sampled for~~ no 6/15/11 |

**SAMPLE DESC:**

column # 7 initial wt 583.14g silica wt 147.41g Final wt 603.23g vapor wt 20.09g

**SAMPLE COMMENTS:**

weather @ 1010 T=73°F RH=12% BP=30.23in

**LOCATION DESC:**

NA

**FIELD SCREENING/MEASUREMENT RESULTS:**

atm $O_2$ 20.9% $CO_2$ 340 ppm
sub atm $O_2$ 20.1% $CO_2$ 4500 ppm

**COLLECTED BY (PRINT)** K Orsto H M Giorgi **REVIEWED BY (PRINT)** M Giorgi

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) M Giorgi | 6/15/11 1445 | (Printed Name) J Valdez | 6/15/11 1445 |
| (Signature) | | (Signature) | |
| **RELINQUISHED BY** | **Date/Time** | **RECEIVED BY** | **Date/Time** |
| (Printed Name) | | (Printed Name) | |
| (Signature) | | (Signature) | |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3515 **EVENT NAME:** FY11 - MDA T - CU 21-018(a)-99 - Pore Gas Sampling

**SAMPLE ID:** MD21-11-14529 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 6/15/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 1020 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | 21-24524W | ok | FIELD QC TYPE: | NA | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | 327.5 | ok | SAMPLE USAGE: | INV | |
| BOTTOM DEPTH: | 332.5 | ok | SCREEN/PORT DESC: | | port 6 |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: NA COMPOSITE TIME INTERVAL: NA WATER FLOWING: YES / NO / NA

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90°

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |
| 1 | | TO15 | ~~6 LITER SUMMA~~ CANISTER | ~~None~~ | N | not sampled for RO 6/15/11 |

**SAMPLE DESC:**
column #7
initial wt 585.07g Final wt 607.32g
Silica wt 145.23g vapor wt 22.25g

**SAMPLE COMMENTS:**
weather @ 1010 T = 73°F RH = 12% BP = 30.23 in

**LOCATION DESC:**
NA

**FIELD SCREENING/MEASUREMENT RESULTS:**
atm $O_2$ 20.9% $CO_2$ 340 ppm
sub $O_2$ 20.1% $CO_2$ 4160 ppm

**COLLECTED BY (PRINT)** L Orsatti M Biorgi **REVIEWED BY (PRINT)** ell Berger

| RELINQUISHED BY | | Date/Time | RECEIVED BY | | Date/Time |
|---|---|---|---|---|---|
| (Printed Name) | | 6/15/11 | (Printed Name) | J Valdez | 6/15/11 |
| (Signature) | | 1495 | (Signature) | | 1495 |
| **RELINQUISHED BY** | | **Date/Time** | **RECEIVED BY** | | **Date/Time** |
| (Printed Name) | | | (Printed Name) | | |
| (Signature) | | | (Signature) | | |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3515 **EVENT NAME:** FY11 - MDA T - CU 21-018(a)-99 - Pore Gas Sampling

**SAMPLE ID:** MD21-11-14530 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 6/15/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 1020 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | 21-24524W | ok | FIELD QC TYPE: | NA | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | 377.5 | ok | SAMPLE USAGE: | INV | |
| BOTTOM DEPTH: | 382.5 | ok | SCREEN/PORT DESC: | | port 7 |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO / (NA) | | |

COMPOSITE TYPE: NA COMPOSITE TIME INTERVAL: NA WATER FLOWING: YES / NO (NA)

BOREHOLE: (YES) / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |
| 1 | | TO15 | 6 LITER SUMMA CANISTER | None | N | Not sampled for |

**SAMPLE DESC:** column #14 initial wt 604.88g Final wt 6/15/11 624.73g silica wt 150.21g vapor wt 19.85g

**SAMPLE COMMENTS:** weather @ 1010 T = 73°F RH = 12% BP = 30.23, in

**LOCATION DESC:** NA

**FIELD SCREENING/MEASUREMENT RESULTS:**

atm $O_2$ 20.9% $CO_2$ 340 ppm
sub atm $O_2$ 20.3% $CO_2$ 3610 ppm

**COLLECTED BY (PRINT)** R Onstott M Boring **REVIEWED BY (PRINT)** M Cooper

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) M Cooper | 6/15/11 | (Printed Name) J Valdez | 6/15/11 |
| (Signature) | 1445 | (Signature) | 1445 |
| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
| (Printed Name) | | (Printed Name) | |
| (Signature) | | (Signature) | |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3515 **EVENT NAME:** FY11 - MDA T - CU 21-018(a)-99 - Pore Gas Sampling

**SAMPLE ID:** MD21-11-14531 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 6/15/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 1020 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | 21-24324S | ok | FIELD QC TYPE: | NA | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | 677.5 | ok | SAMPLE USAGE: | INV | |
| BOTTOM DEPTH: | 682.5 | ok | SCREEN/PORT DESC: | | port 10 |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: NA COMPOSITE TIME INTERVAL: NA WATER FLOWING: YES / NO / NA

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90°

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |
| 1 | | TO15 | 6 LITER SUMMA CANISTER | None | U | Not sampled for |

**SAMPLE DESC:**
column H
9 10/15/11
initial wt = 581.31g
Silica wt 147.99g
Final wt 599.34g to 6/15/11
vapor wt 18.03 to 6/15/11

**SAMPLE COMMENTS:**
weather @ 1010 T = 73°F RH = 12% BP = 30.23 in

**LOCATION DESC:**
NA

**FIELD SCREENING/MEASUREMENT RESULTS:**
atm $O_2$ ~~20.5%~~ 20.9% to 6/15/11 $CO_2$ 340 ppm
sub atm $O_2$ 20.5% $CO_2$ 2350 ppm

**COLLECTED BY (PRINT)** Konstantin Morozov **REVIEWED BY (PRINT)** M Borger

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) M Borger | 6/15/11 | (Printed Name) J Valdez | 6/15/11 |
| (Signature) M Borger | 1445 | (Signature) | 1445 |
| **RELINQUISHED BY** | **Date/Time** | **RECEIVED BY** | **Date/Time** |
| (Printed Name) | | (Printed Name) | |
| (Signature) | | (Signature) | |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3515 **EVENT NAME:** FY11 - MDA T - CU 21-018(a)-99 - Pore Gas Sampling

**SAMPLE ID:** MD21-11-14532 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 6/15/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 1020 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | 21-24524S | ok | FIELD QC TYPE: | NA | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | 712.5 | ok | SAMPLE USAGE: | INV | |
| BOTTOM DEPTH: | 717.5 | ok | SCREEN/PORT DESC: | | port 11 |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: NA COMPOSITE TIME INTERVAL: NA WATER FLOWING: YES / NO / NA

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90°

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |
| ~~1~~ | | ~~TO15~~ | ~~6 LITER SUMMA~~ CANISTER | ~~None~~ | | ~~DNO - Sampled for 10 days~~ |

**SAMPLE DESC:**
Column # 10 initial wt 585.89g Final wt 604.10g
Silica wt 147.02g vapor wt 18.21g

**SAMPLE COMMENTS:**
weather data @ 1010 T = 73°F RH = 12% BP = 30.23 in

**LOCATION DESC:**
NA

**FIELD SCREENING/MEASUREMENT RESULTS:**
atm $O_2$ 20.9% $CO_2$ 340 ppm
sub atm $O_2$ 20.6% $CO_2$ 1520 ppm

**COLLECTED BY (PRINT)** Konstantin Mizirgin **REVIEWED BY (PRINT)** [illegible]

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) [illegible] | 6/15/11 | (Printed Name) J Vander | 6/15/11 |
| (Signature) [illegible] | 1445 | (Signature) [illegible] | 1445 |
| **RELINQUISHED BY** | **Date/Time** | **RECEIVED BY** | **Date/Time** |
| (Printed Name) | | (Printed Name) | |
| (Signature) | | (Signature) | |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3515 **EVENT NAME:** FY11 - MDA T - CU 21-018(a)-99 - Pore Gas Sampling

**SAMPLE ID:** MD21-11-14533 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 6/15/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 1020 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | 21-24524 | ok | FIELD QC TYPE: | FD | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | 0 | 300 | SAMPLE USAGE: | QC | |
| BOTTOM DEPTH: | 0 | 305 | SCREEN/PORT DESC: | | port 5 FD |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO / (NA) | | |

COMPOSITE TYPE: NA COMPOSITE TIME INTERVAL: NA WATER FLOWING: YES / NO (NA)

BOREHOLE: (YES) / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90°

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |
| 1 | | TO15 | 6 LITER SUMMA CANISTER | None | N | Not sampled for @ 6/15/11 |

**SAMPLE DESC:** QC Sample of MD21-11-14528

column # 1 initial wt 585.22g Final wt 604.75g

silica wt 145.38g vapor wt 19.53g

**SAMPLE COMMENTS:**

weather @ 1010 T = 73°F RH = 12% BP = 30.23 in

**LOCATION DESC:**

NA

**FIELD SCREENING/MEASUREMENT RESULTS:**

atm $O_2$ 20.9% $CO_2$ 340 ppm

Sub atm $O_2$ 20.1% $CO_2$ 4500 ppm

**COLLECTED BY (PRINT)** Ronald M Borgi **REVIEWED BY (PRINT)** M Borgi

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) M Borgi | 6/15/11 | (Printed Name) J Valez | 6/15/11 |
| (Signature) M Borgi | 1445 | (Signature) | 1445 |
| **RELINQUISHED BY** | **Date/Time** | **RECEIVED BY** | **Date/Time** |
| (Printed Name) | | (Printed Name) | |
| (Signature) | | (Signature) | |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3515 **EVENT NAME:** FY11 - MDA T - CU 21-018(a)-99 - Pore Gas Sampling

**SAMPLE ID:** MD21-11-14534 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 6/15/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 1200 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | 21-24524 | ok | FIELD QC TYPE: | FB | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | 0 | ok | SAMPLE USAGE: | QC | |
| BOTTOM DEPTH: | 0 | ok | SCREEN/PORT DESC: | | FB |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: NA COMPOSITE TIME INTERVAL: NA WATER FLOWING: YES / NO / NA

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: NA

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |
| ~~1~~ | | ~~TO15~~ | ~~6 LITER SUMMA~~ CANISTER | ~~None~~ | N | Not sampled for RS 6/15/1 |

**SAMPLE DESC:** QC Sample of MD21-11-14528

column #23 initial wt = 595.09g Final = 600.75g

Silica wt = 148.78g DI wt = 5.66g

**SAMPLE COMMENTS:**

weather @ RS 6/15/11 1150 T = 77°F RH = 11% BP = 30.21 in

**LOCATION DESC:**

NA

**FIELD SCREENING/MEASUREMENT RESULTS:**

NA

**COLLECTED BY (PRINT)** L Onsbott M Giorgi **REVIEWED BY (PRINT)** M Gorg

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) M Gorg | 6/15/11 | (Printed Name) J Valdez | 6/15/11 |
| (Signature) | 1425 | (Signature) | 1425 |
| **RELINQUISHED BY** | **Date/Time** | **RECEIVED BY** | **Date/Time** |
| (Printed Name) | | (Printed Name) | |
| (Signature) | | (Signature) | |

# DATA VALIDATION COVER SHEET

**5119-1**

**Data Validation Cover Sheet**

Records Use only

Los Alamos NATIONAL LABORATORY EST. 1943

**Section I.**

REQUEST NUMBER: 11-2668 VALIDATION DATE: 8/4/11 LAB CODE: ARS

CONTRACT LABORATORY NAME: American Radiation Services

VALIDATOR: Allison Felix ORGANIZATION: Analytical Quality Associates, Inc.

ANALYTICAL SUITE (CHECK ALL THAT APPLY):

| | | | |
|---|---|---|---|
| ☐ **TPH-GRO** | ☐ **HIGH EXPLOSIVES** | ☐ **DIOXIN FURANS** | ☐ **LCMSMS PERCHLORATES** |
| ☐ **TPH-DRO** | ☐ **METALS** | ☐ **PCB CONGENERS** | ☐ **ORGANOCHLORINE PESTICIDES/POLYCHLORINATED BIPHENYLS** |
| ☐ **GENERAL CHEMISTRY** | ☒ **RADIOCHEMISTRY** | ☐ **LCMSMS HIGH EXPLOSIVES** | |

☐ **OTHER (DESCRIBE):** Tritium only

**Section II. Completeness Check**

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

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

1. An MS was not analyzed for tritium. However, an LCS was analyzed and met acceptance criteria, thus, no sample results were qualified.
2. An LCSD was analyzed instead of a sample duplicate. Acceptance criteria were met and, thus, no sample results were qualified. The LCS/LCSD RER was hand-calculated using the 2-sigma TPU values and was found to be within specifications. No sample data were qualified.

**Reviewed by**: Mary Donivan **Level:** I **Date:** 08/04/11

VALIDATOR'S SIGNATURE: Allison Felix DATE: 8/4/11

# RAD ANALYTICAL DATA VALIDATION CHECKLIST

| 5119-2<br>Rad Analytical Data Validation Checklist | Records Use only |
|---|---|

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

| RAD ANALYTICAL DATA VALIDATION CHECKLIST | |
|---|---|
| **5119-2**<br>**Rad Analytical Data Validation Checklist** | Records Use only |

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

| RAD ANALYTICAL DATA VALIDATION CHECKLIST | |
|---|---|
| **5119-2**<br>**Rad Analytical Data Validation Checklist** | Records Use only |

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

ARS INTERNATIONAL

2609 North River Road, Port Allen, Louisiana 70767

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

**ARS Sample Delivery Group:** ARS1-11-01342
**Client Sample ID:** MD21-11-14527
**Sample Collection Date:** 06/15/11
**Sample Matrix:** Silica

**Request or PO Number:** 11-2668
**ARS Sample ID:** ARS1-11-01342-001
**Date Received:** 06/17/11
**Report Date:** 07/11/11

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 32753.119 | 1726.401 | 208.440 | 102.378 | | pCi/L | ARS-054/EPA 906.0 | 07/03/11 22:30 | BS | NA |
| | | | | | | | | | | |
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**NOTES: Project Cost Code MR8R032NFM00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-01342 | **Request or PO Number:** | 11-2668 |
| **Client Sample ID:** | MD21-11-14524 | **ARS Sample ID:** | ARS1-11-01342-002 |
| **Sample Collection Date:** | 06/15/11 | **Date Received:** | 06/17/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 07/11/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 41926.866 | 2205.599 | 206.040 | 101.199 | | pCi/L | ARS-054/EPA 906.0 | 07/04/11 01:40 | BS | NA |
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**ARS Sample Delivery Group:** ARS1-11-01342
**Client Sample ID:** MD21-11-14531
**Sample Collection Date:** 06/15/11
**Sample Matrix:** Silica

**Request or PO Number:** 11-2668
**ARS Sample ID:** ARS1-11-01342-003
**Date Received:** 06/17/11
**Report Date:** 07/11/11

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 160.897 | 64.279 | 207.627 | 101.979 | U | pCi/L | ARS-054/EPA 906.0 | 07/04/11 04:49 | BS | NA |
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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-01342 | **Request or PO Number:** | 11-2668 |
| **Client Sample ID:** | MD21-11-14525 | **ARS Sample ID:** | ARS1-11-01342-004 |
| **Sample Collection Date:** | 06/15/11 | **Date Received:** | 06/17/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 07/11/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 11794.262 | 632.551 | 208.577 | 102.445 | | pCi/L | ARS-054/EPA 906.0 | 07/04/11 07:58 | BS | NA |

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-01342 | **Request or PO Number:** | 11-2668 |
| **Client Sample ID:** | MD21-11-14534 | **ARS Sample ID:** | ARS1-11-01342-005 |
| **Sample Collection Date:** | 06/15/11 | **Date Received:** | 06/17/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 07/11/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | -51.944 | 62.390 | 210.666 | 103.471 | U | pCi/L | ARS-054/EPA 906.0 | 07/04/11 11:08 | BS | NA |
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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-01342 | **Request or PO Number:** | 11-2668 |
| **Client Sample ID:** | MD21-11-14532 | **ARS Sample ID:** | ARS1-11-01342-006 |
| **Sample Collection Date:** | 06/15/11 | **Date Received:** | 06/17/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 07/11/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 49.086 | 62.998 | 209.029 | 102.667 | U | pCi/L | ARS-054/EPA 906.0 | 07/04/11 14:17 | BS | NA |

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-01342 | **Request or PO Number:** | 11-2668 |
| **Client Sample ID:** | MD21-11-14526 | **ARS Sample ID:** | ARS1-11-01342-007 |
| **Sample Collection Date:** | 06/15/11 | **Date Received:** | 06/17/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 07/11/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 13441.997 | 718.485 | 210.217 | 103.251 | | pCi/L | ARS-054/EPA 906.0 | 07/04/11 17:27 | BS | NA |
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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-01342 | **Request or PO Number:** | 11-2668 |
| **Client Sample ID:** | MD21-11-14529 | **ARS Sample ID:** | ARS1-11-01342-008 |
| **Sample Collection Date:** | 06/15/11 | **Date Received:** | 06/17/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 07/11/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 9413.044 | 508.886 | 209.650 | 102.972 | | pCi/L | ARS-054/EPA 906.0 | 07/04/11 20:36 | BS | NA |
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|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-01342 | **Request or PO Number:** | 11-2668 |
| **Client Sample ID:** | MD21-11-14533 | **ARS Sample ID:** | ARS1-11-01342-009 |
| **Sample Collection Date:** | 06/15/11 | **Date Received:** | 06/17/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 07/11/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 47952.511 | 2520.727 | 209.086 | 102.695 | | pCi/L | ARS-054/EPA 906.0 | 07/04/11 23:45 | BS | NA |
| | | | | | | | | | | |
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**ARS Sample Delivery Group:** ARS1-11-01342
**Client Sample ID:** MD21-11-14528
**Sample Collection Date:** 06/15/11
**Sample Matrix:** Silica

**Request or PO Number:** 11-2668
**ARS Sample ID:** ARS1-11-01342-010
**Date Received:** 06/17/11
**Report Date:** 07/11/11

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 48532.938 | 2551.217 | 211.314 | 103.789 | | pCi/L | ARS-054/EPA 906.0 | 07/05/11 02:55 | BS | NA |
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**NOTES: Project Cost Code MR8R032NFM00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-01342 | **Request or PO Number:** | 11-2668 |
| **Client Sample ID:** | MD21-11-14530 | **ARS Sample ID:** | ARS1-11-01342-011 |
| **Sample Collection Date:** | 06/15/11 | **Date Received:** | 06/17/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 07/11/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 6328.974 | 349.679 | 212.469 | 104.356 | | pCi/L | ARS-054/EPA 906.0 | 07/05/11 06:04 | BS | NA |
| | | | | | | | | | | |
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**NOTES: Project Cost Code MR8R032NFM00**

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LELAP Certificate# 01949 NELAP Certificate # E87558



AMF
8/4/11

Thursday, June 16, 2011

REQUEST NUMBER: 11-2668

# LOS ALAMOS
## NATIONAL LABORATORY

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

These Samples are on:
LANL Request Number:11-2668
Per Agreement Number:63641-001-10
Project Cost Code: MR8R032NFM00

Please analyse the enclosed samples according to the schedule indicated:

**SHIP DATE: 6/16/2011**
**TURNAROUND/REPORT DUE: 7/16/2011**
**TURNAROUND REQ'D: 30 Days**

**RAD SCREENING: Yes, Below Background**
**LAB REQUEST COMMENTS:**

LANL ER SMO CONTACT:
Signature: Sheri Sherwood

| PRIORITY | METHOD CODE | CNTNR | SAMPLE ID | SAMPLE MATRIX | DATE SAMPLED | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| | EPA:906.0 | 1 | MD21-11-14524 | GAS | 6/15/2011 | |
| | | 1 | MD21-11-14525 | GAS | 6/15/2011 | |
| | | 1 | MD21-11-14526 | GAS | 6/15/2011 | |
| | | 1 | MD21-11-14527 | GAS | 6/15/2011 | |
| | | 1 | MD21-11-14528 | GAS | 6/15/2011 | |
| | | 1 | MD21-11-14529 | GAS | 6/15/2011 | |
| | | 1 | MD21-11-14530 | GAS | 6/15/2011 | |
| | | 1 | MD21-11-14531 | GAS | 6/15/2011 | |
| | | 1 | MD21-11-14532 | GAS | 6/15/2011 | |
| | | 1 | MD21-11-14533 | GAS | 6/15/2011 | |

Thursday, June 16, 2011

REQUEST NUMBER: 11-2668

| PRIORITY | METHOD CODE | CNTNR | SAMPLE ID | SAMPLE MATRIX | DATE SAMPLED | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| | EPA:906.0 | 1 | MD21-11-14534 | GAS | 6/15/2011 | |

**Final Page of REQUEST NUMBER 11-2668**

Thursday, June 16, 2011

# LAB CHAIN OF CUSTODY DOCUMENT NUMBER: 11-2668C

**REQUEST NUMBER: 11-2668**

## LOS ALAMOS
**NATIONAL LABORATORY**

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

TURNAROUND/REPORT DUE: 7/16/2011
TURNAROUND REQ'D: 30

| SAMPLE ID | CTNR | CTNR DESC | ORDER | PRESERV | MATRIX |
|---|---|---|---|---|---|
| MD21-11-14527 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-14524 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-14531 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-14525 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-14534 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-14532 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-14526 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-14529 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-14533 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-14528 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-14530 | 1 | SILICA GEL TUBE | H3 | None | GAS |

| Relinquished By: | Date | Time | Received By: | Date | Time |
|---|---|---|---|---|---|
| SHERRI SHERWOOD Signature | 6/17/11 | 3pm | Signature | | |
| Signature | | | Signature | 6/17/11 | 10:09 |
| Signature | | | Signature | | |

| Received for DISPOSAL By: | Date | Time | Remarks: |
|---|---|---|---|
| Signature | | | |

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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Request Number: 11-2668

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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory Request Number: 11-2668

# Original COC

Thursday, June 16, 2011

REQUEST NUMBER: 11-2668

# LOS ALAMOS
## NATIONAL LABORATORY

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

These Samples are on:
LANL Request Number:11-2668
Per Agreement Number:63641-001-10
Project Cost Code: MR8R032NFM00

Please analyse the enclosed samples according to the schedule indicated:

**SHIP DATE: 6/16/2011**
**TURNAROUND/REPORT DUE: 7/16/2011**
**TURNAROUND REQ'D: 30 Days**

**RAD SCREENING: Yes, Below Background**
**LAB REQUEST COMMENTS:**

LANL ER SMO CONTACT:
Signature: Sheri Sherwood

| PRIORITY | METHOD CODE | CNTNR | SAMPLE ID | SAMPLE MATRIX | DATE SAMPLED | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| | EPA:906.0 | 1 | MD21-11-14524 | GAS | 6/15/2011 | |
| | | 1 | MD21-11-14525 | GAS | 6/15/2011 | |
| | | 1 | MD21-11-14526 | GAS | 6/15/2011 | |
| | | 1 | MD21-11-14527 | GAS | 6/15/2011 | |
| | | 1 | MD21-11-14528 | GAS | 6/15/2011 | |
| | | 1 | MD21-11-14529 | GAS | 6/15/2011 | |
| | | 1 | MD21-11-14530 | GAS | 6/15/2011 | |
| | | 1 | MD21-11-14531 | GAS | 6/15/2011 | |
| | | 1 | MD21-11-14532 | GAS | 6/15/2011 | |
| | | 1 | MD21-11-14533 | GAS | 6/15/2011 | |

Thursday, June 16, 2011

REQUEST NUMBER: 11-2668

| PRIORITY | METHOD CODE | CNTNR | SAMPLE ID | SAMPLE MATRIX | DATE SAMPLED | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| | EPA:906.0 | 1 | MD21-11-14534 | GAS | 6/15/2011 | |

**Final Page of REQUEST NUMBER 11-2668**

Thursday, June 16, 2011

# LAB CHAIN OF CUSTODY DOCUMENT NUMBER: 11-2668C

**REQUEST NUMBER: 11-2668**

## LOS ALAMOS
**NATIONAL LABORATORY**

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

TURNAROUND/REPORT DUE: 7/16/2011
TURNAROUND REQ'D: 30

| SAMPLE ID | CTNR | CTNR DESC | ORDER | PRESERV | MATRIX |
|---|---|---|---|---|---|
| MD21-11-14527 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-14524 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-14531 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-14525 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-14534 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-14532 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-14526 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-14529 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-14533 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-14528 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-14530 | 1 | SILICA GEL TUBE | H3 | None | GAS |

| Relinquished By: | Date | Time | Received By: | Date | Time |
|---|---|---|---|---|---|
| SHERRI SHERWOOD Signature | 6/17/11 | 3pm | Signature | | |
| Signature | | | Signature | 6/17/11 | 10:09 |
| Signature | | | Signature | | |

| Received for DISPOSAL By: | Date | Time | Remarks: |
|---|---|---|---|
| Signature | | | |

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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory Request Number: 11-2668

# Case Narrative

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July 11, 2011

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

Request Number: **11-2668**
LANL Sample ID: **MD21-11-14527; MD21-11-14524; MD21-11-14531; MD21-11-14525; MD21-11-14534; MD21-11-14532; MD21-11-14526; MD21-11-14529; MD21-11-14533; MD21-11-14528; MD21-11-14530.**

Dear Mr. Greene;

On June 17, 2011, ARS International received eleven (11) Silica Gel samples to be analyzed for Tritium.

The samples were received in good condition. They were processed and counted using the appropriate counting equipment and QA/QC for this type of analysis. Results of the analysis and QA/QC are attached in the data package.

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

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

Sincerely,

Virgene Mulligan

Laboratory Management
**ARS International**

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# COVER PAGE

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

| Request Number | LANL PROJECT SAMPLE ID NUMBER | American Radiation Services SAMPLE ID NUMBER(S) |
|---|---|---|
| 11-2668 | MD21-11-14527 | ARS1-11-01342-001 |
| 11-2668 | MD21-11-14524 | ARS1-11-01342-002 |
| 11-2668 | MD21-11-14531 | ARS1-11-01342-003 |
| 11-2668 | MD21-11-14525 | ARS1-11-01342-004 |
| 11-2668 | MD21-11-14534 | ARS1-11-01342-005 |
| 11-2668 | MD21-11-14532 | ARS1-11-01342-006 |
| 11-2668 | MD21-11-14526 | ARS1-11-01342-007 |
| 11-2668 | MD21-11-14529 | ARS1-11-01342-008 |
| 11-2668 | MD21-11-14533 | ARS1-11-01342-009 |
| 11-2668 | MD21-11-14528 | ARS1-11-01342-010 |
| 11-2668 | MD21-11-14530 | ARS1-11-01342-011 |

**ANALYTICAL METHODS**
Tritium analyses were performed using **EPA 906.0.**

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

**American Radiation Services Project Manager/Laboratory Director's Comments:**
*"I certify that this sample data package is in compliance with SOW requirements, both technically and for completeness, other than the conditions detailed above. Release of the data contained in this sample data package and the computer-readable EDD, as applicable, submitted on diskette or by modem, has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature."*

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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 the LANL specific requirements, both technically and for completeness, other than the conditions detailed above or in the sample data package narrative. Release, by submission through email, the data contained in this electronic image and the computer-readable EDD (as applicable), has been authorized by the laboratory Manager/Technical Director or the Manager's designee."*

| Signature | Title | Date |
|---|---|---|
| Eugene Mallegan | Laboratory Management, ARS International | 7-15-11 |

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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Tritium by Low Level Liquid Scintillation Counting

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**ARS Sample Delivery Group:** ARS1-11-01342
**Client Sample ID:** MD21-11-14527
**Sample Collection Date:** 06/15/11
**Sample Matrix:** Silica

**Request or PO Number:** 11-2668
**ARS Sample ID:** ARS1-11-01342-001
**Date Received:** 06/17/11
**Report Date:** 07/11/11

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 32753.119 | 1726.401 | 208.440 | 102.378 | | pCi/L | ARS-054/EPA 906.0 | 07/03/11 22:30 | BS | NA |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-01342 | **Request or PO Number:** | 11-2668 |
| **Client Sample ID:** | MD21-11-14524 | **ARS Sample ID:** | ARS1-11-01342-002 |
| **Sample Collection Date:** | 06/15/11 | **Date Received:** | 06/17/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 07/11/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 41926.866 | 2205.599 | 206.040 | 101.199 | | pCi/L | ARS-054/EPA 906.0 | 07/04/11 01:40 | BS | NA |
| | | | | | | | | | | |
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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-01342 | **Request or PO Number:** | 11-2668 |
| **Client Sample ID:** | MD21-11-14531 | **ARS Sample ID:** | ARS1-11-01342-003 |
| **Sample Collection Date:** | 06/15/11 | **Date Received:** | 06/17/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 07/11/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 160.897 | 64.279 | 207.627 | 101.979 | U | pCi/L | ARS-054/EPA 906.0 | 07/04/11 04:49 | BS | NA |
| | | | | | | | | | | |
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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-01342 | **Request or PO Number:** | 11-2668 |
| **Client Sample ID:** | MD21-11-14525 | **ARS Sample ID:** | ARS1-11-01342-004 |
| **Sample Collection Date:** | 06/15/11 | **Date Received:** | 06/17/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 07/11/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 11794.262 | 632.551 | 208.577 | 102.445 | | pCi/L | ARS-054/EPA 906.0 | 07/04/11 07:58 | BS | NA |
| | | | | | | | | | | |
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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-01342 | **Request or PO Number:** | 11-2668 |
| **Client Sample ID:** | MD21-11-14534 | **ARS Sample ID:** | ARS1-11-01342-005 |
| **Sample Collection Date:** | 06/15/11 | **Date Received:** | 06/17/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 07/11/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | -51.944 | 62.390 | 210.666 | 103.471 | U | pCi/L | ARS-054/EPA 906.0 | 07/04/11 11:08 | BS | NA |
| | | | | | | | | | | |
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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-01342 | **Request or PO Number:** | 11-2668 |
| **Client Sample ID:** | MD21-11-14532 | **ARS Sample ID:** | ARS1-11-01342-006 |
| **Sample Collection Date:** | 06/15/11 | **Date Received:** | 06/17/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 07/11/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 49.086 | 62.998 | 209.029 | 102.667 | U | pCi/L | ARS-054/EPA 906.0 | 07/04/11 14:17 | BS | NA |
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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-01342 | **Request or PO Number:** | 11-2668 |
| **Client Sample ID:** | MD21-11-14526 | **ARS Sample ID:** | ARS1-11-01342-007 |
| **Sample Collection Date:** | 06/15/11 | **Date Received:** | 06/17/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 07/11/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 13441.997 | 718.485 | 210.217 | 103.251 | | pCi/L | ARS-054/EPA 906.0 | 07/04/11 17:27 | BS | NA |
| | | | | | | | | | | |
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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-01342 | **Request or PO Number:** | 11-2668 |
| **Client Sample ID:** | MD21-11-14529 | **ARS Sample ID:** | ARS1-11-01342-008 |
| **Sample Collection Date:** | 06/15/11 | **Date Received:** | 06/17/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 07/11/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 9413.044 | 508.886 | 209.650 | 102.972 | | pCi/L | ARS-054/EPA 906.0 | 07/04/11 20:36 | BS | NA |
| | | | | | | | | | | |
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**NOTES: Project Cost Code MR8R032NFM00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-01342 | **Request or PO Number:** | 11-2668 |
| **Client Sample ID:** | MD21-11-14533 | **ARS Sample ID:** | ARS1-11-01342-009 |
| **Sample Collection Date:** | 06/15/11 | **Date Received:** | 06/17/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 07/11/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 47952.511 | 2520.727 | 209.086 | 102.695 | | pCi/L | ARS-054/EPA 906.0 | 07/04/11 23:45 | BS | NA |
| | | | | | | | | | | |
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**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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**ARS Sample Delivery Group:** ARS1-11-01342
**Client Sample ID:** MD21-11-14528
**Sample Collection Date:** 06/15/11
**Sample Matrix:** Silica

**Request or PO Number:** 11-2668
**ARS Sample ID:** ARS1-11-01342-010
**Date Received:** 06/17/11
**Report Date:** 07/11/11

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 48532.938 | 2551.217 | 211.314 | 103.789 | | pCi/L | ARS-054/EPA 906.0 | 07/05/11 02:55 | BS | NA |
| | | | | | | | | | | |
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**NOTES: Project Cost Code MR8R032NFM00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-01342 | **Request or PO Number:** | 11-2668 |
| **Client Sample ID:** | MD21-11-14530 | **ARS Sample ID:** | ARS1-11-01342-011 |
| **Sample Collection Date:** | 06/15/11 | **Date Received:** | 06/17/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 07/11/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 6328.974 | 349.679 | 212.469 | 104.356 | | pCi/L | ARS-054/EPA 906.0 | 07/05/11 06:04 | BS | NA |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**NOTES: Project Cost Code MR8R032NFM00**

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LELAP Certificate# 01949 NELAP Certificate # E87558

ARS INTERNATIONAL

# QC Results per Analytical Batch

| | |
|---|---|
| Analytical Batch | ARS1-B11-02481 |
| SDG | ARS1-11-01342 |
| Analysis | Tritium (Aqueous) |
| Analysis Test Method | ARS-054/Liquid Scintillation Counter |
| Analysis Code | LSC-A-001 |
| Report Units | pCi/L |

## Acceptable QC Performance Ranges

| QC Sample Type | Performance Items and Ranges | | |
|---|---|---|---|
| Laboratory Control Sample | Recovery (%): | > 80 | < 120 |
| Matrix Spike | Recovery (%): | > 75 | < 125 |
| Duplicate | Replicate Error Ratio (RER): | | < 1 |
| | Duplicate Error Ratio (DER): | | < 3 |
| | Relative Percent Difference (RPD %): | | ≤ 25 |

## Laboratory Control Sample

Analysis Date: 07/03/11 03:35 — Analysis Technician: BSTEFFENS

| Analysis Batch Sample ID | QC Type | Analyte | Results | CSU (1s) | Expected Value | LCS Rec (%) | MDC |
|---|---|---|---|---|---|---|---|
| ARS1-B11-02481-01 | LCS | H-3 | 2170 | 140 | 2426 | 89 | 210 |

## Duplicate RER/DER/RPD

Analysis Date: 07/03/11 06:44 — Analysis Technician: BSTEFFENS

| Analyte | Result LCS | CSU LCS (1s) | Results LCSD | CSU LCSD (1s) | RER | DER | RPD |
|---|---|---|---|---|---|---|---|
| H-3 | 2170 | 140 | 2390 | 150 | 0.39 | 1.07 | 9.6 |

## Method Blank

Analysis Date: 07/03/11 09:53 — Analysis Technician: BSTEFFENS

| Analysis Batch Sample ID | QC Type | Analyte | Results | CSU (1s) | MDC | Qual |
|---|---|---|---|---|---|---|
| ARS1-B11-02481-03 | MBL | H-3 | -14 | 61 | 200 | U |

Susan Leese

Susan Leese

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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Tritium by Low Level Liquid Scintillation Counting

# Samples

ARS INTERNATIONAL

# LSC Instrument Data Transfer Report

\\PACKARD3170_NEW\Results\ARS\H-3 Normal Lvl 3'

| Batch Sample ID | Non-BKG Samples Transferred | Samples Eligible To Save | |
|---|---|---|---|
| ARS1-B11-02481 | 23 | 23 | LSC 2 |

| 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 | 50 | | 1 | BACKGROUND | 07/03/11 00:27 | 5.82 | 405.05 | 36.5700 | 180.00 | ARS1-B11-02481 | | |
| ARS1-B11-02481-01 | 50 | | 2 | B11-02481-01 | 07/03/11 03:35 | 14.81 | 409.02 | 36.7600 | 180.00 | ARS1-B11-02481 | | |
| ARS1-B11-02481-02 | 50 | | 3 | B11-02481-02 | 07/03/11 06:44 | 15.86 | 422.26 | 37.3700 | 180.00 | ARS1-B11-02481 | | |
| ARS1-B11-02481-03 | 50 | | 4 | B11-02481-03 | 07/03/11 09:53 | 5.76 | 415.46 | 37.0500 | 180.00 | ARS1-B11-02481 | | |
| ARS1-B11-02481-04 | 50 | | 5 | B11-024B1-04 | 07/03/11 13:02 | 9.23 | 389.23 | 35.8400 | 180.00 | ARS1-B11-02481 | ARS1-11-01310 | 1 |
| ARS1-B11-02481-05 | 50 | | 6 | B11-024B1-05 | 07/03/11 16:11 | 8.88 | 385.19 | 35.6500 | 180.00 | ARS1-B11-02481 | ARS1-11-01310 | 1 |
| ARS1-B11-02481-06 | 50 | | 7 | B11-02481-06 | 07/03/11 19:20 | 8.58 | 388.11 | 35.7800 | 180.00 | ARS1-B11-02481 | ARS1-11-01310 | 1 |
| ARS1-B11-02481-07 | 50 | | 8 | B11-02481-07 | 07/03/11 22:30 | 139.65 | 406.43 | 36.6300 | 180.00 | ARS1-B11-02481 | ARS1-11-01342 | 1 |
| ARS1-B11-02481-08 | 50 | | 9 | B11-02481-08 | 07/04/11 01:39 | 179.13 | 411.26 | 36.8600 | 180.00 | ARS1-B11-02481 | ARS1-11-01342 | 1 |
| ARS1-B11-02481-09 | 50 | | 10 | B11-02481-09 | 07/04/11 04:49 | 6.48 | 404.71 | 36.5500 | 180.00 | ARS1-B11-02481 | ARS1-11-01342 | 1 |
| ARS1-B11-02481-10 | 50 | | 11 | B11-02481-10 | 07/04/11 07:58 | 53.98 | 400.68 | 36.3700 | 180.00 | ARS1-B11-02481 | ARS1-11-01342 | 1 |
| ARS1-B11-02481-11 | 50 | | 12 | B11-02481-11 | 07/04/11 11:07 | 5.61 | 393.00 | 36.0100 | 180.00 | ARS1-B11-02481 | ARS1-11-01342 | 1 |
| ARS1-B11-02481-12 | 50 | | 13 | B11-02481-12 | 07/04/11 14:17 | 6.02 | 398.16 | 36.2500 | 180.00 | ARS1-B11-02481 | ARS1-11-01342 | 1 |
| ARS1-B11-02481-13 | 50 | | 14 | B11-02481-13 | 07/04/11 17:26 | 60.28 | 398.39 | 36.2600 | 180.00 | ARS1-B11-02481 | ARS1-11-01342 | 1 |
| ARS1-B11-02481-14 | 50 | | 15 | B11-02481-14 | 07/04/11 20:35 | 44.06 | 402.58 | 36.4600 | 180.00 | ARS1-B11-02481 | ARS1-11-01342 | 1 |
| ARS1-B11-02481-15 | 50 | | 16 | B11-02481-15 | 07/04/11 23:45 | 201.15 | 401.32 | 36.4000 | 180.00 | ARS1-B11-02481 | ARS1-11-01342 | 1 |
| ARS1-B11-02481-16 | 50 | | 17 | B11-02481-16 | 07/05/11 02:54 | 201.43 | 396.14 | 36.1600 | 180.00 | ARS1-B11-02481 | ARS1-11-01342 | 1 |
| ARS1-B11-02481-17 | 50 | | 18 | B11-02481-17 | 07/05/11 06:04 | 31.19 | 390.72 | 35.9000 | 180.00 | ARS1-B11-02481 | ARS1-11-01342 | 1 |
| ARS1-B11-02481-18 | 50 | | 19 | B11-02481-18 | 07/05/11 09:13 | 6.56 | 385.73 | 35.6700 | 180.00 | ARS1-B11-02481 | ARS1-11-01343 | 1 |
| ARS1-B11-02481-19 | 50 | | 20 | B11-02481-19 | 07/05/11 12:22 | 12.81 | 387.98 | 35.7800 | 180.00 | ARS1-B11-02481 | ARS1-11-01343 | 1 |
| ARS1-B11-02481-20 | 50 | | 21 | B11-02481-20 | 07/05/11 15:32 | 6.08 | 381.23 | 35.4600 | 180.00 | ARS1-B11-02481 | ARS1-11-01343 | 1 |
| ARS1-B11-02481-21 | 50 | | 22 | [illegible] | [illegible] | 8.[illegible] | 376.[illegible] | 35.2[illegible]00 | 180.00 | ARS1-B11-02481 | ARS1-11-01343 | 1 |
| ARS1-B11-02481-22 | 50 | | 23 | B11-02481-22 | 07/05/11 21:50 | 5.38 | 404.97 | 36.5700 | 180.00 | ARS1-B11-02481 | ARS1-11-01343 | 1 |
| ARS1-B11-02481-23 | 50 | | 24 | B11-02481-23 | 07/06/11 00:58 | 5.59 | 372.68 | 35.0700 | 180.00 | ARS1-B11-02481 | ARS1-11-01343 | 1 |

# Calculation Verification

| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 14.810000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.820000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.367600 |
| Sample Aliquot | 5.088000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 7/3/11 3:35 AM |
| Count Date (t2) | 7/3/11 3:35 AM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| | |
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| | |
| 0 Variables Intact Test | OK |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Value** | **Excel** | **VBA** | **V/V** |
| ACT | 2165.130670 | 2165.130670 | OK |
| CI | 81.533818 | 81.533818 | OK |
| TPU | 139.500135 | 139.500135 | OK |
| MDA | 205.119220 | 205.119220 | OK |
| DL | 100.746637 | 100.746637 | OK |
| Net Count Rate | 8.990000 | 8.990000 | OK |
| D t 1 (t2 - t1) | 0.000000 | 0.000000 | OK |
| DF | 1.000000 | 1.000000 | OK |
| Sys Err | 0.052280 | 0.052280 | OK |
| K | 0.004152 | 0.004152 | OK |
| K MDA | 0.747391 | 0.747391 | OK |
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| Batch Identifiers and Other Related Information | |
|---|---|
| Batch | ARS1-B11-02481 |
| Batch ID | ARS1-B11-02481-01 |
| Analysis Code | |
| SDG | QC Sample |
| Fraction | N/A QC Sample |
| Run Number | |
| | |
| Client | QC Sample |
| Client Profile | |
| Client ID | N/A QC Sample |
| Instr File Name | 76 |
| Instr Detector | P-50-S-2 |
| Instr key | |
| Version/Date | 1.0 -- 11/18/2005 |



Reviewed by: SDL Date: 7-8-11

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 15.860000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.820000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.373700 |
| Sample Aliquot | 5.071000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 7/3/11 6:44 AM |
| Count Date (t2) | 7/3/11 6:44 AM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.9600 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| 0 Variables Intact Test | OK |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| ACT | 2386.514239 | 2386.514239 | OK |
| C | 161.688739 | 161.688739 | OK |
| TP | 293.162078 | 293.162078 | OK |
| MD | 202.447423 | 202.447423 | OK |
| D | 99.434354 | 99.434354 | OK |
| Net Count Rat | 10.040000 | 10.040000 | OK |
| D t 1 (t2 - t1 | 0.000000 | 0.000000 | OK |
| C | 1.000000 | 1.000000 | OK |
| Sys Err | 0.052280 | 0.052280 | OK |
| K | 0.004207 | 0.004207 | OK |
| K MDA | 0.757255 | 0.757255 | OK |

| Batch Identifiers and Other Related Information | |
|---|---|
| Batc | ARS1-B11-02481 |
| Batch I | ARS1-B11-02481-02 |
| Analysis Cod | |
| SD | QC Sample |
| Fractic | N/A QC Sample |
| Run Numbe | |
| | |
| Clier | QC Sample |
| Client Profile | |
| Client ID | N/A QC Sample |
| Instr File Name | 76 |
| Instr Detecto | P-50-S-3 |
| Instr ke | |
| Version/Date | 1.0 -- 11/18/2005 |

Reviewed By: Sdh Date: 7-8-11

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 5.760000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.820000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.370500 |
| Sample Aliquot | 5.061000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 7/3/11 9:53 AM |
| Count Date (t2) | 7/3/11 9:53 AM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.9600 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| **Variables Intact Test** | **OK** |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| **AC** | -14.413642 | -14.413642 | OK |
| **C** | 119.425364 | 119.425364 | OK |
| **TPU** | 119.434497 | 119.434497 | OK |
| **MD** | 204.599426 | 204.599426 | OK |
| **D** | 100.491335 | 100.491335 | OK |
| **Net Count Rat** | -0.060000 | -0.060000 | OK |
| **D t 1 (t2 - t1** | 0.000000 | 0.000000 | OK |
| **D** | 1.000000 | 1.000000 | OK |
| **Sys Er** | 0.052280 | 0.052280 | OK |
| | 0.004163 | 0.004163 | OK |
| **K MDA** | 0.749290 | 0.749290 | OK |

| Batch Identifiers and Other Related Information | |
|---|---|
| **Batc** | ARS1-B11-02481 |
| **Batch I** | ARS1-B11-02481-03 |
| **Analysis Cod** | |
| **SD** | QC Sample |
| **Fractio** | N/A QC Sample |
| **Run Numbe** | |
| | |
| **Clie** | QC Sample |
| **Client Profil** | |
| **Client I** | N/A QC Sample |
| **Instr File Nam** | 76 |
| **Instr Detectr** | P-50-5-4 |
| **Instr ke** | |
| **Version/Date** | 1.0 -- 11/18/2005 |

Reviewed By: SDL Date: 7-8-11

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 139.650000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.820000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.366300 |
| Sample Aliquot | 5.039000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 6/15/11 12:00 PM |
| Count Date (t2) | 7/3/11 10:30 PM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
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| | |
| 0 Variables Intact Test | OK |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| ACT | 32753.119376 | 32753.119371 | OK |
| CU | 220.013666 | 220.013666 | OK |
| TPU | 1726.400575 | 1726.400575 | OK |
| MDA | 208.440030 | 208.440030 | OK |
| DL | 102.377691 | 102.377691 | OK |
| Net Count Rate | 133.830000 | 133.830000 | OK |
| D t 1 (t2 - t1) | 18.437500 | 18.437500 | OK |
| DI | 0.997164 | 0.997164 | OK |
| Sys Err | 0.052280 | 0.052280 | OK |
| K | 0.004086 | 0.004086 | OK |
| K MDA | 0.735484 | 0.735484 | OK |
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| Batch Identifiers and Other Related Information | |
|---|---|
| Batch | ARS1-B11-02481 |
| Batch ID | ARS1-B11-02481-07 |
| Analysis Code | LSC-A-001 |
| SDG | ARS1-11-01342 |
| Fraction | 001 |
| Run Number | 1 |
| | |
| Client | Los Alamos National Laboratory |
| Client Profile | Keith Greene |
| Client ID | MD21-11-14527 |
| Instr File Name | 76 |
| Instr Detector | P-50-S-8 |
| Instr key | |
| Version/Date | 1.0 -- 11/18/2005 |

Reviewed by: SDL  Date: 7-8-11

| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 179.130000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.820000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.368600 |
| Sample Aliquot | 5.066000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 6/15/11 12:00 PM |
| Count Date (t2) | 7/4/11 1:40 AM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| **Variables Intact Test** | **OK** |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| ACT | 41926.865954 | 41926.865946 | OK |
| CTU | 245.222148 | 245.222148 | OK |
| TPU | 2205.599214 | 2205.599214 | OK |
| MDA | 206.039607 | 206.039607 | OK |
| DL | 101.198696 | 101.198696 | OK |
| Net Count Rate | 173.310000 | 173.310000 | OK |
| D t 1 (t2 - t1) | 18.569444 | 18.569444 | OK |
| DF | 0.997144 | 0.997144 | OK |
| Sys Err | 0.052280 | 0.052280 | OK |
| K | 0.004134 | 0.004134 | OK |
| K MDA | 0.744053 | 0.744053 | OK |

| Batch Identifiers and Other Related Information | |
|---|---|
| Batch | ARS1-B11-02481 |
| Batch ID | ARS1-B11-02481-08 |
| Analysis Code | LSC-A-001 |
| SDG | ARS1-11-01342 |
| Fraction | 002 |
| Run Number | 1 |
| | |
| Client | Los Alamos National Laboratory |
| Client Profile | Keith Greene |
| Client ID | MD21-11-14524 |
| Instr File Name | 76 |
| Instr Detector | P-S0-S-9 |
| Instr key | |
| Version/Date | 1.0 -- 11/18/2005 |

Reviewed by: SDL Date: 7-8-11

American Radiation Services
Baton Rouge Laboratory

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 6.480000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.820000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.365500 |
| Sample Aliquot | 5.070000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 6/15/11 12:00 PM |
| Count Date (t2) | 7/4/11 4:49 AM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| 0 Variables Intact Test | OK |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| ACT | 160.896527 | 160.896527 | OK |
| CU | 63.726349 | 63.726349 | OK |
| TPU | 64.279102 | 64.279102 | OK |
| MDA | 207.627402 | 207.627402 | OK |
| DL | 101.978560 | 101.978560 | OK |
| Net Count Rate | 0.660000 | 0.660000 | OK |
| D t 1 (t2 - t1) | 18.700694 | 18.700694 | OK |
| DF | 0.997123 | 0.997123 | OK |
| Sys Err | 0.052280 | 0.052280 | OK |
| K | 0.004102 | 0.004102 | OK |
| K MDA | 0.738363 | 0.738363 | OK |

| Batch Identifiers and Other Related Information | |
|---|---|
| Batch | ARS1-B11-02481 |
| Batch ID | ARS1-B11-02481-09 |
| Analysis Code | LSC-A-001 |
| SDG | ARS1-11-01342 |
| Fraction | 003 |
| Run Number | 1 |
| | |
| Client | Los Alamos National Laboratory |
| Client Profile | Keith Greene |
| Client ID | MD21-11-14531 |
| Instr File Name | 76 |
| Instr Detector | P-50-S-10 |
| Instr keV | |
| Version/Date | 1.0 -- 11/18/2005 |

Reviewed By: ____________ Date: 7-8-11

# Calculation Verification

| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 53.980000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.820000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.363700 |
| Sample Aliquot | 5.072000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 6/15/11 12:00 PM |
| Count Date (t2) | 7/4/11 7:58 AM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| 0 **Variables Intact Test** | **OK** |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| **ACT** | **11794.262439** | **11794.262437** | **OK** |
| **CU** | **141.155774** | **141.155774** | **OK** |
| **TPU** | **632.551493** | **632.551493** | **OK** |
| **MDA** | **208.576918** | **208.576918** | **OK** |
| **DL** | **102.444925** | **102.444925** | **OK** |
| **Net Count Rate** | **48.160000** | **48.160000** | **OK** |
| **D t 1 (t2 - t1)** | **18.831944** | **18.831944** | **OK** |
| **DF** | **0.997103** | **0.997103** | **OK** |
| **Sys Err** | **0.052280** | **0.052280** | **OK** |
| **K** | **0.004083** | **0.004083** | **OK** |
| **K MDA** | **0.735001** | **0.735001** | **OK** |

| Batch Identifiers and Other Related Information | |
|---|---|
| **Batch** | ARS1-B11-02481 |
| **Batch ID** | ARS1-B11-02481-10 |
| **Analysis Code** | LSC-A-001 |
| **SDG** | ARS1-11-01342 |
| **Fraction** | 004 |
| **Run Number** | 1 |
| | |
| **Client** | Los Alamos National Laboratory |
| **Client Profile** | Keith Greene |
| **Client ID** | MD21-11-14525 |
| **Instr File Name** | 76 |
| **Instr Detector** | P-50-S-11 |
| **Instr keV** | |
| **Version/Date** | 1.0 -- 11/18/2005 |

**Reviewed by:** SDL **Date:** 7-8-11

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 5.610000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.820000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.360100 |
| Sample Aliquot | 5.072000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 6/15/11 12:00 PM |
| Count Date (t2) | 7/4/11 11:08 AM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| **Variables Intact Test** | **OK** |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| ACT | -51.943668 | -51.943668 | OK |
| CU | 62.330438 | 62.330438 | OK |
| TPU | 62.389566 | 62.389566 | OK |
| MDA | 210.666389 | 210.666389 | OK |
| DL | 103.471193 | 103.471193 | OK |
| Net Count Rate | -0.210000 | -0.210000 | OK |
| D t 1 (t2 - t1) | 18.963889 | 18.963889 | OK |
| DF | 0.997083 | 0.997083 | OK |
| Sys Err | 0.052280 | 0.052280 | OK |
| K | 0.004043 | 0.004043 | OK |
| K MDA | 0.727711 | 0.727711 | OK |

| Batch Identifiers and Other Related Information | |
|---|---|
| Batch | ARS1-B11-02481 |
| Batch ID | ARS1-B11-02481-11 |
| Analysis Code | LSC-A-001 |
| SDG | ARS1-11-01342 |
| Fraction | 005 |
| Run Number | 1 |
| | |
| Client | Los Alamos National Laboratory |
| Client Profile | Keith Greene |
| Client ID | MD21-11-14534 |
| Instr File Name | 76 |
| Instr Detector | P-50-S-12 |
| Instr key | |
| Version/Date | 1.0 -- 11/18/2005 |

Reviewed By: SDL Date: 7-8-11

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 6.020000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.820000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.362500 |
| Sample Aliquot | 5.078000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 6/15/11 12:00 PM |
| Count Date (t2) | 7/4/11 2:17 PM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| **Variables Intact Test** | **OK** |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| **ACT** | **49.085560** | **49.085560** | **OK** |
| **CU** | **62.945307** | **62.945307** | **OK** |
| **TPU** | **62.997594** | **62.997594** | **OK** |
| **MDA** | **209.028590** | **209.028590** | **OK** |
| **DL** | **102.666769** | **102.666769** | **OK** |
| **Net Count Rate** | **0.200000** | **0.200000** | **OK** |
| **D t 1 (t2 - t1)** | **19.095139** | **19.095139** | **OK** |
| **DF** | **0.997063** | **0.997063** | **OK** |
| **Sys Err** | **0.052280** | **0.052280** | **OK** |
| **K** | **0.004075** | **0.004075** | **OK** |
| **K MDA** | **0.733413** | **0.733413** | **OK** |

| Batch Identifiers and Other Related Information | |
|---|---|
| **Batch** | ARS1-B11-02481 |
| **Batch ID** | ARS1-B11-02481-12 |
| **Analysis Code** | LSC-A-001 |
| **SDG** | ARS1-11-01342 |
| **Fraction** | 006 |
| **Run Number** | 1 |
| | |
| **Client** | Los Alamos National Laboratory |
| **Client Profile** | Keith Greene |
| **Client ID** | MD21-11-14532 |
| **Instr File Name** | 76 |
| **Instr Detector** | P-50-S-13 |
| **Instr key** | |
| **Version/Date** | 1.0 -- 11/18/2005 |



**Reviewed By:** SDL **Date:** 7-8-11

# Calculation Verification

| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 60.280000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.820000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.362600 |
| Sample Aliquot | 5.048000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 6/15/11 12:00 PM |
| Count Date (t2) | 7/4/11 5:27 PM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| **Variables Intact Test** | **OK** |

0

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| **ACT** | **13441.996566** | **13441.996564** | **OK** |
| **CU** | **149.572110** | **149.572110** | **OK** |
| **TPU** | **718.484967** | **718.484967** | **OK** |
| **MDA** | **210.217119** | **210.217119** | **OK** |
| **DL** | **103.250528** | **103.250528** | **OK** |
| **Net Count Rate** | **54.460000** | **54.460000** | **OK** |
| **D t 1 (t2 - t1)** | **19.227083** | **19.227083** | **OK** |
| **DI** | **0.997043** | **0.997043** | **OK** |
| **Sys Err** | **0.052280** | **0.052280** | **OK** |
| **K** | **0.004051** | **0.004051** | **OK** |
| **K MDA** | **0.729267** | **0.729267** | **OK** |

| Batch Identifiers and Other Related Information | |
|---|---|
| **Batch** | ARS1-B11-02481 |
| **Batch ID** | ARS1-B11-02481-13 |
| **Analysis Code** | LSC-A-001 |
| **SDG** | ARS1-11-01342 |
| **Fraction** | 007 |
| **Run Number** | 1 |
| | |
| **Client** | Los Alamos National Laboratory |
| **Client Profile** | Keith Greene |
| **Client ID** | MD21-11-14526 |
| **Instr File Name** | 76 |
| **Instr Detector** | P-50-S-14 |
| **Instr key** | |
| **Version/Date** | 1.0 -- 11/18/2005 |



**Reviewed by:** SDk **Date:** 7-8-11

# Calculation Verification

| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 44.060000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.820000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.364600 |
| Sample Aliquot | 5.034000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 6/15/11 12:00 PM |
| Count Date (t2) | 7/4/11 8:36 PM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| | |
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| | |
| 0 **Variables Intact Test** | OK |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| **ACT** | **9413.043759** | **9413.043757** | **OK** |
| **CU** | **129.580355** | **129.580355** | **OK** |
| **TPU** | **508.885618** | **508.885618** | **OK** |
| **MDA** | **209.649644** | **209.649644** | **OK** |
| **DL** | **102.971807** | **102.971807** | **OK** |
| **Net Count Rate** | **38.240000** | **38.240000** | **OK** |
| **D t 1 (t2 - t1)** | **19.358333** | **19.358333** | **OK** |
| **DF** | **0.997022** | **0.997022** | **OK** |
| **Sys Err** | **0.052280** | **0.052280** | **OK** |
| **JS** | **0.004062** | **0.004062** | **OK** |
| **K MDA** | **0.731241** | **0.731241** | **OK** |
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| Batch Identifiers and Other Related Information | |
|---|---|
| **Batch** | ARS1-B11-02481 |
| **Batch ID** | ARS1-B11-02481-14 |
| **Analysis Code** | LSC-A-001 |
| **SDG** | ARS1-11-01342 |
| **Fraction** | 008 |
| **Run Number** | 1 |
| | |
| **Client** | Los Alamos National Laboratory |
| **Client Profile** | Keith Greene |
| **Client ID** | MD21-11-14529 |
| **Instr File Name** | 76 |
| **Instr Detector** | P-50-S-15 |
| **Instr key** | |
| **Version/Date** | 1.0 -- 11/18/2005 |

**Reviewed by:** SDL **Date:** 7-8-11

American Radiation Services
Baton Rouge Laboratory

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 201.150000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.820000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.364000 |
| Sample Aliquot | 5.056000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 6/15/11 12:00 PM |
| Count Date (t2) | 7/4/11 11:45 PM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| 0 Variables Intact Test | OK |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| ACT | 47952.510723 | 47952.510714 | OK |
| CU | 263.244829 | 263.244829 | OK |
| TPU | 2520.727021 | 2520.727020 | OK |
| MDA | 209.085703 | 209.085703 | OK |
| DL | 102.694821 | 102.694821 | OK |
| Net Count Rate | 195.330000 | 195.330000 | OK |
| D t 1 (t2 - t1) | 19.489583 | 19.489583 | OK |
| DF | 0.997002 | 0.997002 | OK |
| Sys Err | 0.052280 | 0.052280 | OK |
| K | 0.004073 | 0.004073 | OK |
| K MDA | 0.733213 | 0.733213 | OK |

| Batch Identifiers and Other Related Information | |
|---|---|
| Batch | ARS1-B11-02481 |
| Batch ID | ARS1-B11-02481-15 |
| Analysis Code | LSC-A-001 |
| SDG | ARS1-11-01342 |
| Fraction | 009 |
| Run Number | 1 |
| | |
| Client | Los Alamos National Laboratory |
| Client Profile | Keith Greene |
| Client ID | MD21-11-14533 |
| Instr File Name | 76 |
| Instr Detector | P-50-S-16 |
| Instr Key | |
| Version/Date | 1.0 -- 11/18/2005 |

Reviewed by: SDL

Date: 7-8-11

| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 201.430000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.820000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.361600 |
| Sample Aliquot | 5.036000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 6/15/11 12:00 PM |
| Count Date (t2) | 7/5/11 2:55 AM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| 0 **Variables Intact Test** | **OK** |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| **ACT** | **48532.938454** | **48532.938444** | **OK** |
| **CU** | **266.229729** | **266.229729** | **OK** |
| **TPU** | **2551.217422** | **2551.217422** | **OK** |
| **MDA** | **211.313610** | **211.313610** | **OK** |
| **DL** | **103.789083** | **103.789083** | **OK** |
| **Net Count Rate** | **195.610000** | **195.610000** | **OK** |
| **D t 1 (t2 - t1)** | **19.621528** | **19.621528** | **OK** |
| **DF** | **0.996982** | **0.996982** | **OK** |
| **Sys Err** | **0.052280** | **0.052280** | **OK** |
| **K** | **0.004030** | **0.004030** | **OK** |
| **K MDA** | **0.725483** | **0.725483** | **OK** |

**Batch Identifiers and Other Related Information**

| | |
|---|---|
| **Batch** | ARS1-B11-02481 |
| **Batch ID** | ARS1-B11-02481-16 |
| **Analysis Code** | LSC-A-001 |
| **SDG** | ARS1-11-01342 |
| **Fraction** | 010 |
| **Run Number** | 1 |
| | |
| **Client** | Los Alamos National Laboratory |
| **Client Profile** | Keith Greene |
| **Client ID** | MD21-11-14526 |
| **Instr File Name** | 76 |
| **Instr Detector** | P-50-S-17 |
| **Instr key** | |
| **Version/Date** | 1.0 -- 11/18/2005 |

**Reviewed by:** SDL **Date:** 7-8-11

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 31.190000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.820000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.359000 |
| Sample Aliquot | 5.045000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 6/15/11 12:00 PM |
| Count Date (t2) | 7/5/11 6:04 AM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| 0 **Variables Intact Test** | **OK** |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| **ACT** | **6328.973910** | **6328.973909** | **OK** |
| **CU** | **113.119149** | **113.119149** | **OK** |
| **TPU** | **349.679155** | **349.679155** | **OK** |
| **MDA** | **212.468609** | **212.468609** | **OK** |
| **DL** | **104.356373** | **104.356373** | **OK** |
| **Net Count Rate** | **25.370000** | **25.370000** | **OK** |
| **D t 1 (t2 - t1)** | **19.752778** | **19.752778** | **OK** |
| **DF** | **0.996962** | **0.996962** | **OK** |
| **Sys Err** | **0.052280** | **0.052280** | **OK** |
| **K** | **0.004009** | **0.004009** | **OK** |
| **K MDA** | **0.721539** | **0.721539** | **OK** |

| Batch Identifiers and Other Related Information | |
|---|---|
| **Batch** | ARS1-B11-02481 |
| **Batch ID** | ARS1-B11-02481-17 |
| **Analysis Code** | LSC-A-001 |
| **SDG** | ARS1-11-01342 |
| **Fraction** | 011 |
| **Run Number** | 1 |
| | |
| **Client** | Los Alamos National Laboratory |
| **Client Profile** | Keith Greene |
| **Client ID** | MD21-11-14530 |
| **Instr File Name** | 76 |
| **Instr Detector** | P-50-S-18 |
| **Instr keV** | |
| **Version/Date** | 1.0 -- 11/18/2005 |

**Reviewed by:** SDL **Date:** 7-8-11

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

# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Tritium by Low Level Liquid Scintillation Counting

# Laboratory Records

# Analysis Batch Report



**Analysis Batch ID** **ARS1-B11-02481**

**Method** **ARS-054** **Analysis** **LSC-A-001** **Matrix** **SI**

**Description** **Tritium (Aqueous)**

| ABatch Sample ID | Type | Blind Iso1 | Blind Iso2 | Blind Iso3 | SDG | FR | Run | Client ID | Isotope Group | Lab Deadline |
|---|---|---|---|---|---|---|---|---|---|---|
| ARS1-B11-02481-01 | LCS | B-11976 | | | | | | | | |
| ARS1-B11-02481-02 | LCSD | B-11977 | | | | | | | | |
| ARS1-B11-02481-03 | MBL | | | | | | | | | |
| ARS1-B11-02481-04 | TRG | | | | **ARS1-11-01310** | 001 | 1 | MD54-11-7522 | STD | 07/11/11 |
| ARS1-B11-02481-05 | TRG | | | | **ARS1-11-01310** | 002 | 1 | MD54-11-7521 | STD | 07/11/11 |
| ARS1-B11-02481-06 | TRG | | | | **ARS1-11-01310** | 003 | 1 | MD54-11-7602 | STD | 07/11/11 |
| ARS1-B11-02481-07 | TRG | | | | **ARS1-11-01342** | 001 | 1 | MD21-11-14527 | STD | 07/12/11 |
| ARS1-B11-02481-08 | TRG | | | | **ARS1-11-01342** | 002 | 1 | MD21-11-14524 | STD | 07/12/11 |
| ARS1-B11-02481-09 | TRG | | | | **ARS1-11-01342** | 003 | 1 | MD21-11-14531 | STD | 07/12/11 |
| ARS1-B11-02481-10 | TRG | | | | **ARS1-11-01342** | 004 | 1 | MD21-11-14525 | STD | 07/12/11 |
| ARS1-B11-02481-11 | TRG | | | | **ARS1-11-01342** | 005 | 1 | MD21-11-14534 | STD | 07/12/11 |
| ARS1-B11-02481-12 | TRG | | | | **ARS1-11-01342** | 006 | 1 | MD21-11-14532 | STD | 07/12/11 |
| ARS1-B11-02481-13 | TRG | | | | **ARS1-11-01342** | 007 | 1 | MD21-11-14526 | STD | 07/12/11 |
| ARS1-B11-02481-14 | TRG | | | | **ARS1-11-01342** | 008 | 1 | MD21-11-14529 | STD | 07/12/11 |
| ARS1-B11-02481-15 | TRG | | | | **ARS1-11-01342** | 009 | 1 | MD21-11-14533 | STD | 07/12/11 |
| ARS1-B11-02481-16 | TRG | | | | **ARS1-11-01342** | 010 | 1 | MD21-11-14528 | STD | 07/12/11 |
| ARS1-B11-02481-17 | TRG | | | | **ARS1-11-01342** | 011 | 1 | MD21-11-14530 | STD | 07/12/11 |
| ARS1-B11-02481-18 | TRG | | | | **ARS1-11-01343** | 001 | 1 | MD54-11-7605 | STD | 07/12/11 |
| ARS1-B11-02481-19 | TRG | | | | **ARS1-11-01343** | 002 | 1 | MD54-11-7520 | STD | 07/12/11 |
| ARS1-B11-02481-20 | TRG | | | | **ARS1-11-01343** | 003 | 1 | MD54-11-7612 | STD | 07/12/11 |
| ARS1-B11-02481-21 | TRG | | | | **ARS1-11-01343** | 004 | 1 | MD54-11-7519 | STD | 07/12/11 |
| ARS1-B11-02481-22 | TRG | | | | **ARS1-11-01343** | 005 | 1 | MD54-11-7539 | STD | 07/12/11 |
| ARS1-B11-02481-23 | TRG | | | | **ARS1-11-01343** | 006 | 1 | MD54-11-7620 | STD | 07/12/11 |

| | | |
|---|---|---|
| 90230 | 11-01310-001-1 | WRAD |
| 90231 | 11-01310-002-1 | WRAD |
| 90232 | 11-01310-003-1 | WRAD |
| 90233 | 11-01342-001-1 | WRAD |
| 90234 | 11-01342-002-1 | WRAD |
| 90235 | 11-01342-003-1 | WRAD |
| 90236 | 11-01342-004-1 | WRAD |
| 90237 | 11-01342-005-1 | WRAD |
| 90238 | 11-01342-006-1 | WRAD |
| 90239 | 11-01342-007-1 | WRAD |
| 90240 | 11-01342-008-1 | WRAD |
| 90241 | 11-01342-009-1 | WRAD |
| 90242 | 11-01342-010-1 | WRAD |
| 90243 | 11-01342-011-1 | WRAD |
| 90244 | 11-01343-001-1 | WRAD |
| 90245 | 11-01343-002-1 | WRAD |
| 90246 | 11-01343-003-1 | WRAD |
| 90247 | 11-01343-004-1 | WRAD |
| 90248 | 11-01343-005-1 | WRAD |
| 90249 | 11-01343-006-1 | WRAD |

# LCS Report
## Analytical Batch: ARS1-B11-02481



| BlindID | ABatch | ABatchSampleID | BlindGroup | StdID | Isotope | ExpectedAddition | ExpectedValue | EmptyWt | GrossWt | NetWt | UserID | ModDate | ExpectedValue_CT | MidPointCountDate | KnownValue |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B-11976 | ARS1-B11-02481 | ARS1-B11-02481-01 | B-H3 | S-0247 | H-3 | 5 | 2.428209486 | 0 | 1 | 1 | BSTEFFENS | 6/27/2011 | 2.425966282 | 7/3/2011 | 2.425966282 |
| B-11977 | ARS1-B11-02481 | ARS1-B11-02481-02 | B-H3 | S-0247 | H-3 | 5 | 2.428209486 | 0 | 1 | 1 | BSTEFFENS | 6/27/2011 | 2.425966282 | 7/3/2011 | 2.425966282 |

| ID_31001_054 | ABatch | ABatchSampleID | ClientID | Aliquot1 | AliquotUnits1 | IC_ID1 | Aliquot2 | AliquotUnits2 | IC_ID2 | UserID | ModDate |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 9198 | ARS1-B11-02481 | ARS1-B11-02481-01 | | | | | 5.088 | g | | BSTEFFENS | 07/01/2011 15:49:21 |
| 9199 | ARS1-B11-02481 | ARS1-B11-02481-02 | | | | | 5.071 | g | | BSTEFFENS | 07/01/2011 15:49:21 |
| 9200 | ARS1-B11-02481 | ARS1-B11-02481-03 | | | | | 5.061 | g | | BSTEFFENS | 07/01/2011 15:49:21 |
| 9201 | ARS1-B11-02481 | ARS1-B11-02481-04 | MD54-11-7522 | | | | 5.044 | g | 90230 | BSTEFFENS | 07/01/2011 15:49:21 |
| 9202 | ARS1-B11-02481 | ARS1-B11-02481-05 | MD54-11-7521 | | | | 5.054 | g | 90231 | BSTEFFENS | 07/01/2011 15:49:21 |
| 9203 | ARS1-B11-02481 | ARS1-B11-02481-06 | MD54-11-7602 | | | | 5.046 | g | 90232 | BSTEFFENS | 07/01/2011 15:49:21 |
| 9204 | ARS1-B11-02481 | ARS1-B11-02481-07 | MD21-11-14527 | | | | 5.039 | g | 90233 | BSTEFFENS | 07/01/2011 15:49:21 |
| 9205 | ARS1-B11-02481 | ARS1-B11-02481-08 | MD21-11-14524 | | | | 5.066 | g | 90234 | BSTEFFENS | 07/01/2011 15:49:21 |
| 9206 | ARS1-B11-02481 | ARS1-B11-02481-09 | MD21-11-14531 | | | | 5.07 | g | 90235 | BSTEFFENS | 07/01/2011 15:49:21 |
| 9207 | ARS1-B11-02481 | ARS1-B11-02481-10 | MD21-11-14525 | | | | 5.072 | g | 90236 | BSTEFFENS | 07/01/2011 15:49:21 |
| 9208 | ARS1-B11-02481 | ARS1-B11-02481-11 | MD21-11-14534 | | | | 5.072 | g | 90237 | BSTEFFENS | 07/01/2011 15:49:22 |
| 9209 | ARS1-B11-02481 | ARS1-B11-02481-12 | MD21-11-14532 | | | | 5.078 | g | 90238 | BSTEFFENS | 07/01/2011 15:49:22 |
| 9210 | ARS1-B11-02481 | ARS1-B11-02481-13 | MD21-11-14526 | | | | 5.048 | g | 90239 | BSTEFFENS | 07/01/2011 15:49:22 |
| 9211 | ARS1-B11-02481 | ARS1-B11-02481-14 | MD21-11-14529 | | | | 5.034 | g | 90240 | BSTEFFENS | 07/01/2011 15:49:22 |
| 9212 | ARS1-B11-02481 | ARS1-B11-02481-15 | MD21-11-14533 | | | | 5.056 | g | 90241 | BSTEFFENS | 07/01/2011 15:49:22 |
| 9213 | ARS1-B11-02481 | ARS1-B11-02481-16 | MD21-11-14528 | | | | 5.036 | g | 90242 | BSTEFFENS | 07/01/2011 15:49:22 |
| 9214 | ARS1-B11-02481 | ARS1-B11-02481-17 | MD21-11-14530 | | | | 5.045 | g | 90243 | BSTEFFENS | 07/01/2011 15:49:22 |
| 9215 | ARS1-B11-02481 | ARS1-B11-02481-18 | MD54-11-7605 | | | | 5.045 | g | 90244 | BSTEFFENS | 07/01/2011 15:49:22 |
| 9216 | ARS1-B11-02481 | ARS1-B11-02481-19 | MD54-11-7520 | | | | 5.024 | g | 90245 | BSTEFFENS | 07/01/2011 15:49:22 |
| 9217 | ARS1-B11-02481 | ARS1-B11-02481-20 | MD54-11-7612 | | | | 5.044 | g | 90246 | BSTEFFENS | 07/01/2011 15:49:22 |
| 9218 | ARS1-B11-02481 | ARS1-B11-02481-21 | MD54-11-7519 | | | | 5.029 | g | 90247 | BSTEFFENS | 07/01/2011 15:49:22 |
| 9219 | ARS1-B11-02481 | ARS1-B11-02481-22 | MD54-11-7539 | | | | 5.033 | g | 90248 | BSTEFFENS | 07/01/2011 15:49:22 |
| 9220 | ARS1-B11-02481 | ARS1-B11-02481-23 | MD54-11-7620 | | | | 5.048 | g | 90249 | BSTEFFENS | 07/01/2011 15:49:23 |

# Batch Result Verification Report



| ABatchSampleID | SDG | Fraction | ClientID | Run | Isotope | ACT | TPU | TPU1s | TPU2s | MDA | DL | CU | CU1s | CU2s | ActivityReportUnits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARS1-B11-02481-01 | | | | 1 | H-3 | 2165.13067 | 139.5001348 | 139.5001348 | 273.4202642 | 205.1192199 | 100.7466375 | 81.53381838 | 81.53381838 | 159.806284 | pCi |
| ARS1-B11-02481-02 | | | | 1 | H-3 | 2386.514239 | 293.1620784 | 149.572489 | 293.1620784 | 202.4474231 | 99.43435411 | 161.6887393 | 82.49425476 | 161.6887393 | pCi |
| ARS1-B11-02481-03 | | | | 1 | H-3 | -14.41364184 | 119.4344966 | 60.93596764 | 119.4344966 | 204.5994265 | 100.491335 | 119.4253642 | 60.93130827 | 119.4253642 | pCi |
| ARS1-B11-02481-04 | ARS1-11-01310 | 001 | MD54-11-7522 | 1 | H-3 | 852.7070861 | 84.94437177 | 84.94437177 | 166.4909687 | 212.9744126 | 104.6048047 | 72.30652505 | 72.30652505 | 141.7207891 | pCi |
| ARS1-B11-02481-05 | ARS1-11-01310 | 002 | MD54-11-7521 | 1 | H-3 | 767.7574751 | 82.17116267 | 82.17116267 | 161.0554788 | 213.6901791 | 104.9563616 | 71.70097179 | 71.70097179 | 140.5339047 | pCi |
| ARS1-B11-02481-06 | ARS1-11-01310 | 003 | MD54-11-7602 | 1 | H-3 | 691.0789726 | 79.5046165 | 79.5046165 | 155.8290483 | 213.2556435 | 104.7429344 | 70.82125041 | 70.82125041 | 138.8096508 | pCi |
| ARS1-B11-02481-07 | ARS1-11-01342 | 001 | MD21-11-14527 | 1 | H-3 | 32753.11937 | 1726.400575 | 1726.400575 | 3383.745127 | 208.4400296 | 102.3776909 | 220.0136657 | 220.0136657 | 431.2267847 | pCi |
| ARS1-B11-02481-08 | ARS1-11-01342 | 002 | MD21-11-14524 | 1 | H-3 | 41926.86595 | 2205.599214 | 2205.599214 | 4322.974459 | 206.0396074 | 101.1986963 | 245.2221484 | 245.2221484 | 480.6354108 | pCi |
| ARS1-B11-02481-09 | ARS1-11-01342 | 003 | MD21-11-14531 | 1 | H-3 | 160.8965268 | 64.27910219 | 64.27910219 | 125.9870403 | 207.627402 | 101.9785596 | 63.72634889 | 63.72634889 | 124.9036438 | pCi |
| ARS1-B11-02481-10 | ARS1-11-01342 | 004 | MD21-11-14525 | 1 | H-3 | 11794.26244 | 632.5514931 | 632.5514931 | 1239.800926 | 208.5769175 | 102.444925 | 141.1557742 | 141.1557742 | 276.6653174 | pCi |
| ARS1-B11-02481-11 | ARS1-11-01342 | 005 | MD21-11-14534 | 1 | H-3 | -51.94366754 | 62.38956624 | 62.38956624 | 122.2835498 | 210.6663892 | 103.4711927 | 62.33043791 | 62.33043791 | 122.1676583 | pCi |
| ARS1-B11-02481-12 | ARS1-11-01342 | 006 | MD21-11-14532 | 1 | H-3 | 49.08556003 | 62.9975944 | 62.9975944 | 123.475285 | 209.0285898 | 102.666769 | 62.94530661 | 62.94530661 | 123.372801 | pCi |
| ARS1-B11-02481-13 | ARS1-11-01342 | 007 | MD21-11-14526 | 1 | H-3 | 13441.99656 | 718.4849668 | 718.4849668 | 1408.230535 | 210.2171186 | 103.2505284 | 149.57211 | 149.57211 | 293.1613356 | pCi |
| ARS1-B11-02481-14 | ARS1-11-01342 | 008 | MD21-11-14529 | 1 | H-3 | 9413.043757 | 508.885618 | 508.885618 | 997.4158112 | 209.6496443 | 102.971807 | 129.5803545 | 129.5803545 | 253.9774949 | pCi |
| ARS1-B11-02481-15 | ARS1-11-01342 | 009 | MD21-11-14533 | 1 | H-3 | 47952.51071 | 2520.72702 | 2520.72702 | 4940.62496 | 209.0857028 | 102.6948207 | 263.2448286 | 263.2448286 | 515.959864 | pCi |
| ARS1-B11-02481-16 | ARS1-11-01342 | 010 | MD21-11-14528 | 1 | H-3 | 48532.93844 | 2551.217422 | 2551.217422 | 5000.386147 | 211.3136101 | 103.7890827 | 266.2297293 | 266.2297293 | 521.8102695 | pCi |
| ARS1-B11-02481-17 | ARS1-11-01342 | 011 | MD21-11-14530 | 1 | H-3 | 6328.973909 | 349.6791548 | 349.6791548 | 685.3711434 | 212.4686087 | 104.3563734 | 113.1191487 | 113.1191487 | 221.7135314 | pCi |
| ARS1-B11-02481-18 | ARS1-11-01343 | 001 | MD54-11-7605 | 1 | H-3 | 185.8281811 | 66.57000938 | 66.57000938 | 130.4772184 | 213.8758715 | 105.0475665 | 65.85730067 | 65.85730067 | 129.0803093 | pCi |
| ARS1-B11-02481-19 | ARS1-11-01343 | 002 | MD54-11-7520 | 1 | H-3 | 1756.735489 | 122.3609049 | 122.3609049 | 239.8273737 | 214.0479807 | 105.1320999 | 80.8536023 | 80.8536023 | 158.4730605 | pCi |
| ARS1-B11-02481-20 | ARS1-11-01343 | 003 | MD54-11-7612 | 1 | H-3 | 65.6730952 | 65.03653355 | 65.03653355 | 127.4716058 | 215.1275708 | 105.6623529 | 64.94584406 | 64.94584406 | 127.2938544 | pCi |
| ARS1-B11-02481-21 | ARS1-11-01343 | 004 | MD54-11-7519 | 1 | H-3 | 640.0534105 | 78.93943766 | 78.93943766 | 154.7212978 | 217.1823012 | 106.6715571 | 71.49644729 | 71.49644729 | 140.1330367 | pCi |
| ARS1-B11-02481-22 | ARS1-11-01343 | 005 | MD54-11-7539 | 1 | H-3 | -108.0056163 | 61.49010678 | 61.49010678 | 120.5206093 | 209.0622399 | 102.6832966 | 61.23030487 | 61.23030487 | 120.0113975 | pCi |
| ARS1-B11-02481-23 | ARS1-11-01343 | 006 | MD54-11-7620 | 1 | H-3 | -58.63524201 | 64.25873709 | 64.25873709 | 125.9471247 | 217.1264951 | 106.6441472 | 64.18557788 | 64.18557788 | 125.8037326 | pCi |

# Batch Result Verification Report



| ABatchSampleID | SDG | Fraction | AliquotReportUnits | ChemRecovery | TracerRecovery | SampleCounts | SampleCountMins | BKG_Counts | BKG_CountMins | EFF | ALIQ | SampleCollDate | MidPointCountDate | BP_DL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARS1-B11-02481-01 | | | L | | | 0.082277778 | 180 | 0.032333333 | 180 | 0.3676 | 5.088 | 7/6/2011 | 7/3/2011 | |
| ARS1-B11-02481-02 | | | L | | | 0.088111111 | 180 | 0.032333333 | 180 | 0.3737 | 5.071 | 7/6/2011 | 7/3/2011 | |
| ARS1-B11-02481-03 | | | L | | | 0.032 | 180 | 0.032333333 | 180 | 0.3705 | 5.061 | 7/6/2011 | 7/3/2011 | |
| ARS1-B11-02481-04 | ARS1-11-01310 | 001 | L | | | 0.051277778 | 180 | 0.032333333 | 180 | 0.3584 | 5.044 | 6/10/2011 | 7/3/2011 | |
| ARS1-B11-02481-05 | ARS1-11-01310 | 002 | L | | | 0.049333333 | 180 | 0.032333333 | 180 | 0.3565 | 5.054 | 6/10/2011 | 7/3/2011 | |
| ARS1-B11-02481-06 | ARS1-11-01310 | 003 | L | | | 0.047666667 | 180 | 0.032333333 | 180 | 0.3578 | 5.046 | 6/10/2011 | 7/3/2011 | |
| ARS1-B11-02481-07 | ARS1-11-01342 | 001 | L | | | 0.775833333 | 180 | 0.032333333 | 180 | 0.3663 | 5.039 | 6/15/2011 | 7/3/2011 | |
| ARS1-B11-02481-08 | ARS1-11-01342 | 002 | L | | | 0.995166667 | 180 | 0.032333333 | 180 | 0.3686 | 5.066 | 6/15/2011 | 7/4/2011 | |
| ARS1-B11-02481-09 | ARS1-11-01342 | 003 | L | | | 0.036 | 180 | 0.032333333 | 180 | 0.3655 | 5.07 | 6/15/2011 | 7/4/2011 | |
| ARS1-B11-02481-10 | ARS1-11-01342 | 004 | L | | | 0.299888889 | 180 | 0.032333333 | 180 | 0.3637 | 5.072 | 6/15/2011 | 7/4/2011 | |
| ARS1-B11-02481-11 | ARS1-11-01342 | 005 | L | | | 0.031166667 | 180 | 0.032333333 | 180 | 0.3601 | 5.072 | 6/15/2011 | 7/4/2011 | |
| ARS1-B11-02481-12 | ARS1-11-01342 | 006 | L | | | 0.033444444 | 180 | 0.032333333 | 180 | 0.3625 | 5.078 | 6/15/2011 | 7/4/2011 | |
| ARS1-B11-02481-13 | ARS1-11-01342 | 007 | L | | | 0.334888889 | 180 | 0.032333333 | 180 | 0.3626 | 5.048 | 6/15/2011 | 7/4/2011 | |
| ARS1-B11-02481-14 | ARS1-11-01342 | 008 | L | | | 0.244777778 | 180 | 0.032333333 | 180 | 0.3646 | 5.034 | 6/15/2011 | 7/4/2011 | |
| ARS1-B11-02481-15 | ARS1-11-01342 | 009 | L | | | 1.1175 | 180 | 0.032333333 | 180 | 0.364 | 5.056 | 6/15/2011 | 7/4/2011 | |
| ARS1-B11-02481-16 | ARS1-11-01342 | 010 | L | | | 1.119055556 | 180 | 0.032333333 | 180 | 0.3616 | 5.036 | 6/15/2011 | 7/5/2011 | |
| ARS1-B11-02481-17 | ARS1-11-01342 | 011 | L | | | 0.173277778 | 180 | 0.032333333 | 180 | 0.359 | 5.045 | 6/15/2011 | 7/5/2011 | |
| ARS1-B11-02481-18 | ARS1-11-01343 | 001 | L | | | 0.036444444 | 180 | 0.032333333 | 180 | 0.3567 | 5.045 | 6/14/2011 | 7/5/2011 | |
| ARS1-B11-02481-19 | ARS1-11-01343 | 002 | L | | | 0.071166667 | 180 | 0.032333333 | 180 | 0.3578 | 5.024 | 6/16/2011 | 7/5/2011 | |
| ARS1-B11-02481-20 | ARS1-11-01343 | 003 | L | | | 0.033777778 | 180 | 0.032333333 | 180 | 0.3546 | 5.044 | 6/16/2011 | 7/5/2011 | |
| ARS1-B11-02481-21 | ARS1-11-01343 | 004 | L | | | 0.046277778 | 180 | 0.032333333 | 180 | 0.3523 | 5.029 | 6/16/2011 | 7/5/2011 | |
| ARS1-B11-02481-22 | ARS1-11-01343 | 005 | L | | | 0.029888889 | 180 | 0.032333333 | 180 | 0.3657 | 5.033 | 6/16/2011 | 7/5/2011 | |
| ARS1-B11-02481-23 | ARS1-11-01343 | 006 | L | | | 0.031055556 | 180 | 0.032333333 | 180 | 0.3507 | 5.048 | 6/23/2011 | 7/6/2011 | |

# Batch Result Verification Report



| ABatchSampleID | SDG | Fraction | BP_MDA | Sb_Val | UCF | CF | GrossCountRate | BKGCountRate | NetCountRate | PlatingRecovery | InstFileName | DetectorID | InstrumentkeV | NuclideAbd | TracerMeasACT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARS1-B11-02481-01 | | | | | 2.22 | 1 | 14.81 | 5.82 | 8.99 | | 76 | P-50-S-2 | | | |
| ARS1-B11-02481-02 | | | | | 2.22 | 1.96 | 15.86 | 5.82 | 10.04 | | 76 | P-50-S-3 | | | |
| ARS1-B11-02481-03 | | | | | 2.22 | 1.96 | 5.76 | 5.82 | -0.06 | | 76 | P-50-S-4 | | | |
| ARS1-B11-02481-04 | ARS1-11-01310 | 001 | | | 2.22 | 1 | 9.23 | 5.82 | 3.41 | | 76 | P-50-S-5 | | | |
| ARS1-B11-02481-05 | ARS1-11-01310 | 002 | | | 2.22 | 1 | 8.88 | 5.82 | 3.06 | | 76 | P-50-S-6 | | | |
| ARS1-B11-02481-06 | ARS1-11-01310 | 003 | | | 2.22 | 1 | 8.58 | 5.82 | 2.76 | | 76 | P-50-S-7 | | | |
| ARS1-B11-02481-07 | ARS1-11-01342 | 001 | | | 2.22 | 1 | 139.65 | 5.82 | 133.83 | | 76 | P-50-S-8 | | | |
| ARS1-B11-02481-08 | ARS1-11-01342 | 002 | | | 2.22 | 1 | 179.13 | 5.82 | 173.31 | | 76 | P-50-S-9 | | | |
| ARS1-B11-02481-09 | ARS1-11-01342 | 003 | | | 2.22 | 1 | 6.48 | 5.82 | 0.66 | | 76 | P-50-S-10 | | | |
| ARS1-B11-02481-10 | ARS1-11-01342 | 004 | | | 2.22 | 1 | 53.98 | 5.82 | 48.16 | | 76 | P-50-S-11 | | | |
| ARS1-B11-02481-11 | ARS1-11-01342 | 005 | | | 2.22 | 1 | 5.61 | 5.82 | -0.21 | | 76 | P-50-S-12 | | | |
| ARS1-B11-02481-12 | ARS1-11-01342 | 006 | | | 2.22 | 1 | 6.02 | 5.82 | 0.2 | | 76 | P-50-S-13 | | | |
| ARS1-B11-02481-13 | ARS1-11-01342 | 007 | | | 2.22 | 1 | 60.28 | 5.82 | 54.46 | | 76 | P-50-S-14 | | | |
| ARS1-B11-02481-14 | ARS1-11-01342 | 008 | | | 2.22 | 1 | 44.06 | 5.82 | 38.24 | | 76 | P-50-S-15 | | | |
| ARS1-B11-02481-15 | ARS1-11-01342 | 009 | | | 2.22 | 1 | 201.15 | 5.82 | 195.33 | | 76 | P-50-S-16 | | | |
| ARS1-B11-02481-16 | ARS1-11-01342 | 010 | | | 2.22 | 1 | 201.43 | 5.82 | 195.61 | | 76 | P-50-S-17 | | | |
| ARS1-B11-02481-17 | ARS1-11-01342 | 011 | | | 2.22 | 1 | 31.19 | 5.82 | 25.37 | | 76 | P-50-S-18 | | | |
| ARS1-B11-02481-18 | ARS1-11-01343 | 001 | | | 2.22 | 1 | 6.56 | 5.82 | 0.74 | | 76 | P-50-S-19 | | | |
| ARS1-B11-02481-19 | ARS1-11-01343 | 002 | | | 2.22 | 1 | 12.81 | 5.82 | 6.99 | | 76 | P-50-S-20 | | | |
| ARS1-B11-02481-20 | ARS1-11-01343 | 003 | | | 2.22 | 1 | 6.08 | 5.82 | 0.26 | | 76 | P-50-S-21 | | | |
| ARS1-B11-02481-21 | ARS1-11-01343 | 004 | | | 2.22 | 1 | 8.33 | 5.82 | 2.51 | | 76 | P-50-S-22 | | | |
| ARS1-B11-02481-22 | ARS1-11-01343 | 005 | | | 2.22 | 1 | 5.38 | 5.82 | -0.44 | | 76 | P-50-S-23 | | | |
| ARS1-B11-02481-23 | ARS1-11-01343 | 006 | | | 2.22 | 1 | 5.59 | 5.82 | -0.23 | | 76 | P-50-S-24 | | | |

# Batch Result Verification Report



| ABatchSampleID | SDG | Fraction | TracerKnownACT | TracerIsotope | TracerRefDate | TracerRefACT | TracerKnown | Halflife1 | Halflife2 | Halflife3 | TPUF_1 | TPUF_2 | TPUF_3 | TPUF_4 | TPUF_5 | TPUF_6 | DeltaT1 | DeltaT2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARS1-B11-02481-01 | | | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 0 | |
| ARS1-B11-02481-02 | | | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 0 | |
| ARS1-B11-02481-03 | | | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 0 | |
| ARS1-B11-02481-04 | ARS1-11-01310 | 001 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 23.04305556 | |
| ARS1-B11-02481-05 | ARS1-11-01310 | 002 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 23.175 | |
| ARS1-B11-02481-06 | ARS1-11-01310 | 003 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 23.30625 | |
| ARS1-B11-02481-07 | ARS1-11-01342 | 001 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 18.4375 | |
| ARS1-B11-02481-08 | ARS1-11-01342 | 002 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 18.56944444 | |
| ARS1-B11-02481-09 | ARS1-11-01342 | 003 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 18.70069444 | |
| ARS1-B11-02481-10 | ARS1-11-01342 | 004 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 18.83194444 | |
| ARS1-B11-02481-11 | ARS1-11-01342 | 005 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 18.96388889 | |
| ARS1-B11-02481-12 | ARS1-11-01342 | 006 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 19.09513889 | |
| ARS1-B11-02481-13 | ARS1-11-01342 | 007 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 19.22708333 | |
| ARS1-B11-02481-14 | ARS1-11-01342 | 008 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 19.35833333 | |
| ARS1-B11-02481-15 | ARS1-11-01342 | 009 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 19.48958333 | |
| ARS1-B11-02481-16 | ARS1-11-01342 | 010 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 19.62152778 | |
| ARS1-B11-02481-17 | ARS1-11-01342 | 011 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 19.75277778 | |
| ARS1-B11-02481-18 | ARS1-11-01343 | 001 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 20.88402778 | |
| ARS1-B11-02481-19 | ARS1-11-01343 | 002 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 19.01597222 | |
| ARS1-B11-02481-20 | ARS1-11-01343 | 003 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 19.14722222 | |
| ARS1-B11-02481-21 | ARS1-11-01343 | 004 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 19.27916667 | |
| ARS1-B11-02481-22 | ARS1-11-01343 | 005 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 19.41041667 | |
| ARS1-B11-02481-23 | ARS1-11-01343 | 006 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 12.54097222 | |

# Batch Result Verification Report



| ABatchSampleID | SDG | Fraction | DeltaT3 | DeltaT4 | DeltaT5 | DeltaT6 | DF1 | DF2 | DF3 | IF1 | IF2 | SysErr | K_Val | K_MDA | AnalysisCode | UserID | ModDate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARS1-B11-02481-01 | | | | | | | 1 | | | | | 0.052279718 | 0.004152174 | 0.74739138 | | BSTEFFENS | 7/6/2011 |
| ARS1-B11-02481-02 | | | | | | | 1 | | | | | 0.052279718 | 0.004206973 | 0.757255067 | | BSTEFFENS | 7/6/2011 |
| ARS1-B11-02481-03 | | | | | | | 1 | | | | | 0.052279718 | 0.004162723 | 0.74929016 | | BSTEFFENS | 7/6/2011 |
| ARS1-B11-02481-04 | ARS1-11-01310 | 001 | | | | | 0.99645675 | | | | | 0.052279718 | 0.003999029 | 0.719825143 | LSC-A-001 | BSTEFFENS | 7/6/2011 |
| ARS1-B11-02481-05 | ARS1-11-01310 | 002 | | | | | 0.996436498 | | | | | 0.052279718 | 0.003985634 | 0.71741405 | LSC-A-001 | BSTEFFENS | 7/6/2011 |
| ARS1-B11-02481-06 | ARS1-11-01310 | 003 | | | | | 0.996416353 | | | | | 0.052279718 | 0.003993755 | 0.718875873 | LSC-A-001 | BSTEFFENS | 7/6/2011 |
| ARS1-B11-02481-07 | ARS1-11-01342 | 001 | | | | | 0.997163925 | | | | | 0.052279718 | 0.004086023 | 0.735484145 | LSC-A-001 | BSTEFFENS | 7/6/2011 |
| ARS1-B11-02481-08 | ARS1-11-01342 | 002 | | | | | 0.997143658 | | | | | 0.052279718 | 0.004133626 | 0.744052752 | LSC-A-001 | BSTEFFENS | 7/6/2011 |
| ARS1-B11-02481-09 | ARS1-11-01342 | 003 | | | | | 0.997123499 | | | | | 0.052279718 | 0.004102015 | 0.738362738 | LSC-A-001 | BSTEFFENS | 7/6/2011 |
| ARS1-B11-02481-10 | ARS1-11-01342 | 004 | | | | | 0.997103339 | | | | | 0.052279718 | 0.004083341 | 0.735001451 | LSC-A-001 | BSTEFFENS | 7/6/2011 |
| ARS1-B11-02481-11 | ARS1-11-01342 | 005 | | | | | 0.997083074 | | | | | 0.052279718 | 0.004042841 | 0.727711419 | LSC-A-001 | BSTEFFENS | 7/6/2011 |
| ARS1-B11-02481-12 | ARS1-11-01342 | 006 | | | | | 0.997062915 | | | | | 0.052279718 | 0.004074518 | 0.733413248 | LSC-A-001 | BSTEFFENS | 7/6/2011 |
| ARS1-B11-02481-13 | ARS1-11-01342 | 007 | | | | | 0.99704265 | | | | | 0.052279718 | 0.004051481 | 0.729266665 | LSC-A-001 | BSTEFFENS | 7/6/2011 |
| ARS1-B11-02481-14 | ARS1-11-01342 | 008 | | | | | 0.997022493 | | | | | 0.052279718 | 0.004062448 | 0.731240625 | LSC-A-001 | BSTEFFENS | 7/6/2011 |
| ARS1-B11-02481-15 | ARS1-11-01342 | 009 | | | | | 0.997002335 | | | | | 0.052279718 | 0.004073405 | 0.733212912 | LSC-A-001 | BSTEFFENS | 7/6/2011 |
| ARS1-B11-02481-16 | ARS1-11-01342 | 010 | | | | | 0.996982072 | | | | | 0.052279718 | 0.004030459 | 0.725482551 | LSC-A-001 | BSTEFFENS | 7/6/2011 |
| ARS1-B11-02481-17 | ARS1-11-01342 | 011 | | | | | 0.996961915 | | | | | 0.052279718 | 0.004008549 | 0.721538762 | LSC-A-001 | BSTEFFENS | 7/6/2011 |
| ARS1-B11-02481-18 | ARS1-11-01343 | 001 | | | | | 0.996788203 | | | | | 0.052279718 | 0.003982173 | 0.716791174 | LSC-A-001 | BSTEFFENS | 7/6/2011 |
| ARS1-B11-02481-19 | ARS1-11-01343 | 002 | | | | | 0.997075074 | | | | | 0.052279718 | 0.003978971 | 0.716214825 | LSC-A-001 | BSTEFFENS | 7/6/2011 |
| ARS1-B11-02481-20 | ARS1-11-01343 | 003 | | | | | 0.997054916 | | | | | 0.052279718 | 0.003959003 | 0.712620592 | LSC-A-001 | BSTEFFENS | 7/6/2011 |
| ARS1-B11-02481-21 | ARS1-11-01343 | 004 | | | | | 0.997034651 | | | | | 0.052279718 | 0.003921548 | 0.705878592 | LSC-A-001 | BSTEFFENS | 7/6/2011 |
| ARS1-B11-02481-22 | ARS1-11-01343 | 005 | | | | | 0.997014494 | | | | | 0.052279718 | 0.004073862 | 0.7332952 | LSC-A-001 | BSTEFFENS | 7/6/2011 |
| ARS1-B11-02481-23 | ARS1-11-01343 | 006 | | | | | 0.998070059 | | | | | 0.052279718 | 0.003922556 | 0.706060018 | LSC-A-001 | BSTEFFENS | 7/6/2011 |

Assay Definition-

Assay Description:
H-3 Normal Level Assay

Assay Type: DPM (Single)
Report Name: Report1
Output Data Path: C:\Packard\Tricarb\Results\ARS\H-3 Normal Lvl 3\20110703_0022
Raw Results Path: C:\Packard\Tricarb\Results\ARS\H-3 Normal Lvl 3\20110703_0022\20110703_0022.results
RTF File Name: C:\Packard\Tricarb\Results\ARS\H-3 Normal Lvl 3\20110703_0022\H-3 Results.rtf
Comma-Delimited File Name: C:\Packard\Tricarb\Results\ARS\H-3 Normal Lvl 3\20110703_0022\H-3 Results.csv
Assay File Name: C:\Packard\TriCarb\Assays\H-3 Normal Lvl 3.lsa

Count Conditions-

Nuclide: H-3 Normal
Quench Indicator: tSIE/AEC
External Std Terminator (sec): 0.5 2s%
Pre-Count Delay (min): 0.00
Quench Set:
Low Energy: UG STD H-3
Count Time (min): 180.00
Count Mode: Normal
Assay Count Cycles: 1 Repeat Sample Count: 1
#Vials/Sample: 1 Calculate % Reference: Off

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

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

Count Corrections-

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

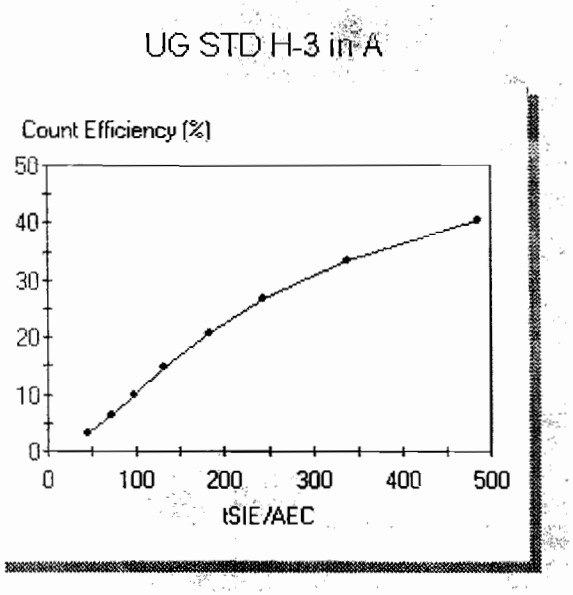
Half Life-

Half Life Correction: Off

| Regions | Half Life | Units | Reference Date | Reference Time |
|---|---|---|---|---|

A
B
C

Cycle 1 Results
Quench Curve Block Data




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

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

| P# | S# | SMPL_ID | CPMA | DPM1 | tSIE | Eff Nucl In A | Count Time | DATE | TIME | MESSAGES |
|---|---|---|---|---|---|---|---|---|---|---|
| 50 | 1 | BACKGROUND | 5.82 | 15.91 | 405.05 | 36.57 | 180.00 | 7/3/2011 | 12:27:51 AM | |
| 50 | 2 | B11-02481-01 | 14.81 | 40.29 | 409.02 | 36.76 | 180.00 | 7/3/2011 | 3:35:13 AM | |
| 50 | 3 | B11-02481-02 | 15.86 | 42.43 | 422.26 | 37.37 | 180.00 | 7/3/2011 | 6:44:08 AM | |
| 50 | 4 | B11-02481-03 | 5.76 | 15.54 | 415.46 | 37.05 | 180.00 | 7/3/2011 | 9:53:13 AM | |
| 50 | 5 | B11-02481-04 | 9.23 | 25.75 | 389.23 | 35.84 | 180.00 | 7/3/2011 | 1:02:13 PM | |
| 50 | 6 | B11-02481-05 | 8.88 | 24.92 | 385.19 | 35.65 | 180.00 | 7/3/2011 | 4:11:35 PM | |
| 50 | 7 | B11-02481-06 | 8.58 | 23.98 | 388.11 | 35.78 | 180.00 | 7/3/2011 | 7:20:58 PM | |
| 50 | 8 | B11-02481-07 | 139.65 | 381.20 | 406.43 | 36.63 | 180.00 | 7/3/2011 | 10:30:19 PM | |
| 50 | 9 | B11-02481-08 | 179.13 | 485.98 | 411.26 | 36.86 | 180.00 | 7/4/2011 | 1:39:41 AM | |
| 50 | 10 | B11-02481-09 | 6.48 | 17.73 | 404.71 | 36.55 | 180.00 | 7/4/2011 | 4:49:02 AM | |
| 50 | 11 | B11-02481-10 | 53.98 | 148.43 | 400.68 | 36.37 | 180.00 | 7/4/2011 | 7:58:22 AM | |
| 50 | 12 | B11-02481-11 | 5.61 | 15.58 | 393.00 | 36.01 | 180.00 | 7/4/2011 | 11:07:42 AM | |
| 50 | 13 | B11-02481-12 | 6.02 | 16.60 | 398.16 | 36.25 | 180.00 | 7/4/2011 | 2:17:09 PM | |
| 50 | 14 | B11-02481-13 | 60.28 | 166.25 | 398.39 | 36.26 | 180.00 | 7/4/2011 | 5:26:30 PM | |
| 50 | 15 | B11-02481-14 | 44.06 | 120.85 | 402.58 | 36.46 | 180.00 | 7/4/2011 | 8:35:52 PM | |
| 50 | 16 | B11-02481-15 | 201.15 | 552.64 | 401.32 | 36.40 | 180.00 | 7/4/2011 | 11:45:14 PM | |
| 50 | 17 | B11-02481-16 | 201.43 | 557.10 | 396.14 | 36.16 | 180.00 | 7/5/2011 | 2:54:36 AM | |
| 50 | 18 | B11-02481-17 | 31.19 | 86.86 | 390.72 | 35.90 | 180.00 | 7/5/2011 | 6:04:02 AM | |
| 50 | 19 | B11-02481-18 | 6.56 | 18.39 | 385.73 | 35.67 | 180.00 | 7/5/2011 | 9:13:22 AM | |
| 50 | 20 | B11-02481-19 | 12.81 | 35.81 | 387.98 | 35.78 | 180.00 | 7/5/2011 | 12:22:49 PM | |
| 50 | 21 | B11-02481-20 | 6.08 | 17.16 | 381.23 | 35.46 | 180.00 | 7/5/2011 | 3:32:15 PM | |
| 50 | 22 | B11-02481-21 | 8.33 | 23.65 | 376.30 | 35.23 | 180.00 | 7/5/2011 | 6:41:36 PM | |
| 50 | 23 | B11-02481-22 | 5.38 | 14.70 | 404.97 | 36.57 | 180.00 | 7/5/2011 | 9:50:59 PM | |
| 50 | 24 | B11-02481-23 | 5.59 | 15.93 | 372.68 | 35.07 | 180.00 | 7/6/2011 | 12:58:31 AM | |

# Beta Liquid Scintillation Counter Log Book

| Date | Time | ARS Sample I.D. Number | Batch Number | Liquid Scintillation File Number | Technician Initials |
|---|---|---|---|---|---|
| 6-29-11 | 1321 | B11-02472-12 | B11-02472 | 1413 | JDR |
| ↓ | ↓ | B11-02472-13 | ↓ | ↓ | JDR |
| ↓ | ↓ | B11-02472-14 | ↓ | ↓ | JDR |
| ↓ | ↓ | B11-02472-15 | ↓ | ↓ | JDR |
| ↓ | ↓ | B11-02472-16 | ↓ | ↓ | JDR |
| ↓ | ↓ | B11-02472-17 | ↓ | ↓ | JDR |
| ↓ | ↓ | B11-02472-18 | ↓ | ↓ | JDR |
| ↓ | ↓ | B11-02472-19 | ↓ | ↓ | JDR |
| ↓ | ↓ | B11-02472-20 | ↓ | ↓ | JDR |
| ↓ | ↓ | B11-02472-21 | ↓ | ↓ | JDR |
| ↓ | ↓ | B11-02472-22 | ↓ | ↓ | JDR |
| ↓ | ↓ | B11-02472-23 | ↓ | ↓ | JDR |
| 7-1-11 | 1156 | Background | UK Fe-55 | 1226 | [illegible] |
| ↓ | ↓ | LCS | ↓ | ↓ | [illegible] |
| ↓ | ↓ | LCSD | ↓ | ↓ | [illegible] |
| ↓ | ↓ | MBL | ↓ | ↓ | [illegible] |
| ↓ | ↓ | 11-01338-001 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | 11-01338-002 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | Yield Spk | ↓ | ↓ | [illegible] |
| 7-1-11 | 1508 | SNC 117 | QA | QA | [illegible] |



Reviewed By: [illegible] Date: 7-6-11
Initials

# Beta Liquid Scintillation Counter Log Book

| Date | Time | ARS Sample I.D. Number | Batch Number | Liquid Scintillation File Number | Technician Initials |
|---|---|---|---|---|---|
| 7-1-11 | 1508 | Background | B11-02481 | 0022 | [illegible] |
| ↓ | ↓ | B11-02481-01 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-02481-02 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-02481-03 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-02481-04 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-02481-05 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-02481-06 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-02481-07 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-02481-09 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-02481-10 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-02481-11 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-02481-12 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-02481-13 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-02481-14 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-02481-15 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-02481-16 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-02481-17 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-02481-18 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-02481-19 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-02481-20 | ↓ | ↓ | [illegible] |



Reviewed By: LSW Date: 7-16-11
Initials

# Beta Liquid Scintillation Counter Log Book

| Date | Time | ARS Sample I.D. Number | Batch Number | Liquid Scintillation File Number | Technician Initials |
|---|---|---|---|---|---|
| 7-1-11 | 1508 | B11-02481-21 | B11-02481 | 0022 | [illegible] |
| ↓ | ↓ | B11-02481-22 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-02481-23 | ↓ | ↓ | [illegible] |
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[illegible] 7-6-11

[illegible] 7-11-11



Reviewed By: [illegible] Date: 7-8-11
Initials

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

# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Tritium by Low Level Liquid Scintillation Counting

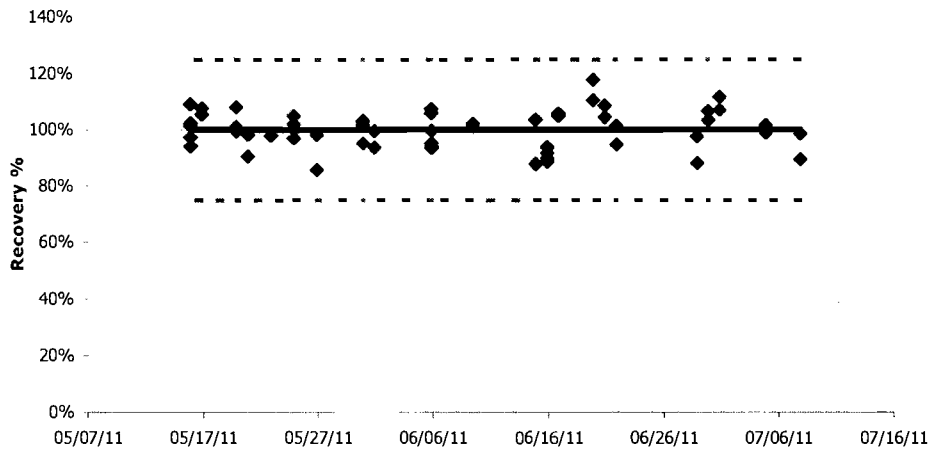
# Control Charts

American Radiation Services
Baton Rouge Laboratory

# QC Chart

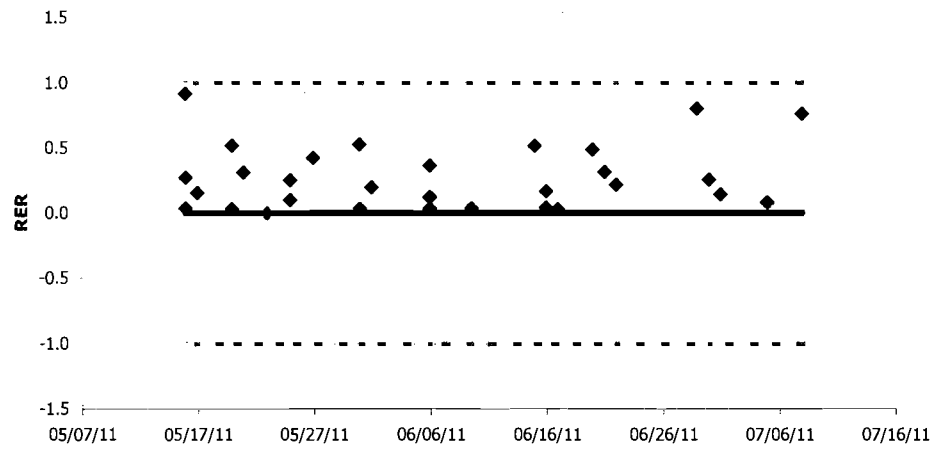


## H-3 LCS



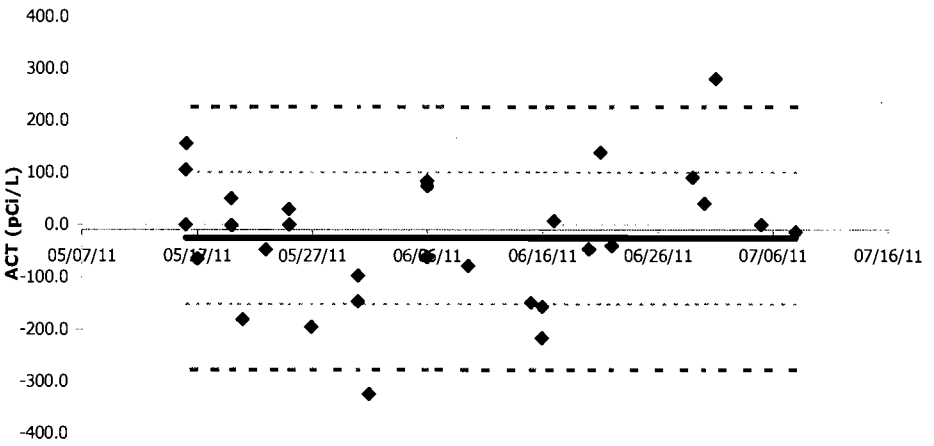

| Average | STDEV | n | UCL | LCL |
|---|---|---|---|---|
| 0.9994 | 0.0655 | 30 | 1.2500 | 0.7500 |

## H-3 RER



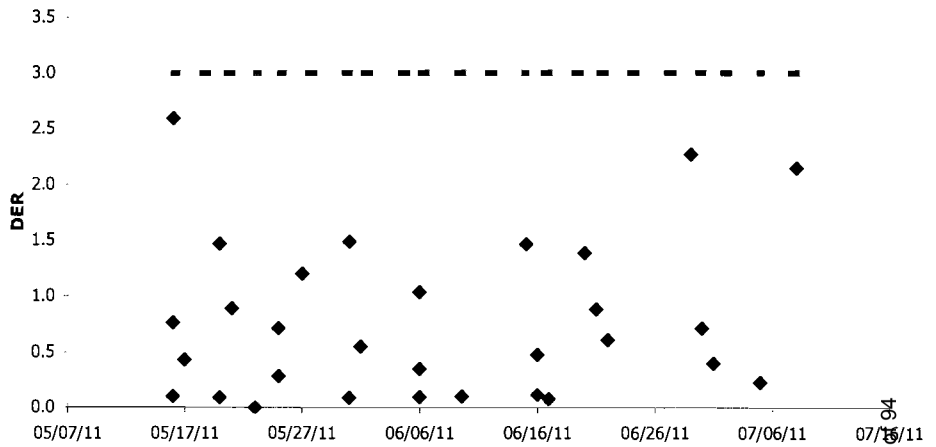

| | | n | UCL | LCL |
|---|---|---|---|---|
| | | 30 | 1.0000 | -1.0000 |

## H-3 Blank




| Average | STDEV | n | UCL | LCL |
|---|---|---|---|---|
| -25.3159 | 125.6900 | 30 | 226.0641 | -276.6960 |

## H-3 DER



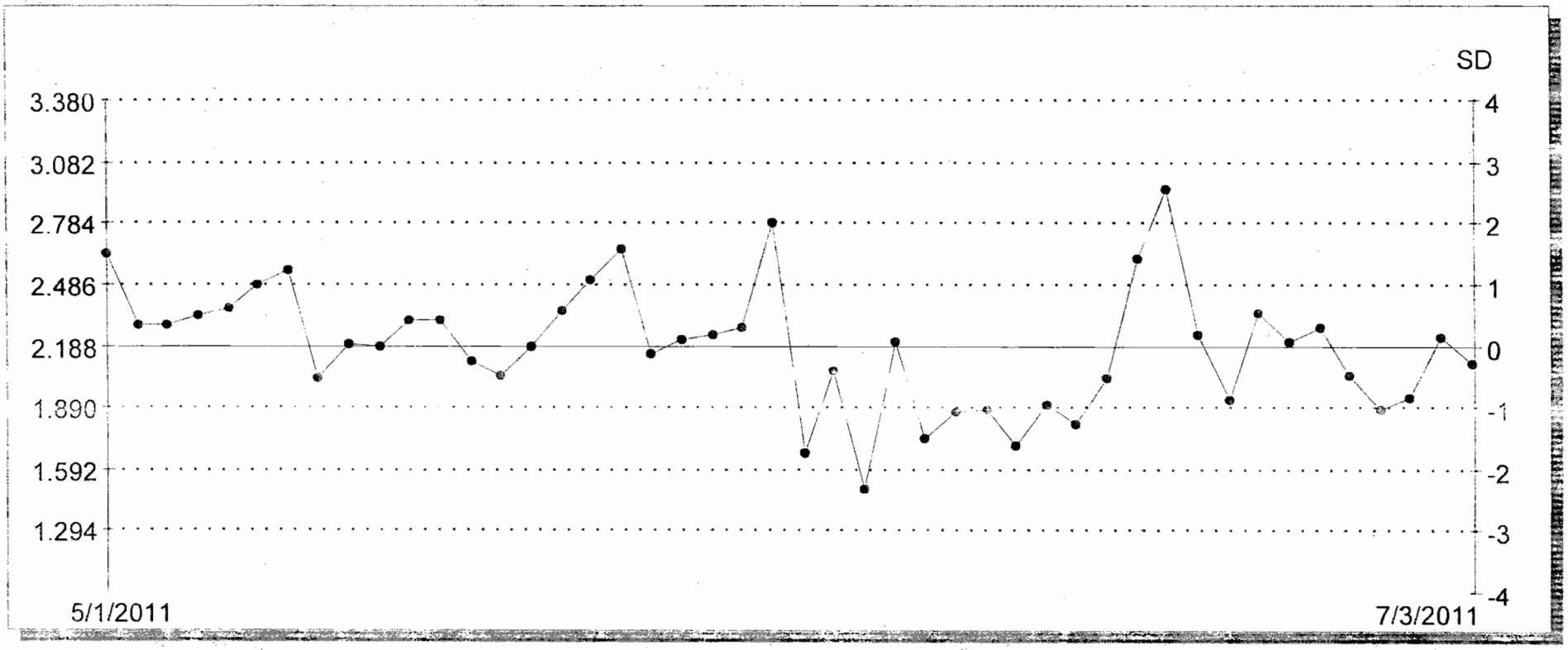

| | | n | UCL | |
|---|---|---|---|---|
| | | 30 | 3.0000 | |

55 of 94

3H Background
Total # pts : 1592
Valid # pts : 46
Mean : 2.19
SD : 0.30

| Date | Value | Valid Pt |
|---|---|---|
| May 01, 2011 | 2.64 | X |
| May 01, 2011 | 2.29 | X |
| May 01, 2011 | 2.29 | X |
| May 01, 2011 | 2.34 | X |
| May 01, 2011 | 2.37 | X |
| May 01, 2011 | 2.49 | X |
| May 01, 2011 | 2.55 | X |
| May 01, 2011 | 2.04 | X |
| May 01, 2011 | 2.19 | X |
| May 01, 2011 | 2.19 | X |
| May 01, 2011 | 2.31 | X |
| May 01, 2011 | 2.32 | X |
| May 01, 2011 | 2.12 | X |
| May 01, 2011 | 2.05 | X |
| May 02, 2011 | 2.18 | X |
| May 02, 2011 | 2.36 | X |
| May 02, 2011 | 2.51 | X |
| May 02, 2011 | 2.67 | X |
| May 02, 2011 | 2.15 | X |
| May 02, 2011 | 2.22 | X |
| May 09, 2011 | 2.24 | X |
| May 16, 2011 | 2.27 | X |
| May 21, 2011 | 2.79 | X |
| Jun 02, 2011 | 1.67 | X |
| Jun 02, 2011 | 2.07 | X |
| Jun 02, 2011 | 1.50 | X |
| Jun 02, 2011 | 2.21 | X |
| Jun 02, 2011 | 1.74 | X |
| Jun 03, 2011 | 1.87 | X |
| Jun 03, 2011 | 1.88 | X |
| Jun 03, 2011 | 1.70 | X |
| Jun 03, 2011 | 1.91 | X |
| Jun 03, 2011 | 1.81 | X |
| Jun 03, 2011 | 2.03 | X |
| Jun 06, 2011 | 2.62 | X |
| Jun 09, 2011 | 2.95 | X |
| Jun 13, 2011 | 2.24 | X |
| Jun 15, 2011 | 1.93 | X |
| Jun 16, 2011 | 2.35 | X |
| Jun 21, 2011 | 2.21 | X |
| Jun 24, 2011 | 2.28 | X |
| Jun 28, 2011 | 2.04 | X |
| Jun 29, 2011 | 1.89 | X |
| Jun 29, 2011 | 1.94 | X |
| Jun 29, 2011 | 2.23 | X |
| Jul 03, 2011 | 2.10 | X |

3H Background
Total # pts : 1592
Valid # pts : 46
Mean : 2.19
SD : 0.30

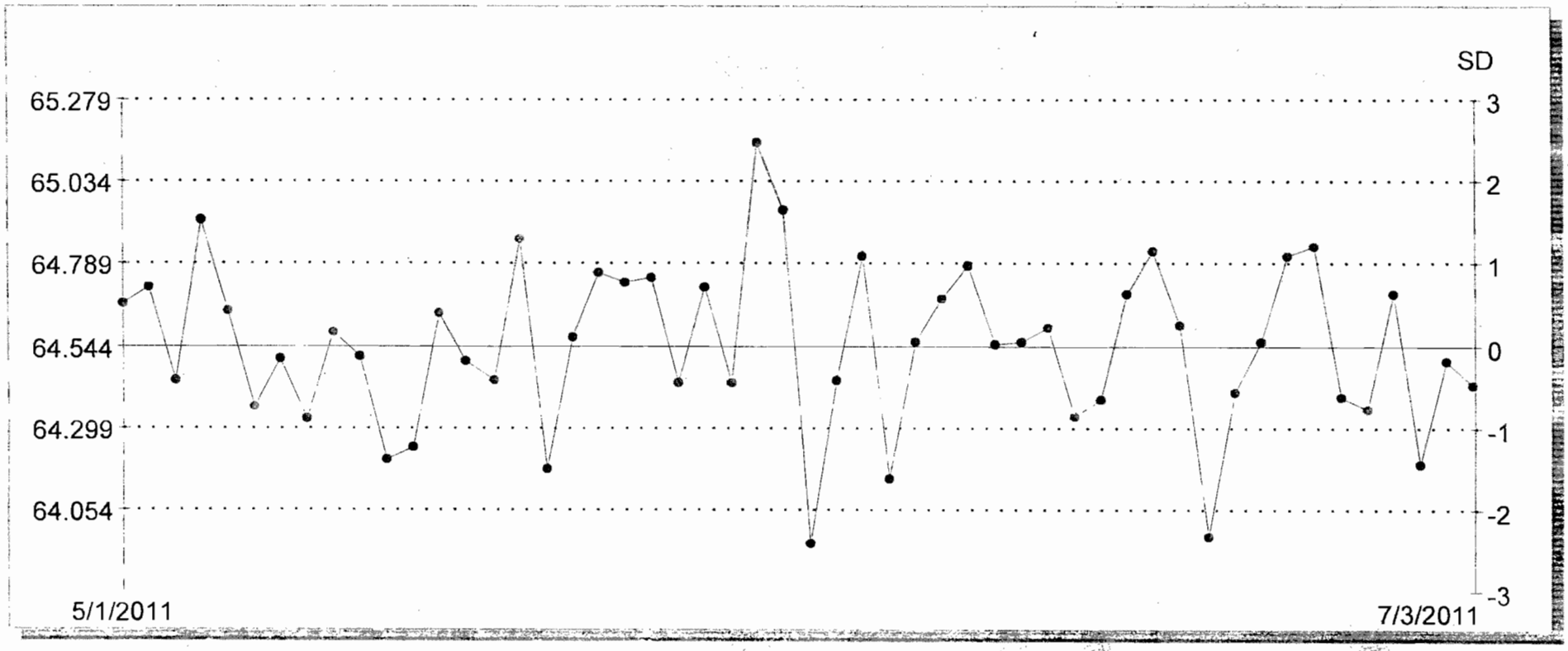


3H Efficiency
Total # pts : 1636
Valid # pts : 52
Mean : 64.54
SD : 0.24

| Date | Value | Valid Pt |
|---|---|---|
| May 01, 2011 | 64.67 | X |
| May 01, 2011 | 64.72 | X |
| May 01, 2011 | 64.44 | X |
| May 01, 2011 | 64.92 | X |
| May 01, 2011 | 64.65 | X |
| May 01, 2011 | 64.36 | X |
| May 01, 2011 | 64.50 | X |
| May 01, 2011 | 64.32 | X |
| May 01, 2011 | 64.58 | X |
| May 01, 2011 | 64.51 | X |
| May 01, 2011 | 64.20 | X |
| May 01, 2011 | 64.24 | X |
| May 01, 2011 | 64.64 | X |
| May 01, 2011 | 64.50 | X |
| May 02, 2011 | 64.44 | X |
| May 02, 2011 | 64.86 | X |
| May 02, 2011 | 64.17 | X |
| May 02, 2011 | 64.57 | X |
| May 02, 2011 | 64.76 | X |
| May 02, 2011 | 64.73 | X |
| May 02, 2011 | 64.75 | X |
| May 09, 2011 | 64.44 | X |
| May 16, 2011 | 64.72 | X |
| May 21, 2011 | 64.43 | X |
| May 26, 2011 | 65.15 | X |
| Jun 02, 2011 | 64.95 | X |
| Jun 02, 2011 | 63.95 | X |
| Jun 02, 2011 | 64.44 | X |
| Jun 02, 2011 | 64.81 | X |
| Jun 02, 2011 | 64.15 | X |
| Jun 02, 2011 | 64.56 | X |
| Jun 02, 2011 | 64.68 | X |
| Jun 02, 2011 | 64.78 | X |
| Jun 03, 2011 | 64.55 | X |
| Jun 03, 2011 | 64.55 | X |
| Jun 03, 2011 | 64.60 | X |
| Jun 03, 2011 | 64.33 | X |
| Jun 03, 2011 | 64.39 | X |
| Jun 03, 2011 | 64.70 | X |
| Jun 06, 2011 | 64.83 | X |
| Jun 09, 2011 | 64.60 | X |
| Jun 13, 2011 | 63.97 | X |
| Jun 15, 2011 | 64.40 | X |
| Jun 15, 2011 | 64.56 | X |
| Jun 16, 2011 | 64.81 | X |
| Jun 21, 2011 | 64.84 | X |
| Jun 24, 2011 | 64.39 | X |

| | | |
|---|---|---|
| Jun 28, 2011 | 64.35 | X |
| Jun 29, 2011 | 64.70 | X |
| Jun 29, 2011 | 64.19 | X |
| Jun 29, 2011 | 64.50 | X |
| Jul 03, 2011 | 64.43 | X |

3H Efficiency
Total # pts : 1636
Valid # pts : 52
Mean : 64.54
SD : 0.24



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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Low Level Liquid Scintillation Counting

# Calibration Information

# STD ID: S-0247

ARS INTERNATIONAL

## Add/Edit *Secondary Stds*

| Planning | |
|---|---|
| Planning Comments | Create an H-3 LCS standard |
| Target dpm/g (on dil. date) | 5.56 |
| Target Final volume mL | 2000 |
| Appx mass g of Parent Sol'n | 3.274623294 |
| Appx vol ml of Parent Sol'n | 3.280528244 |
| Expected Addition for Analysis g | 5 |

| Standards Preparation / Dilution | |
|---|---|
| Secondary Solution # | S-0247 |
| Dilution Date (New Ref Date) | 10/11/2010 10:30 |
| Ampoule, Empty (g) | |
| Ampoule /Solution Gross (g) | |
| Net Wt Removed (g) | |
| Transfer Container, empty (g) | 1.7 |
| Container Plus Solution (g) | 4.994 |
| Net Wt Transferred (g) | 3.294 |
| DPM Xferred on 10/11/2010 10:30 | 11185.79962 |
| Diluent/matrix | DI H2O |
| Diluent Density Cont, empty (g) | |
| Test Mass of 5 ml of Diluent (g) | |
| Diluent Density Test - (g/mL) | |
| Dilution Empty Container Mass (g) | 473.96 |
| Dilution Full Cont g (If measured) | 2467.85 |
| Dilution Final Volume ml (If measured) | 2000 |
| Final Dilution Density (g/mL) | 0.996945 |
| Final Dilution Measured Mass g | 1993.89 |

## Parent Standard Data

| | | | | |
|---|---|---|---|---|
| Parent Solution Reference # | NIST SRM 4927F | | | |
| Parent Solution # | S-0237 | | | |
| Parent Principal Radionuclide | H-3 | Half Life (Days) | 4499.8000000 | |
| Parent Reference Date | 03/22/2010 10:10 | | | |
| Parent Certified Act | 3503.682716 | Certl Act/Vol Units | dpm | g |
| Parent Cert Act Uncert 1 Sigma | 0.0036 | | | |
| Parent Sp. Gravity G/Ml | 0.9982 | | | |
| Parent Supplier | NIST SRM 4927F | | | |
| Parent Date Recvd | 01/02/00 | | | |
| Parent Received By | Unknown | | | |
| Parent Cert Exp Date | | | | |
| Parent Matrix | H2O | | | |
| Certified dpm/g At Ref Date | 3503.682716 | | | |
| Certified dpm/g on 10/11/2010 10:30 | 3395.81045 | | | |
| Parent Comments | Intermediate level H-3 standard for creating LCS solutions and matrix spikes. Dilution performed as stated above by B Steffens. -BJS 3/22/10 | | | |
| Parent Tech | Unknown | | | |
| Is_Primary | FALSE | | | |
| Is_LCS | TRUE | | | |
| Is_Tracer | FALSE | | | |
| Is_Calib | FALSE | | | |

| | |
|---|---|
| Comments | Stock H-3 LCS standard. Dilution performed as stated above by B Steffens. -BJS 10/11/10 |
| Final Dilution dpm/g | 5.610038479 |
| Final Dil New Ref Date/Time | 10/11/2010 10:30 |

| | | |
|---|---|---|
| S-0247 | | |
| H-3 | Verified | 10/13/10 |
| SL | Expires | 10/13/11 |
| Manufactuer | NIST SRM 4927F | |
| Sol Matrix | H2O | |
| Ref No | NIST SRM 4927F | |
| Tech | Unknown | |
| Parent ID | S-0237 | |

ARS INTERNATIONAL

RADIOACTIVE STANDARDS -- BATON ROUGE LABORATORY

ARS INTERNATIONAL

## QUALITY CONTROL PROGRAM

AMERICAN RADIATION SERVICES
RADIOACTIVE REFERENCE SOLUTIONS

# ANNUAL ACTIVITY VERIFICATION

VERIFICATION DATE 10/13/2010 20:18 *date counted*
STANDARD REFERENCE # S-0247

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

Radionuclide H-3 Dilution Reference Date 10/11/2010 10:30

| | | | |
|---|---|---|---|
| Dilution Activity | 2.53 | pCi per gram ===> dpm/g | 5.61 |
| Verif. Date Decay Corrected | 2.53 | pCi per gram ===> dpm/g | 5.61 |

***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-0247-V1 | 16.99 | 1 | LSC | 0.3440 | 6.86 | 5.017 | 5.87 | 2.64 |
| S-0247-V2 | 16.76 | 1 | LSC | 0.3484 | 6.86 | 4.979 | 5.70 | 2.57 |
| S-0247-V3 | 16.97 | 1 | LSC | 0.3465 | 6.86 | 4.972 | 5.87 | 2.64 |
| S-0247-V4 | 16.76 | 1 | LSC | 0.3449 | 6.86 | 4.982 | 5.76 | 2.60 |
| S-0247-V5 | 16.88 | 1 | LSC | 0.3433 | 6.86 | 4.980 | 5.86 | 2.64 |

| | | | |
|---|---|---|---|
| | Average | 5.81 | 2.62 |
| | Two Sigma Uncertainty | 0.15 | 0.07 |
| *10% Max* *PASS* | Standard Deviation percent of known concentration | 1.35% | 1.35% |
| | Target Activity | 5.61 | 2.53 |
| *5% Max* *PASS* | % Diff | 3.66% | 3.66% |

**Verification Expiration Date:** October 13, 2011

Prepared & Counted By [signature] Date: 10/13/2010 20:18

Verified & Approved By Dwyane Mulligan Date: 10-14-10 / 1224

QC Approval [signature] Date: 10-14-10/12:30

# STD ID: S-0031

ARS INTERNATIONAL

## Add/Edit *Secondary Stds*

| Planning | |
|---|---|
| Planning Comments | Dilute intermediate level solution from SRM 4927F |
| Target dpm/g (on dil. date) | 267000 |
| Target Final volume mL | 200 |
| Appx mass g of Parent Sol'n | 2.093763934 |
| Appx vol ml of Parent Sol'n | 2.097539505 |
| Expected Addition for Analysis g | |

| Standards Preparation / Dilution | |
|---|---|
| Secondary Solution # | S-0031 |
| Dilution Date (New Ref Date) | 10/19/2005 00:00 |
| Ampoule, Empty (g) | |
| Ampoule /Solution Gross (g) | |
| Net Wt Removed (g) | |
| Transfer Container, empty (g) | 0 |
| Container Plus Solution (g) | 4.7574 |
| Net Wt Transferred (g) | 4.7574 |
| DPM Xferred on 10/19/2005 00:00 | 121334194.3 |
| Diluent/matrix | H20 |
| Diluent Density Cont, empty (g) | |
| Test Mass of 5 ml of Diluent (g) | |
| Diluent Density Test - (g/mL) | |
| Dilution Empty Container Mass (g) | 1 |
| Dilution Full Cont g (if measured) | 200.64 |
| Dilution Final Volume ml (if measured) | 200 |
| Final Dilution Density (g/mL) | 0.9982 |
| Final Dilution Measured Mass g | 199.64 |

| Parent Standard Data | | | | |
|---|---|---|---|---|
| Parent Solution Reference # | NIST SRM 4927F | | | |
| Parent Solution # | S-0107 | | | |
| Parent Principal Radionuclide | H-3 | Half Life (Days) | 4499.8000000 | |
| Parent Reference Date | 09/03/1998 11:00 | | | |
| Parent Certified Act | 38082000 | Certi Act/Vol Units | dpm | g |
| Parent Cert Act Uncert 1 Sigma | 0.0036 | | | |
| Parent Sp. Gravity G/Ml | 0.9982 | | | |
| Parent Supplier | NIST SRM 4927F | | | |
| Parent Date Recvd | 01/02/00 | | | |
| Parent Received By | Unknown | | | |
| Parent Cert Exp Date | | | | |
| Parent Matrix | H2O | | | |
| Certified dpm/g At Ref Date | 38082000 | | | |
| Certified dpm/g on 10/19/2005 00:00 | 25504307.89 | | | |
| Parent Comments | Primary for S-0029 - Information entered from dilution records - 4/18/2006 RTS | | | |
| Parent Tech | Unknown | | | |
| Is_Primary | FALSE | | | |
| Is_LCS | TRUE | | | |
| Is_Tracer | FALSE | | | |
| Is_Calib | FALSE | | | |

| | |
|---|---|
| Comments | S-0031 Intermediate dilution - Information entered from dilution records - 4/19/2006 RTS |
| Final Dilution dpm/g | 607764.9486 |
| Final Dil New Ref Date/Time | 10/19/2005 00:00 |

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

S-0031

# National Institute of Standards & Technology

# Certificate

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

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

### Radiological Hazard

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

### Chemical Hazard

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

### Storage and Handling

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

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

### Preparation

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

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

Bert M. Coursey, Chief
Ionizing Radiation Division

Nancy M. Trahey, Chief
Standard Reference Materials Program

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



*Notes and references are on pages 5 and 6.

## PROPERTIES OF SRM 4927F

### Certified values

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

### Uncertified values

| | | | |
|---|---|---|---|
| **Physical Properties:** | | | |
| Source description | Liquid in flame-sealed NIST borosilicate-glass ampoule | | |
| Ampoule specifications | Body outside diameter<br>Wall Thickness<br>Barium content<br>Lead-oxide content<br>Other heavy elements | (16.5 ± 0.5) mm<br>(0.60 ± 0.04) mm<br>Less than 2.5%<br>Less than 0.02%<br>Trace quantities | |
| Solution mass | Approximately 5.0 g | | |
| **Chemical Properties:** | | | |
| Solution composition | Chemical Formula | Concentration (mol·L$^{-1}$) | Mass Fraction (g·g$^{-1}$) |
| | $H_2O$<br>$^3HHO$ | 55<br>$6 \times 10^{-7}$ | 1.00<br>$1 \times 10^{-8}$ |
| **Radiological Properties:** | | | |
| Radionuclidic impurities | None detected [f] | | |
| Half lives used | Hydrogen-3: (4500 ± 8) d [g] | | |
| Calibration method and measuring instrument(s) | 4πβ gas counting of SRM 4927E using the NIST length-compensated internal gas proportional counters and intercomparison of SRMs 4927E/4927F using two 4πβ liquid-scintillation counting systems [h] | | |



*Notes and references are on pages 5 and 6.

## NOTES

[a] The Sievert is the SI unit for dose equivalent. See reference [1]. One $\mu$Sv is equal to 0.1 mrem.

| Distance from Ampoule (cm): | 1 | 30 | 100 |
|---|---|---|---|
| Approximate Dose Rate ($\mu$Sv/h): | <0.1 (Not detectable) | | |

[b] The stated uncertainty is two times the standard uncertainty.

[c] **Massic activity** is the preferred name for the quantity activity divided by the total mass of the sample. See reference [1].

[d] The reported value, $y$, of massic activity (activity per unit mass) at the reference time was not measured directly but was derived from measurements and calculations of other quantities. This can be expressed as $y = f(x_1, x_2, x_3, \ldots x_n)$, where $f$ is a mathematical function derived from the assumed model of the measurement process.

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

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

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

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

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

[e] The value of each standard uncertainty component, and hence the value of the expanded uncertainty itself, is a best estimate based upon all available information, but is only approximately known. That is to say, the "uncertainty of the uncertainty" is large and not well known. This is true for uncertainties evaluated by statistical methods (e.g., the relative standard deviation of the standard deviation of the mean for the massic response is approximately 50%) and for uncertainties evaluated by other methods (which could easily be over estimated or under estimated by substantial amounts). The unknown value of the expanded uncertainty is believed to lie in the interval $U/2$ to $2U$ (i.e., within a factor of 2 of the estimated value).

[f] The estimated limit of detection for radionuclidic impurities is 300 $Bq \cdot g^{-1}$.

[g] The stated uncertainty is the standard uncertainty. See reference [5].

[h] Extensive gas-counting measurements were made on the SRM 4927E solution during 1998 and 1999. The SRM 4927F solution was intercompared with the SRM 4927E solution using liquid-scintillation counting.

[i] Relative standard uncertainty of the input quantity $x_i$.

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# American Radiation Services Analytical Reports

## for

## Los Alamos National Laboratory

# Percent Moisture

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-01342 | **Request or PO Number:** | 11-2668 |
| **Client Sample ID:** | MD21-11-14527 | **ARS Sample ID:** | ARS1-11-01342-001 |
| **Sample Collection Date:** | 06/15/11 | **Date Received:** | 06/17/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 07/11/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 12.080 | NA | NA | NA | | % | Percent Moisture | 07/03/11 22:30 | BS | NA |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-01342 | **Request or PO Number:** | 11-2668 |
| **Client Sample ID:** | MD21-11-14524 | **ARS Sample ID:** | ARS1-11-01342-002 |
| **Sample Collection Date:** | 06/15/11 | **Date Received:** | 06/17/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 07/11/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 13.880 | NA | NA | NA | | % | Percent Moisture | 07/04/11 01:40 | BS | NA |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-01342 | **Request or PO Number:** | 11-2668 |
| **Client Sample ID:** | MD21-11-14531 | **ARS Sample ID:** | ARS1-11-01342-003 |
| **Sample Collection Date:** | 06/15/11 | **Date Received:** | 06/17/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 07/11/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 12.724 | NA | NA | NA | U | % | Percent Moisture | 07/04/11 04:49 | BS | NA |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**NOTES: Project Cost Code MR8R032NFM00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-01342 | **Request or PO Number:** | 11-2668 |
| **Client Sample ID:** | MD21-11-14525 | **ARS Sample ID:** | ARS1-11-01342-004 |
| **Sample Collection Date:** | 06/15/11 | **Date Received:** | 06/17/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 07/11/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 14.430 | NA | NA | NA | | % | Percent Moisture | 07/04/11 07:58 | BS | NA |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**NOTES: Project Cost Code MR8R032NFM00**

SDL

Project Manager Review

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-01342 | **Request or PO Number:** | 11-2668 |
| **Client Sample ID:** | MD21-11-14534 | **ARS Sample ID:** | ARS1-11-01342-005 |
| **Sample Collection Date:** | 06/15/11 | **Date Received:** | 06/17/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 07/11/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 4.790 | NA | NA | NA | U | % | Percent Moisture | 07/04/11 11:08 | BS | NA |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-01342 | **Request or PO Number:** | 11-2668 |
| **Client Sample ID:** | MD21-11-14532 | **ARS Sample ID:** | ARS1-11-01342-006 |
| **Sample Collection Date:** | 06/15/11 | **Date Received:** | 06/17/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 07/11/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 12.389 | NA | NA | NA | U | % | Percent Moisture | 07/04/11 14:17 | BS | NA |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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

LELAP Certificate# 01949 NELAP Certificate # E87558

ARS INTERNATIONAL

2609 North River Road, Port Allen, Louisiana 70767

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

| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-01342 | **Request or PO Number:** | 11-2668 |
| **Client Sample ID:** | MD21-11-14526 | **ARS Sample ID:** | ARS1-11-01342-007 |
| **Sample Collection Date:** | 06/15/11 | **Date Received:** | 06/17/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 07/11/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 13.116 | NA | NA | NA | | % | Percent Moisture | 07/04/11 17:27 | BS | NA |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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

| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-01342 | **Request or PO Number:** | 11-2668 |
| **Client Sample ID:** | MD21-11-14529 | **ARS Sample ID:** | ARS1-11-01342-008 |
| **Sample Collection Date:** | 06/15/11 | **Date Received:** | 06/17/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 07/11/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 14.556 | NA | NA | NA | | % | Percent Moisture | 07/04/11 20:36 | BS | NA |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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

| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-01342 | **Request or PO Number:** | 11-2668 |
| **Client Sample ID:** | MD21-11-14533 | **ARS Sample ID:** | ARS1-11-01342-009 |
| **Sample Collection Date:** | 06/15/11 | **Date Received:** | 06/17/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 07/11/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 13.007 | NA | NA | NA | | % | Percent Moisture | 07/04/11 23:45 | BS | NA |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**NOTES: Project Cost Code MR8R032NFM00**

SDL

Project Manager Review

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LELAP Certificate# 01949 NELAP Certificate # E87558

ARS INTERNATIONAL

2609 North River Road, Port Allen, Louisiana 70767

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

| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-01342 | **Request or PO Number:** | 11-2668 |
| **Client Sample ID:** | MD21-11-14528 | **ARS Sample ID:** | ARS1-11-01342-010 |
| **Sample Collection Date:** | 06/15/11 | **Date Received:** | 06/17/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 07/11/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 12.154 | NA | NA | NA | | % | Percent Moisture | 07/05/11 02:55 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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LELAP Certificate# 01949 NELAP Certificate # E87558

ARS INTERNATIONAL

2609 North River Road, Port Allen, Louisiana 70767

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

**ARS Sample Delivery Group:** ARS1-11-01342
**Client Sample ID:** MD21-11-14530
**Sample Collection Date:** 06/15/11
**Sample Matrix:** Silica

**Request or PO Number:** 11-2668
**ARS Sample ID:** ARS1-11-01342-011
**Date Received:** 06/17/11
**Report Date:** 07/11/11

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 10.874 | NA | NA | NA | | % | Percent Moisture | 07/05/11 06:04 | BS | NA |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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

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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Percent Moisture Laboratory Records

**AMERICAN RADIATION SERVICES**
**Port Allen, LA**
**PERCENT MOISTURE DETERMINATION IN SOILS**

SDG Number ARS1-11-01310, 01342, 01343
Client LANL

| LANL ID | ARS ID | weight of cylinder with gel (g) | weight of empty cylinder (g) | Weight of gel (g) | amount of liquid collected (ml) | amount of liquid tested (ml) | **% moisture** |
|---|---|---|---|---|---|---|---|
| MD54-11-7522 | ARS1-11-01310-001 | 603 | 444 | 158 | 15.519 | 5.044 | **9.8221519** |
| MD54-11-7521 | ARS1-11-01310-002 | 589 | 441 | 148 | 8.394 | 5.054 | **5.67162162** |
| MD54-11-7602 | ARS1-11-01310-003 | 599 | 437 | 162 | 15.011 | 5.046 | **9.26604938** |
| MD21-11-14527 | ARS1-11-01342-001 | 616 | 450 | 166 | 20.052 | 5.039 | **12.0795181** |
| MD21-11-14524 | ARS1-11-01342-002 | 610 | 447 | 163 | 22.624 | 5.066 | **13.8797546** |
| MD21-11-14531 | ARS1-11-01342-003 | 602 | 435 | 166 | 21.122 | 5.07 | **12.7240964** |
| MD21-11-14525 | ARS1-11-01342-004 | 607 | 436 | 171 | 24.676 | 5.072 | **14.4304094** |
| MD21-11-14534 | ARS1-11-01342-005 | 603 | 448 | 155 | 7.425 | 5.072 | **4.79032258** |
| MD21-11-14532 | ARS1-11-01342-006 | 605 | 440 | 166 | 20.566 | 5.078 | **12.3891566** |
| MD21-11-14526 | ARS1-11-01342-007 | 627 | 457 | 171 | 22.429 | 5.048 | **13.1163743** |
| MD21-11-14529 | ARS1-11-01342-008 | 609 | 441 | 168 | 24.454 | 5.034 | **14.5559524** |
| MD21-11-14533 | ARS1-11-01342-009 | 606 | 441 | 165 | 21.462 | 5.056 | **13.0072727** |
| MD21-11-14528 | ARS1-11-01342-010 | 605 | 437 | 168 | 20.419 | 5.036 | **12.1541667** |
| MD21-11-14530 | ARS1-11-01342-011 | 626 | 456 | 170 | 18.486 | 5.045 | **10.8741176** |
| MD54-11-7605 | ARS1-11-01343-001 | 606 | 449 | 157 | 10.643 | 5.045 | **6.77898089** |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| MD54-11-7520 | ARS1-11-01343-002 | 621 | 454 | 167 | 19.114 | 5.024 | **11.445509** |
| MD54-11-7612 | ARS1-11-01343-003 | 588 | 439 | 149 | 9.978 | 5.044 | **6.6966443** |
| MD54-11-7519 | ARS1-11-01343-004 | 619 | 456 | 162 | 15.972 | 5.029 | **9.85925926** |
| MD54-11-7539 | ARS1-11-01343-005 | 611 | 438 | 172 | 22.836 | 5.033 | **13.2767442** |
| MD54-11-7620 | ARS1-11-01343-006 | 583 | 437 | 146 | 9.718 | 5.048 | **6.65616438** |

Balance ID: 0102/H1331122173560P

Pipettor ID: FJ40469

Signature _____ Date 7-6-11

**AMERICAN RADIATION SERVICES**
**Port Allen, LA**
**PERCENT MOISTURE DETERMINATION IN SOILS**

SDG Number ARS1-11-01310, 01342, 01343
Client LANL

LCS- 5.088
LCSD- 5.071
BLK- 5.061

| LANL ID | ARS ID | weight of cylinder with gel (g) | weight of empty cylinder (g) | Weight of gel (g) | amount of liquid collected (ml) | amount of liquid tested (ml) | % moisture |
|---|---|---|---|---|---|---|---|
| MD54-11-7522 | ARS1-11-01310-001 | 603 | 444 | 158 | 15.519 | 5.044 | #DIV/0! |
| MD54-11-7521 | ARS1-11-01310-002 | 589 | 441 | 148 | 8.394 | 5.054 | #DIV/0! |
| MD54-11-7602 | ARS1-11-01310-003 | 599 | 437 | 162 | 15.011 | 5.046 | #DIV/0! |
| MD21-11-14527 | ARS1-11-01342-001 | 616 | 450 | 166 | 20.052 | 5.039 | #DIV/0! |
| MD21-11-14524 | ARS1-11-01342-002 | 610 | 447 | 163 | 22.624 | 5.066 | #DIV/0! |
| MD21-11-14531 | ARS1-11-01342-003 | 602 | 435 | 166 | 21.122 | 5.070 | #DIV/0! |
| MD21-11-14525 | ARS1-11-01342-004 | 607 | 436 | 171 | 24.676 | 5.072 | #DIV/0! |
| MD21-11-14534 | ARS1-11-01342-005 | 603 | 448 | 155 | 7.425 | 5.072 | #DIV/0! |
| MD21-11-14532 | ARS1-11-01342-006 | 605 | 440 | 166 | 20.566 | 5.078 | #DIV/0! |
| MD21-11-14526 | ARS1-11-01342-007 | 627 | 457 | 171 | 22.429 | 5.048 | #DIV/0! |
| MD21-11-14529 | ARS1-11-01342-008 | 609 | 441 | 168 | 24.454 | 5.034 | #DIV/0! |
| MD21-11-14533 | ARS1-11-01342-009 | 606 | 441 | 165 | 21.462 | 5.056 | #DIV/0! |
| MD21-11-14528 | ARS1-11-01342-010 | 605 | 437 | 168 | 20.419 | 5.036 | #DIV/0! |
| MD21-11-14530 | ARS1-11-01342-011 | 626 | 456 | 170 | 18.486 | 5.045 | #DIV/0! |
| MD54-11-7605 | ARS1-11-01343-001 | 606 | 449 | 157 | 10.643 | 5.045 | #DIV/0! |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| MD54-11-7520 | ARS1-11-01343-002 | 621 | 454 | 167 | 19.114 | 5.024 | #DIV/0! |
| MD54-11-7612 | ARS1-11-01343-003 | 588 | 439 | 149 | 9.978 | 5.044 | #DIV/0! |
| MD54-11-7519 | ARS1-11-01343-004 | 619 | 456 | 162 | 15.972 | 5.029 | #DIV/0! |
| MD54-11-7539 | ARS1-11-01343-005 | 611 | 438 | 172 | 22.836 | 5.033 | #DIV/0! |
| MD54-11-7620 | ARS1-11-01343-006 | 583 | 437 | 146 | 9.718 | 5.048 | #DIV/0! |

Balance ID: 0102/H1331122173560P

Pipettor ID: FJ40469

Signature [illegible] Date 7-1-11

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

# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Folder Duplicate

ARS INTERNATIONAL

# Report Compilation Checklist

**ARS SDG:** 11-01342 **Client Name:** LANL **Sample Matrix:** SI

| LEVEL 1 COMPONENTS | 1st Reviewer | |
|---|---|---|
| 1) Cover Page Complete and Accurate (see ARS-059)? | ~~Yes~~ No N/A | |
| 2) Technical Review Checklist(s) Complete and Accurate? | ~~Yes~~ No N/A | |
| 3) Case Narrative Complete and Accurate (see ARS-059)? | ~~Yes~~ No N/A | |
| 4) Form 1s Present for all Samples and Tests? | ~~Yes~~ No N/A | |
| 5) Client Specific Components are Present and Complete? | ~~Yes~~ No N/A | |

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

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

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

Susan Reese 7-11-11
Report Generator Signature Date

VHM 7-15-11
Management Review Signature Date

# LSC
# Technical Review Checklist

**ARS SDG** 11-01342

**Sample Matrix:** SI **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:** B11-02481 **Batch B:** N/A **Batch C:** N/A

**Test Method(s):** LSC-A-001 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): _____

7-1-11 — Chemist Signature — Date

Tamara Brown 7-1-11 — 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 |

QA Officer Signature — Date: 7-15-11

| | 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): _____

7-6-11 — Analyst Signature — Date

N/A — Technicial Reviewer Signature — Date

ARS INTERNATIONAL

Batch A: B11-02481

# 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): _____

Susan Heck 7-11-11
Project Manager Signature Date

VYM 7-15-11
QA Officer Signature Date

## GENERAL COMMENTS

# SDG Report - Samples and Containers

**SDG Specific Data**

| | | | | | |
|---|---|---|---|---|---|
| SDG | ARS1-11-01342 | TAT Days | 30 | Project Type | Environmental |
| Sample Count | 11 Rpt Level 4 | Date Received | 6/17/2011 | COC Number | 11-2668 |
| Client | Los Alamos National Laboratory | Client Deadline | 7/16/2011 | PO Number | 63641-001-10 |
| Client Code | 114 | Internal Deadline | 7/14/2011 | Job Number | MR8R032NFM00 |
| Profile Number | PN-00094 | Lab Deadline | 7/12/2011 | Job Location | |
| Comments | | | | | |

**Samples and Containers (→) Checked In Thus Far**

| FR | ClientID | Matrix | SampleStartDate | SampleEndDate | Disp | Hold | Arch | Storage | X | Units | Y | Units | Z | Units | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 001 | MD21-11-14527 | SI | 06/15/11 12:00 PM | 06/15/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| → | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 89305 | 1 | | 1.00 | | | 20 | 13 | | N | N/A | | | | |
| 002 | MD21-11-14524 | SI | 06/15/11 12:00 PM | 06/15/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| → | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 89306 | 1 | | 1.00 | | | 20 | 13 | | N | N/A | | | | |
| 003 | MD21-11-14531 | SI | 06/15/11 12:00 PM | 06/15/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| → | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 89307 | 1 | | 1.00 | | | 20 | 14 | | N | N/A | | | | |
| 004 | MD21-11-14525 | SI | 06/15/11 12:00 PM | 06/15/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| → | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 89308 | 1 | | 1.00 | | | 25 | 13 | | N | N/A | | | | |
| 005 | MD21-11-14534 | SI | 06/15/11 12:00 PM | 06/15/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| → | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 89309 | 1 | | 1.00 | | | 20 | 14 | | N | N/A | | | | |
| 006 | MD21-11-14532 | SI | 06/15/11 12:00 PM | 06/15/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| → | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 89310 | 1 | | 1.00 | | | 25 | 14 | | N | N/A | | | | |
| 007 | MD21-11-14526 | SI | 06/15/11 12:00 PM | 06/15/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| → | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 89311 | 1 | | 1.00 | | | 20 | 14 | | N | N/A | | | | |
| 008 | MD21-11-14529 | SI | 06/15/11 12:00 PM | 06/15/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| → | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 89312 | 1 | | 1.00 | | | 20 | 14 | | N | N/A | | | | |
| 009 | MD21-11-14533 | SI | 06/15/11 12:00 PM | 06/15/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| → | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 89313 | 1 | | 1.00 | | | 20 | 13 | | N | N/A | | | | |
| 010 | MD21-11-14528 | SI | 06/15/11 12:00 PM | 06/15/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| → | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 89314 | 1 | | 1.00 | | | 20 | 13 | | N | N/A | | | | |
| 011 | MD21-11-14530 | SI | 06/15/11 12:00 PM | 06/15/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| → | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 89315 | 1 | | 1.00 | | | 20 | 13 | | N | N/A | | | | |

# SDG Report - Analysis Assignments

| | | | |
|---|---|---|---|
| Temp SDG | ARS1-11-01342 | Sample Count | 11 |
| Client | Los Alamos National Laboratory | Analysis Count | 1-11 |

**Samples Count Totals per Analysis**

| Analysis Code | Analysis Description | Samples Count |
|---|---|---|
| LSC-A-001 | Tritium in (Water [Aqueous, AQ, SI]) | 11 |

**Analyses Assigned Per Fraction**

| Fraction | Analysis Code | X = Assigned |
|---|---|---|
| 001 | LSC-A-001 | X |
| 002 | LSC-A-001 | X |
| 003 | LSC-A-001 | X |
| 004 | LSC-A-001 | X |
| 005 | LSC-A-001 | X |
| 006 | LSC-A-001 | X |
| 007 | LSC-A-001 | X |
| 008 | LSC-A-001 | X |
| 009 | LSC-A-001 | X |
| 010 | LSC-A-001 | X |
| 011 | LSC-A-001 | X |

# DQO Report for SDG

ARS1-11-01342



| Analysis Code | Group | Isotope | Activity Units | Aliquot Units | ProcedureNo | RDL | LCS_LL | LCS_UL | MS_LL | MS_UL | RadY_LL | RadY_UL | GravY_LL | GravY_LL | RER | RPD | DiltionReq | RoughPrepReq | BlankCorrectionMDA | BlankCorrectionAll | CountTimeReq | AliquotRequired |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LSC-A-001 | STD | H-3 | pCi | L | ARS-054 | 2.50E+02 | 80 | 120 | 75 | 125 | 30 | 110 | 40 | 110 | 1.00 | 25 | FALSE | FALSE | FALSE | FALSE | | |

# ARS FILE TRACKING SHEET

SDG: ARS1-11-01342

| Task | Date / Time | Initials |
|---|---|---|
| Date & Time Samples Received | 06-17-11/10:09 | CMB |
| ICOC Initiated / Storage Location: Q6 | 06-17-11/15:06 | CMB |
| Technical Checks Performed | See Batch | — |
| Report Written / EDD Generated: 7-11-11/1705 \| SDL (Date/Time · Initials) | 7-11-11/1701 | SDL |
| Quality Assurance Checks Performed on Report | 7-15-11 1115 | |
| Management Check Performed on Report | | |
| *Preliminary Report Sent* | | |
| Report E-mailed | | |
| Report Faxed | | |
| Report Reviewed | | |
| Report Mailed | | |
| Invoice Completed Invoice #:_____ | | |
| Report Imaged | | |

***SPECIAL REQUIREMENTS***

| Requirement | Yes | No |
|---|---|---|
| 3 Hour Rush | | ✓ |
| 24 Hour Rush | | ✓ |
| 48 Hour Rush | | ✓ |
| Special Invoicing *see notes* Mgmt. Approval:_____ | | ✓ |

**NOTES:**

ARS-062
04/23/2010

**COMPANY NAME:** Los Alamos Nation Lab **SDG:** ARJH101312

**SHIPPING CONTAINER**

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

**COC PRESENT WITH SAMPLES**

| | | |
|---|---|---|
| COC | ☑ Yes | ☐ No |

**SAMPLE CONTAINER(S)**

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

# Samples Rcv 11

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

**External and Internal Surveys**

| | | | | | |
|---|---|---|---|---|---|
| Exposure Rate Meter: | M3 242801 | Serial No.: | M44-2 PR242801 | Calibration Due Date: | 4-2012 |
| Count Rate Meter: | M2 154859 | Serial No.: | M44-9 PR184959 | Calibration Due Date: | 4-2012 |

| | | | | |
|---|---|---|---|---|
| Background Exposure Rate (µR/hr) | 26 | Max. Exposure Rate on Shipping Containers Externals (Plus Bkgd) | 10 | µR/hr |
| Background Count Rate (cpm) | 70 | Max. Removable Count Rate on Shipping Containers Externals (Plus Bkgd) | 20 | cpm |
| | | Max. Removable Count Rate on Shipping Containers Internals (Plus Bkgd) | 20 | cpm |

| Sample Label/Comments/Notes | pH Orig (pH ≤ 2 is Acceptable) | pH Final | Mark if Preserve | Acid Lot # | Weight(g) / Volume(mL) | µR/hr (Acceptance Limits <500 µR/hr) | cpm (Acceptance Limits <100 cpm/cm²) |
|---|---|---|---|---|---|---|---|
| MD2-11-14527 | | | | | 1 sample | 13 | 20 |
| ↓ 14524 | | | | | ↓ | 13 | 20 |
| ↓ 14531 | | | | | ↓ | 14 | 20 |
| ↓ 14525 | | | | | ↓ | 13 | 25 |
| ↓ 14534 | | | | | ↓ | 14 | 20 |
| ↓ 14532 | | | | | ↓ | 14 | 25 |
| ↓ 14526 | | | | | ↓ | 14 | 20 |
| ↓ 14529 | | | | | ↓ | 14 | 20 |
| ↓ 14533 | | | | | ↓ | 13 | 20 |
| ↓ 14528 | | | | | ↓ | 13 | 20 |
| ↓ 14530 | | | | | ↓ | 13 | 20 |
| | | | | | | | |
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| | | | | | | | |

Surveyors' Name: [signature] Date/Time Surveyed: 6-17-11 | 11:28

Monday, March 14, 2011

REQUEST NUMBER: 11-1611

# LOS ALAMOS
## NATIONAL LABORATORY

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

These Samples are on:
LANL Request Number:11-1611
Per Agreement Number:63641-001-10
Project Cost Code: MR8R032NFM00

Please analyse the enclosed samples according to the schedule indicated:

**SHIP DATE: 3/14/2011**
**TURNAROUND/REPORT DUE: 4/13/2011**
**TURNAROUND REQ'D: 30 Days**

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

LANL ER SMO CONTACT:
Signature:

| PRIORITY | METHOD CODE | CNTNR | SAMPLE ID | SAMPLE MATRIX | DATE SAMPLED | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| | EPA:906.0 | 1 | MD21-11-5604 | GAS | 3/10/2011 | |
| | | 1 | MD21-11-5609 | GAS | 3/10/2011 | |

**Final Page of REQUEST NUMBER 11-1611**

Monday, March 14, 2011

**LAB CHAIN OF CUSTODY DOCUMENT NUMBER: 11-1611C**

**REQUEST NUMBER: 11-1611**

# LOS ALAMOS

**NATIONAL LABORATORY**

ATTN: Danny Coleman

American Radiation Services - Primary

1726 Wooddale Court

Baton Rouge, LA 70806

LAB REQUEST COMMENTS:

TURNAROUND/REPORT DUE: 4/13/2011

TURNAROUND REQ'D: 30

| SAMPLE ID | CTNR | CTNR DESC | ORDER | PRESERV | MATRIX |
|---|---|---|---|---|---|
| MD21-11-5604 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-5609 | 1 | SILICA GEL TUBE | H3 | None | GAS |

| Relinquished By: | Date | Time | Received By: | Date | Time |
|---|---|---|---|---|---|
| Signature | | | Signature | | |
| Signature | | | Signature | | |
| Signature | | | Signature | | |

3/14/11 1400

| Received for DISPOSAL By: | Date | Time | Remarks: |
|---|---|---|---|
| Signature | | | |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3396 **EVENT NAME:** Pore Gas Sampling - MDA T - CU 21-016(a)-99

**SAMPLE ID:** MD21-11-5604 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 3/10/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 14:20 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | 21-24524W | ok | FIELD QC TYPE: | NA | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | 300 | ok | SAMPLE USAGE: | INV | |
| BOTTOM DEPTH: | 305 | ok | SCREEN/PORT DESC: | | PrA # 5 |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: NA COMPOSITE TIME INTERVAL: NA WATER FLOWING: YES / NO / NA

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90°

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | | NA |
| ~~1~~ | | ~~TO15~~ | ~~6 LITER SUMMA~~ CANISTER | ~~None~~ KO 3/9/11 | Not collected | |

SAMPLE DESC:
column # 21 initial wt 610.4Bg Final wt = ~~602.17 gm~~ 627.15gm
silica wt 150.29g $ vapor wt = 16.67gms

SAMPLE COMMENTS:
weather data @

LOCATION DESC:
NA

FIELD SCREENING/MEASUREMENT RESULTS:
atm $O_2$ 20.9% $CO_2$ 440ppm
sub atm $O_2$ 20.9% $CO_2$ 3650 ppm

COLLECTED BY (PRINT) R. Snoth & MGiorgi REVIEWED BY (PRINT) MGiorgi

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) MGiorgi | 3/10/11 | (Printed Name) Melissa Martin | 3/10/11 |
| (Signature) MGiorgi | 15:40 | (Signature) | 15:40 |
| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
| (Printed Name) | | (Printed Name) | |
| (Signature) | | (Signature) | |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3396 **EVENT NAME:** Pore Gas Sampling - MDA T - CU 21-016(a)-99

**SAMPLE ID:** MD21-11-5609 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 3/10/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 14:20 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | 21-24524W | ok | FIELD QC TYPE: | FD | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | 0 | 300.0 ft bgs | SAMPLE USAGE: | QC | |
| BOTTOM DEPTH: | 0 | 305.0 ft bgs | SCREEN/PORT DESC: | port 5FD | |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: NA COMPOSITE TIME INTERVAL: NA WATER FLOWING: YES / NO / NA

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90°

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | | NA |
| 1 | | TO15 | 6 LITER SUMMA CANISTER | None | eo 3/9/11 | Not collected |

SAMPLE DESC: QC Sample of MD21-11-5604

column # 22 initial wt = 583.26g Final wt = ~~697.15~~ 602.17g (mvo 3/10/11)

silica wt = 149.30g vapor wt = ~~43.89~~ 18.91gm (mvo 3/18/11)

SAMPLE COMMENTS:

weather data

LOCATION DESC:

NA

FIELD SCREENING/MEASUREMENT RESULTS: eo 3/9/11

atm $O_2$ = 20.9% $CO_2$ 440 ppm

subatm $O_2$ = 20.9% $CO_2$ 3650 ppm

COLLECTED BY (PRINT) Ronald M Georgi REVIEWED BY (PRINT) M V Georgi

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) M V Georgi | 3/10/11 | (Printed Name) Melissa Martin | 3/10/11 |
| (Signature) MVG | 15:40 | (Signature) | 15:40 |
| **RELINQUISHED BY** | **Date/Time** | **RECEIVED BY** | **Date/Time** |
| (Printed Name) | | (Printed Name) | |
| (Signature) | | (Signature) | |

# DATA VALIDATION COVER SHEET

**5119-1**

**Data Validation Cover Sheet**

Records Use only

Los Alamos NATIONAL LABORATORY EST. 1943

**Section I.**

REQUEST NUMBER: 11-1611 VALIDATION DATE: 05/17/2011 LAB CODE: ARS

CONTRACT LABORATORY NAME: American Radiation Services

VALIDATOR: Janis Kardatzke ORGANIZATION: Analytical Quality Associates, Inc.

ANALYTICAL SUITE (CHECK ALL THAT APPLY):

- ☐ **TPH-GRO**
- ☐ **TPH-DRO**
- ☐ **GENERAL CHEMISTRY**
- ☐ **HIGH EXPLOSIVES**
- ☐ **METALS**
- ☒ **RADIOCHEMISTRY**
- ☐ **DIOXIN FURANS**
- ☐ **PCB CONGENERS**
- ☐ **LCMSMS HIGH EXPLOSIVES**
- ☐ **LCMSMS PERCHLORATES**
- ☐ **ORGANOCHLORINE PESTICIDES/POLYCHLORINATED BIPHENYLS**
- ☐ **OTHER (DESCRIBE):** tritium only

**Section II. Completeness Check**

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

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

1. An MS was not analyzed for tritium. However, an LCS was analyzed and met acceptance criteria, thus, no sample data were qualified.
2. A sample duplicate was not analyzed for tritium. However, an LCSD was analyzed and met the acceptance criteria, thus, no sample data were qualified.
3. It should be noted that the LCS/LCSD RER was hand-calculated using the 2-sigma TPU values and was found to be within specifications. No sample data were qualified.

Reviewed by: Mary Donivan Level: I Date: 05/17/11

VALIDATOR'S SIGNATURE: DATE: 05/17/2011

# RAD ANALYTICAL DATA VALIDATION CHECKLIST

**5119-2**

**Rad Analytical Data Validation Checklist**

Records Use only

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

| RAD ANALYTICAL DATA VALIDATION CHECKLIST | |
|---|---|
| **5119-2**<br>**Rad Analytical Data Validation Checklist** | Records Use only |

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

| RAD ANALYTICAL DATA VALIDATION CHECKLIST | |
|---|---|
| **5119-2**<br>**Rad Analytical Data Validation Checklist** | Records Use only |

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

ARS INTERNATIONAL

2609 North River Road, Port Allen, Louisiana 70767

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

| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00527 | **Request or PO Number:** | 11-1611 |
| **Client Sample ID:** | MD21-11-5604 | **ARS Sample ID:** | ARS1-11-00527-001 |
| **Sample Collection Date:** | 03/10/11 | **Date Received:** | 03/15/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 05/06/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 32710.295 | 1724.530 | 221.448 | 108.850 | | pCi/L | ARS-054/EPA 906.0 | 05/05/11 13:26 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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

LELAP Certificate# 01949 NELAP Certificate # E87558



JKK
05/17/11

ARS INTERNATIONAL

2609 North River Road, Port Allen, Louisiana 70767

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

| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00527 | **Request or PO Number:** | 11-1611 |
| **Client Sample ID:** | MD21-11-5609 | **ARS Sample ID:** | ARS1-11-00527-002 |
| **Sample Collection Date:** | 03/10/11 | **Date Received:** | 03/15/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 05/06/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 38195.903 | 2011.292 | 223.616 | 109.916 | | pCi/L | ARS-054/EPA 906.0 | 05/05/11 16:36 | BS | NA |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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

LELAP Certificate# 01949 NELAP Certificate # E87558



JKK
05/17/11

Monday, March 14, 2011

**LAB CHAIN OF CUSTODY DOCUMENT NUMBER: 11-1611C**

**REQUEST NUMBER: 11-1611**

# LOS ALAMOS
**NATIONAL LABORATORY**

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

TURNAROUND/REPORT DUE: 4/13/2011
TURNAROUND REQ'D: 30

LAB REQUEST COMMENTS:

| SAMPLE ID | CTNR | CTNR DESC | ORDER | PRESERV | MATRIX |
|---|---|---|---|---|---|
| MD21-11-5604 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-5609 | 1 | SILICA GEL TUBE | H3 | None | GAS |

| Relinquished By: | Date | Time | Received By: | Date | Time |
|---|---|---|---|---|---|
| Signature | | | Signature | | |
| [illegible] | 3/14/11 | 1400 | [illegible] | 3-15-11 | 11:03 |
| Signature | | | Signature | | |
| Signature | | | Signature | | |

| Received for DISPOSAL By: | Date | Time | Remarks: |
|---|---|---|---|
| Signature | | | |

Monday, March 14, 2011

REQUEST NUMBER: 11-1611



# LOS ALAMOS
## NATIONAL LABORATORY

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

These Samples are on:
LANL Request Number:11-1611
Per Agreement Number:63641-001-10
Project Cost Code: MR8R032NFM00

Please analyse the enclosed samples according to the schedule indicated:

**SHIP DATE: 3/14/2011**
**TURNAROUND/REPORT DUE: 4/13/2011**
**TURNAROUND REQ'D: 30 Days**

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

LANL ER SMO CONTACT:
Signature:

| PRIORITY | METHOD CODE | CNTNR | SAMPLE ID | SAMPLE MATRIX | DATE SAMPLED | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| | EPA:906.0 | 1 | MD21-11-5604 | GAS | 3/10/2011 | |
| | | 1 | MD21-11-5609 | GAS | 3/10/2011 | |

**Final Page of REQUEST NUMBER 11-1611**

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

# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Request Number: 11-1611

2609 North River Road • Port Allen, Louisiana 70767
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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory Request Number: 11-1611

# Original COC

Monday, March 14, 2011

REQUEST NUMBER: 11-1611



# LOS ALAMOS
## NATIONAL LABORATORY

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

These Samples are on:
LANL Request Number:11-1611
Per Agreement Number:63641-001-10
Project Cost Code: MR8R032NFM00

Please analyse the enclosed samples according to the schedule indicated:

**SHIP DATE: 3/14/2011**
**TURNAROUND/REPORT DUE: 4/13/2011**
**TURNAROUND REQ'D: 30 Days**

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

LANL ER SMO CONTACT:
Signature:

| PRIORITY | METHOD CODE | CNTNR | SAMPLE ID | SAMPLE MATRIX | DATE SAMPLED | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| | EPA 906.0 | 1 | MD21-11-5604 | GAS | 3/10/2011 | |
| | | 1 | MD21-11-5609 | GAS | 3/10/2011 | |

**Final Page of REQUEST NUMBER 11-1611**

Monday, March 14, 2011

**LAB CHAIN OF CUSTODY DOCUMENT NUMBER: 11-1611C**

**REQUEST NUMBER: 11-1611**

# LOS ALAMOS
**NATIONAL LABORATORY**

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

TURNAROUND/REPORT DUE: 4/13/2011
TURNAROUND REQ'D: 30

LAB REQUEST COMMENTS:

| SAMPLE ID | CTNR | CTNR DESC | ORDER | PRESERV | MATRIX |
|---|---|---|---|---|---|
| MD21-11-5604 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-5609 | 1 | SILICA GEL TUBE | H3 | None | GAS |

| Relinquished By: | Date | Time | Received By: | Date | Time |
|---|---|---|---|---|---|
| Signature | | | Signature | | |
| [illegible] | 3/14/11 | 1400 | [illegible] | 3-15-11 | 11:03 |
| Signature | | | Signature | | |
| Signature | | | Signature | | |

| Received for DISPOSAL By: | Date | Time | Remarks: |
|---|---|---|---|
| Signature | | | |

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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory Request Number: 11-1611

# Case Narrative

ARS INTERNATIONAL

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May 6, 2011

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

Request Number: **11-1611**
LANL Sample ID: **MD21-11-5604; MD21-11-5609.**

Dear Mr. Greene;

On March 15, 2011, ARS International received two (2) Silica Gel samples to be analyzed for Tritium.

The samples were received in good condition. They were processed and counted using the appropriate counting equipment and QA/QC for this type of analysis. Results of the analysis and QA/QC are attached in the data package.

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

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

Sincerely,

Virgene Mulligan
Laboratory Management
**ARS International**

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# COVER PAGE

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

| Request Number | LANL PROJECT SAMPLE ID NUMBER | American Radiation Services SAMPLE ID NUMBER(S) |
|---|---|---|
| 11-1611 | MD21-11-5604 | ARS1-11-00527-001 |
| 11-1611 | MD21-11-5609 | ARS1-11-00527-002 |

**ANALYTICAL METHODS**
Tritium analyses were performed using **EPA 906.0.**

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

**American Radiation Services Project Manager/Laboratory Director's Comments:**
*"I certify that this sample data package is in compliance with SOW requirements, both technically and for completeness, other than the conditions detailed above. Release of the data contained in this sample data package and the computer-readable EDD, as applicable, submitted on diskette or by modem, has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature."*

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

| Signature | Title | Date |
|---|---|---|
| Eugene Mulligan | Laboratory Management, ARS International | 5-6-11 |

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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Tritium by Low Level Liquid Scintillation Counting

ARS INTERNATIONAL

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00527 | **Request or PO Number:** | 11-1611 |
| **Client Sample ID:** | MD21-11-5604 | **ARS Sample ID:** | ARS1-11-00527-001 |
| **Sample Collection Date:** | 03/10/11 | **Date Received:** | 03/15/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 05/06/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 32710.295 | 1724.530 | 221.448 | 108.850 | | pCi/L | ARS-054/EPA 906.0 | 05/05/11 13:26 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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

LELAP Certificate# 01949 NELAP Certificate # E87558

ARS INTERNATIONAL

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00527 | **Request or PO Number:** | 11-1611 |
| **Client Sample ID:** | MD21-11-5609 | **ARS Sample ID:** | ARS1-11-00527-002 |
| **Sample Collection Date:** | 03/10/11 | **Date Received:** | 03/15/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 05/06/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 38195.903 | 2011.292 | 223.616 | 109.916 | | pCi/L | ARS-054/EPA 906.0 | 05/05/11 16:36 | BS | NA |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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

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ARS INTERNATIONAL

# QC Results per Analytical Batch

| | |
|---|---|
| Analytical Batch | ARS1-B11-01640 |
| SDG | ARS1-11-00527 |
| Analysis | Tritium (Aqueous) |
| Analysis Test Method | ARS-054/Liquid Scintillation Counter |
| Analysis Code | LSC-A-001 |
| Report Units | pCi/L |

## Acceptable QC Performance Ranges

| QC Sample Type | Performance Items and Ranges | | |
|---|---|---|---|
| Laboratory Control Sample | Recovery (%): | > 80 | < 120 |
| Matrix Spike | Recovery (%): | > 75 | < 125 |
| Duplicate | Replicate Error Ratio (RER): | | < 1 |
| | Duplicate Error Ratio (DER): | | < 3 |
| | Relative Percent Difference (RPD %): | | ≤ 25 |

## Laboratory Control Sample

Analysis Date: 05/02/11 19:14 — Analysis Technician: BSTEFFENS

| Analysis Batch Sample ID | QC Type | Analyte | Results | CSU (1s) | Expected Value | LCS Rec (%) | MDC |
|---|---|---|---|---|---|---|---|
| ARS1-B11-01640-01 | LCS | H-3 | 2460 | 160 | 2449 | 100 | 220 |

## Duplicate RER/DER/RPD

Analysis Date: 05/02/11 22:23 — Analysis Technician: BSTEFFENS

| Analyte | Result LCS | CSU LCS (1s) | Results LCSD | CSU LCSD (1s) | RER | DER | RPD |
|---|---|---|---|---|---|---|---|
| H-3 | 2460 | 155 | 2440 | 155 | 0.03 | 0.09 | 0.8 |

## Method Blank

Analysis Date: 05/03/11 01:31 — Analysis Technician: BSTEFFENS

| Analysis Batch Sample ID | QC Type | Analyte | Results | CSU (1s) | MDC | Qual |
|---|---|---|---|---|---|---|
| ARS1-B11-01640-03 | MBL | H-3 | -110 | 64 | 220 | U |

Susan Leese

Susan Leese

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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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Tritium by Low Level Liquid Scintillation Counting

# Samples

# LSC Instrument Data Transfer Report

\\PACKARD3170_NEW\Results\ARS\H-3 Normal 3\

| Batch Sample ID | Non-BKG Samples Transferred | Samples Eligible To Save | |
|---|---|---|---|
| ARS1-B11-01640 | 23 | 23 | LSC 2 |

| 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 | 54 | | 1 | BACKGROUND | 05/02/11 16:07 | 6.36 | 422.88 | 35.9200 | 180.00 | ARS1-B11-01640 | | |
| ARS1-B11-01640-01 | 54 | | 2 | B11-01640-01 | 05/02/11 19:13 | 16.38 | 435.49 | 36.4800 | 180.00 | ARS1-B11-01640 | | |
| ARS1-B11-01640-02 | 54 | | 3 | B11-01640-02 | 05/02/11 22:23 | 16.31 | 435.50 | 36.4800 | 180.00 | ARS1-B11-01640 | | |
| ARS1-B11-01640-03 | 54 | | 4 | B11-01640-03 | 05/03/11 01:31 | 5.91 | 437.63 | 36.5700 | 180.00 | ARS1-B11-01640 | | |
| ARS1-B11-01640-04 | 54 | | 5 | B11-01640-04 | 05/03/11 04:39 | 80.21 | 436.54 | 36.5300 | 180.00 | ARS1-B11-01640 | ARS1-11-00491 | 1 |
| ARS1-B11-01640-05 | 54 | | 6 | B11-01640-05 | 05/03/11 07:48 | 40.15 | 439.73 | 36.6700 | 180.00 | ARS1-B11-01640 | ARS1-11-00491 | 1 |
| ARS1-B11-01640-06 | 54 | | 7 | B11-01640-06 | 05/03/11 10:58 | 41.50 | 435.59 | 36.4900 | 180.00 | ARS1-B11-01640 | ARS1-11-00491 | 1 |
| ARS1-B11-01640-07 | 54 | | 6 | B11-01640-07 | 05/03/11 14:07 | 96.14 | 433.67 | 36.4000 | 180.00 | ARS1-B11-01640 | ARS1-11-00491 | 1 |
| ARS1-B11-01640-08 | 54 | | 9 | B11-01640-08 | 05/03/11 17:17 | 28.66 | 431.65 | 36.3100 | 180.00 | ARS1-B11-01640 | ARS1-11-00491 | 1 |
| ARS1-B11-01640-09 | 54 | | 10 | B11-01640-09 | 05/03/11 20:26 | 23.99 | 435.20 | 36.4700 | 180.00 | ARS1-B11-01640 | ARS1-11-00491 | 1 |
| ARS1-B11-01640-10 | 54 | | 11 | B11-01640-10 | 05/03/11 23:36 | 6.77 | 430.55 | 36.2600 | 180.00 | ARS1-B11-01640 | ARS1-11-00491 | 1 |
| ARS1-B11-01640-11 | 54 | | 12 | B11-01640-11 | 05/04/11 02:45 | 7.45 | 427.76 | 36.1400 | 180.00 | ARS1-B11-01640 | ARS1-11-00491 | 1 |
| ARS1-B11-01640-12 | 54 | | 13 | B11-01640-12 | 05/04/11 05:55 | 6.37 | 429.04 | 36.2000 | 180.00 | ARS1-B11-01640 | ARS1-11-00491 | 1 |
| ARS1-B11-01640-13 | 54 | | 14 | B11-01640-13 | 05/04/11 09:04 | 6.20 | 424.17 | 35.9800 | 180.00 | ARS1-B11-01640 | ARS1-11-00622 | 1 |
| ARS1-B11-01640-14 | 54 | | 15 | B11-01640-14 | 05/04/11 12:12 | 6.24 | 423.99 | 35.9700 | 180.00 | ARS1-B11-01640 | ARS1-11-00622 | 1 |
| ARS1-B11-01640-15 | 54 | | 16 | B11-01640-15 | 05/04/11 15:20 | 6.82 | 418.05 | 35.7100 | 180.00 | ARS1-B11-01640 | ARS1-11-00622 | 1 |
| ARS1-B11-01640-16 | 54 | | 17 | B11-01640-16 | 05/04/11 18:29 | 6.57 | 424.88 | 36.0100 | 180.00 | ARS1-B11-01640 | ARS1-11-00622 | 1 |
| ARS1-B11-01640-17 | 54 | | 18 | B11-01640-17 | 05/04/11 21:39 | 6.80 | 434.42 | 36.4300 | 180.00 | ARS1-B11-01640 | ARS1-11-00622 | 1 |
| ARS1-B11-01640-18 | 54 | | 19 | B11-01640-18 | 05/05/11 00:48 | 6.97 | 428.92 | 36.1900 | 180.00 | ARS1-B11-01640 | ARS1-11-00622 | 1 |
| ARS1-B11-01640-19 | 54 | | 20 | B11-01640-19 | 05/05/11 03:58 | 7.28 | 406.85 | 35.0900 | 180.00 | ARS1-B11-01640 | ARS1-11-00526 | 1 |
| ARS1-B11-01640-20 | 54 | | 21 | B11-01640-20 | 05/05/11 07:07 | 8.06 | 416.46 | 35.6400 | 180.00 | ARS1-B11-01640 | ARS1-11-00526 | 1 |
| ARS1-B11-01640-21 | 54 | | 22 | B11-01640-21 | 05/05/11 10:16 | 7.01 | 400.48 | 34.6300 | 180.00 | ARS1-B11-01640 | ARS1-11-00526 | 1 |
| ARS1-B11-01640-22 | 54 | | 23 | B11-01640-22 | 05/05/11 13:26 | 137.77 | 423.60 | 35.9600 | 180.00 | ARS1-B11-01640 | ARS1-11-00527 | 1 |
| ARS1-B11-01640-23 | 54 | | 24 | B11-01640-23 | 05/05/11 16:35 | 158.32 | 419.18 | 35.7600 | 180.00 | ARS1-B11-01640 | ARS1-11-00527 | 1 |

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 16.380000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 6.360000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.364800 |
| Sample Aliquot | 5.037000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 5/2/11 7:14 PM |
| Count Date (t2) | 5/2/11 7:14 PM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| ACT | 2456.337093 | 2456.337093 | OK |
| CD | 87.132309 | 87.132309 | OK |
| TPU | 155.186549 | 155.186549 | OK |
| MDA | 218.090111 | 218.090111 | OK |
| DL | 107.199670 | 107.199670 | OK |
| Net Count Rate | 10.020000 | 10.020000 | OK |
| D t 1 (t2 - t1) | 0.000000 | 0.000000 | OK |
| DF | 1.000000 | 1.000000 | OK |
| Sys Err | 0.052280 | 0.052280 | OK |
| K | 0.004079 | 0.004079 | OK |
| K MDA | 0.734264 | 0.734264 | OK |

| Batch Identifiers and Other Related Information | |
|---|---|
| Batch | ARS1-B11-01640 |
| Batch ID | ARS1-B11-01640-01 |
| Analysis Code | |
| SDG | QC Sample |
| Fraction | N/A QC Sample |
| Run Number | |
| Client | QC Sample |
| Client Profile | |
| Client ID | N/A QC Sample |
| Instr File Name | 71 |
| Instr Detector | P-54-S-2 |
| Instr keV | |
| Version/Date | 1.0 -- 11/18/2005 |

0 **Variables Intact Test** OK

**Reviewed by:** SLK **Date:** 5-6-11

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 16.310000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 6.360000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.364800 |
| Sample Aliquot | 5.027000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 5/2/11 10:23 PM |
| Count Date (t2) | 5/2/11 10:23 PM |
| Activity Units = pCi ··· UCF = | 2.2200 |
| CF | 1.9600 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| ACT | 2444.029206 | 2444.029206 | OK |
| CU | 170.855471 | 170.855471 | OK |
| TPU | 303.165756 | 303.165756 | OK |
| MDA | 218.523949 | 218.523949 | OK |
| DL | 107.412918 | 107.412918 | OK |
| Net Count Rate | 9.950000 | 9.950000 | OK |
| D t 1 (t2 - t1) | 0.000000 | 0.000000 | OK |
| DF | 1.000000 | 1.000000 | OK |
| Sys Err | 0.052280 | 0.052280 | OK |
| K | 0.004071 | 0.004071 | OK |
| K MDA | 0.732806 | 0.732806 | OK |

**Batch Identifiers and Other Related Information**

| | |
|---|---|
| Batch | ARS1-B11-01640 |
| Batch ID | ARS1-B11-01640-02 |
| Analysis Code | |
| SDG | QC Sample |
| Fraction | N/A QC Sample |
| Run Number | |
| Client | QC Sample |
| Client Profile | |
| Client ID | N/A QC Sample |
| Instr File Name | 71 |
| Instr Detector | P-54-S-3 |
| Instr keV | |
| Version/Date | 1.0 -- 11/18/2005 |

0 **Variables Intact Test** OK

**Reviewed by:** SRW **Date:** 5-6-11

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 5.910000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 6.360000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.365700 |
| Sample Aliquot | 5.044000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 5/3/11 1:31 AM |
| Count Date (t2) | 5/3/11 1:31 AM |
| Activity Units = pCi -- UCF = | 2.2200 |
| CF | 1.9600 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| ACT | -109.890336 | -109.890336 | OK |
| CU | 124.965200 | 124.965200 | OK |
| TPU | 125.471490 | 125.471490 | OK |
| MDA | 217.251466 | 217.251466 | OK |
| DL | 106.787444 | 106.787444 | OK |
| Net Count Rate | -0.450000 | -0.450000 | OK |
| D t 1 (t2 - t1) | 0.000000 | 0.000000 | OK |
| DF | 1.000000 | 1.000000 | OK |
| Sys Err | 0.052280 | 0.052280 | OK |
| K | 0.004095 | 0.004095 | OK |
| K MDA | 0.737098 | 0.737098 | OK |

| Batch Identifiers and Other Related Information | |
|---|---|
| Batch | ARS1-B11-01640 |
| Batch ID | ARS1-B11-01640-03 |
| Analysis Code | |
| SDG | QC Sample |
| Fraction | N/A QC Sample |
| Run Number | |
| Client | QC Sample |
| Client Profile | |
| Client ID | N/A QC Sample |
| Instr File Name | 71 |
| Instr Detector | P-54-S-4 |
| Instr keV | |
| Version/Date | 1.0 -- 11/18/2005 |

0 **Variables Intact Test** OK

**Reviewed by:** SGH **Date:** 5-6-11

**American Radiation Services**
**Baton Rouge Laboratory**

# Calculation Verification

**Printed 5/6/2011 8:53 AM**


| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 137.770000 |
| Sample Count Mins | 160.000000 |
| BKG Count Rate | 6.360000 |
| BKG Count Mins | 160.000000 |
| Instrument Efficiency | 0.359600 |
| Sample Aliquot | 5.076000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 3/10/11 12:00 PM |
| Count Date (t2) | 5/5/11 1:26 PM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| ACT | 32710.294728 | 32710.294711 | OK |
| CU | 222.739368 | 222.739368 | OK |
| TPU | 1724.529925 | 1724.529924 | OK |
| MDA | 221.448006 | 221.448004 | OK |
| DL | 108.850204 | 108.850204 | OK |
| Net Count Rate | 131.410000 | 131.410000 | OK |
| D t 1 (t2 - t1) | 56.059722 | 56.059722 | OK |
| DF | 0.991402 | 0.991402 | OK |
| Sys Err | 0.052280 | 0.052280 | OK |
| K | 0.004017 | 0.004017 | OK |
| K MDA | 0.723130 | 0.723130 | OK |

| Batch Identifiers and Other Related Information | |
|---|---|
| Batch | ARS1-B11-01640 |
| Batch ID | ARS1-B11-01640-22 |
| Analysis Code | LSC-A-001 |
| SDG | ARS1-11-00527 |
| Fraction | 001 |
| Run Number | 1 |
| Client | Los Alamos National Laboratory |
| Client Profile | Keith Greene |
| Client ID | MD21-11-5604 |
| Instr File Name | 71 |
| Instr Detector | P-54-S-23 |
| Instr keV | |
| Version/Date | 1.0 -- 11/18/2005 |

0 **Variables Intact Test** **OK**

**Reviewed by:** SCH **Date:** 5-6-11

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 158.320000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 6.360000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.357600 |
| Sample Aliquot | 5.055000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 3/10/11 12:00 PM |
| Count Date (t2) | 5/5/11 4:36 PM |
| Activity Units = pCi -- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| ACT | 38195.902859 | 38195.902838 | OK |
| CU | 240.420597 | 240.420597 | OK |
| TPU | 2011.292111 | 2011.292110 | OK |
| MDA | 223.616180 | 223.616180 | OK |
| DL | 109.915946 | 109.915946 | OK |
| Net Count Rate | 151.960000 | 151.960000 | OK |
| D t 1 (t2 - t1) | 56.191667 | 56.191667 | OK |
| DF | 0.991382 | 0.991382 | OK |
| Sys Err | 0.052280 | 0.052280 | OK |
| K | 0.003978 | 0.003978 | OK |
| K MDA | 0.716119 | 0.716119 | OK |

**Batch Identifiers and Other Related Information**

| | |
|---|---|
| Batch | ARS1-B11-01640 |
| Batch ID | ARS1-B11-01640-23 |
| Analysis Code | LSC-A-001 |
| SDG | ARS1-11-00527 |
| Fraction | 002 |
| Run Number | 1 |
| Client | Los Alamos National Laboratory |
| Client Profile | Keith Greene |
| Client ID | MD21-11-5609 |
| Instr File Name | 71 |
| Instr Detector | P-54-5-24 |
| Instr keV | |
| Version/Date | 1.0 -- 11/18/2005 |

0 **Variables Intact Test** OK

**Reviewed by:** SKL **Date:** 5-6-11

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

# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Tritium by Low Level Liquid Scintillation Counting

# Laboratory Records

# Analysis Batch Report





**Analysis Batch ID** **ARS1-B11-01640**

| Method | ARS-054 | Analysis | LSC-A-001 | Matrix | SI |
|---|---|---|---|---|---|
| Description | Tritium (Aqueous) | | | | |

| ABatch Sample ID | Type | Blind Iso1 | Blind Iso2 | Blind Iso3 |
|---|---|---|---|---|
| ARS1-B11-01640-01 | LCS | B-11644 | | |
| ARS1-B11-01640-02 | LCSD | B-1164S | | |
| ARS1-B11-01640-03 | MBL | | | |
| ARS1-B11-01640-04 | TRG | | | |
| ARS1-B11-01640-05 | TRG | | | |
| ARS1-B11-01640-06 | TRG | | | |
| ARS1-B11-01640-07 | TRG | | | |
| ARS1-B11-01640-08 | TRG | | | |
| ARS1-B11-01640-09 | TRG | | | |
| ARS1-B11-01640-10 | TRG | | | |
| ARS1-B11-01640-11 | TRG | | | |
| ARS1-B11-01640-12 | TRG | | | |
| ARS1-B11-01640-13 | TRG | | | |
| ARS1-B11-01640-14 | TRG | | | |
| ARS1-B11-01640-15 | TRG | | | |
| ARS1-B11-01640-16 | TRG | | | |
| ARS1-B11-01640-17 | TRG | | | |
| ARS1-B11-01640-18 | TRG | | | |
| ARS1-B11-01640-19 | TRG | | | |
| ARS1-B11-01640-20 | TRG | | | |
| ARS1-B11-01640-21 | TRG | | | |
| ARS1-B11-01640-22 | TRG | | | |
| ARS1-B11-01640-23 | TRG | | | |

| SDG | FR | Run | Client ID | Isotope Group | Lab Deadline |
|---|---|---|---|---|---|
| **ARS1-11-00491** | 001 | 1 | MD21-11-5600 | STD | 04/05/11 |
| **ARS1-11-00491** | 002 | 1 | MD21-11-5601 | STD | 04/05/11 |
| **ARS1-11-00491** | 003 | 1 | MD21-11-5602 | STD | 04/05/11 |
| **ARS1-11-00491** | 004 | 1 | MD21-11-5603 | STD | 04/05/11 |
| **ARS1-11-00491** | 005 | 1 | MD21-11-5605 | STD | 04/05/11 |
| **ARS1-11-00491** | 006 | 1 | MD21-11-5606 | STD | 04/05/11 |
| **ARS1-11-00491** | 007 | 1 | MD21-11-5607 | STD | 04/05/11 |
| **ARS1-11-00491** | 008 | 1 | MD21-11-5608 | STD | 04/05/11 |
| **ARS1-11-00491** | 009 | 1 | MD21-11-5610 | STD | 04/05/11 |
| **ARS1-11-00622** | 001 | 1 | MD50-11-5957 | STD | 04/08/11 |
| **ARS1-11-00622** | 002 | 1 | MD50-11-5958 | STD | 04/08/11 |
| **ARS1-11-00622** | 003 | 1 | MD50-11-5959 | STD | 04/08/11 |
| **ARS1-11-00622** | 004 | 1 | MD50-11-5960 | STD | 04/08/11 |
| **ARS1-11-00622** | 005 | 1 | MD50-11-5961 | STD | 04/08/11 |
| **ARS1-11-00622** | 006 | 1 | MD50-11-5962 | STD | 04/08/11 |
| **ARS1-11-00526** | 001 | 1 | MD54-11-3767 | STD | 04/11/11 |
| **ARS1-11-00526** | 002 | 1 | MD54-11-3766 | STD | 04/11/11 |
| **ARS1-11-00526** | 003 | 1 | MD54-11-3768 | STD | 04/11/11 |
| **ARS1-11-00527** | 001 | 1 | MD21-11-5604 | STD | 04/11/11 |
| **ARS1-11-00527** | 002 | 1 | MD21-11-5609 | STD | 04/11/11 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **85817** 11-00491-001-1 **WRAD** | **85818** 11-00491-002-1 **WRAD** | **85819** 11-00491-003-1 **WRAD** | **85820** 11-00491-004-1 **WRAD** | **85821** 11-00491-005-1 **WRAD** | **85822** 11-00491-006-1 **WRAD** | **85823** 11-00491-007-1 **WRAD** | **85824** 11-00491-008-1 **WRAD** | **85825** 11-00491-009-1 **WRAD** |
| **85826** 11-00622-001-1 **WRAD** | **85827** 11-00622-002-1 **WRAD** | **85828** 11-00622-003-1 **WRAD** | **85829** 11-00622-004-1 **WRAD** | **85830** 11-00622-005-1 **WRAD** | **85831** 11-00622-006-1 **WRAD** | **85832** 11-00526-001-1 **WRAD** | **85833** 11-00526-002-1 **WRAD** | **85834** 11-00526-003-1 **WRAD** |
| **85835** 11-00527-001-1 **WRAD** | **85836** 11-00527-002-1 **WRAD** | | | | | | | |

# LCS Report
## Analytical Batch: ARS1-B11-01640



64

| BlindID | ABatch | ABatchSampleID | BlindGroup | StdID | Isotope | ExpectedAddition | ExpectedValue | EmptyWt | GrossWt | NetWt | UserID | ModDate | ExpectedValue_CT | MidPointCountDate | KnownValue |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B-11644 | ARS1-B11-01640 | ARS1-B11-01640-01 | B-H3 | S-0247 | H-3 | 5 | 2.454533971 | 0 | 1 | 1 | BSTEFFENS | 4/18/2011 | 2.449246341 | 5/2/2011 | 2.449246341 |
| B-11645 | ARS1-B11-01640 | ARS1-B11-01640-02 | B-H3 | S-0247 | H-3 | 5 | 2.454533971 | 0 | 1 | 1 | BSTEFFENS | 4/18/2011 | 2.449246341 | 5/2/2011 | 2.449246341 |

# ARS-054





| ID_31001_054 | ABatch | ABatchSampleID | ClientID | Aliquot1 | AliquotUnits1 | IC_ID1 | Aliquot2 | AliquotUnits2 | IC_ID2 | UserID | ModDate |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8443 | ARS1-B11-01640 | ARS1-B11-01640-01 | | | | | 5.037 | g | | BSTEFFENS | 05/03/2011 10:19:34 |
| 8444 | ARS1-B11-01640 | ARS1-B11-01640-02 | | | | | 5.027 | g | | BSTEFFENS | 05/03/2011 10:19:34 |
| 8445 | ARS1-B11-01640 | ARS1-B11-01640-03 | | | | | 5.044 | g | | BSTEFFENS | 05/03/2011 10:19:34 |
| 8446 | ARS1-B11-01640 | ARS1-B11-01640-04 | MD21-11-5600 | | | | 5.015 | g | 85817 | BSTEFFENS | 05/03/2011 10:19:34 |
| 8447 | ARS1-B11-01640 | ARS1-B11-01640-05 | MD21-11-5601 | | | | 5.03 | g | 85818 | BSTEFFENS | 05/03/2011 10:19:34 |
| 8448 | ARS1-B11-01640 | ARS1-B11-01640-06 | MD21-11-5602 | | | | 5.037 | g | 85819 | BSTEFFENS | 05/03/2011 10:19:34 |
| 8449 | ARS1-B11-01640 | ARS1-B11-01640-07 | MD21-11-5603 | | | | 5.04 | g | 85820 | BSTEFFENS | 05/03/2011 10:19:34 |
| 8450 | ARS1-B11-01640 | ARS1-B11-01640-08 | MD21-11-5605 | | | | 5.05 | g | 85821 | BSTEFFENS | 05/03/2011 10:19:34 |
| 8451 | ARS1-B11-01640 | ARS1-B11-01640-09 | MD21-11-5606 | | | | 5.06 | g | 85822 | BSTEFFENS | 05/03/2011 10:19:35 |
| 8452 | ARS1-B11-01640 | ARS1-B11-01640-10 | MD21-11-5607 | | | | 5.081 | g | 85823 | BSTEFFENS | 05/03/2011 10:19:35 |
| 8453 | ARS1-B11-01640 | ARS1-B11-01640-11 | MD21-11-5608 | | | | 5.094 | g | 85824 | BSTEFFENS | 05/03/2011 10:19:35 |
| 8454 | ARS1-B11-01640 | ARS1-B11-01640-12 | MD21-11-5610 | | | | 5.063 | g | 85825 | BSTEFFENS | 05/03/2011 10:19:35 |
| 8455 | ARS1-B11-01640 | ARS1-B11-01640-13 | MD50-11-5957 | | | | 5.03 | g | 85826 | BSTEFFENS | 05/03/2011 10:19:35 |
| 8456 | ARS1-B11-01640 | ARS1-B11-01640-14 | MD50-11-5958 | | | | 5.075 | g | 85827 | BSTEFFENS | 05/03/2011 10:19:35 |
| 8457 | ARS1-B11-01640 | ARS1-B11-01640-15 | MD50-11-5959 | | | | 5.054 | g | 85828 | BSTEFFENS | 05/03/2011 10:19:35 |
| 8458 | ARS1-B11-01640 | ARS1-B11-01640-16 | MD50-11-5960 | | | | 5.051 | g | 85829 | BSTEFFENS | 05/03/2011 10:19:35 |
| 8459 | ARS1-B11-01640 | ARS1-B11-01640-17 | MD50-11-5961 | | | | 5.069 | g | 85830 | BSTEFFENS | 05/03/2011 10:19:35 |
| 8460 | ARS1-B11-01640 | ARS1-B11-01640-18 | MD50-11-5962 | | | | 5.05 | g | 85831 | BSTEFFENS | 05/03/2011 10:19:35 |
| 8461 | ARS1-B11-01640 | ARS1-B11-01640-19 | MD54-11-3767 | | | | 5.033 | g | 85832 | BSTEFFENS | 05/03/2011 10:19:35 |
| 8462 | ARS1-B11-01640 | ARS1-B11-01640-20 | MD54-11-3766 | | | | 5.028 | g | 85833 | BSTEFFENS | 05/03/2011 10:19:35 |
| 8463 | ARS1-B11-01640 | ARS1-B11-01640-21 | MD54-11-3768 | | | | 5.007 | g | 85834 | BSTEFFENS | 05/03/2011 10:19:35 |
| 8464 | ARS1-B11-01640 | ARS1-B11-01640-22 | MD21-11-5604 | | | | 5.076 | g | 85835 | BSTEFFENS | 05/03/2011 10:19:36 |
| 8465 | ARS1-B11-01640 | ARS1-B11-01640-23 | MD21-11-5609 | | | | 5.055 | g | 85836 | BSTEFFENS | 05/03/2011 10:19:36 |

# Batch Result Verification Report





| ABatchSampleID | SDG | Fraction | ClientID | Run | Isotope | ACT | TPU | TPU1s | TPU2s | MDA | DL | CU | CU1s | CU2s | ActivityReportUnits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARS1-B11-01640-01 | | | | 1 | H-3 | 2456.337093 | 155.1865492 | 155.1865492 | 304.1656363 | 218.0901114 | 107.1996705 | 87.13230894 | 87.13230894 | 170.7793255 | pCi |
| ARS1-B11-01640-02 | | | | 1 | H-3 | 2444.029206 | 303.1657561 | 154.6764062 | 303.1657561 | 218.5239489 | 107.4129183 | 170.8554708 | 87.17115858 | 170.8554708 | pCi |
| ARS1-B11-01640-03 | | | | 1 | H-3 | -109.890336 | 125.47149 | 64.01606635 | 125.47149 | 217.2514664 | 106.7874443 | 124.9651997 | 63.75775494 | 124.9651997 | pCi |
| ARS1-B11-01640-04 | ARS1-11-00491 | 001 | MD21-11-5600 | 1 | H-3 | 18312.00283 | 972.6679752 | 972.6679752 | 1906.429231 | 220.5977489 | 108.4322707 | 171.962125 | 171.962125 | 337.0457651 | pCi |
| ARS1-B11-01640-05 | ARS1-11-00491 | 002 | MD21-11-5601 | 1 | H-3 | 8321.93042 | 452.7218584 | 452.7218584 | 887.3348424 | 219.1046617 | 107.698361 | 125.1909127 | 125.1909127 | 245.3741889 | pCi |
| ARS1-B11-01640-06 | ARS1-11-00491 | 003 | MD21-11-5602 | 1 | H-3 | 8685.193665 | 471.6064159 | 471.6064159 | 924.3485752 | 219.8839242 | 108.0813984 | 127.4464798 | 127.4464798 | 249.7951004 | pCi |
| ARS1-B11-01640-07 | ARS1-11-00491 | 004 | MD21-11-5603 | 1 | H-3 | 22232.07874 | 1177.212322 | 1177.212322 | 2307.336151 | 220.3008638 | 108.2863403 | 186.8642194 | 186.8642194 | 366.25387 | pCi |
| ARS1-B11-01640-08 | ARS1-11-00491 | 005 | MD21-11-5605 | 1 | H-3 | 5524.950703 | 308.8245062 | 308.8245062 | 605.2960322 | 220.4140495 | 108.3419754 | 109.2811767 | 109.2811767 | 214.1911063 | pCi |
| ARS1-B11-01640-09 | ARS1-11-00491 | 006 | MD21-11-5606 | 1 | H-3 | 4340.262838 | 248.407397 | 248.407397 | 486.878498 | 219.0178177 | 107.6556738 | 101.089678 | 101.089678 | 198.1357689 | pCi |
| ARS1-B11-01640-10 | ARS1-11-00491 | 007 | MD21-11-5607 | 1 | H-3 | 101.1033721 | 66.809977 | 66.809977 | 130.9475549 | 219.380243 | 107.8338198 | 66.60056208 | 66.60056208 | 130.5371017 | pCi |
| ARS1-B11-01640-11 | ARS1-11-00491 | 008 | MD21-11-5608 | 1 | H-3 | 268.9967099 | 69.78830671 | 69.78830671 | 136.7850812 | 219.5513943 | 107.9179472 | 68.35669504 | 68.35669504 | 133.9791223 | pCi |
| ARS1-B11-01640-12 | ARS1-11-00491 | 009 | MD21-11-5610 | 1 | H-3 | 2.478905026 | 65.92326012 | 65.92326012 | 129.2095898 | 220.5340318 | 108.4009513 | 65.92313274 | 65.92313274 | 129.2093402 | pCi |
| ARS1-B11-01640-13 | ARS1-11-00622 | 001 | MD50-11-5957 | 1 | H-3 | -40.08725551 | 66.21593903 | 66.21593903 | 129.7832405 | 222.8958953 | 109.5618979 | 66.18276521 | 66.18276521 | 129.7182198 | pCi |
| ARS1-B11-01640-14 | ARS1-11-00622 | 002 | MD50-11-5958 | 1 | H-3 | -29.80773851 | 65.738359 | 65.738359 | 128.8471836 | 220.9853639 | 108.6227984 | 65.71988603 | 65.71988603 | 128.8109766 | pCi |
| ARS1-B11-01640-15 | ARS1-11-00622 | 003 | MD50-11-5959 | 1 | H-3 | 115.5754778 | 68.25550695 | 68.25550695 | 133.7807936 | 223.5237089 | 109.8704925 | 67.98753859 | 67.98753859 | 133.2555756 | pCi |
| ARS1-B11-01640-16 | ARS1-11-00622 | 004 | MD50-11-5960 | 1 | H-3 | 52.3552919 | 66.87570253 | 66.87570253 | 131.076377 | 221.7976906 | 109.0220881 | 66.81966599 | 66.81966599 | 130.9665453 | pCi |
| ARS1-B11-01640-17 | ARS1-11-00622 | 005 | MD50-11-5961 | 1 | H-3 | 108.0492545 | 66.6387333 | 66.6387333 | 130.6119173 | 218.4664883 | 107.3846742 | 66.3988856 | 66.3988856 | 130.1418158 | pCi |
| ARS1-B11-01640-18 | ARS1-11-00622 | 006 | MD50-11-5962 | 1 | H-3 | 151.3593526 | 67.9860895 | 67.9860895 | 133.2527354 | 220.7471757 | 108.5057197 | 67.5240136 | 67.5240136 | 132.3470667 | pCi |
| ARS1-B11-01640-19 | ARS1-11-00526 | 001 | MD54-11-3767 | 1 | H-3 | 236.672871 | 71.88884579 | 71.88884579 | 140.9021377 | 228.8634188 | 112.4951651 | 70.81603134 | 70.81603134 | 138.7994214 | pCi |
| ARS1-B11-01640-20 | ARS1-11-00526 | 002 | MD54-11-3766 | 1 | H-3 | 431.0182784 | 75.21642731 | 75.21642731 | 147.4241975 | 225.5602129 | 110.8715124 | 71.76177035 | 71.76177035 | 140.6530699 | pCi |
| ARS1-B11-01640-21 | ARS1-11-00526 | 003 | MD54-11-3768 | 1 | H-3 | 170.3224249 | 71.96773679 | 71.96773679 | 141.0567641 | 233.1171388 | 114.5860319 | 71.41475094 | 71.41475094 | 139.9729118 | pCi |
| ARS1-B11-01640-22 | ARS1-11-00527 | 001 | MD21-11-5604 | 1 | H-3 | 32710.29471 | 1724.529924 | 1724.529924 | 3380.078652 | 221.4480044 | 108.850204 | 222.7393677 | 222.7393677 | 436.5691607 | pCi |
| ARS1-B11-01640-23 | ARS1-11-00527 | 002 | MD21-11-5609 | 1 | H-3 | 38195.90284 | 2011.29211 | 2011.29211 | 3942.132535 | 223.6161801 | 109.9159456 | 240.4205972 | 240.4205972 | 471.2243706 | pCi |

# Batch Result Verification Report





| ABatchSampleID | SDG | Fraction | AliquotReportUnits | ChemRecovery | TracerRecovery | SampleCounts | SampleCountMins | BKG_Counts | BKG_CountMins | EFF | ALIQ | SampleCollDate | MidPointCountDate | BP_DL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARS1-B11-01640-01 | | | L | | | 0.091 | 180 | 0.035333333 | 180 | 0.3648 | 5.037 | 5/6/2011 | 5/2/2011 | |
| ARS1-B11-01640-02 | | | L | | | 0.090611111 | 180 | 0.035333333 | 180 | 0.3648 | 5.027 | 5/6/2011 | 5/2/2011 | |
| ARS1-B11-01640-03 | | | L | | | 0.032833333 | 180 | 0.035333333 | 180 | 0.3657 | 5.044 | 5/6/2011 | 5/3/2011 | |
| ARS1-B11-01640-04 | ARS1-11-00491 | 001 | L | | | 0.445611111 | 180 | 0.035333333 | 180 | 0.3653 | 5.015 | 3/9/2011 | 5/3/2011 | |
| ARS1-B11-01640-05 | ARS1-11-00491 | 002 | L | | | 0.223055556 | 180 | 0.035333333 | 180 | 0.3667 | 5.03 | 3/9/2011 | 5/3/2011 | |
| ARS1-B11-01640-06 | ARS1-11-00491 | 003 | L | | | 0.230555556 | 180 | 0.035333333 | 180 | 0.3649 | 5.037 | 3/9/2011 | 5/3/2011 | |
| ARS1-B11-01640-07 | ARS1-11-00491 | 004 | L | | | 0.534111111 | 180 | 0.035333333 | 180 | 0.364 | 5.04 | 3/9/2011 | 5/3/2011 | |
| ARS1-B11-01640-08 | ARS1-11-00491 | 005 | L | | | 0.159222222 | 180 | 0.035333333 | 180 | 0.3631 | 5.05 | 3/9/2011 | 5/3/2011 | |
| ARS1-B11-01640-09 | ARS1-11-00491 | 006 | L | | | 0.133277778 | 180 | 0.035333333 | 180 | 0.3647 | 5.06 | 3/9/2011 | 5/3/2011 | |
| ARS1-B11-01640-10 | ARS1-11-00491 | 007 | L | | | 0.037611111 | 180 | 0.035333333 | 180 | 0.3626 | 5.081 | 3/9/2011 | 5/3/2011 | |
| ARS1-B11-01640-11 | ARS1-11-00491 | 008 | L | | | 0.041388889 | 180 | 0.035333333 | 180 | 0.3614 | 5.094 | 3/9/2011 | 5/4/2011 | |
| ARS1-B11-01640-12 | ARS1-11-00491 | 009 | L | | | 0.035388889 | 180 | 0.035333333 | 180 | 0.362 | 5.063 | 3/9/2011 | 5/4/2011 | |
| ARS1-B11-01640-13 | ARS1-11-00622 | 001 | L | | | 0.034444444 | 180 | 0.035333333 | 180 | 0.3598 | 5.03 | 3/22/2011 | 5/4/2011 | |
| ARS1-B11-01640-14 | ARS1-11-00622 | 002 | L | | | 0.034666667 | 180 | 0.035333333 | 180 | 0.3597 | 5.075 | 3/22/2011 | 5/4/2011 | |
| ARS1-B11-01640-15 | ARS1-11-00622 | 003 | L | | | 0.037888889 | 180 | 0.035333333 | 180 | 0.3571 | 5.054 | 3/22/2011 | 5/4/2011 | |
| ARS1-B11-01640-16 | ARS1-11-00622 | 004 | L | | | 0.0365 | 180 | 0.035333333 | 180 | 0.3601 | 5.051 | 3/22/2011 | 5/4/2011 | |
| ARS1-B11-01640-17 | ARS1-11-00622 | 005 | L | | | 0.037777778 | 180 | 0.035333333 | 180 | 0.3643 | 5.069 | 3/22/2011 | 5/4/2011 | |
| ARS1-B11-01640-18 | ARS1-11-00622 | 006 | L | | | 0.038722222 | 180 | 0.035333333 | 180 | 0.3619 | 5.05 | 3/22/2011 | 5/5/2011 | |
| ARS1-B11-01640-19 | ARS1-11-00526 | 001 | L | | | 0.040444444 | 180 | 0.035333333 | 180 | 0.3509 | 5.033 | 3/10/2011 | 5/5/2011 | |
| ARS1-B11-01640-20 | ARS1-11-00526 | 002 | L | | | 0.044777778 | 180 | 0.035333333 | 180 | 0.3564 | 5.028 | 3/10/2011 | 5/5/2011 | |
| ARS1-B11-01640-21 | ARS1-11-00526 | 003 | L | | | 0.038944444 | 180 | 0.035333333 | 180 | 0.3463 | 5.007 | 3/10/2011 | 5/5/2011 | |
| ARS1-B11-01640-22 | ARS1-11-00527 | 001 | L | | | 0.765388889 | 180 | 0.035333333 | 180 | 0.3596 | 5.076 | 3/10/2011 | 5/5/2011 | |
| ARS1-B11-01640-23 | ARS1-11-00527 | 002 | L | | | 0.879555556 | 180 | 0.035333333 | 180 | 0.3576 | 5.055 | 3/10/2011 | 5/5/2011 | |

# Batch Result Verification Report





| ABatchSampleID | SDG | Fraction | BP_MDA | Sb_Val | UCF | CF | GrossCountRate | BKGCountRate | NetCountRate | PlatingRecovery | InstFileName | DetectorID | InstrumentkeV | NuclideAbd | TracerMeasACT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARS1-B11-01640-01 | | | | | 2.22 | 1 | 16.38 | 6.36 | 10.02 | | 71 | P-54-S-2 | | | |
| ARS1-B11-01640-02 | | | | | 2.22 | 1.96 | 16.31 | 6.36 | 9.95 | | 71 | P-54-S-3 | | | |
| ARS1-B11-01640-03 | | | | | 2.22 | 1.96 | 5.91 | 6.36 | -0.45 | | 71 | P-54-S-4 | | | |
| ARS1-B11-01640-04 | ARS1-11-00491 | 001 | | | 2.22 | 1 | 80.21 | 6.36 | 73.85 | | 71 | P-54-S-5 | | | |
| ARS1-B11-01640-05 | ARS1-11-00491 | 002 | | | 2.22 | 1 | 40.15 | 6.36 | 33.79 | | 71 | P-54-S-6 | | | |
| ARS1-B11-01640-06 | ARS1-11-00491 | 003 | | | 2.22 | 1 | 41.5 | 6.36 | 35.14 | | 71 | P-54-S-7 | | | |
| ARS1-B11-01640-07 | ARS1-11-00491 | 004 | | | 2.22 | 1 | 96.14 | 6.36 | 89.78 | | 71 | P-54-S-8 | | | |
| ARS1-B11-01640-08 | ARS1-11-00491 | 005 | | | 2.22 | 1 | 28.66 | 6.36 | 22.3 | | 71 | P-54-S-9 | | | |
| ARS1-B11-01640-09 | ARS1-11-00491 | 006 | | | 2.22 | 1 | 23.99 | 6.36 | 17.63 | | 71 | P-54-S-10 | | | |
| ARS1-B11-01640-10 | ARS1-11-00491 | 007 | | | 2.22 | 1 | 6.77 | 6.36 | 0.41 | | 71 | P-54-S-11 | | | |
| ARS1-B11-01640-11 | ARS1-11-00491 | 008 | | | 2.22 | 1 | 7.45 | 6.36 | 1.09 | | 71 | P-54-S-12 | | | |
| ARS1-B11-01640-12 | ARS1-11-00491 | 009 | | | 2.22 | 1 | 6.37 | 6.36 | 0.01 | | 71 | P-54-S-13 | | | |
| ARS1-B11-01640-13 | ARS1-11-00622 | 001 | | | 2.22 | 1 | 6.2 | 6.36 | -0.16 | | 71 | P-54-S-14 | | | |
| ARS1-B11-01640-14 | ARS1-11-00622 | 002 | | | 2.22 | 1 | 6.24 | 6.36 | -0.12 | | 71 | P-54-S-15 | | | |
| ARS1-B11-01640-15 | ARS1-11-00622 | 003 | | | 2.22 | 1 | 6.82 | 6.36 | 0.46 | | 71 | P-54-S-16 | | | |
| ARS1-B11-01640-16 | ARS1-11-00622 | 004 | | | 2.22 | 1 | 6.57 | 6.36 | 0.21 | | 71 | P-54-S-17 | | | |
| ARS1-B11-01640-17 | ARS1-11-00622 | 005 | | | 2.22 | 1 | 6.8 | 6.36 | 0.44 | | 71 | P-54-S-18 | | | |
| ARS1-B11-01640-18 | ARS1-11-00622 | 006 | | | 2.22 | 1 | 6.97 | 6.36 | 0.61 | | 71 | P-54-S-19 | | | |
| ARS1-B11-01640-19 | ARS1-11-00526 | 001 | | | 2.22 | 1 | 7.28 | 6.36 | 0.92 | | 71 | P-54-S-20 | | | |
| ARS1-B11-01640-20 | ARS1-11-00526 | 002 | | | 2.22 | 1 | 8.06 | 6.36 | 1.7 | | 71 | P-54-S-21 | | | |
| ARS1-B11-01640-21 | ARS1-11-00526 | 003 | | | 2.22 | 1 | 7.01 | 6.36 | 0.65 | | 71 | P-54-S-22 | | | |
| ARS1-B11-01640-22 | ARS1-11-00527 | 001 | | | 2.22 | 1 | 137.77 | 6.36 | 131.41 | | 71 | P-54-S-23 | | | |
| ARS1-B11-01640-23 | ARS1-11-00527 | 002 | | | 2.22 | 1 | 158.32 | 6.36 | 151.96 | | 71 | P-54-S-24 | | | |

# Batch Result Verification Report





| ABatchSampleID | SDG | Fraction | TracerKnownACT | TracerIsotope | TracerRefDate | TracerRefACT | TracerKnown | Halflife1 | Halflife2 | Halflife3 | TPUF_1 | TPUF_2 | TPUF_3 | TPUF_4 | TPUF_5 | TPUF_6 | DeltaT1 | DeltaT2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARS1-B11-01640-01 | | | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 0 | |
| ARS1-B11-01640-02 | | | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 0 | |
| ARS1-B11-01640-03 | | | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 0 | |
| ARS1-B11-01640-04 | ARS1-11-00491 | 001 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 54.69375 | |
| ARS1-B11-01640-05 | ARS1-11-00491 | 002 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 54.82569444 | |
| ARS1-B11-01640-06 | ARS1-11-00491 | 003 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 54.95694444 | |
| ARS1-B11-01640-07 | ARS1-11-00491 | 004 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 55.08888889 | |
| ARS1-B11-01640-08 | ARS1-11-00491 | 005 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 55.22013889 | |
| ARS1-B11-01640-09 | ARS1-11-00491 | 006 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 55.35208333 | |
| ARS1-B11-01640-10 | ARS1-11-00491 | 007 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 55.48333333 | |
| ARS1-B11-01640-11 | ARS1-11-00491 | 008 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 55.61458333 | |
| ARS1-B11-01640-12 | ARS1-11-00491 | 009 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 55.74652778 | |
| ARS1-B11-01640-13 | ARS1-11-00622 | 001 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 42.87777778 | |
| ARS1-B11-01640-14 | ARS1-11-00622 | 002 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 43.00902778 | |
| ARS1-B11-01640-15 | ARS1-11-00622 | 003 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 43.13888889 | |
| ARS1-B11-01640-16 | ARS1-11-00622 | 004 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 43.27083333 | |
| ARS1-B11-01640-17 | ARS1-11-00622 | 005 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 43.40208333 | |
| ARS1-B11-01640-18 | ARS1-11-00622 | 006 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 43.53402778 | |
| ARS1-B11-01640-19 | ARS1-11-00526 | 001 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 55.66527778 | |
| ARS1-B11-01640-20 | ARS1-11-00526 | 002 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 55.79652778 | |
| ARS1-B11-01640-21 | ARS1-11-00526 | 003 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 55.92847222 | |
| ARS1-B11-01640-22 | ARS1-11-00527 | 001 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 56.05972222 | |
| ARS1-B11-01640-23 | ARS1-11-00527 | 002 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 56.19166667 | |

# Batch Result Verification Report





| ABatchSampleID | SDG | Fraction | DeltaT3 | DeltaT4 | DeltaT5 | DeltaT6 | DF1 | DF2 | DF3 | IF1 | IF2 | SysErr | K_Val | K_MDA | AnalysisCode | UserID | ModDate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARS1-B11-01640-01 | | | | | | | 1 | | | | | 0.052279718 | 0.004079245 | 0.734264041 | | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-02 | | | | | | | 1 | | | | | 0.052279718 | 0.004071146 | 0.7328063 | | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-03 | | | | | | | 1 | | | | | 0.052279718 | 0.004094992 | 0.737098484 | | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-04 | ARS1-11-00491 | 001 | | | | | 0.991610391 | | | | | 0.052279718 | 0.004032874 | 0.725917319 | LSC-A-001 | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-05 | ARS1-11-00491 | 002 | | | | | 0.991590237 | | | | | 0.052279718 | 0.004060356 | 0.730864078 | LSC-A-001 | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-06 | ARS1-11-00491 | 003 | | | | | 0.991570169 | | | | | 0.052279718 | 0.004045966 | 0.728273916 | LSC-A-001 | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-07 | ARS1-11-00491 | 004 | | | | | 0.991550036 | | | | | 0.052279718 | 0.004038309 | 0.72689559 | LSC-A-001 | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-08 | ARS1-11-00491 | 005 | | | | | 0.991529989 | | | | | 0.052279718 | 0.004036235 | 0.72652232 | LSC-A-001 | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-09 | ARS1-11-00491 | 006 | | | | | 0.991509837 | | | | | 0.052279718 | 0.004061966 | 0.731153877 | LSC-A-001 | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-10 | ARS1-11-00491 | 007 | | | | | 0.991489791 | | | | | 0.052279718 | 0.004055255 | 0.72994598 | LSC-A-001 | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-11 | ARS1-11-00491 | 008 | | | | | 0.991469746 | | | | | 0.052279718 | 0.004052094 | 0.729376951 | LSC-A-001 | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-12 | ARS1-11-00491 | 009 | | | | | 0.991449595 | | | | | 0.052279718 | 0.004034039 | 0.726127052 | LSC-A-001 | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-13 | ARS1-11-00622 | 001 | | | | | 0.993416891 | | | | | 0.052279718 | 0.003991293 | 0.71843282 | LSC-A-001 | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-14 | ARS1-11-00622 | 002 | | | | | 0.993396807 | | | | | 0.052279718 | 0.0040258 | 0.724644038 | LSC-A-001 | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-15 | ARS1-11-00622 | 003 | | | | | 0.993376935 | | | | | 0.052279718 | 0.003980083 | 0.716414949 | LSC-A-001 | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-16 | ARS1-11-00622 | 004 | | | | | 0.993356745 | | | | | 0.052279718 | 0.004011056 | 0.721990054 | LSC-A-001 | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-17 | ARS1-11-00622 | 005 | | | | | 0.993336662 | | | | | 0.052279718 | 0.004072217 | 0.732999041 | LSC-A-001 | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-18 | ARS1-11-00622 | 006 | | | | | 0.993316473 | | | | | 0.052279718 | 0.004030144 | 0.725425936 | LSC-A-001 | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-19 | ARS1-11-00526 | 001 | | | | | 0.991462004 | | | | | 0.052279718 | 0.003887222 | 0.699699967 | LSC-A-001 | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-20 | ARS1-11-00526 | 002 | | | | | 0.991441959 | | | | | 0.052279718 | 0.003944148 | 0.70994669 | LSC-A-001 | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-21 | ARS1-11-00526 | 003 | | | | | 0.991421808 | | | | | 0.052279718 | 0.003816291 | 0.686932446 | LSC-A-001 | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-22 | ARS1-11-00527 | 001 | | | | | 0.991401764 | | | | | 0.052279718 | 0.00401739 | 0.72313014 | LSC-A-001 | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-23 | ARS1-11-00527 | 002 | | | | | 0.991381614 | | | | | 0.052279718 | 0.003978437 | 0.716118693 | LSC-A-001 | BSTEFFENS | 5/6/2011 |

Assay Definition-

Assay Description:
H3 Normal Lvl

Assay Type: DPM (Single)
Report Name: Report1
Output Data Path: C:\Packard\Tricarb\Results\ARS\H-3 Normal 3\20110502_1602
Raw Results Path: C:\Packard\Tricarb\Results\ARS\H-3 Normal 3\20110502_1602\20110502_1602.results
RTF File Name: C:\Packard\Tricarb\Results\ARS\H-3 Normal 3\20110502_1602\H3 Results.rtf
Comma-Delimited File Name: C:\Packard\Tricarb\Results\ARS\H-3 Normal 3\20110502_1602\H3 Results.csv
Assay File Name: C:\Packard\TriCarb\Assays\H-3 Normal 3.lsa

Count Conditions-

Nuclide: H-3 Normal
Quench Indicator: tSIE/AEC
External Std Terminator (sec): 0.5 2s%
Pre-Count Delay (min): 0.00
Quench Set:
Low Energy: UG STD H-3
Count Time (min): 180.00
Count Mode: Normal
Assay Count Cycles: 1 Repeat Sample Count: 1
#Vials/Sample: 1 Calculate % Reference: Off

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

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

Count Corrections-

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

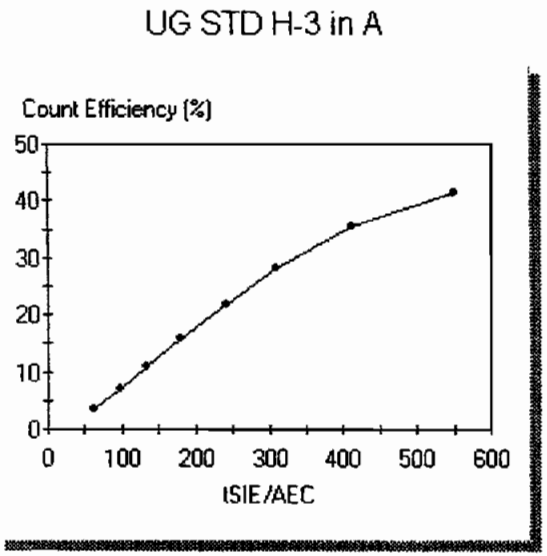
Half Life-

Half Life Correction: Off

| Regions | Half Life | Units | Reference Date | Reference Time |
|---|---|---|---|---|

A
B
C

Cycle 1 Results
Quench Curve Block Data




Date Acquired: 06/30/2010
Date Modified:
UG STD H-3 in A

| tSIE/AEC | Count Efficiency (%) |
|---|---|
| 551.03 | 41.58 |
| 411.38 | 35.42 |
| 310.08 | 28.09 |
| 241.32 | 21.90 |
| 178.11 | 15.75 |
| 132.72 | 11.03 |
| 96.52 | 6.92 |
| 63.58 | 3.36 |

Protocol# 54 - H-3 Normal 3.1sa

User: ARS

| P# | S# | SMPL_ID | CPMA | DPM1 | tSIE | Eff Nucl In A | Count Time | DATE | TIME | MESSAGE |
|---|---|---|---|---|---|---|---|---|---|---|
| 54 | 1 | BACKGROUND | 6.36 | 17.71 | 422.88 | 35.92 | 180.00 | 5/2/2011 | 4:07:03 PM | |
| 54 | 2 | B11-01640-01 | 16.38 | 44.91 | 435.49 | 36.48 | 180.00 | 5/2/2011 | 7:13:59 PM | |
| 54 | 3 | B11-01640-02 | 16.31 | 44.72 | 435.50 | 36.48 | 180.00 | 5/2/2011 | 10:23:14 PM | |
| 54 | 4 | B11-01640-03 | 5.91 | 16.16 | 437.63 | 36.57 | 180.00 | 5/3/2011 | 1:31:18 AM | |
| 54 | 5 | B11-01640-04 | 80.21 | 219.60 | 436.54 | 36.53 | 180.00 | 5/3/2011 | 4:39:00 AM | |
| 54 | 6 | B11-01640-05 | 40.15 | 109.48 | 439.73 | 36.67 | 180.00 | 5/3/2011 | 7:48:32 AM | |
| 54 | 7 | B11-01640-06 | 41.50 | 113.75 | 435.59 | 36.49 | 180.00 | 5/3/2011 | 10:58:02 AM | |
| 54 | 8 | B11-01640-07 | 96.14 | 264.11 | 433.67 | 36.40 | 180.00 | 5/3/2011 | 2:07:33 PM | |
| 54 | 9 | B11-01640-08 | 28.66 | 78.93 | 431.65 | 36.31 | 180.00 | 5/3/2011 | 5:17:04 PM | |
| 54 | 10 | B11-01640-09 | 23.99 | 65.80 | 435.20 | 36.47 | 180.00 | 5/3/2011 | 8:26:32 PM | |
| 54 | 11 | B11-01640-10 | 6.77 | 18.67 | 430.55 | 36.26 | 180.00 | 5/3/2011 | 11:36:00 PM | |
| 54 | 12 | B11-01640-11 | 7.45 | 20.62 | 427.76 | 36.14 | 180.00 | 5/4/2011 | 2:45:27 AM | |
| 54 | 13 | B11-01640-12 | 6.37 | 17.59 | 429.04 | 36.20 | 180.00 | 5/4/2011 | 5:55:02 AM | |
| 54 | 14 | B11-01640-13 | 6.20 | 17.23 | 424.17 | 35.98 | 180.00 | 5/4/2011 | 9:04:28 AM | |
| 54 | 15 | B11-01640-14 | 6.24 | 17.34 | 423.99 | 35.97 | 180.00 | 5/4/2011 | 12:12:40 PM | |
| 54 | 16 | B11-01640-15 | 6.82 | 19.09 | 418.05 | 35.71 | 180.00 | 5/4/2011 | 3:20:13 PM | |
| 54 | 17 | B11-01640-16 | 6.57 | 18.25 | 424.88 | 36.01 | 180.00 | 5/4/2011 | 6:29:40 PM | |
| 54 | 18 | B11-01640-17 | 6.80 | 18.68 | 434.42 | 36.43 | 180.00 | 5/4/2011 | 9:39:08 PM | |
| 54 | 19 | B11-01640-18 | 6.97 | 19.27 | 428.92 | 36.19 | 180.00 | 5/5/2011 | 12:48:36 AM | |
| 54 | 20 | B11-01640-19 | 7.28 | 20.74 | 406.85 | 35.09 | 180.00 | 5/5/2011 | 3:58:02 AM | |
| 54 | 21 | B11-01640-20 | 8.06 | 22.61 | 416.46 | 35.64 | 180.00 | 5/5/2011 | 7:07:29 AM | |
| 54 | 22 | B11-01640-21 | 7.01 | 20.25 | 400.48 | 34.63 | 180.00 | 5/5/2011 | 10:16:58 AM | |
| 54 | 23 | B11-01640-22 | 137.77 | 383.16 | 423.60 | 35.96 | 180.00 | 5/5/2011 | 1:26:27 PM | |
| 54 | 24 | B11-01640-23 | 158.32 | 442.71 | 419.18 | 35.76 | 180.00 | 5/5/2011 | 4:35:56 PM | |

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# Beta Liquid Scintillation Counter Log Book

| Date | Time | ARS Sample I.D. Number | Batch Number | Liquid Scintillation File Number | Technician Initials |
|---|---|---|---|---|---|
| 4-21-11 | 1623 | B11-01513-03 | B11-01513 | 2132 | |
| ↓ | ↓ | B11-01513-04 | ↓ | ↓ | |
| ↓ | ↓ | B11-01513-05 | ↓ | ↓ | |
| ↓ | ↓ | B11-01513-06 | ↓ | ↓ | |
| ↓ | ↓ | B11-01513-07 | ↓ | ↓ | |
| ↓ | ↓ | B11-01513-08 | ↓ | ↓ | |
| ↓ | ↓ | B11-01513-09 | ↓ | ↓ | |
| ↓ | ↓ | B11-01513-10 | ↓ | ↓ | |
| ↓ | ↓ | B11-01513-11 | ↓ | ↓ | |
| ↓ | ↓ | B11-01513-12 | ↓ | ↓ | |
| ↓ | ↓ | B11-01513-13 | ↓ | ↓ | |
| ↓ | ↓ | B11-01513-14 | ↓ | ↓ | |
| ↓ | ↓ | B11-01513-15 | ↓ | ↓ | |
| ↓ | ↓ | B11-01513-16 | ↓ | ↓ | |
| ↓ | ↓ | B11-01513-17 | ↓ | ↓ | |
| ↓ | ↓ | B11-01513-18 | ↓ | ↓ | |
| ↓ | ↓ | B11-01513-19 | ↓ | ↓ | |
| ↓ | ↓ | B11-01513-20 | ↓ | ↓ | |
| 5-2-11 | 1421 | SNC 117 | QA | QA | |
| ↓ | 1502 | Background | B11-01640 | 1602 | |



Reviewed By: LSW Date: 5-3-11
Initials

# Beta Liquid Scintillation Counter Log Book

| Date | Time | ARS Sample I.D. Number | Batch Number | Liquid Scintillation File Number | Technician Initials |
|---|---|---|---|---|---|
| 5-2-11 | 1506 | B11-01640-01 | B11-01640 | 1602 | [illegible] |
| ↓ | ↓ | B11-01640-02 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01640-03 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01640-04 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01640-05 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01640-06 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01640-07 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01640-08 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01640-09 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01640-10 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01640-11 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01640-12 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01640-13 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01640-14 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01640-15 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01640-16 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01640-17 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01640-18 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01640-19 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01640-20 | ↓ | ↓ | [illegible] |



Reviewed By: LSW Date: 5-03-11
Initials

# Beta Liquid Scintillation Counter Log Book

| Date | Time | ARS Sample I.D. Number | Batch Number | Liquid Scintillation File Number | Technician Initials |
|---|---|---|---|---|---|
| 5-2-11 | 1506 | B11-01640-21 | B11-01640 | 1602 | |
| ↓ | ↓ | B11-01640-22 | ↓ | ↓ | |
| ↓ | ↓ | B11-01640-23 | ↓ | ↓ | |
| 5-4-11 | 1632 | Background | B11-01659 | 1941 | |
| ↓ | ↓ | B11-01659-01 | ↓ | ↓ | |
| ↓ | ↓ | B11-01659-02 | ↓ | ↓ | |
| ↓ | ↓ | B11-01659-03 | ↓ | ↓ | |
| ↓ | ↓ | B11-01659-04 | ↓ | ↓ | |
| ↓ | ↓ | B11-01659-05 | ↓ | ↓ | |
| ↓ | ↓ | B11-01659-06 | ↓ | ↓ | |
| ↓ | ↓ | B11-01659-07 | ↓ | ↓ | |
| ↓ | ↓ | B11-01659-08 | ↓ | ↓ | |
| ↓ | ↓ | B11-01659-09 | ↓ | ↓ | |
| ↓ | ↓ | B11-01659-10 | ↓ | ↓ | |
| ↓ | ↓ | B11-01659-11 | ↓ | ↓ | |
| ↓ | ↓ | B11-01659-12 | ↓ | ↓ | |
| ↓ | ↓ | B11-01659-13 | ↓ | ↓ | |
| ↓ | ↓ | B11-01659-14 | ↓ | ↓ | |
| ↓ | ↓ | B11-01659-15 | ↓ | ↓ | |
| ↓ | ↓ | B11-01659-16 | ↓ | ↓ | |

LSW 5-6-11



Reviewed By: LSW Date: 5-06-11
Initials

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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

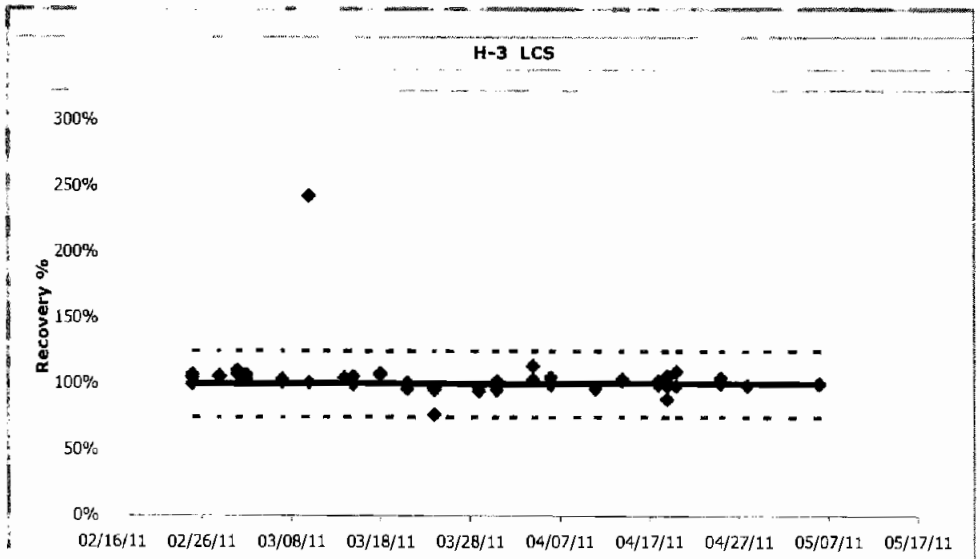
# Tritium by Low Level Liquid Scintillation Counting

# Control Charts

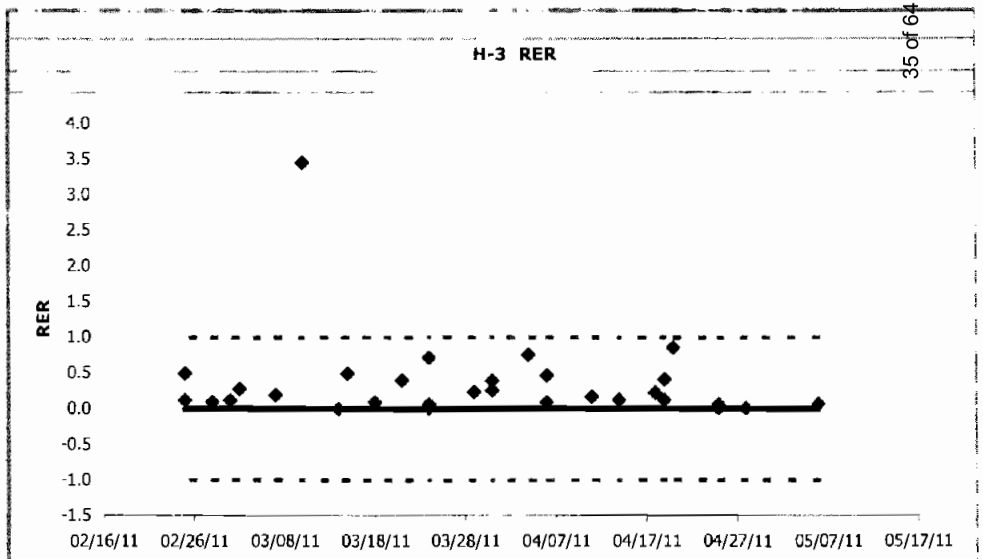
# QC Chart



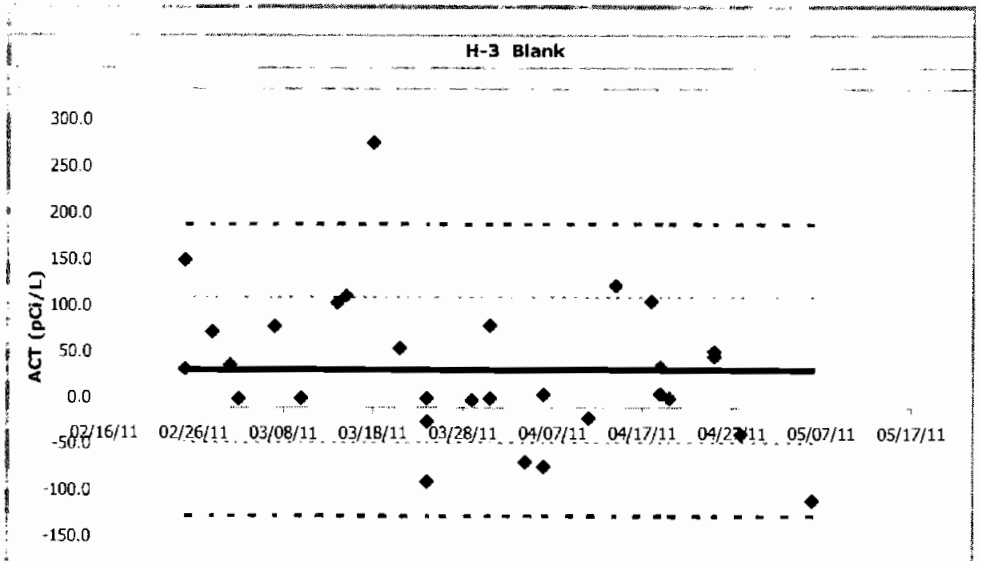




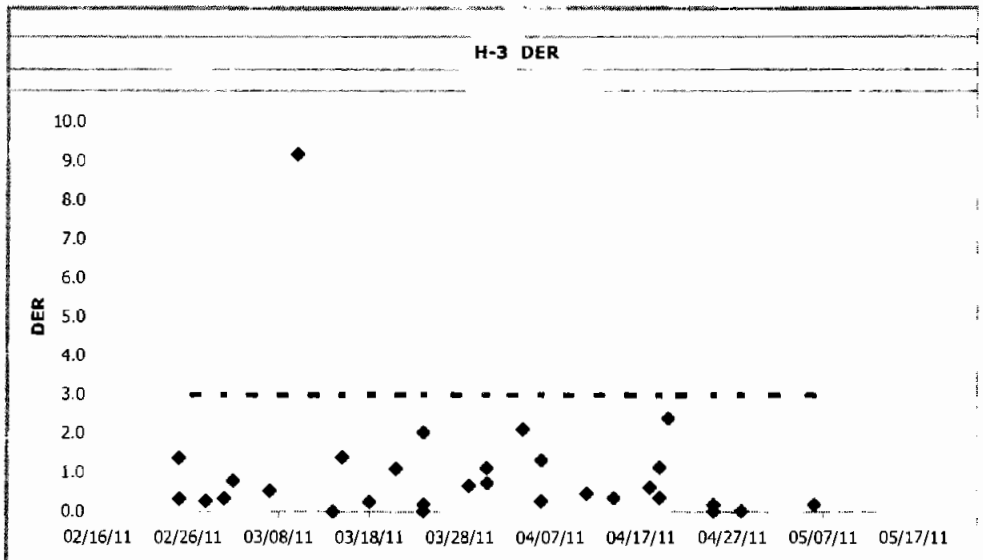

| Average | STDEV | n | UCL | LCL |
|---|---|---|---|---|
| 1.0367 | 0.1907 | 30 | 1.2500 | 0.7500 |




| n | UCL | LCL |
|---|---|---|
| 30 | 1.0000 | -1.0000 |




| Average | STDEV | n | UCL | LCL |
|---|---|---|---|---|
| 30.9399 | 78.9231 | 30 | 188.7861 | -126.9063 |

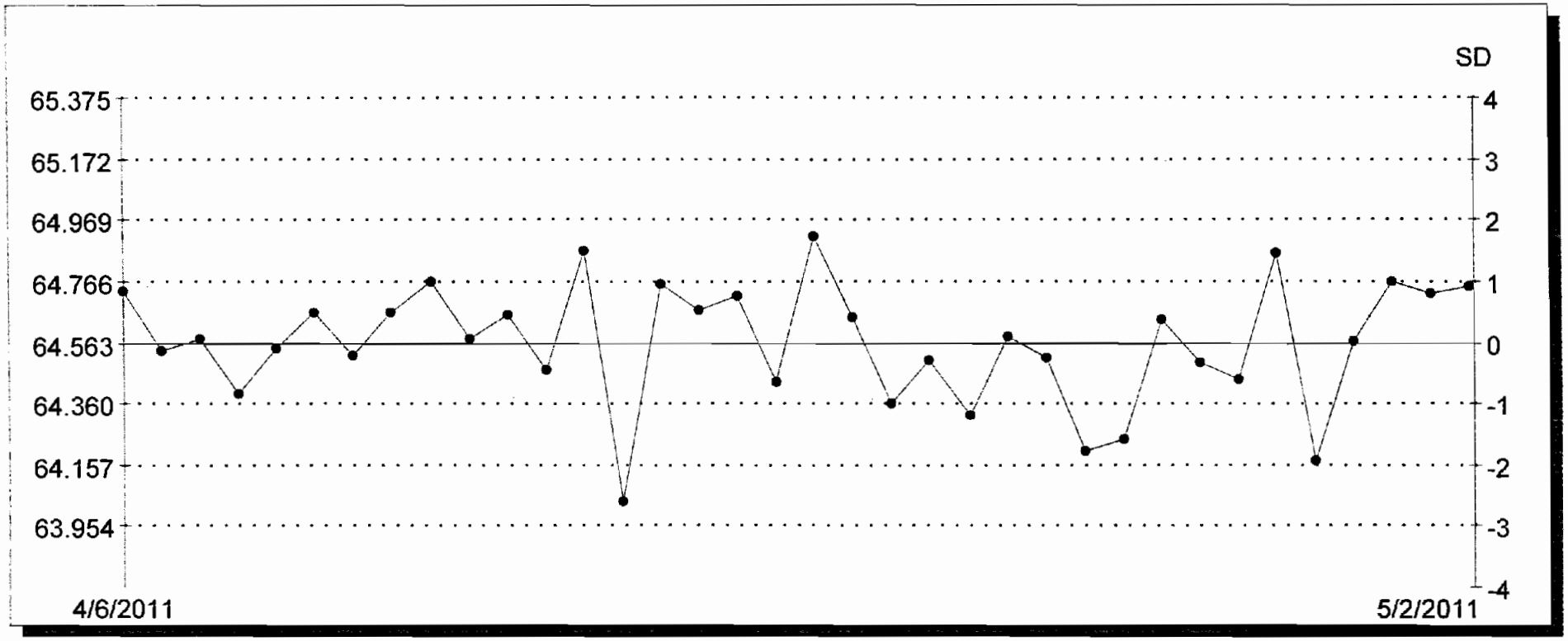



| n | UCL |
|---|---|
| 30 | 3.0000 |

3H Efficiency
Total # pts : 1605
Valid # pts : 36
Mean : 64.56
SD : 0.20

| Date | Value | Valid Pt |
|---|---|---|
| Apr 06, 2011 | 64.74 | X |
| Apr 10, 2011 | 64.54 | X |
| Apr 16, 2011 | 64.58 | X |
| Apr 19, 2011 | 64.39 | X |
| Apr 25, 2011 | 64.54 | X |
| Apr 30, 2011 | 64.67 | X |
| Apr 30, 2011 | 64.52 | X |
| Apr 30, 2011 | 64.66 | X |
| Apr 30, 2011 | 64.76 | X |
| Apr 30, 2011 | 64.58 | X |
| Apr 30, 2011 | 64.66 | X |
| Apr 30, 2011 | 64.47 | X |
| Apr 30, 2011 | 64.87 | X |
| Apr 30, 2011 | 64.03 | X |
| Apr 30, 2011 | 64.76 | X |
| May 01, 2011 | 64.67 | X |
| May 01, 2011 | 64.72 | X |
| May 01, 2011 | 64.44 | X |
| May 01, 2011 | 64.92 | X |
| May 01, 2011 | 64.65 | X |
| May 01, 2011 | 64.36 | X |
| May 01, 2011 | 64.50 | X |
| May 01, 2011 | 64.32 | X |
| May 01, 2011 | 64.58 | X |
| May 01, 2011 | 64.51 | X |
| May 01, 2011 | 64.20 | X |
| May 01, 2011 | 64.24 | X |
| May 01, 2011 | 64.64 | X |
| May 01, 2011 | 64.50 | X |
| May 02, 2011 | 64.44 | X |
| May 02, 2011 | 64.86 | X |
| May 02, 2011 | 64.17 | X |
| May 02, 2011 | 64.57 | X |
| May 02, 2011 | 64.76 | X |
| May 02, 2011 | 64.73 | X |
| May 02, 2011 | 64.75 | X |

3H Efficiency
Total # pts : 1605
Valid # pts : 36
Mean : 64.56
SD : 0.20

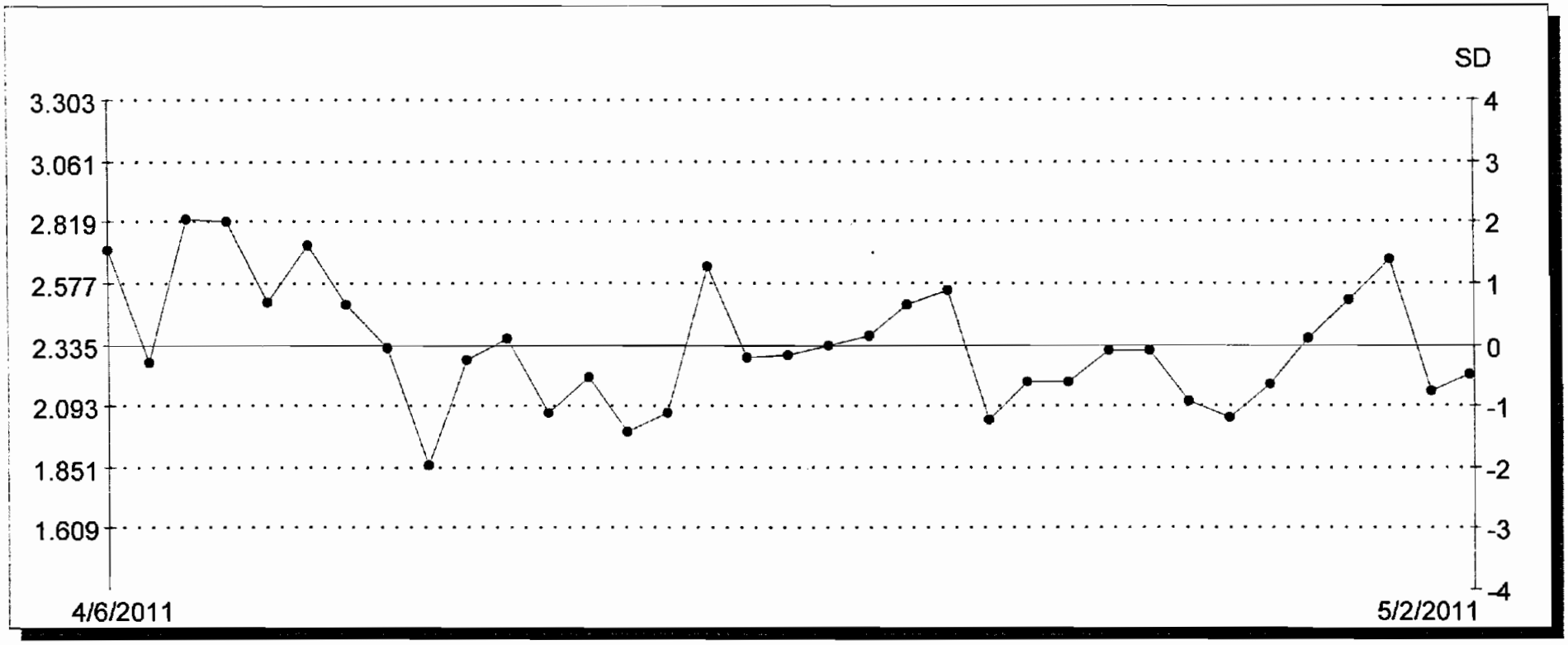


3H Background
Total # pts : 1566
Valid # pts : 35
Mean : 2.34
SD : 0.24

| Date | Value | Valid Pt |
|---|---|---|
| Apr 06, 2011 | 2.70 | X |
| Apr 10, 2011 | 2.27 | X |
| Apr 16, 2011 | 2.84 | X |
| Apr 19, 2011 | 2.82 | X |
| Apr 25, 2011 | 2.50 | X |
| Apr 30, 2011 | 2.73 | X |
| Apr 30, 2011 | 2.49 | X |
| Apr 30, 2011 | 2.32 | X |
| Apr 30, 2011 | 1.86 | X |
| Apr 30, 2011 | 2.27 | X |
| Apr 30, 2011 | 2.36 | X |
| Apr 30, 2011 | 2.07 | X |
| Apr 30, 2011 | 2.20 | X |
| Apr 30, 2011 | 1.99 | X |
| Apr 30, 2011 | 2.07 | X |
| May 01, 2011 | 2.64 | X |
| May 01, 2011 | 2.29 | X |
| May 01, 2011 | 2.29 | X |
| May 01, 2011 | 2.34 | X |
| May 01, 2011 | 2.37 | X |
| May 01, 2011 | 2.49 | X |
| May 01, 2011 | 2.55 | X |
| May 01, 2011 | 2.04 | X |
| May 01, 2011 | 2.19 | X |
| May 01, 2011 | 2.19 | X |
| May 01, 2011 | 2.31 | X |
| May 01, 2011 | 2.32 | X |
| May 01, 2011 | 2.12 | X |
| May 01, 2011 | 2.05 | X |
| May 02, 2011 | 2.18 | X |
| May 02, 2011 | 2.36 | X |
| May 02, 2011 | 2.51 | X |
| May 02, 2011 | 2.67 | X |
| May 02, 2011 | 2.15 | X |
| May 02, 2011 | 2.22 | X |

3H Background

| | |
|---|---|
| Total # pts | : 1566 |
| Valid # pts | : 35 |
| Mean | : 2.34 |
| SD | : 0.24 |



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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Low Level Liquid Scintillation Counting

# Calibration Information

# STD ID: S-0247

ARS INTERNATIONAL

## Add/Edit *Secondary Stds*

| Planning | |
|---|---|
| Planning Comments | Create an H-3 LCS standard |
| Target dpm/g (on dil. date) | 5.56 |
| Target Final volume mL | 2000 |
| Appx mass g of Parent Sol'n | 3.274623294 |
| Appx vol ml of Parent Sol'n | 3.280528244 |
| Expected Addition for Analysis g | 5 |

| Standards Preparation / Dilution | |
|---|---|
| Secondary Solution # | S-0247 |
| Dilution Date (New Ref Date) | 10/11/2010 10:30 |
| Ampoule, Empty (g) | |
| Ampoule /Solution Gross (g) | |
| Net Wt Removed (g) | |
| Transfer Container, empty (g) | 1.7 |
| Container Plus Solution (g) | 4.994 |
| Net Wt Transferred (g) | 3.294 |
| DPM Xferred on 10/11/2010 10:30 | 11185.79962 |
| Diluent/matrix | DI H2O |
| Diluent Density Cont, empty (g) | |
| Test Mass of 5 ml of Diluent (g) | |
| Diluent Density Test - (g/mL) | |
| Dilution Empty Container Mass (g) | 473.96 |
| Dilution Full Cont g (if measured) | 2467.85 |
| Dilution Final Volume ml (if measured) | 2000 |
| Final Dilution Density (g/mL) | 0.996945 |
| Final Dilution Measured Mass g | 1993.89 |
| Comments | Stock H-3 LCS standard. Dilution performed as stated above by B Steffens. -BJS 10/11/10 |
| Final Dilution dpm/g | 5.610038479 |
| Final Dil New Ref Date/Time | 10/11/2010 10:30 |

## Parent Standard Data

| | | | | | |
|---|---|---|---|---|---|
| Parent Solution Reference # | NIST SRM 4927F | | | | |
| Parent Solution # | S-0237 | | | | |
| Parent Principal Radionuclide | H-3 | Half Life (Days) | 4499.8000000 | | |
| Parent Reference Date | 03/22/2010 10:10 | | | | |
| Parent Certified Act | 3503.682716 | Certd Act/Vol Units | dpm | g | |
| Parent Cert Act Uncert 1 Sigma | 0.0036 | | | | |
| Parent Sp. Gravity G/Ml | 0.9982 | | | | |
| Parent Supplier | NIST SRM 4927F | | | | |
| Parent Date Recvd | 01/02/00 | | | | |
| Parent Received By | Unknown | | | | |
| Parent Cert Exp Date | | | | | |
| Parent Matrix | H2O | | | | |
| Certified dpm/g At Ref Date | 3503.682716 | | | | |
| Certified dpm/g on 10/11/2010 10:30 | 3395.81045 | | | | |
| Parent Comments | Intermediate level H-3 standard for creating LCS solutions and matrix spikes. Dilution performed as stated above by B Steffens. -BJS 3/22/10 | | | | |
| Parent Tech | Unknown | | | | |
| Is_Primary | FALSE | | | | |
| Is_LCS | TRUE | | | | |
| Is_Tracer | FALSE | | | | |
| Is_Calib | FALSE | | | | |

| | | |
|---|---|---|
| S-0247 | | |
| H-3 | Verified | 10/13/10 |
| SL | Expires | 10/13/11 |
| Manufactuer | NIST SRM 4927F | |
| Sol Matrix | H2O | |
| Ref No | NIST SRM 4927F | |
| Tech | Unknown | |
| Parent ID | S-0237 | |

ARS INTERNATIONAL

RADIOACTIVE STANDARDS -- BATON ROUGE LABORATORY

ARS INTERNATIONAL

## QUALITY CONTROL PROGRAM

AMERICAN RADIATION SERVICES
RADIOACTIVE REFERENCE SOLUTIONS

# ANNUAL ACTIVITY VERIFICATION

VERIFICATION DATE: 10/13/2010 20:18 *date counted*
STANDARD REFERENCE #: S-0247

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

Radionuclide: H-3 — Dilution Reference Date: 10/11/2010 10:30

| | | | |
|---|---|---|---|
| Dilution Activity | 2.53 | pCi per gram ===> dpm/g | 5.61 |
| Verif. Date Decay Corrected | 2.53 | pCi per gram ===> dpm/g | 5.61 |

***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-0247-V1 | 16.99 | 1 | LSC | 0.3440 | 6.86 | 5.017 | 5.87 | 2.64 |
| S-0247-V2 | 16.76 | 1 | LSC | 0.3484 | 6.86 | 4.979 | 5.70 | 2.57 |
| S-0247-V3 | 16.97 | 1 | LSC | 0.3465 | 6.86 | 4.972 | 5.87 | 2.64 |
| S-0247-V4 | 16.76 | 1 | LSC | 0.3449 | 6.86 | 4.982 | 5.76 | 2.60 |
| S-0247-V5 | 16.88 | 1 | LSC | 0.3433 | 6.86 | 4.980 | 5.86 | 2.64 |

| | | |
|---|---|---|
| Average | 5.81 | 2.62 |
| Two Sigma Uncertainty | 0.15 | 0.07 |
| Standard Deviation percent of known concentration | 1.35% | 1.35% |
| Target Activity | 5.61 | 2.53 |
| % Diff | 3.66% | 3.66% |

*10% Max* *PASS*

*5% Max* *PASS*

**Verification Expiration Date:** October 13, 2011

Prepared & Counted By: [signature] Date: 10/13/2010 20:18

Verified & Approved By: Dwayne Mulligan Date: 10-14-10 / 1224

QC Approval: [signature] Date: 10-14-10/12:30

# STD ID: S-0031

ARS INTERNATIONAL

## Add/Edit *Secondary Stds*

| Planning | |
|---|---|
| Planning Comments | Dilute intermediate level solution from SRM 4927F |
| Target dpm/g (on dil. date) | 267000 |
| Target Final volume mL | 200 |
| Appx mass g of Parent Sol'n | 2.093763934 |
| Appx vol ml of Parent Sol'n | 2.097539505 |
| Expected Addition for Analysis g | |

| Standards Preparation / Dilution | |
|---|---|
| Secondary Solution # | S-0031 |
| Dilution Date (New Ref Date) | 10/19/2005 00:00 |
| Ampoule, Empty (g) | |
| Ampoule /Solution Gross (g) | |
| Net Wt Removed (g) | |
| Transfer Container, empty (g) | 0 |
| Container Plus Solution (g) | 4.7574 |
| Net Wt Transferred (g) | 4.7574 |
| DPM Xferred on 10/19/2005 00:00 | 121334194.3 |
| Diluent/matrix | H20 |
| Diluent Density Cont, empty (g) | |
| Test Mass of 5 ml of Diluent (g) | |
| Diluent Density Test - (g/mL) | |
| Dilution Empty Container Mass (g) | 1 |
| Dilution Full Cont g (If measured) | 200.64 |
| Dilution Final Volume ml (If measured) | 200 |
| Final Dilution Density (g/mL) | 0.9982 |
| Final Dilution Measured Mass g | 199.64 |
| Comments | S-0031 Intermediate dilution - Information entered from dilution records - 4/19/2006 RTS |
| Final Dilution dpm/g | 607764.9486 |
| Final Dil New Ref Date/Time | 10/19/2005 00:00 |

## Parent Standard Data

| | | | | |
|---|---|---|---|---|
| Parent Solution Reference # | NIST SRM 4927F | | | |
| Parent Solution # | S-0107 | | | |
| Parent Principal Radionuclide | H-3 | Half Life (Days) | 4499.8000000 | |
| Parent Reference Date | 09/03/1998 11:00 | | | |
| Parent Certified Act | 38082000 | Certi Act/Vol Units | dpm | g |
| Parent Cert Act Uncert 1 Sigma | 0.0036 | | | |
| Parent Sp. Gravity G/Ml | 0.9982 | | | |
| Parent Supplier | NIST SRM 4927F | | | |
| Parent Date Recvd | 01/02/00 | | | |
| Parent Received By | Unknown | | | |
| Parent Cert Exp Date | | | | |
| Parent Matrix | H2O | | | |
| Certified dpm/g At Ref Date | 38082000 | | | |
| Certified dpm/g on 10/19/2005 00:00 | 25504307.89 | | | |
| Parent Comments | Primary for S-0029 - Information entered from dilution records - 4/18/2006 RTS | | | |
| Parent Tech | Unknown | | | |
| Is_Primary | FALSE | | | |
| Is_LCS | TRUE | | | |
| Is_Tracer | FALSE | | | |
| Is_Calib | FALSE | | | |

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

S-0031

# National Institute of Standards & Technology

# Certificate

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

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

### Radiological Hazard

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

### Chemical Hazard

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

### Storage and Handling

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

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

### Preparation

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

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

Bert M. Coursey, Chief
Ionizing Radiation Division

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

Nancy M. Trahey, Chief
Standard Reference Materials Program



*Notes and references are on pages 5 and 6.

## PROPERTIES OF SRM 4927F

### Certified values

| | |
|---|---|
| **Solution density** | **(0.996 ± 0.002) g·mL$^{-1}$ at 20.0 °C [b]*** |
| **Radionuclide** | **Hydrogen-3** |
| **Reference time** | **1200 EST, 3 September 1998** 1100 CST |
| **Massic activity of the solution [c]** | **634.7 kBq·g$^{-1}$** |
| **Relative expanded uncertainty ($k$=2)** | **0.72% [d] [e]** |

### Uncertified values

| | | | |
|---|---|---|---|
| **Physical Properties:** | | | |
| Source description | Liquid in flame-sealed NIST borosilicate-glass ampoule | | |
| Ampoule specifications | Body outside diameter<br>Wall Thickness<br>Barium content<br>Lead-oxide content<br>Other heavy elements | (16.5 ± 0.5) mm<br>(0.60 ± 0.04) mm<br>Less than 2.5%<br>Less than 0.02%<br>Trace quantities | |
| Solution mass | Approximately 5.0 g | | |
| **Chemical Properties:** | | | |
| Solution composition | Chemical Formula | Concentration (mol·L$^{-1}$) | Mass Fraction (g·g$^{-1}$) |
| | $H_2O$ | 55 | 1.00 |
| | $^3HHO$ | $6 \times 10^{-7}$ | $1 \times 10^{-8}$ |
| **Radiological Properties:** | | | |
| Radionuclidic impurities | None detected [f] | | |
| Half lives used | Hydrogen-3: (4500 ± 8) d [g] | | |
| Calibration method and measuring instrument(s) | 4πβ gas counting of SRM 4927E using the NIST length-compensated internal gas proportional counters and intercomparison of SRMs 4927E/4927F using two 4πβ liquid-scintillation counting systems [h] | | |



*Notes and references are on pages 5 and 6.

## NOTES

[a] The Sievert is the SI unit for dose equivalent. See reference [1]. One μSv is equal to 0.1 mrem.

| Distance from Ampoule (cm): | 1 | 30 | 100 |
|---|---|---|---|
| Approximate Dose Rate (μSv/h): | <0.1 (Not detectable) | | |

[b] The stated uncertainty is two times the standard uncertainty.

[c] **Massic activity** is the preferred name for the quantity activity divided by the total mass of the sample. See reference [1].

[d] The reported value, $y$, of massic activity (activity per unit mass) at the reference time was not measured directly but was derived from measurements and calculations of other quantities. This can be expressed as $y = f(x_1, x_2, x_3, \ldots x_n)$, where $f$ is a mathematical function derived from the assumed model of the measurement process.

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

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

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

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

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

[e] The value of each standard uncertainty component, and hence the value of the expanded uncertainty itself, is a best estimate based upon all available information, but is only approximately known. That is to say, the "uncertainty of the uncertainty" is large and not well known. This is true for uncertainties evaluated by statistical methods (e.g., the relative standard deviation of the standard deviation of the mean for the massic response is approximately 50%) and for uncertainties evaluated by other methods (which could easily be over estimated or under estimated by substantial amounts). The unknown value of the expanded uncertainty is believed to lie in the interval $U/2$ to $2U$ (i.e., within a factor of 2 of the estimated value).

[f] The estimated limit of detection for radionuclidic impurities is 300 $Bq \cdot g^{-1}$.

[g] The stated uncertainty is the standard uncertainty. See reference [5].

[h] Extensive gas-counting measurements were made on the SRM 4927E solution during 1998 and 1999. The SRM 4927F solution was intercompared with the SRM 4927E solution using liquid-scintillation counting.

[i] Relative standard uncertainty of the input quantity $x_i$.

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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Percent Moisture

ARS INTERNATIONAL

2609 North River Road, Port Allen, Louisiana 70767

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

| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00527 | **Request or PO Number:** | 11-1611 |
| **Client Sample ID:** | MD21-11-5604 | **ARS Sample ID:** | ARS1-11-00527-001 |
| **Sample Collection Date:** | 03/10/11 | **Date Received:** | 03/15/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 05/06/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 11.299 | NA | NA | NA | | % | Percent Moisture | 05/05/11 13:26 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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

LELAP Certificate# 01949 NELAP Certificate # E87558

ARS INTERNATIONAL

2609 North River Road, Port Allen, Louisiana 70767

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

| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00527 | **Request or PO Number:** | 11-1611 |
| **Client Sample ID:** | MD21-11-5609 | **ARS Sample ID:** | ARS1-11-00527-002 |
| **Sample Collection Date:** | 03/10/11 | **Date Received:** | 03/15/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 05/06/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 11.464 | NA | NA | NA | | % | Percent Moisture | 05/05/11 16:36 | BS | NA |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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

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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Percent Moisture Laboratory Records

**AMERICAN RADIATION SERVICES**
**Port Allen, LA**
**PERCENT MOISTURE DETERMINATION IN SOILS**

SDG Number ARS1-11-00491, 00622, 00526, 00527
Client LANL

| LANL ID | ARS ID | weight of cylinder with gel (g) | weight of empty cylinder (g) | Weight of gel (g) | amount of liquid collected (ml) | amount of liquid tested (ml) | % moisture |
|---|---|---|---|---|---|---|---|
| MD21-11-5600 | ARS1-11-00491-001 | 612 | 446 | 166 | 15.186 | 5.015 | **9.14819277** |
| MD21-11-5601 | ARS1-11-00491-002 | 606 | 438 | 167 | 19.547 | 5.03 | **11.7047904** |
| MD21-11-5602 | ARS1-11-00491-003 | 607 | 428 | 179 | 15.199 | 5.037 | **8.49106145** |
| MD21-11-5603 | ARS1-11-00491-004 | 617 | 454 | 165 | 16.333 | 5.04 | **9.89878788** |
| MD21-11-5605 | ARS1-11-00491-005 | 607 | 443 | 165 | 16.378 | 5.05 | **9.92606061** |
| MD21-11-5606 | ARS1-11-00491-006 | 615 | 450 | 165 | 15.928 | 5.06 | **9.65333333** |
| MD21-11-5607 | ARS1-11-00491-007 | 605 | 450 | 154 | 10.955 | 5.081 | **7.11363636** |
| MD21-11-5608 | ARS1-11-00491-008 | 598 | 436 | 162 | 14.886 | 5.094 | **9.18888889** |
| MD21-11-5610 | ARS1-11-00491-009 | 601 | 447 | 154 | 8.502 | 5.063 | **5.52077922** |
| MD50-11-5957 | ARS1-11-00622-001 | 604 | 443 | 161 | 13.697 | 5.03 | **8.50745342** |
| MD50-11-5958 | ARS1-11-00622-002 | 601 | 443 | 157 | 10.123 | 5.075 | **6.4477707** |
| MD50-11-5959 | ARS1-11-00622-003 | 598 | 440 | 159 | 9.564 | 5.054 | **6.01509434** |
| MD50-11-5960 | ARS1-11-00622-004 | 606 | 442 | 164 | 18.137 | 5.051 | **11.0591463** |
| MD50-11-5961 | ARS1-11-00622-005 | 610 | 444 | 165 | 16.472 | 5.069 | **9.9830303** |
| MD50-11-5962 | ARS1-11-00622-006 | 602 | 441 | 161 | 15.059 | 5.05 | **9.35341615** |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| MD54-11-3767 | ARS1-11-00526-001 | 611 | 455 | 156 | 11.189 | 5.033 | **7.1724359** |
| MD54-11-3766 | ARS1-11-00526-002 | 628 | 455 | 172 | 21.497 | 5.028 | **12.4982558** |
| MD54-11-3768 | ARS1-11-00526-003 | 599 | 438 | 159 | 16.892 | 5.007 | **10.6238994** |
| MD21-11-5604 | ARS1-11-00527-001 | 629 | 461 | 168 | 18.983 | 5.076 | **11.2994048** |
| MD21-11-5605 | ARS1-11-00527-002 | 604 | 435 | 169 | 19.375 | 5.055 | **11.464497** |

Balance ID: 0102/H1331122173560P
Pipettor ID: FJ40469

Signature [illegible] Date 5-6-11

**AMERICAN RADIATION SERVICES**
**Port Allen, LA**
**PERCENT MOISTURE DETERMINATION IN SOILS**

SDG Number ARS1-11-00491, 00622, 00526, 00527
Client LANL

LCS - 5.037
LCSD - 5.027
BLK - 5.044

| LANL ID | ARS ID | weight of cylinder with gel (g) | weight of empty cylinder (g) | Weight of gel (g) | amount of liquid collected (ml) | amount of liquid tested (ml) | % moisture |
|---|---|---|---|---|---|---|---|
| MD21-11-5600 | ARS1-11-00491-001 | 612 | 446 | 166 | 15.186 | 5.015 | #DIV/0! |
| MD21-11-5601 | ARS1-11-00491-002 | 606 | 438 | 167 | 19.547 | 5.030 | #DIV/0! |
| MD21-11-5602 | ARS1-11-00491-003 | 607 | 428 | 179 | 15.199 | 5.037 | #DIV/0! |
| MD21-11-5603 | ARS1-11-00491-004 | 617 | 454 | 165 | 16.333 | 5.040 | #DIV/0! |
| MD21-11-5605 | ARS1-11-00491-005 | 607 | 443 | 165 | 16.378 | 5.050 | #DIV/0! |
| MD21-11-5606 | ARS1-11-00491-006 | 615 | 450 | 165 | 15.928 | 5.060 | #DIV/0! |
| MD21-11-5607 | ARS1-11-00491-007 | 605 | 450 | 154 | 10.955 | 5.081 | #DIV/0! |
| MD21-11-5608 | ARS1-11-00491-008 | 598 | 436 | 162 | 14.886 | 5.094 | #DIV/0! |
| MD21-11-5610 | ARS1-11-00491-009 | 601 | 447 | 154 | 8.502 | 5.063 | #DIV/0! |
| MD50-11-5957 | ARS1-11-00622-001 | 604 | 443 | 161 | 13.697 | 5.030 | #DIV/0! |
| MD50-11-5958 | ARS1-11-00622-002 | 601 | 443 | 157 | 10.123 | 5.075 | #DIV/0! |
| MD50-11-5959 | ARS1-11-00622-003 | 598 | 440 | 159 | 9.564 | 5.054 | #DIV/0! |
| MD50-11-5960 | ARS1-11-00622-004 | 606 | 442 | 164 | 18.137 | 5.051 | #DIV/0! |
| MD50-11-5961 | ARS1-11-00622-005 | 610 | 444 | 165 | 16.472 | 5.069 | #DIV/0! |
| MD50-11-5962 | ARS1-11-00622-006 | 602 | 441 | 161 | 15.059 | 5.050 | #DIV/0! |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| MD54-11-3767 | ARS1-11-00526-001 | 611 | 455 | 156 | 11.189 | 5.033 | #DIV/0! |
| MD54-11-3766 | ARS1-11-00526-002 | 628 | 455 | 172 | 21.497 | 5.028 | #DIV/0! |
| MD54-11-3768 | ARS1-11-00526-003 | 599 | 438 | 159 | 16.892 | 5.007 | #DIV/0! |
| MD21-11-5604 | ARS1-11-00527-001 | 429 | 461 | 168 | 18.983 | 5.076 | #DIV/0! |
| MD21-11-5605 | ARS1-11-00527-002 | 604 | 435 | 169 | 19.375 | 5.055 | #DIV/0! |

Balance ID: 0102/H1331122173560P
Pipettor ID: FJ40469

Signature [signature] Date 5-3-11

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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Folder Duplicate

# Report Compilation Checklist

**ARS SDG:** 11-00527 **Client Name:** LANL **Sample Matrix:** SI

| LEVEL 1 COMPONENTS | 1st Reviewer | |
|---|---|---|
| 1) Cover Page Complete and Accurate (see ARS-059)? | ~~Yes~~ No N/A | |
| 2) Technical Review Checklist(s) Complete and Accurate? | ~~Yes~~ No N/A | |
| 3) Case Narrative Complete and Accurate (see ARS-059)? | ~~Yes~~ No N/A | |
| 4) Form 1s Present for all Samples and Tests? | ~~Yes~~ No N/A | |
| 5) Client Specific Components are Present and Complete? | ~~Yes~~ No N/A | |

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

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

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

Susan Keese 5-6-11
**Report Generator Signature** **Date**

[illegible] 5-6-11
**Management Review Signature** **Date**

# LSC
# Technical Review Checklist

**ARS SDG** 11-00527

**Sample Matrix:** SI **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:** B11-01640 **Batch B:** N/A **Batch C:** N/A

**Test Method(s):** LSC-A-001 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] Date: 5-3-11 Verifier Review Signature: Tamara Brown Date: 5-3-11

## 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: VJM Date: 5-6-11

| | 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 |

5-6-11

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

Analyst Signature: [signature] Date: 5-6-11 Technicial Reviewer Signature: N/A Date

Batch A: B11-01640

# 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): _____

| Project Manager Signature | Date | QA Officer Signature | Date |
|---|---|---|---|
| [illegible] | 5-6-11 | VJM | 5-6-11 |

## GENERAL COMMENTS

# DQO Report for SDG
ARS1-11-00527





| Analysis Code | Group | Isotope | Activity Units | Aliquot Units | ProcedureNo | RDL | LCS_LL | LCS_UL | MS_LL | MS_UL | RadY_LL | RadY_UL | GravY_LL | GravY_UL | RER | RPD | DiltionReq | RoughPrepReq | BlankCorrectionMDA | BlankCorrectionAll | CountTimeReq | AliquotRequired |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LSC-A-001 | STD | H-3 | pCi | L | ARS-054 | 2.50E+02 | 80 | 120 | 75 | 125 | 30 | 110 | 40 | 110 | 1.00 | 25 | FALSE | FALSE | FALSE | FALSE | | |

# SDG Report - Samples and Containers

**SDG Specific Data**

| | | | | | |
|---|---|---|---|---|---|
| SDG | ARS1-11-00527 | TAT Days | 30 | Project Type | Environmental |
| Sample Count | Rpt Level 4 | Date Received | 3/15/2011 | COC Number | 11-1611 |
| Client | Los Alamos National Laboratory | Client Deadline | 4/13/2011 | PO Number | 63641-001-10 |
| Client Code | 114 | Internal Deadline | 4/13/2011 | Job Number | MR8A032NFM00 |
| Profile Number | PN-00094 | Lab Deadline | 4/11/2011 | Job Location | |
| Comments | | | | | |



**Samples and Containers (➔) Checked In Thus Far**

| FR | ClientID | Matrix | SampleStartDate | SampleEndDate | Disp | Hold | Arch | Storage | X | Units | Y | Units | Z | Units | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 001 | MD21-11-5604 | SI | 03/10/11 12:00 PM | 03/10/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| ➔ | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 82293 | 1 | | 1.00 | | | 20 | 12 | | N | N/A | | | | |
| 002 | MD21-11-5609 | SI | 03/10/11 12:00 PM | 03/10/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| ➔ | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 82294 | 1 | | 1.00 | | | 20 | 12 | | N | N/A | | | | |

# SDG Report - Analysis Assignments

| | | | |
|---|---|---|---|
| Temp SDG | ARS1-11-00527 | Sample Count | |
| Client | Los Alamos National Laboratory | Analysis Count | 1-2 |

**Samples Count Totals per Analysis**

| Analysis Code | Analysis Description | Samples Count |
|---|---|---|
| LSC-A-001 | Tritium in (Water [Aqueous, AQ, SI]) | 2 |

**Analyses Assigned Per Fraction**

| Fraction | Analysis Code | X = Assigned |
|---|---|---|
| 001 | LSC-A-001 | X |
| 002 | LSC-A-001 | X |

# ARS FILE TRACKING SHEET

SDG: ARS1-11-00527

| Task | Date / Time | Initials |
|---|---|---|
| Date & Time Samples Received | 03-15-11/11:03 | CWB |
| ICOC Initiated / Storage Location: Q6 | 03-15-11/12:37 | CWB |
| Technical Checks Performed | See Batch | — |
| Report Written / EDD Generated: ____/____\|____ Date/Time Initials | 5-6-11/1200 | SDL |
| Quality Assurance Checks Performed on Report | 5-6-11 1323 | JLM |
| Management Check Performed on Report | | |
| *Preliminary Report Sent* | | |
| Report E-mailed | | |
| Report Faxed | | |
| Report Reviewed | | |
| Report Mailed | | |
| Invoice Completed Invoice #:_____ | | |
| Report Imaged | | |

***SPECIAL REQUIREMENTS***

| Requirement | Yes | No |
|---|---|---|
| 3 Hour Rush | | ✓ |
| 24 Hour Rush | | ✓ |
| 48 Hour Rush | | ✓ |
| Special Invoicing *see notes* Mgmt. Approval:_____ | | ✓ |

**NOTES:**

ARS-062
04/23/2010

**COMPANY NAME:** Los Alamos National Lab **SDG:** ARSM120527

**SHIPPING CONTAINER**

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

**COC PRESENT WITH SAMPLES**

| | | |
|---|---|---|
| COC | ☑ Yes | ☐ No |

**SAMPLE CONTAINER(S)**

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

# Samples Rcv 2

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

**External and Internal Surveys**

| | | | | | |
|---|---|---|---|---|---|
| Exposure Rate Meter: | M3 242861 | Serial No.: | M44-2 DR2042266 | Calibration Due Date: | 4-19-11 |
| Count Rate Meter: | M2 154859 | Serial No.: | M44-9 PR184559 | Calibration Due Date: | 4-6-11 |

| | | | | |
|---|---|---|---|---|
| Background Exposure Rate (µR/hr) | 24 | Max. Exposure Rate on Shipping Containers Externals (Plus Bkgd) | 12 | µR/hr |
| Background Count Rate (cpm) | 60 | Max. Removable Count Rate on Shipping Containers Externals (Plus Bkgd) | 20 | cpm |
| | | Max. Removable Count Rate on Shipping Containers Internals (Plus Bkgd) | 20 | cpm |

| Sample Label/Comments/Notes | pH Orig (pH ≤ 2 is Acceptable) | pH Final | Mark if Preserve | Acid Lot # | Weight(g) / Volume(mL) | µR/hr (Acceptance Limits <500 µR/hr) | cpm (Acceptance Limits <100 cpm/cm²) |
|---|---|---|---|---|---|---|---|
| MD21-11-5604 | | | | | 1 sample | 12 | 20 |
| ↓ - 5609 | | | | | ↓ | 12 | 20 |

Surveyors' Name: [signature] Date/Time Surveyed: 3-15-11 / 11:18

Wednesday, March 09, 2011

REQUEST NUMBER: 11-1587

# LOS ALAMOS
## NATIONAL LABORATORY

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

These Samples are on:
LANL Request Number:11-1587
Per Agreement Number:63641-001-10
Project Cost Code: MR8R032NFM00

Please analyse the enclosed samples according to the schedule indicated:

**SHIP DATE: 3/9/2011**
**TURNAROUND/REPORT DUE: 4/8/2011**
**TURNAROUND REQ'D: 30 Days**

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

LANL ER SMO CONTACT:
Signature:

| PRIORITY | METHOD CODE | CNTNR | SAMPLE ID | SAMPLE MATRIX | DATE SAMPLED | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| | EPA:906.0 | 1 | MD21-11-5600 | GAS | 3/9/2011 | |
| | | 1 | MD21-11-5601 | GAS | 3/9/2011 | |
| | | 1 | MD21-11-5602 | GAS | 3/9/2011 | |
| | | 1 | MD21-11-5603 | GAS | 3/9/2011 | |
| | | 1 | MD21-11-5605 | GAS | 3/9/2011 | |
| | | 1 | MD21-11-5606 | GAS | 3/9/2011 | |
| | | 1 | MD21-11-5607 | GAS | 3/9/2011 | |
| | | 1 | MD21-11-5608 | GAS | 3/9/2011 | |
| GAS1 | [illegible]-5610 | GAS1 | [illegible]-5610 | GAS | 3/9/2011 | |

Wednesday, March 09, 2011

**LAB CHAIN OF CUSTODY DOCUMENT NUMBER: 11-1587C**

**REQUEST NUMBER: 11-1587**

## LOS ALAMOS
**NATIONAL LABORATORY**

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

TURNAROUND/REPORT DUE: 4/8/2011
TURNAROUND REQ'D: 30

LAB REQUEST COMMENTS:

| SAMPLE ID | CTNR | CTNR DESC | ORDER | PRESERV | MATRIX |
|---|---|---|---|---|---|
| MD21-11-5610 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-5607 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-5605 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-5608 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-5600 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-5602 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-5603 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-5606 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-5601 | 1 | SILICA GEL TUBE | H3 | None | GAS |

| Relinquished By: | Date | Time | Received By: | Date | Time |
|---|---|---|---|---|---|
| Signature | | | Signature | | |
| Signature | 3/9/11 | 1400 | Signature | | |
| Signature | | | Signature | | |

| Received for DISPOSAL By: | Date | Time | Remarks: |
|---|---|---|---|
| Signature | | | |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3396 **EVENT NAME:** Pore Gas Sampling - MDA T - CU 21-016(a)-99

**SAMPLE ID:** MD21-11-5600 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 3/9/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 950 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | 21-24524W | ok | FIELD QC TYPE: | NA | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | 42.5 | ok | SAMPLE USAGE: | INV | |
| BOTTOM DEPTH: | 47.5 | ok | SCREEN/PORT DESC: | | Port #1 |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: NA COMPOSITE TIME INTERVAL: NA WATER FLOWING: YES / NO / NA

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90°

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |
| ~~1~~ | | TO15 | 6 LITER SUMMA CANISTER | None | Not collected KO 3/9/11 | |

SAMPLE DESC: column #17 initial wt = 598.23g silica wt = 153.52g Final wt = 611.03g vapor wt = 12.8g

SAMPLE COMMENTS:

weather data @ 950 T = 36°F RH = 56% BP 30.36 in

LOCATION DESC:

NA

FIELD SCREENING/MEASUREMENT RESULTS:

atm $O_2$ 20.9% $CO_2$ 360 ppm

sub atm $O_2$ 15.9% $CO_2$ 2.90%

COLLECTED BY (PRINT) R. Inskeep M Giorgi REVIEWED BY (PRINT) M Giorgi

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) M Giorgi | 3/9/11 | (Printed Name) Mike Martin | 3/9/11 |
| (Signature) MVG | 1345 | (Signature) | 1345 |
| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
| (Printed Name) | | (Printed Name) | |
| (Signature) | | (Signature) | |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3396 **EVENT NAME:** Pore Gas Sampling - MDA T - CU 21-016(a)-99

**SAMPLE ID:** MD21-11-5601 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 3/9/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 950 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | 21-24524W | ok | FIELD QC TYPE: | NA | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | 122.5 | ok | SAMPLE USAGE: | INV | |
| BOTTOM DEPTH: | 127.5 | ok | SCREEN/PORT DESC: | | port # 2 |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: NA COMPOSITE TIME INTERVAL: NA WATER FLOWING: YES / NO / NA

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90°

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |
| ~~1~~ | | ~~TO15~~ | ~~6 LITER SUMMA~~ CANISTER | None | Not collected | Not sampled for |

SAMPLE DESC: column # 18 initial wt = 587.04g silica wt 149.92g Final wt 605.20g vapor wt = 18.16g

SAMPLE COMMENTS:

weather data @ 950 T = 36°F RH = 56% BP = 30.36 in

LOCATION DESC:

NA

FIELD SCREENING/MEASUREMENT RESULTS:

atm $O_2$ 20.9% $CO_2$ 380 ppm

sub atm $O_2$ 20.2% $CO_2$ 4500 ppm

COLLECTED BY (PRINT) K. Onstott M Giorgi REVIEWED BY (PRINT) M Giorgi

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) M Giorgi | 3/9/11 | (Printed Name) [illegible] | 3/9/11 |
| (Signature) [illegible] | 1345 | (Signature) [illegible] | 1345 |
| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
| (Printed Name) | | (Printed Name) | |
| (Signature) | | (Signature) | |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3396 **EVENT NAME:** Pore Gas Sampling - MDA T - CU 21-016(a)-99

**SAMPLE ID:** MD21-11-5602 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 3/9/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 950 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | 21-24524W | ok | FIELD QC TYPE: | NA | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | 172.5 | ok | SAMPLE USAGE: | INV | |
| ~~BOTTOM DEPTH:~~ | ~~177.5~~ | ok | SCREEN/PORT DESC: | | port # 3 |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: NA COMPOSITE TIME INTERVAL: NA WATER FLOWING: YES / NO / NA

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90°

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |
| ~~1~~ | | ~~TO15~~ | ~~6 LITER SUMMA CANISTER~~ | ~~None~~ | ~~No~~ | ~~Not collected~~ |

SAMPLE DESC: column # 19 initial wt = 593.90 g silica wt = 167.75 Final wt = 605.17 g vapor wt = 11.27 g

SAMPLE COMMENTS:

weather @ 950 T = 36°F RH = 56% BP = 30.36 in

LOCATION DESC:

NA

FIELD SCREENING/MEASUREMENT RESULTS:

atm $O_2$ 20.9% $CO_2$ 420 ppm

sub atm $O_2$ 20.4% $CO_2$ 4000 ppm

COLLECTED BY (PRINT) L. Orsat M Giorgi REVIEWED BY (PRINT) M V Giorgi

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) M V Giorgi | 3/9/11 1345 | (Printed Name) Melissa Martinez | 3/9/11 1345 |
| (Signature) | | (Signature) | |
| **RELINQUISHED BY** | **Date/Time** | **RECEIVED BY** | **Date/Time** |
| (Printed Name) | | (Printed Name) | |
| (Signature) | | (Signature) | |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3396 **EVENT NAME:** Pore Gas Sampling - MDA T - CU 21-016(a)-99

**SAMPLE ID:** MD21-11-5603 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 3/9/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 950 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | 21-24524W | ok | FIELD QC TYPE: | NA | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | 257.5 | ok | SAMPLE USAGE: | INV | |
| BOTTOM DEPTH: | 262.5 | ok | SCREEN/PORT DESC: | | port #4 |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: NA COMPOSITE TIME INTERVAL: NA WATER FLOWING: YES / NO / NA

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90°

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |
| ~~1~~ | | ~~TO15~~ | ~~6 LITER SUMMA~~ CANISTER | ~~None~~ | to 3/9/11 not collected | |

SAMPLE DESC:
column # 20
initial wt = 603.29g
silica wt = 150.99g
Final wt = 616.56g
to 3/9/11 vapor wt = 13.27g

SAMPLE COMMENTS:
weather @ 950 T = 36°F RH 56% BP 30.36in

LOCATION DESC:
NA

FIELD SCREENING/MEASUREMENT RESULTS:
atm $O_2$ 20.9% $CO_2$ 440ppm
sub atm $O_2$ 20.5% $CO_2$ 4350ppm

COLLECTED BY (PRINT) R. Orsbt M Giorgi REVIEWED BY (PRINT) M V Giorgi

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) M V Giorgi | 3/9/11 | (Printed Name) [illegible] | 3/9/11 |
| (Signature) [illegible] | 1345 | (Signature) [illegible] | 1345 |
| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
| (Printed Name) | | (Printed Name) | |
| (Signature) | | (Signature) | |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3396 **EVENT NAME:** Pore Gas Sampling - MDA T - CU 21-016(a)-99

**SAMPLE ID:** MD21-11-5605 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 3/9/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 950 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | 21-24524W | ok | FIELD QC TYPE: | NA | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | 327.5 | ok | SAMPLE USAGE: | INV | |
| BOTTOM DEPTH: | 332.5 | ok | SCREEN/PORT DESC: | | port # 6 |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO (NA) | | |

COMPOSITE TYPE: NA COMPOSITE TIME INTERVAL: NA WATER FLOWING: YES / NO (NA)

BOREHOLE: (YES) / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90°

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |
| ~~1~~ | | ~~TO15~~ | ~~6 LITER SUMMA~~ CANISTER | ~~None~~ | ko 3/9/11 Not | collected |

SAMPLE DESC:
column # 23 initial wt = 591.84g silica wt = 150.67g Final wt: 605.58g vapor wt: 13.74g

SAMPLE COMMENTS:
weather @ 950 T = 36°F RH = 56% BP 30.36in

LOCATION DESC:
NA

FIELD SCREENING/MEASUREMENT RESULTS:
atm $O_2$ 20.9% $CO_2$ 420ppm
sub atm $O_2$ 20.9% $CO_2$ 3700ppm

COLLECTED BY (PRINT) Konstantin Mbiorgii REVIEWED BY (PRINT) [illegible]

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) [illegible] | 3/9/11 | (Printed Name) [illegible] | 3/9/11 |
| (Signature) [illegible] | 1345 | (Signature) [illegible] | 1345 |
| **RELINQUISHED BY** | **Date/Time** | **RECEIVED BY** | **Date/Time** |
| (Printed Name) | | (Printed Name) | |
| (Signature) | | (Signature) | |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3396 **EVENT NAME:** Pore Gas Sampling - MDA T - CU 21-016(a)-99

**SAMPLE ID:** MD21-11-5606 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 3/9/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 950 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | 21-24524W | ok | FIELD QC TYPE: | NA | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | 377.5 | ok | SAMPLE USAGE: | INV | |
| BOTTOM DEPTH: | 382.5 | ok | SCREEN/PORT DESC: | | port # 7 |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: NA ~~COMPOSITE TIME INTERVAL:~~ ~~WATER FLOWING: YES / NO / NA~~

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90°

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |
| 1 | | TO15 | ~~6 LITER SUMMA~~ CANISTER | ~~None~~ to 3/9/11 not collected | | |

SAMPLE DESC: column # 24 initial wt = 600.0 g Final wt = 613.48 g silica wt = 151.65 g vapor wt = 13.47 g

SAMPLE COMMENTS:

weather @ 950 T = 36 °F RH = 56% BP = 30.36 in

LOCATION DESC:

NA

FIELD SCREENING/MEASUREMENT RESULTS:

atm $O_2$ 20.9% $CO_2$ 440 ppm

Sub atm $O_2$ 20.9% $CO_2$ 3300 ppm

COLLECTED BY (PRINT) R Onsto H M Gorgi REVIEWED BY (PRINT) M V Gorgi

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) M V Gorgi | 3/9/11 | (Printed Name) Alex Martin | 3/9/11 |
| (Signature) | 1345 | (Signature) | 1345 |
| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
| (Printed Name) | | (Printed Name) | |
| (Signature) | | (Signature) | |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3396 **EVENT NAME:** Pore Gas Sampling - MDA T - CU 21-016(a)-99

**SAMPLE ID:** MD21-11-5607 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 3/9/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 950 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | 21-24524W 5 ko 3/9/11 | ok | FIELD QC TYPE: | NA | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | 677.5 | ok | SAMPLE USAGE: | INV | |
| BOTTOM DEPTH: | 682.5 | ok | SCREEN/PORT DESC: | | port # 10 |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: NA COMPOSITE TIME INTERVAL: NA WATER FLOWING: YES / NO / NA

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90°

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |
| 1 | | TO15 | 6 LITER SUMMA CANISTER | None | ko 3/9/11 | Not collected |

**SAMPLE DESC:**
column # 25 initial wt = 595.54 g Final wt = 603.06 g
Silical wt = 146.75 g Vapor wt = 7.52 g

**SAMPLE COMMENTS:**
weather @ 950 T = 36°F RH = 56% BP = 30.36 in

**LOCATION DESC:**
NA

**FIELD SCREENING/MEASUREMENT RESULTS:**
atm $O_2$ 20.9% $CO_2$ 440 ppm
sub atm $O_2$ 20.9% $CO_2$ 1800 ppm

**COLLECTED BY (PRINT)** R. Onstott M Giorgi **REVIEWED BY (PRINT)** MV Burger

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) MV Burger | 3/9/11 | (Printed Name) Melissa Martinez | 3/9/11 |
| (Signature) MVB | 1345 | (Signature) | 1345 |
| **RELINQUISHED BY** | **Date/Time** | **RECEIVED BY** | **Date/Time** |
| (Printed Name) | | (Printed Name) | |
| (Signature) | | (Signature) | |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3396 **EVENT NAME:** Pore Gas Sampling - MDA T - CU 21-016(a)-99

**SAMPLE ID:** MD21-11-5608 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 3/9/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 950 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | 21-24524~~W~~ S 3/9/11 | ok | FIELD QC TYPE: | NA | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | 712.5 | ok | SAMPLE USAGE: | INV | |
| BOTTOM DEPTH: | 717.5 | ok | SCREEN/PORT DESC: | port #11 | |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: NA ~~COMPOSITE TIME INTERVAL:~~ ~~WATER FLOWING: YES / NO / NA~~

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90°

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |
| 1 | | TO15 | 6 LITER SUMMA CANISTER | None | RD 3/9/11 | Not collected |

SAMPLE DESC: Column # 26 initial wt 582.13g silica wt 148.10g Final wt = 595.86g vapor wt = 13.73g

SAMPLE COMMENTS:

weather data @ 950 T = 36°F RH = 56% BP = 30.36in

LOCATION DESC:

NA

FIELD SCREENING/MEASUREMENT RESULTS:

atm $O_2$ 20.9% $CO_2$ 440 ppm
sub atm $O_2$ 20.9% $CO_2$ 2290 ppm

COLLECTED BY (PRINT) K Onstott M Giorgi REVIEWED BY (PRINT) M Giorgi

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) M Giorgi | 3/9/11 | (Printed Name) Melissa Martyn | 3/9/11 |
| (Signature) | 1345 | (Signature) | 1345 |
| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
| (Printed Name) | | (Printed Name) | |
| (Signature) | | (Signature) | |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3396 **EVENT NAME:** Pore Gas Sampling - MDA T - CU 21-016(a)-99

**SAMPLE ID:** MD21-11-5610 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 3/9/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 950 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | 21-24524W | ok | FIELD QC TYPE: | FB | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | 0 | ok | SAMPLE USAGE: | QC | |
| BOTTOM DEPTH: | 0 | ok | SCREEN/PORT DESC: | | Port 5 FB |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: NA COMPOSITE TIME INTERVAL: ~~WATER FLOWING: YES / NO / NA~~

BOREHOLE: YES / NO / NA ~~BOREHOLE DECLINATION:~~ ~~BOREHOLE DIRECTION:~~

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |
| ~~1~~ | | ~~TO15~~ | ~~6 LITER SUMMA CANISTER~~ | None | RO 3/9/11 | NOT collected |

SAMPLE DESC: QC Sample of MD21-11-5604
column # 27 initial wt = 593.25 g Final wt 599.41 g
silica wt = 148.20 g DI wt = ~~6.2~~ 6.16 g RO 3/9/11

SAMPLE COMMENTS:

NA

LOCATION DESC:

NA

FIELD SCREENING/MEASUREMENT RESULTS:

NA

COLLECTED BY (PRINT) R. Anstoff Mborgii REVIEWED BY (PRINT) M V Gorges

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) M V Gorges | 3/9/11 | (Printed Name) Melissa Martinez | 3/9/11 |
| (Signature) | 1345 | (Signature) | 1345 |
| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
| (Printed Name) | | (Printed Name) | |
| (Signature) | | (Signature) | |

# DATA VALIDATION COVER SHEET

**5119-1**

**Data Validation Cover Sheet**

Records Use only

Los Alamos NATIONAL LABORATORY EST. 1943

**Section I.**

REQUEST NUMBER: 11-1587 VALIDATION DATE: 05/17/2011 LAB CODE: ARS

CONTRACT LABORATORY NAME: American Radiation Services

VALIDATOR: Janis Kardatzke ORGANIZATION: Analytical Quality Associates, Inc.

ANALYTICAL SUITE (CHECK ALL THAT APPLY):

- ☐ **TPH-GRO**
- ☐ **TPH-DRO**
- ☐ **GENERAL CHEMISTRY**
- ☐ **HIGH EXPLOSIVES**
- ☐ **METALS**
- ☒ **RADIOCHEMISTRY**
- ☐ **DIOXIN FURANS**
- ☐ **PCB CONGENERS**
- ☐ **LCMSMS HIGH EXPLOSIVES**
- ☐ **LCMSMS PERCHLORATES**
- ☐ **ORGANOCHLORINE PESTICIDES/POLYCHLORINATED BIPHENYLS**
- ☐ **OTHER (DESCRIBE):** tritium only

**Section II. Completeness Check**

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

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

1. An MS was not analyzed for tritium. However, an LCS was analyzed and met acceptance criteria, thus, no sample data were qualified.
2. A sample duplicate was not analyzed for tritium. However, an LCSD was analyzed and met the acceptance criteria, thus, no sample data were qualified.
3. It should be noted that the LCS/LCSD RER was hand-calculated using the 2-sigma TPU values and was found to be within specifications. No sample data were qualified.

Reviewed by: Mary Donivan Level: I Date: 05/17/11

VALIDATOR'S SIGNATURE: DATE: 05/17/2011

# RAD ANALYTICAL DATA VALIDATION CHECKLIST

**5119-2**

**Rad Analytical Data Validation Checklist**

Records Use only

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

| RAD ANALYTICAL DATA VALIDATION CHECKLIST | |
|---|---|
| **5119-2**<br>**Rad Analytical Data Validation Checklist** | Records Use only |

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

| RAD ANALYTICAL DATA VALIDATION CHECKLIST | |
|---|---|
| **5119-2**<br>**Rad Analytical Data Validation Checklist** | Records Use only |

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

ARS INTERNATIONAL

2609 North River Road, Port Allen, Louisiana 70767

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

| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00491 | **Request or PO Number:** | 11-1587 |
| **Client Sample ID:** | MD21-11-5600 | **ARS Sample ID:** | ARS1-11-00491-001 |
| **Sample Collection Date:** | 03/09/11 | **Date Received:** | 03/10/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 05/06/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 18312.003 | 972.668 | 220.598 | 108.432 | | pCi/L | ARS-054/EPA 906.0 | 05/03/11 04:39 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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

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JKK 05/17/11

ARS INTERNATIONAL

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00491 | **Request or PO Number:** | 11-1587 |
| **Client Sample ID:** | MD21-11-5601 | **ARS Sample ID:** | ARS1-11-00491-002 |
| **Sample Collection Date:** | 03/09/11 | **Date Received:** | 03/10/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 05/06/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 8321.930 | 452.722 | 219.105 | 107.698 | | pCi/L | ARS-054/EPA 906.0 | 05/03/11 07:49 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00491 | **Request or PO Number:** | 11-1587 |
| **Client Sample ID:** | MD21-11-5602 | **ARS Sample ID:** | ARS1-11-00491-003 |
| **Sample Collection Date:** | 03/09/11 | **Date Received:** | 03/10/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 05/06/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 8685.194 | 471.606 | 219.884 | 108.081 | | pCi/L | ARS-054/EPA 906.0 | 05/03/11 10:58 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00491 | **Request or PO Number:** | 11-1587 |
| **Client Sample ID:** | MD21-11-5603 | **ARS Sample ID:** | ARS1-11-00491-004 |
| **Sample Collection Date:** | 03/09/11 | **Date Received:** | 03/10/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 05/06/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 22232.079 | 1177.212 | 220.301 | 108.286 | | pCi/L | ARS-054/EPA 906.0 | 05/03/11 14:08 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00491 | **Request or PO Number:** | 11-1587 |
| **Client Sample ID:** | MD21-11-5605 | **ARS Sample ID:** | ARS1-11-00491-005 |
| **Sample Collection Date:** | 03/09/11 | **Date Received:** | 03/10/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 05/06/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 5524.951 | 308.825 | 220.414 | 108.342 | | pCi/L | ARS-054/EPA 906.0 | 05/03/11 17:17 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00491 | **Request or PO Number:** | 11-1587 |
| **Client Sample ID:** | MD21-11-5606 | **ARS Sample ID:** | ARS1-11-00491-006 |
| **Sample Collection Date:** | 03/09/11 | **Date Received:** | 03/10/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 05/06/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 4340.263 | 248.407 | 219.018 | 107.656 | | pCi/L | ARS-054/EPA 906.0 | 05/03/11 20:27 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00491 | **Request or PO Number:** | 11-1587 |
| **Client Sample ID:** | MD21-11-5607 | **ARS Sample ID:** | ARS1-11-00491-007 |
| **Sample Collection Date:** | 03/09/11 | **Date Received:** | 03/10/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 05/06/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 101.103 | 66.810 | 219.380 | 107.834 | U | pCi/L | ARS-054/EPA 906.0 | 05/03/11 23:36 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00491 | **Request or PO Number:** | 11-1587 |
| **Client Sample ID:** | MD21-11-5608 | **ARS Sample ID:** | ARS1-11-00491-008 |
| **Sample Collection Date:** | 03/09/11 | **Date Received:** | 03/10/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 05/06/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 268.997 | 69.788 | 219.551 | 107.918 | | pCi/L | ARS-054/EPA 906.0 | 05/04/11 02:45 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00491 | **Request or PO Number:** | 11-1587 |
| **Client Sample ID:** | MD21-11-5610 | **ARS Sample ID:** | ARS1-11-00491-009 |
| **Sample Collection Date:** | 03/09/11 | **Date Received:** | 03/10/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 05/06/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 2.479 | 65.923 | 220.534 | 108.401 | U | pCi/L | ARS-054/EPA 906.0 | 05/04/11 05:55 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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LELAP Certificate# 01949 NELAP Certificate # E87558



JKK
05/17/11

Wednesday, March 09, 2011

# LAB CHAIN OF CUSTODY DOCUMENT NUMBER: 11-1587

## LOS ALAMOS
**NATIONAL LABORATORY**

**REQUEST NUMBER: 11-1587**

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

TURNAROUND/REPORT DUE: 4/8/2011
TURNAROUND REQ'D: 30

LAB REQUEST COMMENTS:

| SAMPLE ID | CTNR | CTNR DESC | ORDER | PRESERV | MATRIX |
|---|---|---|---|---|---|
| MD21-11-5610 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-5607 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-5605 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-5608 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-5600 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-5602 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-5603 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-5606 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-5601 | 1 | SILICA GEL TUBE | H3 | None | GAS |

| Relinquished By: | Date | Time | Received By: | Date | Time |
|---|---|---|---|---|---|
| Signature | | | Signature | | |
| [illegible] | 3/9/11 | 14:00 | [illegible] | 3/10/11 | 10:45 |
| Signature | | | Signature | | |
| Signature | | | Signature | | |

| Received for DISPOSAL By: | Date | Time | Remarks: |
|---|---|---|---|
| Signature | | | |

Wednesday, March 09, 2011

REQUEST NUMBER: 11-1587



# LOS ALAMOS
## NATIONAL LABORATORY

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

These Samples are on:
LANL Request Number:11-1587
Per Agreement Number:63641-001-10
Project Cost Code: MR8R032NFM00

Please analyse the enclosed samples according to the schedule indicated:

**SHIP DATE: 3/9/2011**
**TURNAROUND/REPORT DUE: 4/8/2011**
**TURNAROUND REQ'D: 30 Days**

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

LANL ER SMO CONTACT:
Signature:

| PRIORITY | METHOD CODE | CNTNR | SAMPLE ID | SAMPLE MATRIX | DATE SAMPLED | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| | EPA:906.0 | 1 | MD21-11-5600 | GAS | 3/9/2011 | |
| | | 1 | MD21-11-5601 | GAS | 3/9/2011 | |
| | | 1 | MD21-11-5602 | GAS | 3/9/2011 | |
| | | 1 | MD21-11-5603 | GAS | 3/9/2011 | |
| | | 1 | MD21-11-5605 | GAS | 3/9/2011 | |
| | | 1 | MD21-11-5606 | GAS | 3/9/2011 | |
| | | 1 | MD21-11-5607 | GAS | 3/9/2011 | |
| | | 1 | MD21-11-5608 | GAS | 3/9/2011 | |
| GAS1 | [illegible]-5610 | GAS1 | [illegible]-5610 | GAS | 3/9/2011 | |

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

# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Request Number: 11-1587

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

# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory Request Number: 11-1587

# Original COC

Wednesday, March 09, 2011

REQUEST NUMBER: 11-1587



# LOS ALAMOS
## NATIONAL LABORATORY

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

These Samples are on:
LANL Request Number:11-1587
Per Agreement Number:63641-001-10
Project Cost Code: MR8R032NFM00

Please analyse the enclosed samples according to the schedule indicated:

**SHIP DATE: 3/9/2011**
**TURNAROUND/REPORT DUE: 4/8/2011**
**TURNAROUND REQ'D: 30 Days**

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

LANL ER SMO CONTACT:
Signature:

| PRIORITY | METHOD CODE | CNTNR | SAMPLE ID | SAMPLE MATRIX | DATE SAMPLED | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| | EPA:906.0 | 1 | MD21-11-5600 | GAS | 3/9/2011 | |
| | | 1 | MD21-11-5601 | GAS | 3/9/2011 | |
| | | 1 | MD21-11-5602 | GAS | 3/9/2011 | |
| | | 1 | MD21-11-5603 | GAS | 3/9/2011 | |
| | | 1 | MD21-11-5605 | GAS | 3/9/2011 | |
| | | 1 | MD21-11-5606 | GAS | 3/9/2011 | |
| | | 1 | MD21-11-5607 | GAS | 3/9/2011 | |
| | | 1 | MD21-11-5608 | GAS | 3/9/2011 | |
| GAS1 | MD21-11-5610 | GAS1 | MD21-11-5610 | GAS | 3/9/2011 | |

Wednesday, March 09, 2011

# LAB CHAIN OF CUSTODY DOCUMENT NUMBER: 11-1587

## LOS ALAMOS
**NATIONAL LABORATORY**

**REQUEST NUMBER: 11-1587**

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

TURNAROUND/REPORT DUE: 4/8/2011
TURNAROUND REQ'D: 30

LAB REQUEST COMMENTS:

| SAMPLE ID | CTNR | CTNR DESC | ORDER | PRESERV | MATRIX |
|---|---|---|---|---|---|
| MD21-11-5610 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-5607 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-5605 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-5608 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-5600 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-5602 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-5603 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-5606 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-5601 | 1 | SILICA GEL TUBE | H3 | None | GAS |

| Relinquished By: | Date | Time | Received By: | Date | Time |
|---|---|---|---|---|---|
| Signature | | | Signature | | |
| [illegible] | 3/9/11 | 14:00 | [illegible] | 3/10/11 | 10:45 |
| Signature | | | Signature | | |
| Signature | | | Signature | | |

| Received for DISPOSAL By: | Date | Time | Remarks: |
|---|---|---|---|
| Signature | | | |

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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory Request Number: 11-1587

# Case Narrative

ARS INTERNATIONAL

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

May 6, 2011

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

Request Number: **11-1587**
LANL Sample ID: **MD21-11-5600; MD21-11-5601; MD21-11-5602; MD21-11-5603; MD21-11-5605; MD21-11-5606; MD21-11-5607; MD21-11-5608; MD21-11-5610.**

Dear Mr. Greene;

On March 10, 2011, ARS International received nine (9) Silica Gel samples to be analyzed for Tritium.

The samples were received in good condition. They were processed and counted using the appropriate counting equipment and QA/QC for this type of analysis. Results of the analysis and QA/QC are attached in the data package.

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

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

Sincerely,

Eugene Mulligan

Laboratory Management
**ARS International**

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

# COVER PAGE

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

| Request Number | LANL PROJECT SAMPLE ID NUMBER | American Radiation Services SAMPLE ID NUMBER(S) |
|---|---|---|
| 11-1587 | MD21-11-5600 | ARS1-11-00491-001 |
| 11-1587 | MD21-11-5601 | ARS1-11-00491-002 |
| 11-1587 | MD21-11-5602 | ARS1-11-00491-003 |
| 11-1587 | MD21-11-5603 | ARS1-11-00491-004 |
| 11-1587 | MD21-11-5605 | ARS1-11-00491-005 |
| 11-1587 | MD21-11-5606 | ARS1-11-00491-006 |
| 11-1587 | MD21-11-5607 | ARS1-11-00491-007 |
| 11-1587 | MD21-11-5608 | ARS1-11-00491-008 |
| 11-1587 | MD21-11-5610 | ARS1-11-00491-009 |

**ANALYTICAL METHODS**
Tritium analyses were performed using **EPA 906.0.**

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

ARS INTERNATIONAL

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**American Radiation Services Project Manager/Laboratory Director's Comments:**
*"I certify that this sample data package is in compliance with SOW requirements, both technically and for completeness, other than the conditions detailed above. Release of the data contained in this sample data package and the computer-readable EDD, as applicable, submitted on diskette or by modem, has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature."*

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

| Signature | Title | Date |
|---|---|---|
| Virgene Mulligan | Laboratory Management, ARS International | 5-6-11 |

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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Tritium by Low Level Liquid Scintillation Counting

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00491 | **Request or PO Number:** | 11-1587 |
| **Client Sample ID:** | MD21-11-5600 | **ARS Sample ID:** | ARS1-11-00491-001 |
| **Sample Collection Date:** | 03/09/11 | **Date Received:** | 03/10/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 05/06/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 18312.003 | 972.668 | 220.598 | 108.432 | | pCi/L | ARS-054/EPA 906.0 | 05/03/11 04:39 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00491 | **Request or PO Number:** | 11-1587 |
| **Client Sample ID:** | MD21-11-5601 | **ARS Sample ID:** | ARS1-11-00491-002 |
| **Sample Collection Date:** | 03/09/11 | **Date Received:** | 03/10/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 05/06/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 8321.930 | 452.722 | 219.105 | 107.698 | | pCi/L | ARS-054/EPA 906.0 | 05/03/11 07:49 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00491 | **Request or PO Number:** | 11-1587 |
| **Client Sample ID:** | MD21-11-5602 | **ARS Sample ID:** | ARS1-11-00491-003 |
| **Sample Collection Date:** | 03/09/11 | **Date Received:** | 03/10/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 05/06/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 8685.194 | 471.606 | 219.884 | 108.081 | | pCi/L | ARS-054/EPA 906.0 | 05/03/11 10:58 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00491 | **Request or PO Number:** | 11-1587 |
| **Client Sample ID:** | MD21-11-5603 | **ARS Sample ID:** | ARS1-11-00491-004 |
| **Sample Collection Date:** | 03/09/11 | **Date Received:** | 03/10/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 05/06/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 22232.079 | 1177.212 | 220.301 | 108.286 | | pCi/L | ARS-054/EPA 906.0 | 05/03/11 14:08 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00491 | **Request or PO Number:** | 11-1587 |
| **Client Sample ID:** | MD21-11-5605 | **ARS Sample ID:** | ARS1-11-00491-005 |
| **Sample Collection Date:** | 03/09/11 | **Date Received:** | 03/10/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 05/06/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 5524.951 | 308.825 | 220.414 | 108.342 | | pCi/L | ARS-054/EPA 906.0 | 05/03/11 17:17 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00491 | **Request or PO Number:** | 11-1587 |
| **Client Sample ID:** | MD21-11-5606 | **ARS Sample ID:** | ARS1-11-00491-006 |
| **Sample Collection Date:** | 03/09/11 | **Date Received:** | 03/10/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 05/06/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 4340.263 | 248.407 | 219.018 | 107.656 | | pCi/L | ARS-054/EPA 906.0 | 05/03/11 20:27 | BS | NA |

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00491 | **Request or PO Number:** | 11-1587 |
| **Client Sample ID:** | MD21-11-5607 | **ARS Sample ID:** | ARS1-11-00491-007 |
| **Sample Collection Date:** | 03/09/11 | **Date Received:** | 03/10/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 05/06/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 101.103 | 66.810 | 219.380 | 107.834 | U | pCi/L | ARS-054/EPA 906.0 | 05/03/11 23:36 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00491 | **Request or PO Number:** | 11-1587 |
| **Client Sample ID:** | MD21-11-5608 | **ARS Sample ID:** | ARS1-11-00491-008 |
| **Sample Collection Date:** | 03/09/11 | **Date Received:** | 03/10/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 05/06/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 268.997 | 69.788 | 219.551 | 107.918 | | pCi/L | ARS-054/EPA 906.0 | 05/04/11 02:45 | BS | NA |

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00491 | **Request or PO Number:** | 11-1587 |
| **Client Sample ID:** | MD21-11-5610 | **ARS Sample ID:** | ARS1-11-00491-009 |
| **Sample Collection Date:** | 03/09/11 | **Date Received:** | 03/10/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 05/06/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 2.479 | 65.923 | 220.534 | 108.401 | U | pCi/L | ARS-054/EPA 906.0 | 05/04/11 05:55 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

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# QC Results per Analytical Batch

| | |
|---|---|
| Analytical Batch | ARS1-B11-01640 |
| SDG | ARS1-11-00491 |
| Analysis | Tritium (Aqueous) |
| Analysis Test Method | ARS-054/Liquid Scintillation Counter |
| Analysis Code | LSC-A-001 |
| Report Units | pCi/L |

## Acceptable QC Performance Ranges

| QC Sample Type | Performance Items and Ranges | | |
|---|---|---|---|
| Laboratory Control Sample | Recovery (%): | > 80 | < 120 |
| Matrix Spike | Recovery (%): | > 75 | < 125 |
| Duplicate | Replicate Error Ratio (RER): | | < 1 |
| | Duplicate Error Ratio (DER): | | < 3 |
| | Relative Percent Difference (RPD %): | | ≤ 25 |

## Laboratory Control Sample

Analysis Date: 05/02/11 19:14 — Analysis Technician: BSTEFFENS

| Analysis Batch Sample ID | QC Type | Analyte | Results | CSU (1s) | Expected Value | LCS Rec (%) | MDC |
|---|---|---|---|---|---|---|---|
| ARS1-B11-01640-01 | LCS | H-3 | 2460 | 160 | 2449 | 100 | 220 |

## Duplicate RER/DER/RPD

Analysis Date: 05/02/11 22:23 — Analysis Technician: BSTEFFENS

| Analyte | Result LCS | CSU LCS (1s) | Results LCSD | CSU LCSD (1s) | RER | DER | RPD |
|---|---|---|---|---|---|---|---|
| H-3 | 2460 | 155 | 2440 | 155 | 0.03 | 0.09 | 0.8 |

## Method Blank

Analysis Date: 05/03/11 01:31 — Analysis Technician: BSTEFFENS

| Analysis Batch Sample ID | QC Type | Analyte | Results | CSU (1s) | MDC | Qual |
|---|---|---|---|---|---|---|
| ARS1-B11-01640-03 | MBL | H-3 | -110 | 64 | 220 | U |

Susan Leese

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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Tritium by Low Level Liquid Scintillation Counting

# Samples

# LSC Instrument Data Transfer Report

\\PACKARD3170_NEW\Results\ARS\H-3 Normal 3\

| Batch Sample ID | Non-BKG Samples Transferred | Samples Eligible To Save | |
|---|---|---|---|
| ARS1-B11-01640 | 23 | 23 | LSC 2 |

| LIMS Batch Sample ID | LSC P# | LSC PID | LSC S# | LSC SMPL_ID | LSC Count Date | LSC CPMA | LSC ISIE | LSC EFF | LSC Count Dur | Analysis Batch | LIMS SDG | LIMS Run |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BKG | 54 | | 1 | BACKGROUND | 05/02/11 16:07 | 6.36 | 422.88 | 35.9200 | 180.00 | ARS1-B11-01640 | | |
| ARS1-B11-01640-01 | 54 | | 2 | B11-01640-01 | 05/02/11 19:13 | 16.38 | 435.49 | 36.4800 | 180.00 | ARS1-B11-01640 | | |
| ARS1-B11-01640-02 | 54 | | 3 | B11-01640-02 | 05/02/11 22:23 | 16.31 | 435.50 | 36.4800 | 180.00 | ARS1-B11-01640 | | |
| ARS1-B11-01640-03 | 54 | | 4 | B11-01640-03 | 05/03/11 01:31 | 5.91 | 437.63 | 36.5700 | 180.00 | ARS1-B11-01640 | | |
| ARS1-B11-01640-04 | 54 | | 5 | B11-01640-04 | 05/03/11 04:39 | 80.21 | 436.54 | 36.5300 | 180.00 | ARS1-B11-01640 | ARS1-11-00491 | 1 |
| ARS1-B11-01640-05 | 54 | | 6 | B11-01640-05 | 05/03/11 07:48 | 40.15 | 439.73 | 36.6700 | 180.00 | ARS1-B11-01640 | ARS1-11-00491 | 1 |
| ARS1-B11-01640-06 | 54 | | 7 | B11-01640-06 | 05/03/11 10:58 | 41.50 | 435.59 | 36.4900 | 180.00 | ARS1-B11-01640 | ARS1-11-00491 | 1 |
| ARS1-B11-01640-07 | 54 | | 8 | B11-01640-07 | 05/03/11 14:07 | 96.14 | 433.67 | 36.4000 | 180.00 | ARS1-B11-01640 | ARS1-11-00491 | 1 |
| ARS1-B11-01640-08 | 54 | | 9 | B11-01640-08 | 05/03/11 17:17 | 28.66 | 431.65 | 36.3100 | 180.00 | ARS1-B11-01640 | ARS1-11-00491 | 1 |
| ARS1-B11-01640-09 | 54 | | 10 | B11-01640-09 | 05/03/11 20:26 | 23.99 | 435.20 | 36.4700 | 180.00 | ARS1-B11-01640 | ARS1-11-00491 | 1 |
| ARS1-B11-01640-10 | 54 | | 11 | B11-01640-10 | 05/03/11 23:36 | 6.77 | 430.55 | 36.2600 | 180.00 | ARS1-B11-01640 | ARS1-11-00491 | 1 |
| ARS1-B11-01640-11 | 54 | | 12 | B11-01640-11 | 05/04/11 02:45 | 7.45 | 427.76 | 36.1400 | 180.00 | ARS1-B11-01640 | ARS1-11-00491 | 1 |
| ARS1-B11-01640-12 | 54 | | 13 | B11-01640-12 | 05/04/11 05:55 | 6.37 | 429.04 | 36.2000 | 180.00 | ARS1-B11-01640 | ARS1-11-00491 | 1 |
| ARS1-B11-01640-13 | 54 | | 14 | B11-01640-13 | 05/04/11 09:04 | 6.20 | 424.17 | 35.9800 | 180.00 | ARS1-B11-01640 | ARS1-11-00622 | 1 |
| ARS1-B11-01640-14 | 54 | | 15 | B11-01640-14 | 05/04/11 12:12 | 6.24 | 423.99 | 35.9700 | 180.00 | ARS1-B11-01640 | ARS1-11-00622 | 1 |
| ARS1-B11-01640-15 | 54 | | 16 | B11-01640-15 | 05/04/11 15:20 | 6.82 | 418.05 | 35.7100 | 180.00 | ARS1-B11-01640 | ARS1-11-00622 | 1 |
| ARS1-B11-01640-16 | 54 | | 17 | B11-01640-16 | 05/04/11 18:29 | 6.57 | 424.88 | 36.0100 | 180.00 | ARS1-B11-01640 | ARS1-11-00622 | 1 |
| ARS1-B11-01640-17 | 54 | | 18 | B11-01640-17 | 05/04/11 21:39 | 6.80 | 434.42 | 36.4300 | 180.00 | ARS1-B11-01640 | ARS1-11-00622 | 1 |
| ARS1-B11-01640-18 | 54 | | 19 | B11-01640-18 | 05/05/11 00:48 | 6.97 | 428.92 | 36.1900 | 180.00 | ARS1-B11-01640 | ARS1-11-00622 | 1 |
| ARS1-B11-01640-19 | 54 | | 20 | B11-01640-19 | 05/05/11 03:58 | 7.28 | 406.85 | 35.0900 | 180.00 | ARS1-B11-01640 | ARS1-11-00526 | 1 |
| ARS1-B11-01640-20 | 54 | | 21 | B11-01640-20 | 05/05/11 07:07 | 8.06 | 416.46 | 35.6400 | 180.00 | ARS1-B11-01640 | ARS1-11-00526 | 1 |
| ARS1-B11-01640-21 | 54 | | 22 | B11-01640-21 | 05/05/11 10:16 | 7.01 | 400.48 | 34.6300 | 180.00 | ARS1-B11-01640 | ARS1-11-00526 | 1 |
| ARS1-B11-01640-22 | 54 | | 23 | B11-01640-22 | 05/05/11 13:26 | 137.77 | 423.60 | 35.9600 | 180.00 | ARS1-B11-01640 | ARS1-11-00527 | 1 |
| ARS1-B11-01640-23 | 54 | | 24 | B11-01640-23 | 05/05/11 16:35 | 158.32 | 419.18 | 35.7600 | 180.00 | ARS1-B11-01640 | ARS1-11-00527 | 1 |

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 16.380000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 6.360000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.364800 |
| Sample Aliquot | 5.037000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 5/2/11 7:14 PM |
| Count Date (t2) | 5/2/11 7:14 PM |
| Activity Units = pCi ---- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| 0 **Variables Intact Test** | **OK** |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| **ACT** | **2456.337093** | **2456.337093** | **OK** |
| **CU** | **87.132309** | **87.132309** | **OK** |
| **TPU** | **155.186549** | **155.186549** | **OK** |
| **MDA** | **218.090111** | **218.090111** | **OK** |
| **DL** | **107.199670** | **107.199670** | **OK** |
| **Net Count Rate** | **10.020000** | **10.020000** | **OK** |
| **D t 1 (t2 - t1)** | **0.000000** | **0.000000** | **OK** |
| **DF** | **1.000000** | **1.000000** | **OK** |
| **Sys Err** | **0.052280** | **0.052280** | **OK** |
| **K** | **0.004079** | **0.004079** | **OK** |
| **K MDA** | **0.734264** | **0.734264** | **OK** |

| Batch Identifiers and Other Related Information | |
|---|---|
| **Batch** | ARS1-B11-01640 |
| **Batch ID** | ARS1-B11-01640-01 |
| **Analysis Code** | |
| **SDG** | QC Sample |
| **Fraction** | N/A QC Sample |
| **Run Number** | |
| | |
| **Client** | QC Sample |
| **Client Profile** | |
| **Client ID** | N/A QC Sample |
| **Instr File Name** | 71 |
| **Instr Detector** | P-54-S-2 |
| **Instr keV** | |
| **Version/Date** | 1.0 -- 11/18/2005 |

**Reviewed by:** SDh **Date:** 5-6-11

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 16.310000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 6.360000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.364800 |
| Sample Aliquot | 5.027000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 5/2/11 10:23 PM |
| Count Date (t2) | 5/2/11 10:23 PM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.9600 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| **Variables Intact Test** | **OK** |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| **ACT** | **2444.029206** | **2444.029206** | **OK** |
| **CU** | **170.858471** | **170.858471** | **OK** |
| **TPU** | **303.165756** | **303.165756** | **OK** |
| **MDA** | **218.523949** | **218.523949** | **OK** |
| **DL** | **107.412918** | **107.412918** | **OK** |
| **Net Count Rate** | **9.950000** | **9.950000** | **OK** |
| **D t 1 (t2 - t1)** | **0.000000** | **0.000000** | **OK** |
| **DF** | **1.000000** | **1.000000** | **OK** |
| **Sys Err** | **0.052280** | **0.052280** | **OK** |
| **K** | **0.004071** | **0.004071** | **OK** |
| **K MDA** | **0.732806** | **0.732806** | **OK** |

| Batch Identifiers and Other Related Information | |
|---|---|
| **Batch** | ARS1-B11-01640 |
| **Batch ID** | ARS1-B11-01640-02 |
| **Analysis Code** | |
| **SDG** | QC Sample |
| **Fraction** | N/A QC Sample |
| **Run Number** | |
| | |
| **Client** | QC Sample |
| **Client Profile** | |
| **Client ID** | N/A QC Sample |
| **Instr File Name** | 71 |
| **Instr Detector** | P-54-S-3 |
| **Instr keV** | |
| **Version/Date** | 1.0 -- 11/18/2005 |

**Reviewed by:** SDh **Date:** 5-6-11

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 5.910000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 6.360000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.365700 |
| Sample Aliquot | 5.044000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 5/3/11 1:31 AM |
| Count Date (t2) | 5/3/11 1:31 AM |
| Activity Units # pCi --- UCF = | 2.2200 |
| CF | 1.9600 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| **Variables Intact Test** | **OK** |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| ACT | -109.890336 | -109.890336 | OK |
| CU | 124.968200 | 124.968200 | OK |
| TPU | 125.471490 | 125.471490 | OK |
| MDA | 217.251466 | 217.251466 | OK |
| DL | 106.787444 | 106.787444 | OK |
| Net Count Rate | -0.450000 | -0.450000 | OK |
| D t 1 (t2 - t1) | 0.000000 | 0.000000 | OK |
| DF | 1.000000 | 1.000000 | OK |
| Sys Err | 0.052280 | 0.052280 | OK |
| K | 0.004095 | 0.004095 | OK |
| K MDA | 0.737098 | 0.737098 | OK |

| Batch Identifiers and Other Related Information | |
|---|---|
| Batch | ARS1-B11-01640 |
| Batch ID | ARS1-B11-01640-03 |
| Analysis Code | |
| SDG | QC Sample |
| Fraction | N/A QC Sample |
| Run Number | |
| Client | QC Sample |
| Client Profile | |
| Client ID | N/A QC Sample |
| Instr File Name | 71 |
| Instr Detector | P-54-S-4 |
| Instr keV | |
| Version/Date | 1.0 -- 11/18/2005 |

Reviewed by: SDK Date: 5-6-11

American Radiation Services
Baton Rouge Laboratory

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 80.210000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 6.360000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.365300 |
| Sample Aliquot | 5.015000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 3/9/11 12:00 PM |
| Count Date (t2) | 5/3/11 4:39 AM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.030000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| **Variables Intact Test** | **OK** |

0

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| **ACT** | 18312.002839 | 18312.002829 | OK |
| **CU** | 171.962125 | 171.962126 | OK |
| **TPU** | 972.667976 | 972.667975 | OK |
| **MDA** | 220.597749 | 220.597749 | OK |
| **DL** | 108.432271 | 108.432271 | OK |
| **Net Count Rate** | 73.850000 | 73.850000 | OK |
| **D t 1 (t2 - t1)** | 54.693750 | 54.693750 | OK |
| **DF** | 0.991610 | 0.991610 | OK |
| **Sys Err** | 0.052280 | 0.052280 | OK |
| **K** | 0.004033 | 0.004033 | OK |
| **K MDA** | 0.725917 | 0.725917 | OK |

| Batch Identifiers and Other Related Information | |
|---|---|
| **Batch** | ARS1-B11-01640 |
| **Batch ID** | ARS1-B11-01640-04 |
| **Analysis Code** | LSC-A-001 |
| **SDG** | ARS1-11-00491 |
| **Fraction** | 001 |
| **Run Number** | 1 |
| | |
| **Client** | Los Alamos National Laboratory |
| **Client Profile** | Keith Greene |
| **Client ID** | MD21-11-5600 |
| **Instr File Name** | 71 |
| **Instr Detector** | P-54-S-5 |
| **Instr keV** | |
| **Version/Date** | 1.0 -- 11/18/2005 |

**Reviewed by:** SDL **Date:** 5-6-11

| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 40.150000 |
| Sample Count Mins | 160.000000 |
| BKG Count Rate | 6.360000 |
| BKG Count Mins | 160.000000 |
| Instrument Efficiency | 0.366700 |
| Sample Aliquot | 5.030000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 3/9/11 12:00 PM |
| Count Date (t2) | 5/3/11 7:49 AM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| 0 **Variables Intact Test** | **OK** |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| ACT | 8321.930425 | 8321.930420 | OK |
| CU | 125.190913 | 125.190913 | OK |
| TPU | 452.721859 | 452.721858 | OK |
| MDA | 219.104662 | 219.104662 | OK |
| OL | 107.698361 | 107.698361 | OK |
| Net Count Rate | 33.790000 | 33.790000 | OK |
| D t 1 (t2 - t1) | 54.825694 | 54.825694 | OK |
| DF | 0.991590 | 0.991590 | OK |
| Sys Err | 0.052280 | 0.052280 | OK |
| K | 0.004060 | 0.004060 | OK |
| K MDA | 0.730864 | 0.730864 | OK |

**Batch Identifiers and Other Related Information**

| | |
|---|---|
| Batch | ARS1-B11-01640 |
| Batch ID | ARS1-B11-01640-05 |
| Analysis Code | LSC-A-001 |
| SDG | ARS1-11-00491 |
| Fraction | 002 |
| Run Number | 1 |
| | |
| Client | Los Alamos National Laboratory |
| Client Profile | Keith Greene |
| Client ID | ND21-11-5601 |
| Instr File Name | 71 |
| Instr Detector | P-54-S-6 |
| Instr keV | |
| Version/Date | 1.0 -- 11/18/2005 |

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American Radiation Services
Baton Rouge Laboratory

# Calculation Verification

Printed 5/6/2011 8:53 AM


| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 41.500000 |
| Sample Count Mins | 160.000000 |
| BKG Count Rate | 6.360000 |
| BKG Count Mins | 160.000000 |
| Instrument Efficiency | 0.364900 |
| Sample Aliquot | 5.037000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 3/9/11 12:00 PM |
| Count Date (t2) | 5/3/11 10:58 AM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| 0 **Variables Intact Test** | OK |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| ACT | 8685.193670 | 8685.193665 | OK |
| CU | 127.446480 | 127.446480 | OK |
| TPU | 471.606416 | 471.606416 | OK |
| MDA | 219.883924 | 219.883924 | OK |
| DL | 108.081398 | 108.081398 | OK |
| Net Count Rate | 35.140000 | 35.140000 | OK |
| D t 1 (t2 - t1) | 54.956944 | 54.956944 | OK |
| DF | 0.991570 | 0.991570 | OK |
| Sys Err | 0.052280 | 0.052280 | OK |
| K | 0.004046 | 0.004046 | OK |
| K MDA | 0.728274 | 0.728274 | OK |

| Batch Identifiers and Other Related Information | |
|---|---|
| Batch | ARS1-B11-01640 |
| Batch ID | ARS1-B11-01640-06 |
| Analysis Code | LSC-A-001 |
| SDG | ARS1-11-00491 |
| Fraction | 003 |
| Run Number | 1 |
| | |
| Client | Los Alamos National Laboratory |
| Client Profile | Keith Greene |
| Client ID | MD21-11-5602 |
| Instr File Name | 71 |
| Instr Detector | P-54-S-7 |
| Instr keV | |
| Version/Date | 1.0 -- 11/18/2005 |

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**American Radiation Services**
**Baton Rouge Laboratory**

# Calculation Verification

**Printed 5/6/2011 8:53 AM**


| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 96.140000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 6.360000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.364000 |
| Sample Aliquot | 5.040000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 3/9/11 12:00 PM |
| Count Date (t2) | 5/3/11 2:08 PM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| 0 **Variables Intact Test** | **OK** |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| ACT | 22232.078748 | 22232.078736 | OK |
| CU | 186.864219 | 186.864219 | OK |
| TPU | 1177.212323 | 1177.212322 | OK |
| MDA | 220.300864 | 220.300864 | OK |
| DL | 108.286340 | 108.286340 | OK |
| Net Count Rate | 89.780000 | 89.780000 | OK |
| D t 1 (t2 - t1) | 55.088889 | 55.088889 | OK |
| DF | 0.991550 | 0.991550 | OK |
| Sys Err | 0.052280 | 0.052280 | OK |
| K | 0.004038 | 0.004038 | OK |
| K MDA | 0.726896 | 0.726896 | OK |

| Batch Identifiers and Other Related Information | |
|---|---|
| Batch | ARS1-B11-01640 |
| Batch ID | ARS1-B11-01640-07 |
| Analysis Code | LSC-A-001 |
| SDG | ARS1-11-00491 |
| Fraction | 004 |
| Run Number | 1 |
| | |
| Client | Los Alamos National Laboratory |
| Client Profile | Keith Greene |
| Client ID | MD21-11-5603 |
| Instr File Name | 71 |
| Instr Detector | P-54-S-8 |
| Instr keV | |
| Version/Date | 1.0 -- 11/18/2005 |

Reviewed by: SDH Date: 5-6-11

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 28.660000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 6.360000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.363100 |
| Sample Aliquot | 5.050000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 3/9/11 12:00 PM |
| Count Date (t2) | 5/3/11 5:17 PM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| **Variables Intact Test** | **OK** |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| ACT | 5524.950706 | 5524.950703 | OK |
| CU | 109.281177 | 109.281177 | OK |
| TPU | 308.824506 | 308.824506 | OK |
| MDA | 220.414050 | 220.414049 | OK |
| DL | 108.341975 | 108.341975 | OK |
| Net Count Rate | 22.300000 | 22.300000 | OK |
| D t 1 (t2 - t1) | 55.220139 | 55.220139 | OK |
| DF | 0.991530 | 0.991530 | OK |
| Sys Err | 0.052280 | 0.052280 | OK |
| K | 0.004036 | 0.004036 | OK |
| K MDA | 0.726522 | 0.726522 | OK |

| Batch Identifiers and Other Related Information | |
|---|---|
| Batch | ARS1-B11-01640 |
| Batch ID | ARS1-B11-01640-08 |
| Analysis Code | LSC-A-001 |
| SDG | ARS1-11-00491 |
| Fraction | 005 |
| Run Number | 1 |
| | |
| Client | Los Alamos National Laboratory |
| Client Profile | Keith Greene |
| Client ID | MD21-11-5605 |
| Instr File Name | 71 |
| Instr Detector | P-54-S-9 |
| Instr keV | |
| Version/Date | 1.0 -- 11/18/2005 |

Reviewed by: SDL Date: 5-6-11

**American Radiation Services**
**Baton Rouge Laboratory**

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 23.990000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 6.360000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.364700 |
| Sample Aliquot | 5.060000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 3/9/11 12:00 PM |
| Count Date (t2) | 5/3/11 8:27 PM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| 0 **Variables Intact Test** | **OK** |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| **ACT** | **4340.262840** | **4340.262838** | **OK** |
| **CU** | **101.089678** | **101.089678** | **OK** |
| **TPU** | **248.407397** | **248.407397** | **OK** |
| **MDA** | **219.017818** | **219.017818** | **OK** |
| **DL** | **107.655674** | **107.655674** | **OK** |
| **Net Count Rate** | **17.630000** | **17.630000** | **OK** |
| **D t 1 (t2 - t1)** | **55.352083** | **55.352083** | **OK** |
| **DF** | **0.991510** | **0.991510** | **OK** |
| **Sys Err** | **0.052280** | **0.052280** | **OK** |
| **K** | **0.004062** | **0.004062** | **OK** |
| **K MDA** | **0.731154** | **0.731154** | **OK** |

| Batch Identifiers and Other Related Information | |
|---|---|
| **Batch** | ARS1-B11-01640 |
| **Batch ID** | ARS1-B11-01640-09 |
| **Analysis Code** | LSC-A-001 |
| **SDG** | ARS1-11-00491 |
| **Fraction** | 006 |
| **Run Number** | 1 |
| | |
| **Client** | Los Alamos National Laboratory |
| **Client Profile** | Keith Greene |
| **Client ID** | MD21-11-5606 |
| **Instr File Name** | 71 |
| **Instr Detector** | P-54-S-10 |
| **Instr keV** | |
| **Version/Date** | 1.0 -- 11/18/2005 |

**Reviewed by:** SDh **Date:** 5-6-11

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 6.770000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 6.360000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.362600 |
| Sample Aliquot | 5.081000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 3/9/11 12:00 PM |
| Count Date (t2) | 5/3/11 11:36 PM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| 0 **Variables Intact Test** | **OK** |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| **ACT** | **101.103372** | **101.103372** | **OK** |
| **CU** | **66.600562** | **66.600562** | **OK** |
| **TPU** | **66.809977** | **66.809977** | **OK** |
| **MDA** | **219.380243** | **219.380243** | **OK** |
| **DL** | **107.833820** | **107.833820** | **OK** |
| **Net Count Rate** | **0.410000** | **0.410000** | **OK** |
| **D t 1 (t2 - t1)** | **55.483333** | **55.483333** | **OK** |
| **DF** | **0.991490** | **0.991490** | **OK** |
| **Sys Err** | **0.052280** | **0.052280** | **OK** |
| **K** | **0.004055** | **0.004055** | **OK** |
| **K MDA** | **0.729946** | **0.729946** | **OK** |

**Batch Identifiers and Other Related Information**

| | |
|---|---|
| **Batch** | ARS1-B11-01640 |
| **Batch ID** | ARS1-B11-01640-10 |
| **Analysis Code** | LSC-A-001 |
| **SDG** | ARS1-11-00491 |
| **Fraction** | 007 |
| **Run Number** | 1 |
| | |
| **Client** | Los Alamos National Laboratory |
| **Client Profile** | Keith Greene |
| **Client ID** | MD21-11-5607 |
| **Instr File Name** | 71 |
| **Instr Detector** | P-54-5-11 |
| **Instr keV** | |
| **Version/Date** | 1.0 -- 11/18/2005 |

**Reviewed by:** SDh **Date:** 5-6-11

# Calculation Verification

| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 7.450000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 6.360000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.361400 |
| Sample Aliquot | 5.094000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 3/9/11 12:00 PM |
| Count Date (t2) | 5/4/11 2:45 AM |
| Activity Units = pCi -- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| 0 **Variables Intact Test** | **OK** |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| **ACT** | **268.996710** | **268.996710** | **OK** |
| **CU** | **68.356695** | **68.356695** | **OK** |
| **TPU** | **69.788307** | **69.788307** | **OK** |
| **MDA** | **219.551384** | **219.551384** | **OK** |
| **DL** | **107.917947** | **107.917947** | **OK** |
| **Net Count Rate** | **1.090000** | **1.090000** | **OK** |
| **D t 1 (t2 - t1)** | **55.614583** | **55.614583** | **OK** |
| **DF** | **0.991470** | **0.991470** | **OK** |
| **Sys Err** | **0.052280** | **0.052280** | **OK** |
| **K** | **0.004052** | **0.004052** | **OK** |
| **K MDA** | **0.729377** | **0.729377** | **OK** |

| Batch Identifiers and Other Related Information | |
|---|---|
| **Batch** | ARS1-B11-01640 |
| **Batch ID** | ARS1-B11-01640-11 |
| **Analysis Code** | LSC-A-001 |
| **SDG** | ARS1-11-00491 |
| **Fraction** | 008 |
| **Run Number** | 1 |
| | |
| **Client** | Los Alamos National Laboratory |
| **Client Profile** | Keith Greene |
| **Client ID** | MD21-11-5608 |
| **Instr File Name** | 71 |
| **Instr Detector** | P-54-S-12 |
| **Instr keV** | |
| **Version/Date** | 1.0 -- 11/18/2005 |

**Reviewed by:** SDh **Date:** 5-6-11

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 6.370000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 6.360000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.362000 |
| Sample Aliquot | 5.063000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 3/9/11 12:00 PM |
| Count Date (t2) | 5/4/11 5:55 AM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| 0 **Variables Intact Test** | **OK** |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| **ACT** | **2.478905** | **2.478905** | **OK** |
| **CU** | **65.923133** | **65.923133** | **OK** |
| **TPU** | **65.923260** | **65.923260** | **OK** |
| **MDA** | **220.534032** | **220.534032** | **OK** |
| **DL** | **10B.400951** | **108.400951** | **OK** |
| **Net Count Rate** | **0.010000** | **0.010000** | **OK** |
| **D t 1 (t2 - t1)** | **55.746528** | **55.746528** | **OK** |
| **DF** | **0.991450** | **0.991450** | **OK** |
| **Sys Err** | **0.052280** | **0.052280** | **OK** |
| **K** | **0.004034** | **0.004034** | **OK** |
| **K MDA** | **0.726127** | **0.726127** | **OK** |

| Batch Identifiers and Other Related Information | |
|---|---|
| **Batch** | ARS1-B11-01640 |
| **Batch ID** | ARS1-B11-01640-12 |
| **Analysis Code** | LSC-A-001 |
| **SDG** | ARS1-11-00491 |
| **Fraction** | 009 |
| **Run Number** | 1 |
| | |
| **Client** | Los Alamos National Laboratory |
| **Client Profile** | Keith Greene |
| **Client ID** | MD21-11-5610 |
| **Instr File Name** | 71 |
| **Instr Detector** | P-54-S-13 |
| **Instr keV** | |
| **Version/Date** | 1.0 -- 11/18/2005 |

Reviewed by: SDr    Date: 5-6-11

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

# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Tritium by Low Level Liquid Scintillation Counting

# Laboratory Records

# Analysis Batch Report





ARS INTERNATIONAL

**Analysis Batch ID** **ARS1-B11-01640**

| Method | ARS-054 | Analysis | LSC-A-001 | Matrix | SI |
|---|---|---|---|---|---|
| Description | Tritium (Aqueous) | | | | |

| ABatch Sample ID | Type | Blind Iso1 | Blind Iso2 | Blind Iso3 | SDG | FR | Run | Client ID | Isotope Group | Lab Deadline |
|---|---|---|---|---|---|---|---|---|---|---|
| ARS1-B11-01640-01 | LCS | B-11644 | | | | | | | | |
| ARS1-B11-01640-02 | LCSD | B-11645 | | | | | | | | |
| ARS1-B11-01640-03 | MBL | | | | | | | | | |
| ARS1-B11-01640-04 | TRG | | | | ARS1-11-00491 | 001 | 1 | MD21-11-5600 | STD | 04/05/11 |
| ARS1-B11-01640-05 | TRG | | | | ARS1-11-00491 | 002 | 1 | MD21-11-5601 | STD | 04/05/11 |
| ARS1-B11-01640-06 | TRG | | | | ARS1-11-00491 | 003 | 1 | MD21-11-5602 | STD | 04/05/11 |
| ARS1-B11-01640-07 | TRG | | | | ARS1-11-00491 | 004 | 1 | MD21-11-5603 | STD | 04/05/11 |
| ARS1-B11-01640-08 | TRG | | | | ARS1-11-00491 | 005 | 1 | MD21-11-5605 | STD | 04/05/11 |
| ARS1-B11-01640-09 | TRG | | | | ARS1-11-00491 | 006 | 1 | MD21-11-5606 | STD | 04/05/11 |
| ARS1-B11-01640-10 | TRG | | | | ARS1-11-00491 | 007 | 1 | MD21-11-5607 | STD | 04/05/11 |
| ARS1-B11-01640-11 | TRG | | | | ARS1-11-00491 | 008 | 1 | MD21-11-5608 | STD | 04/05/11 |
| ARS1-B11-01640-12 | TRG | | | | ARS1-11-00491 | 009 | 1 | MD21-11-5610 | STD | 04/05/11 |
| ARS1-B11-01640-13 | TRG | | | | ARS1-11-00622 | 001 | 1 | MD50-11-5957 | STD | 04/08/11 |
| ARS1-B11-01640-14 | TRG | | | | ARS1-11-00622 | 002 | 1 | MD50-11-5958 | STD | 04/08/11 |
| ARS1-B11-01640-15 | TRG | | | | ARS1-11-00622 | 003 | 1 | MD50-11-5959 | STD | 04/08/11 |
| ARS1-B11-01640-16 | TRG | | | | ARS1-11-00622 | 004 | 1 | MD50-11-5960 | STD | 04/08/11 |
| ARS1-B11-01640-17 | TRG | | | | ARS1-11-00622 | 005 | 1 | MD50-11-5961 | STD | 04/08/11 |
| ARS1-B11-01640-18 | TRG | | | | ARS1-11-00622 | 006 | 1 | MD50-11-5962 | STD | 04/08/11 |
| ARS1-B11-01640-19 | TRG | | | | ARS1-11-00526 | 001 | 1 | MD54-11-3767 | STD | 04/11/11 |
| ARS1-B11-01640-20 | TRG | | | | ARS1-11-00526 | 002 | 1 | MD54-11-3766 | STD | 04/11/11 |
| ARS1-B11-01640-21 | TRG | | | | ARS1-11-00526 | 003 | 1 | MD54-11-3768 | STD | 04/11/11 |
| ARS1-B11-01640-22 | TRG | | | | ARS1-11-00527 | 001 | 1 | MD21-11-5604 | STD | 04/11/11 |
| ARS1-B11-01640-23 | TRG | | | | ARS1-11-00527 | 002 | 1 | MD21-11-5609 | STD | 04/11/11 |

85817 11-00491-001-1 WRAD
85818 11-00491-002-1 WRAD
85819 11-00491-003-1 WRAD
85820 11-00491-004-1 WRAD
85821 11-00491-005-1 WRAD
85822 11-00491-006-1 WRAD
85823 11-00491-007-1 WRAD
85824 11-00491-008-1 WRAD
85825 11-00491-009-1 WRAD
85826 11-00622-001-1 WRAD
85827 11-00622-002-1 WRAD
85828 11-00622-003-1 WRAD
85829 11-00622-004-1 WRAD
85830 11-00622-005-1 WRAD
85831 11-00622-006-1 WRAD
85832 11-00526-001-1 WRAD
85833 11-00526-002-1 WRAD
85834 11-00526-003-1 WRAD
85835 11-00527-001-1 WRAD
85836 11-00527-002-1 WRAD

American Radiation Services
Baton Rouge Laboratory

# LCS Report
## Analytical Batch: ARS1-B11-01640



| BlindID | ABatch | ABatchSampleID | BlindGroup | StdID | Isotope | ExpectedAddition | ExpectedValue | EmptyWt | GrossWt | NetWt | UserID | ModDate | ExpectedValue_CT | MidPointCountDate | KnownValue |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B-11644 | ARS1-B11-01640 | ARS1-B11-01640-01 | B-H3 | S-0247 | H-3 | 5 | 2.454533971 | 0 | 1 | 1 | BSTEFFENS | 4/18/2011 | 2.449246341 | 5/2/2011 | 2.449246341 |
| B-11645 | ARS1-B11-01640 | ARS1-B11-01640-02 | B-H3 | S-0247 | H-3 | 5 | 2.454533971 | 0 | 1 | 1 | BSTEFFENS | 4/18/2011 | 2.449246341 | 5/2/2011 | 2.449246341 |

# ARS-054





| ID_31001_054 | ABatch | ABatchSampleID | ClientID | Aliquot1 | AliquotUnits1 | IC_ID1 | Aliquot2 | AliquotUnits2 | IC_ID2 | UserID | ModDate |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8443 | ARS1-B11-01640 | ARS1-B11-01640-01 | | | | | 5.037 | g | | BSTEFFENS | 05/03/2011 10:19:34 |
| 8444 | ARS1-B11-01640 | ARS1-B11-01640-02 | | | | | 5.027 | g | | BSTEFFENS | 05/03/2011 10:19:34 |
| 8445 | ARS1-B11-01640 | ARS1-B11-01640-03 | | | | | 5.044 | g | | BSTEFFENS | 05/03/2011 10:19:34 |
| 8446 | ARS1-B11-01640 | ARS1-B11-01640-04 | MD21-11-5600 | | | | 5.015 | g | 85817 | BSTEFFENS | 05/03/2011 10:19:34 |
| 8447 | ARS1-B11-01640 | ARS1-B11-01640-05 | MD21-11-5601 | | | | 5.03 | g | 85818 | BSTEFFENS | 05/03/2011 10:19:34 |
| 8448 | ARS1-B11-01640 | ARS1-B11-01640-06 | MD21-11-5602 | | | | 5.037 | g | 85819 | BSTEFFENS | 05/03/2011 10:19:34 |
| 8449 | ARS1-B11-01640 | ARS1-B11-01640-07 | MD21-11-5603 | | | | 5.04 | g | 85820 | BSTEFFENS | 05/03/2011 10:19:34 |
| 8450 | ARS1-B11-01640 | ARS1-B11-01640-08 | MD21-11-5605 | | | | 5.05 | g | 85821 | BSTEFFENS | 05/03/2011 10:19:34 |
| 8451 | ARS1-B11-01640 | ARS1-B11-01640-09 | MD21-11-5606 | | | | 5.06 | g | 85822 | BSTEFFENS | 05/03/2011 10:19:35 |
| 8452 | ARS1-B11-01640 | ARS1-B11-01640-10 | MD21-11-5607 | | | | 5.081 | g | 85823 | BSTEFFENS | 05/03/2011 10:19:35 |
| 8453 | ARS1-B11-01640 | ARS1-B11-01640-11 | MD21-11-5608 | | | | 5.094 | g | 85824 | BSTEFFENS | 05/03/2011 10:19:35 |
| 8454 | ARS1-B11-01640 | ARS1-B11-01640-12 | MD21-11-5610 | | | | 5.063 | g | 85825 | BSTEFFENS | 05/03/2011 10:19:35 |
| 8455 | ARS1-B11-01640 | ARS1-B11-01640-13 | MD50-11-5957 | | | | 5.03 | g | 85826 | BSTEFFENS | 05/03/2011 10:19:35 |
| 8456 | ARS1-B11-01640 | ARS1-B11-01640-14 | MD50-11-5958 | | | | 5.075 | g | 85827 | BSTEFFENS | 05/03/2011 10:19:35 |
| 8457 | ARS1-B11-01640 | ARS1-B11-01640-15 | MD50-11-5959 | | | | 5.054 | g | 85828 | BSTEFFENS | 05/03/2011 10:19:35 |
| 8458 | ARS1-B11-01640 | ARS1-B11-01640-16 | MD50-11-5960 | | | | 5.051 | g | 85829 | BSTEFFENS | 05/03/2011 10:19:35 |
| 8459 | ARS1-B11-01640 | ARS1-B11-01640-17 | MD50-11-5961 | | | | 5.069 | g | 85830 | BSTEFFENS | 05/03/2011 10:19:35 |
| 8460 | ARS1-B11-01640 | ARS1-B11-01640-18 | MD50-11-5962 | | | | 5.05 | g | 85831 | BSTEFFENS | 05/03/2011 10:19:35 |
| 8461 | ARS1-B11-01640 | ARS1-B11-01640-19 | MD54-11-3767 | | | | 5.033 | g | 85832 | BSTEFFENS | 05/03/2011 10:19:35 |
| 8462 | ARS1-B11-01640 | ARS1-B11-01640-20 | MD54-11-3766 | | | | 5.028 | g | 85833 | BSTEFFENS | 05/03/2011 10:19:35 |
| 8463 | ARS1-B11-01640 | ARS1-B11-01640-21 | MD54-11-3768 | | | | 5.007 | g | 85834 | BSTEFFENS | 05/03/2011 10:19:35 |
| 8464 | ARS1-B11-01640 | ARS1-B11-01640-22 | MD21-11-5604 | | | | 5.076 | g | 85835 | BSTEFFENS | 05/03/2011 10:19:36 |
| 8465 | ARS1-B11-01640 | ARS1-B11-01640-23 | MD21-11-5609 | | | | 5.055 | g | 85836 | BSTEFFENS | 05/03/2011 10:19:36 |

# Batch Result Verification Report





| ABatchSampleID | SDG | Fraction | ClientID | Run | Isotope | ACT | TPU | TPU1s | TPU2s | MDA | DL | CU | CU1s | CU2s | ActivityReportUnits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARS1-B11-01640-01 | | | | 1 | H-3 | 2456.337093 | 155.1865492 | 155.1865492 | 304.1656363 | 218.0901114 | 107.1996705 | 87.13230894 | 87.13230894 | 170.7793255 | pCi |
| ARS1-B11-01640-02 | | | | 1 | H-3 | 2444.029206 | 303.1657561 | 154.6764062 | 303.1657561 | 218.5239489 | 107.4129183 | 170.8554708 | 87.17115858 | 170.8554708 | pCi |
| ARS1-B11-01640-03 | | | | 1 | H-3 | -109.890336 | 125.47149 | 64.01606635 | 125.47149 | 217.2514664 | 106.7874443 | 124.9651997 | 63.75775494 | 124.9651997 | pCi |
| ARS1-B11-01640-04 | ARS1-11-00491 | 001 | MD21-11-5600 | 1 | H-3 | 18312.00283 | 972.6679752 | 972.6679752 | 1906.429231 | 220.5977489 | 108.4322707 | 171.962125 | 171.962125 | 337.0457651 | pCi |
| ARS1-B11-01640-05 | ARS1-11-00491 | 002 | MD21-11-5601 | 1 | H-3 | 8321.93042 | 452.7218584 | 452.7218584 | 887.3348424 | 219.1046617 | 107.698361 | 125.1909127 | 125.1909127 | 245.3741889 | pCi |
| ARS1-B11-01640-06 | ARS1-11-00491 | 003 | MD21-11-5602 | 1 | H-3 | 8685.193665 | 471.6064159 | 471.6064159 | 924.3485752 | 219.8839242 | 108.0813984 | 127.4464798 | 127.4464798 | 249.7951004 | pCi |
| ARS1-B11-01640-07 | ARS1-11-00491 | 004 | MD21-11-5603 | 1 | H-3 | 22232.07874 | 1177.212322 | 1177.212322 | 2307.336151 | 220.3008638 | 108.2863403 | 186.8642194 | 186.8642194 | 366.25387 | pCi |
| ARS1-B11-01640-08 | ARS1-11-00491 | 005 | MD21-11-5605 | 1 | H-3 | 5524.950703 | 308.8245062 | 308.8245062 | 605.2960322 | 220.4140495 | 108.3419754 | 109.2811767 | 109.2811767 | 214.1911083 | pCi |
| ARS1-B11-01640-09 | ARS1-11-00491 | 006 | MD21-11-5606 | 1 | H-3 | 4340.262838 | 248.407397 | 248.407397 | 486.878498 | 219.0178177 | 107.6556736 | 101.089678 | 101.089678 | 198.1357689 | pCi |
| ARS1-B11-01640-10 | ARS1-11-00491 | 007 | MD21-11-5607 | 1 | H-3 | 101.1033721 | 66.809977 | 66.809977 | 130.9475549 | 219.380243 | 107.8338198 | 66.60056208 | 66.60056208 | 130.5371017 | pCi |
| ARS1-B11-01640-11 | ARS1-11-00491 | 008 | MD21-11-5608 | 1 | H-3 | 268.9967099 | 69.78830671 | 69.78830671 | 136.7850812 | 219.5513943 | 107.9179472 | 68.35669504 | 68.35669504 | 133.9791223 | pCi |
| ARS1-B11-01640-12 | ARS1-11-00491 | 009 | MD21-11-5610 | 1 | H-3 | 2.478905026 | 65.92326012 | 65.92326012 | 129.2095898 | 220.5340318 | 108.4009513 | 65.92313274 | 65.92313274 | 129.2093402 | pCi |
| ARS1-B11-01640-13 | ARS1-11-00622 | 001 | MD50-11-5957 | 1 | H-3 | -40.08725551 | 66.21593903 | 66.21593903 | 129.7832405 | 222.8958953 | 109.5618979 | 66.18276521 | 66.18276521 | 129.7182198 | pCi |
| ARS1-B11-01640-14 | ARS1-11-00622 | 002 | MD50-11-5958 | 1 | H-3 | -29.80773851 | 65.738359 | 65.738359 | 128.8471836 | 220.9853639 | 108.6227984 | 65.71988603 | 65.71988603 | 128.8109766 | pCi |
| ARS1-B11-01640-15 | ARS1-11-00622 | 003 | MD50-11-5959 | 1 | H-3 | 115.5754778 | 68.25550695 | 68.25550695 | 133.7807936 | 223.5237089 | 109.8704925 | 67.98753859 | 67.98753859 | 133.2555756 | pCi |
| ARS1-B11-01640-16 | ARS1-11-00622 | 004 | MD50-11-5960 | 1 | H-3 | 52.3552919 | 66.87570253 | 66.87570253 | 131.076377 | 221.7976906 | 109.0220881 | 66.81966599 | 66.81966599 | 130.9665453 | pCi |
| ARS1-B11-01640-17 | ARS1-11-00622 | 005 | MD50-11-5961 | 1 | H-3 | 108.0492545 | 66.6387333 | 66.6387333 | 130.6119173 | 218.4664883 | 107.3846742 | 66.3988856 | 66.3988856 | 130.1418158 | pCi |
| ARS1-B11-01640-18 | ARS1-11-00622 | 006 | MD50-11-5962 | 1 | H-3 | 151.3593526 | 67.9860895 | 67.9860895 | 133.2527354 | 220.7471757 | 108.5057197 | 67.5240136 | 67.5240136 | 132.3470667 | pCi |
| ARS1-B11-01640-19 | ARS1-11-00526 | 001 | MD54-11-3767 | 1 | H-3 | 236.672871 | 71.88884579 | 71.88884579 | 140.9021377 | 228.8634188 | 112.4951651 | 70.81603134 | 70.81603134 | 138.7994214 | pCi |
| ARS1-B11-01640-20 | ARS1-11-00526 | 002 | MD54-11-3766 | 1 | H-3 | 431.0182784 | 75.21642731 | 75.21642731 | 147.4241975 | 225.5602129 | 110.8715124 | 71.76177035 | 71.76177035 | 140.6530699 | pCi |
| ARS1-B11-01640-21 | ARS1-11-00526 | 003 | MD54-11-3768 | 1 | H-3 | 170.3224249 | 71.96773679 | 71.96773679 | 141.0567641 | 233.1171388 | 114.5860319 | 71.41475094 | 71.41475094 | 139.9729118 | pCi |
| ARS1-B11-01640-22 | ARS1-11-00527 | 001 | MD21-11-5604 | 1 | H-3 | 32710.29471 | 1724.529924 | 1724.529924 | 3380.078652 | 221.4480044 | 108.850204 | 222.7393677 | 222.7393677 | 436.5691607 | pCi |
| ARS1-B11-01640-23 | ARS1-11-00527 | 002 | MD21-11-5609 | 1 | H-3 | 38195.90284 | 2011.29211 | 2011.29211 | 3942.132535 | 223.6161801 | 109.9159456 | 240.4205972 | 240.4205972 | 471.2243706 | pCi |

# Batch Result Verification Report





| ABatchSampleID | SDG | Fraction | AliquotReportUnits | ChemRecovery | TracerRecovery | SampleCounts | SampleCountMins | BKG_Counts | BKG_CountMins | EFF | ALIQ | SampleCollDate | MidPointCountDate | BP_DL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARS1-B11-01640-01 | | | L | | | 0.091 | 180 | 0.035333333 | 180 | 0.3648 | 5.037 | 5/6/2011 | 5/2/2011 | |
| ARS1-B11-01640-02 | | | L | | | 0.090611111 | 180 | 0.035333333 | 180 | 0.3648 | 5.027 | 5/6/2011 | 5/2/2011 | |
| ARS1-B11-01640-03 | | | L | | | 0.032833333 | 180 | 0.035333333 | 180 | 0.3657 | 5.044 | 5/6/2011 | 5/3/2011 | |
| ARS1-B11-01640-04 | ARS1-11-00491 | 001 | L | | | 0.445611111 | 180 | 0.035333333 | 180 | 0.3653 | 5.015 | 3/9/2011 | 5/3/2011 | |
| ARS1-B11-01640-05 | ARS1-11-00491 | 002 | L | | | 0.223055556 | 180 | 0.035333333 | 180 | 0.3667 | 5.03 | 3/9/2011 | 5/3/2011 | |
| ARS1-B11-01640-06 | ARS1-11-00491 | 003 | L | | | 0.230555556 | 180 | 0.035333333 | 180 | 0.3649 | 5.037 | 3/9/2011 | 5/3/2011 | |
| ARS1-B11-01640-07 | ARS1-11-00491 | 004 | L | | | 0.534111111 | 180 | 0.035333333 | 180 | 0.364 | 5.04 | 3/9/2011 | 5/3/2011 | |
| ARS1-B11-01640-08 | ARS1-11-00491 | 005 | L | | | 0.159222222 | 180 | 0.035333333 | 180 | 0.3631 | 5.05 | 3/9/2011 | 5/3/2011 | |
| ARS1-B11-01640-09 | ARS1-11-00491 | 006 | L | | | 0.133277778 | 180 | 0.035333333 | 180 | 0.3647 | 5.06 | 3/9/2011 | 5/3/2011 | |
| ARS1-B11-01640-10 | ARS1-11-00491 | 007 | L | | | 0.037611111 | 180 | 0.035333333 | 180 | 0.3626 | 5.081 | 3/9/2011 | 5/3/2011 | |
| ARS1-B11-01640-11 | ARS1-11-00491 | 008 | L | | | 0.041388889 | 180 | 0.035333333 | 180 | 0.3614 | 5.094 | 3/9/2011 | 5/4/2011 | |
| ARS1-B11-01640-12 | ARS1-11-00491 | 009 | L | | | 0.035388889 | 180 | 0.035333333 | 180 | 0.362 | 5.063 | 3/9/2011 | 5/4/2011 | |
| ARS1-B11-01640-13 | ARS1-11-00622 | 001 | L | | | 0.034444444 | 180 | 0.035333333 | 180 | 0.3598 | 5.03 | 3/22/2011 | 5/4/2011 | |
| ARS1-B11-01640-14 | ARS1-11-00622 | 002 | L | | | 0.034666667 | 180 | 0.035333333 | 180 | 0.3597 | 5.075 | 3/22/2011 | 5/4/2011 | |
| ARS1-B11-01640-15 | ARS1-11-00622 | 003 | L | | | 0.037888889 | 180 | 0.035333333 | 180 | 0.3571 | 5.054 | 3/22/2011 | 5/4/2011 | |
| ARS1-B11-01640-16 | ARS1-11-00622 | 004 | L | | | 0.0365 | 180 | 0.035333333 | 180 | 0.3601 | 5.051 | 3/22/2011 | 5/4/2011 | |
| ARS1-B11-01640-17 | ARS1-11-00622 | 005 | L | | | 0.037777778 | 180 | 0.035333333 | 180 | 0.3643 | 5.069 | 3/22/2011 | 5/4/2011 | |
| ARS1-B11-01640-18 | ARS1-11-00622 | 006 | L | | | 0.038722222 | 180 | 0.035333333 | 180 | 0.3619 | 5.05 | 3/22/2011 | 5/5/2011 | |
| ARS1-B11-01640-19 | ARS1-11-00526 | 001 | L | | | 0.040444444 | 180 | 0.035333333 | 180 | 0.3509 | 5.033 | 3/10/2011 | 5/5/2011 | |
| ARS1-B11-01640-20 | ARS1-11-00526 | 002 | L | | | 0.044777778 | 180 | 0.035333333 | 180 | 0.3564 | 5.028 | 3/10/2011 | 5/5/2011 | |
| ARS1-B11-01640-21 | ARS1-11-00526 | 003 | L | | | 0.038944444 | 180 | 0.035333333 | 180 | 0.3463 | 5.007 | 3/10/2011 | 5/5/2011 | |
| ARS1-B11-01640-22 | ARS1-11-00527 | 001 | L | | | 0.765388889 | 180 | 0.035333333 | 180 | 0.3596 | 5.076 | 3/10/2011 | 5/5/2011 | |
| ARS1-B11-01640-23 | ARS1-11-00527 | 002 | L | | | 0.879555556 | 180 | 0.035333333 | 180 | 0.3576 | 5.055 | 3/10/2011 | 5/5/2011 | |

# Batch Result Verification Report





| ABatchSampleID | SDG | Fraction | BP_MDA | Sb_Val | UCF | CF | GrossCountRate | BKGCountRate | NetCountRate | PlatingRecovery | InstFileName | DetectorID | InstrumentkeV | NuclideAbd | TracerMeasACT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARS1-B11-01640-01 | | | | | 2.22 | 1 | 16.38 | 6.36 | 10.02 | | 71 | P-54-S-2 | | | |
| ARS1-B11-01640-02 | | | | | 2.22 | 1.96 | 16.31 | 6.36 | 9.95 | | 71 | P-54-S-3 | | | |
| ARS1-B11-01640-03 | | | | | 2.22 | 1.96 | 5.91 | 6.36 | -0.45 | | 71 | P-54-S-4 | | | |
| ARS1-B11-01640-04 | ARS1-11-00491 | 001 | | | 2.22 | 1 | 80.21 | 6.36 | 73.85 | | 71 | P-54-S-5 | | | |
| ARS1-B11-01640-05 | ARS1-11-00491 | 002 | | | 2.22 | 1 | 40.15 | 6.36 | 33.79 | | 71 | P-54-S-6 | | | |
| ARS1-B11-01640-06 | ARS1-11-00491 | 003 | | | 2.22 | 1 | 41.5 | 6.36 | 35.14 | | 71 | P-54-S-7 | | | |
| ARS1-B11-01640-07 | ARS1-11-00491 | 004 | | | 2.22 | 1 | 96.14 | 6.36 | 89.78 | | 71 | P-54-S-8 | | | |
| ARS1-B11-01640-08 | ARS1-11-00491 | 005 | | | 2.22 | 1 | 28.66 | 6.36 | 22.3 | | 71 | P-54-S-9 | | | |
| ARS1-B11-01640-09 | ARS1-11-00491 | 006 | | | 2.22 | 1 | 23.99 | 6.36 | 17.63 | | 71 | P-54-S-10 | | | |
| ARS1-B11-01640-10 | ARS1-11-00491 | 007 | | | 2.22 | 1 | 6.77 | 6.36 | 0.41 | | 71 | P-54-S-11 | | | |
| ARS1-B11-01640-11 | ARS1-11-00491 | 008 | | | 2.22 | 1 | 7.45 | 6.36 | 1.09 | | 71 | P-54-S-12 | | | |
| ARS1-B11-01640-12 | ARS1-11-00491 | 009 | | | 2.22 | 1 | 6.37 | 6.36 | 0.01 | | 71 | P-54-S-13 | | | |
| ARS1-B11-01640-13 | ARS1-11-00622 | 001 | | | 2.22 | 1 | 6.2 | 6.36 | -0.16 | | 71 | P-54-S-14 | | | |
| ARS1-B11-01640-14 | ARS1-11-00622 | 002 | | | 2.22 | 1 | 6.24 | 6.36 | -0.12 | | 71 | P-54-S-15 | | | |
| ARS1-B11-01640-15 | ARS1-11-00622 | 003 | | | 2.22 | 1 | 6.82 | 6.36 | 0.46 | | 71 | P-54-S-16 | | | |
| ARS1-B11-01640-16 | ARS1-11-00622 | 004 | | | 2.22 | 1 | 6.57 | 6.36 | 0.21 | | 71 | P-54-S-17 | | | |
| ARS1-B11-01640-17 | ARS1-11-00622 | 005 | | | 2.22 | 1 | 6.8 | 6.36 | 0.44 | | 71 | P-54-S-18 | | | |
| ARS1-B11-01640-18 | ARS1-11-00622 | 006 | | | 2.22 | 1 | 6.97 | 6.36 | 0.61 | | 71 | P-54-S-19 | | | |
| ARS1-B11-01640-19 | ARS1-11-00526 | 001 | | | 2.22 | 1 | 7.28 | 6.36 | 0.92 | | 71 | P-54-S-20 | | | |
| ARS1-B11-01640-20 | ARS1-11-00526 | 002 | | | 2.22 | 1 | 8.06 | 6.36 | 1.7 | | 71 | P-54-S-21 | | | |
| ARS1-B11-01640-21 | ARS1-11-00526 | 003 | | | 2.22 | 1 | 7.01 | 6.36 | 0.65 | | 71 | P-54-S-22 | | | |
| ARS1-B11-01640-22 | ARS1-11-00527 | 001 | | | 2.22 | 1 | 137.77 | 6.36 | 131.41 | | 71 | P-54-S-23 | | | |
| ARS1-B11-01640-23 | ARS1-11-00527 | 002 | | | 2.22 | 1 | 158.32 | 6.36 | 151.96 | | 71 | P-54-S-24 | | | |

# Batch Result Verification Report





| ABatchSampleID | SDG | Fraction | TracerKnownACT | TracerIsotope | TracerRefDate | TracerRefACT | TracerKnown | Halflife1 | Halflife2 | Halflife3 | TPUF_1 | TPUF_2 | TPUF_3 | TPUF_4 | TPUF_5 | TPUF_6 | DeltaT1 | DeltaT2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARS1-B11-01640-01 | | | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 0 | |
| ARS1-B11-01640-02 | | | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 0 | |
| ARS1-B11-01640-03 | | | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 0 | |
| ARS1-B11-01640-04 | ARS1-11-00491 | 001 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 54.69375 | |
| ARS1-B11-01640-05 | ARS1-11-00491 | 002 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 54.82569444 | |
| ARS1-B11-01640-06 | ARS1-11-00491 | 003 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 54.95694444 | |
| ARS1-B11-01640-07 | ARS1-11-00491 | 004 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 55.08888889 | |
| ARS1-B11-01640-08 | ARS1-11-00491 | 005 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 55.22013889 | |
| ARS1-B11-01640-09 | ARS1-11-00491 | 006 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 55.35208333 | |
| ARS1-B11-01640-10 | ARS1-11-00491 | 007 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 55.48333333 | |
| ARS1-B11-01640-11 | ARS1-11-00491 | 008 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 55.61458333 | |
| ARS1-B11-01640-12 | ARS1-11-00491 | 009 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 55.74652778 | |
| ARS1-B11-01640-13 | ARS1-11-00622 | 001 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 42.87777778 | |
| ARS1-B11-01640-14 | ARS1-11-00622 | 002 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 43.00902778 | |
| ARS1-B11-01640-15 | ARS1-11-00622 | 003 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 43.13888889 | |
| ARS1-B11-01640-16 | ARS1-11-00622 | 004 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 43.27083333 | |
| ARS1-B11-01640-17 | ARS1-11-00622 | 005 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 43.40208333 | |
| ARS1-B11-01640-18 | ARS1-11-00622 | 006 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 43.53402778 | |
| ARS1-B11-01640-19 | ARS1-11-00526 | 001 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 55.66527778 | |
| ARS1-B11-01640-20 | ARS1-11-00526 | 002 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 55.79652778 | |
| ARS1-B11-01640-21 | ARS1-11-00526 | 003 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 55.92847222 | |
| ARS1-B11-01640-22 | ARS1-11-00527 | 001 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 56.05972222 | |
| ARS1-B11-01640-23 | ARS1-11-00527 | 002 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 56.19166667 | |

# Batch Result Verification Report





| ABatchSampleID | SDG | Fraction | DeltaT3 | DeltaT4 | DeltaT5 | DeltaT6 | DF1 | DF2 | DF3 | IF1 | IF2 | SysErr | K_Val | K_MDA | AnalysisCode | UserID | ModDate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARS1-B11-01640-01 | | | | | | | 1 | | | | | 0.052279718 | 0.004079245 | 0.734264041 | | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-02 | | | | | | | 1 | | | | | 0.052279718 | 0.004071146 | 0.7328063 | | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-03 | | | | | | | 1 | | | | | 0.052279718 | 0.004094992 | 0.737098484 | | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-04 | ARS1-11-00491 | 001 | | | | | 0.991610391 | | | | | 0.052279718 | 0.004032874 | 0.725917319 | LSC-A-001 | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-05 | ARS1-11-00491 | 002 | | | | | 0.991590237 | | | | | 0.052279718 | 0.004060356 | 0.730864078 | LSC-A-001 | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-06 | ARS1-11-00491 | 003 | | | | | 0.991570189 | | | | | 0.052279718 | 0.004045966 | 0.728273916 | LSC-A-001 | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-07 | ARS1-11-00491 | 004 | | | | | 0.991550036 | | | | | 0.052279718 | 0.004038309 | 0.72689559 | LSC-A-001 | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-08 | ARS1-11-00491 | 005 | | | | | 0.991529989 | | | | | 0.052279718 | 0.004036235 | 0.72652232 | LSC-A-001 | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-09 | ARS1-11-00491 | 006 | | | | | 0.991509837 | | | | | 0.052279718 | 0.004061966 | 0.731153877 | LSC-A-001 | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-10 | ARS1-11-00491 | 007 | | | | | 0.991489791 | | | | | 0.052279718 | 0.004055255 | 0.72994598 | LSC-A-001 | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-11 | ARS1-11-00491 | 008 | | | | | 0.991469746 | | | | | 0.052279718 | 0.004052094 | 0.729376951 | LSC-A-001 | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-12 | ARS1-11-00491 | 009 | | | | | 0.991449595 | | | | | 0.052279718 | 0.004034039 | 0.726127052 | LSC-A-001 | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-13 | ARS1-11-00622 | 001 | | | | | 0.993416891 | | | | | 0.052279718 | 0.003991293 | 0.71843282 | LSC-A-001 | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-14 | ARS1-11-00622 | 002 | | | | | 0.993396807 | | | | | 0.052279718 | 0.0040258 | 0.724644038 | LSC-A-001 | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-15 | ARS1-11-00622 | 003 | | | | | 0.993376935 | | | | | 0.052279718 | 0.003980083 | 0.716414949 | LSC-A-001 | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-16 | ARS1-11-00622 | 004 | | | | | 0.993356745 | | | | | 0.052279718 | 0.004011056 | 0.721990054 | LSC-A-001 | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-17 | ARS1-11-00622 | 005 | | | | | 0.993336662 | | | | | 0.052279718 | 0.004072217 | 0.732999041 | LSC-A-001 | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-18 | ARS1-11-00622 | 006 | | | | | 0.993316473 | | | | | 0.052279718 | 0.004030144 | 0.725425936 | LSC-A-001 | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-19 | ARS1-11-00526 | 001 | | | | | 0.991462004 | | | | | 0.052279718 | 0.003887222 | 0.699699967 | LSC-A-001 | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-20 | ARS1-11-00526 | 002 | | | | | 0.991441959 | | | | | 0.052279718 | 0.003944148 | 0.70994669 | LSC-A-001 | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-21 | ARS1-11-00526 | 003 | | | | | 0.991421808 | | | | | 0.052279718 | 0.003816291 | 0.686932446 | LSC-A-001 | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-22 | ARS1-11-00527 | 001 | | | | | 0.991401764 | | | | | 0.052279718 | 0.00401739 | 0.72313014 | LSC-A-001 | BSTEFFENS | 5/6/2011 |
| ARS1-B11-01640-23 | ARS1-11-00527 | 002 | | | | | 0.991381614 | | | | | 0.052279718 | 0.003978437 | 0.716118693 | LSC-A-001 | BSTEFFENS | 5/6/2011 |

Assay Definition-

Assay Description:
H3 Normal Lvl

Assay Type: DPM (Single)
Report Name: Report1
Output Data Path: C:\Packard\Tricarb\Results\ARS\H-3 Normal 3\20110502_1602
Raw Results Path: C:\Packard\Tricarb\Results\ARS\H-3 Normal 3\20110502_1602\20110502_1602.results
RTF File Name: C:\Packard\Tricarb\Results\ARS\H-3 Normal 3\20110502_1602\H3 Results.rtf
Comma-Delimited File Name: C:\Packard\Tricarb\Results\ARS\H-3 Normal 3\20110502_1602\H3 Results.csv
Assay File Name: C:\Packard\TriCarb\Assays\H-3 Normal 3.lsa

Count Conditions-

Nuclide: H-3 Normal
Quench Indicator: tSIE/AEC
External Std Terminator (sec): 0.5 2s%
Pre-Count Delay (min): 0.00
Quench Set:
Low Energy: UG STD H-3
Count Time (min): 180.00
Count Mode: Normal
Assay Count Cycles: 1 Repeat Sample Count: 1
#Vials/Sample: 1 Calculate % Reference: Off

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

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

Count Corrections-

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

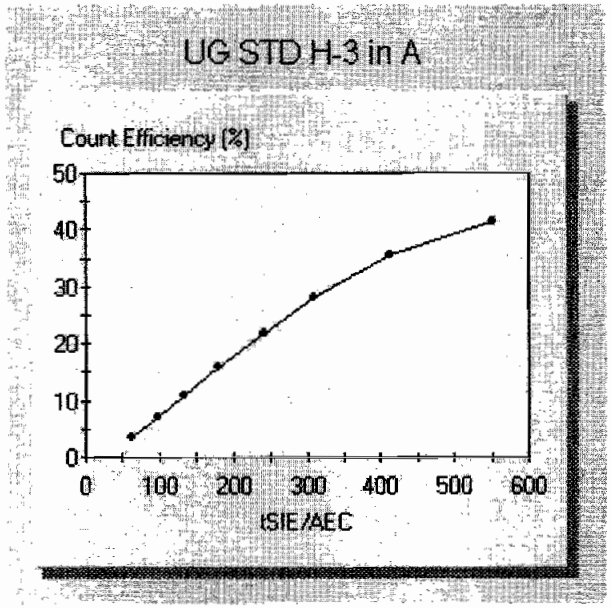
Half Life-

Half Life Correction: Off

| Regions | Half Life | Units | Reference Date | Reference Time |
|---|---|---|---|---|

A
B
C

Cycle 1 Results
Quench Curve Block Data




Date Acquired: 06/30/2010
Date Modified:
UG STD H-3 in A

| tSIE/AEC | Count Efficiency (%) |
|---|---|
| 551.03 | 41.58 |
| 411.38 | 35.42 |
| 310.08 | 28.09 |
| 241.32 | 21.90 |
| 178.11 | 15.75 |
| 132.72 | 11.03 |
| 96.52 | 6.92 |
| 63.58 | 3.36 |

| P# | S# | SMPL_ID | CPMA | DPM1 | tSIE | Eff Nucl In A | Count Time | DATE | TIME | MESSAGES |
|---|---|---|---|---|---|---|---|---|---|---|
| 54 | 1 | BACKGROUND | 6.36 | 17.71 | 422.88 | 35.92 | 180.00 | 5/2/2011 | 4:07:03 PM | |
| 54 | 2 | B11-01640-01 | 16.38 | 44.91 | 435.49 | 36.48 | 180.00 | 5/2/2011 | 7:13:59 PM | |
| 54 | 3 | B11-01640-02 | 16.31 | 44.72 | 435.50 | 36.48 | 180.00 | 5/2/2011 | 10:23:14 PM | |
| 54 | 4 | B11-01640-03 | 5.91 | 16.16 | 437.63 | 36.57 | 180.00 | 5/3/2011 | 1:31:18 AM | |
| 54 | 5 | B11-01640-04 | 80.21 | 219.60 | 436.54 | 36.53 | 180.00 | 5/3/2011 | 4:39:00 AM | |
| 54 | 6 | B11-01640-05 | 40.15 | 109.48 | 439.73 | 36.67 | 180.00 | 5/3/2011 | 7:48:32 AM | |
| 54 | 7 | B11-01640-06 | 41.50 | 113.75 | 435.59 | 36.49 | 180.00 | 5/3/2011 | 10:58:02 AM | |
| 54 | 8 | B11-01640-07 | 96.14 | 264.11 | 433.67 | 36.40 | 180.00 | 5/3/2011 | 2:07:33 PM | |
| 54 | 9 | B11-01640-08 | 28.66 | 78.93 | 431.65 | 36.31 | 180.00 | 5/3/2011 | 5:17:04 PM | |
| 54 | 10 | B11-01640-09 | 23.99 | 65.80 | 435.20 | 36.47 | 180.00 | 5/3/2011 | 8:26:32 PM | |
| 54 | 11 | B11-01640-10 | 6.77 | 18.67 | 430.55 | 36.26 | 180.00 | 5/3/2011 | 11:36:00 PM | |
| 54 | 12 | B11-01640-11 | 7.45 | 20.62 | 427.76 | 36.14 | 180.00 | 5/4/2011 | 2:45:27 AM | |
| 54 | 13 | B11-01640-12 | 6.37 | 17.59 | 429.04 | 36.20 | 180.00 | 5/4/2011 | 5:55:02 AM | |
| 54 | 14 | B11-01640-13 | 6.20 | 17.23 | 424.17 | 35.98 | 180.00 | 5/4/2011 | 9:04:28 AM | |
| 54 | 15 | B11-01640-14 | 6.24 | 17.34 | 423.99 | 35.97 | 180.00 | 5/4/2011 | 12:12:40 PM | |
| 54 | 16 | B11-01640-15 | 6.82 | 19.09 | 418.05 | 35.71 | 180.00 | 5/4/2011 | 3:20:13 PM | |
| 54 | 17 | B11-01640-16 | 6.57 | 18.25 | 424.88 | 36.01 | 180.00 | 5/4/2011 | 6:29:40 PM | |
| 54 | 18 | B11-01640-17 | 6.80 | 18.68 | 434.42 | 36.43 | 180.00 | 5/4/2011 | 9:39:08 PM | |
| 54 | 19 | B11-01640-18 | 6.97 | 19.27 | 428.92 | 36.19 | 180.00 | 5/5/2011 | 12:48:36 AM | |
| 54 | 20 | B11-01640-19 | 7.28 | 20.74 | 406.85 | 35.09 | 180.00 | 5/5/2011 | 3:58:02 AM | |
| 54 | 21 | B11-01640-20 | 8.06 | 22.61 | 416.46 | 35.64 | 180.00 | 5/5/2011 | 7:07:29 AM | |
| 54 | 22 | B11-01640-21 | 7.01 | 20.25 | 400.48 | 34.63 | 180.00 | 5/5/2011 | 10:16:58 AM | |
| 54 | 23 | B11-01640-22 | 137.77 | 383.16 | 423.60 | 35.96 | 180.00 | 5/5/2011 | 1:26:27 PM | |
| 54 | 24 | B11-01640-23 | 158.32 | 442.71 | 419.18 | 35.76 | 180.00 | 5/5/2011 | 4:35:56 PM | |

# Beta Liquid Scintillation Counter Log Book

| Date | Time | ARS Sample I.D. Number | Batch Number | Liquid Scintillation File Number | Technician Initials |
|---|---|---|---|---|---|
| 4-21-11 | 1623 | B11-01513-03 | B11-01513 | 2132 | [illegible] |
| ↓ | ↓ | B11-01513-04 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01513-05 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01513-06 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01513-07 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01513-08 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01513-09 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01513-10 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01513-11 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01513-12 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01513-13 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01513-14 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01513-15 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01513-16 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01513-17 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01513-18 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01513-19 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01513-20 | ↓ | ↓ | [illegible] |
| 5-2-11 | 1421 | SNC 117 | QA | QA | [illegible] |
| ↓ | 1506 | Background | B11-01640 | 1602 | [illegible] |



Reviewed By: [illegible] Date: 5-3-11
Initials

# Beta Liquid Scintillation Counter Log Book

| Date | Time | ARS Sample I.D. Number | Batch Number | Liquid Scintillation File Number | Technician Initials |
|---|---|---|---|---|---|
| 5-2-11 | 1504 | B11-01640-01 | B11-01640 | 1602 | [illegible] |
| ↓ | ↓ | B11-01640-02 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01640-03 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01640-04 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01640-05 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01640-06 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01640-07 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01640-08 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01640-09 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01640-10 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01640-11 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01640-12 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01640-13 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01640-14 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01640-15 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01640-16 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01640-17 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01640-18 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01640-19 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-01640-20 | ↓ | ↓ | [illegible] |



Reviewed By: LSW Date: 5-03-11
Initials

# Beta Liquid Scintillation Counter Log Book

| Date | Time | ARS Sample I.D. Number | Batch Number | Liquid Scintillation File Number | Technician Initials |
|---|---|---|---|---|---|
| 5-2-11 | 1506 | B11-01640-21 | B11-01640 | 1602 | |
| ↓ | ↓ | B11-01640-22 | ↓ | ↓ | |
| ↓ | ↓ | B11-01640-23 | ↓ | ↓ | |
| 5-4-11 | 1632 | Background | B11-01659 | 1941 | |
| ↓ | ↓ | B11-01659-01 | ↓ | ↓ | |
| ↓ | ↓ | B11-01659-02 | ↓ | ↓ | |
| ↓ | ↓ | B11-01659-03 | ↓ | ↓ | |
| ↓ | ↓ | B11-01659-04 | ↓ | ↓ | |
| ↓ | ↓ | B11-01659-05 | ↓ | ↓ | |
| ↓ | ↓ | B11-01659-06 | ↓ | ↓ | |
| ↓ | ↓ | B11-01659-07 | ↓ | ↓ | |
| ↓ | ↓ | B11-01659-08 | ↓ | ↓ | |
| ↓ | ↓ | B11-01659-09 | ↓ | ↓ | |
| ↓ | ↓ | B11-01659-10 | ↓ | ↓ | |
| ↓ | ↓ | B11-01659-11 | ↓ | ↓ | |
| ↓ | ↓ | B11-01659-12 | ↓ | ↓ | |
| ↓ | ↓ | B11-01659-13 | ↓ | ↓ | |
| ↓ | ↓ | B11-01659-14 | ↓ | ↓ | |
| ↓ | ↓ | B11-01659-15 | ↓ | ↓ | |
| ↓ | ↓ | B11-01659-16 | ↓ | ↓ | |

LSW 5-2-6



Reviewed By: LSW Date: 5-06-11
Initials

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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Tritium by Low Level Liquid Scintillation Counting

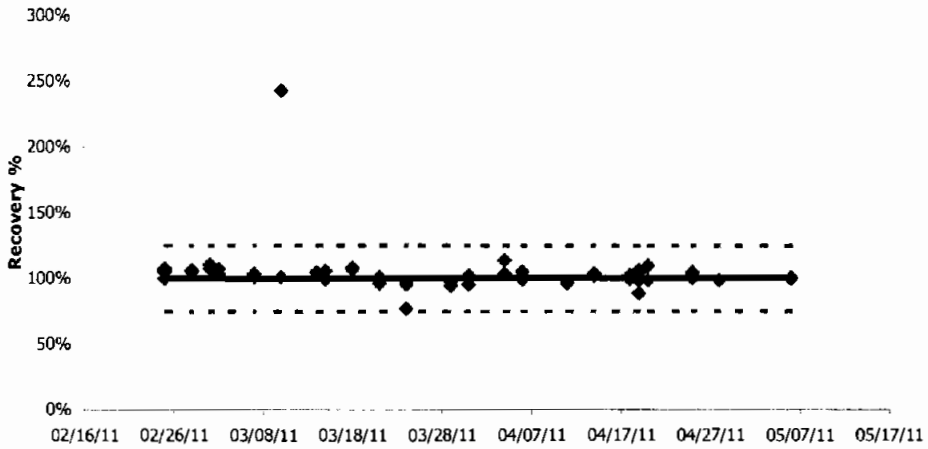
# Control Charts

# QC Chart



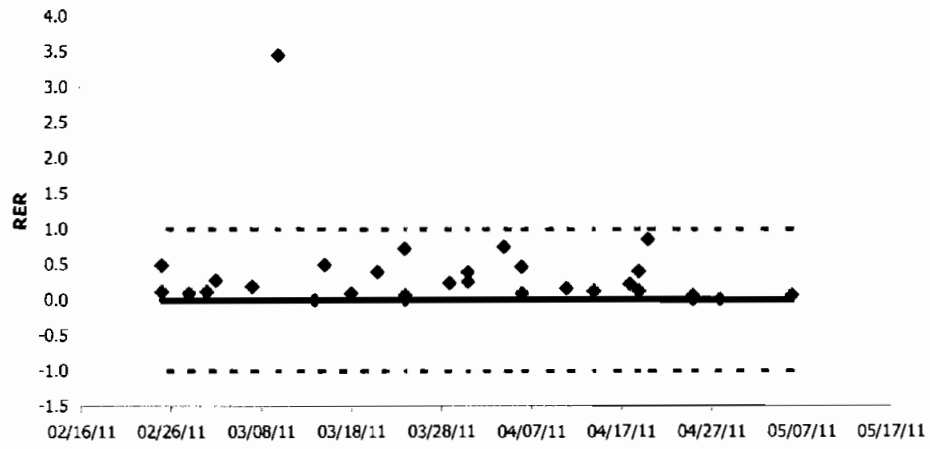


## H-3 LCS



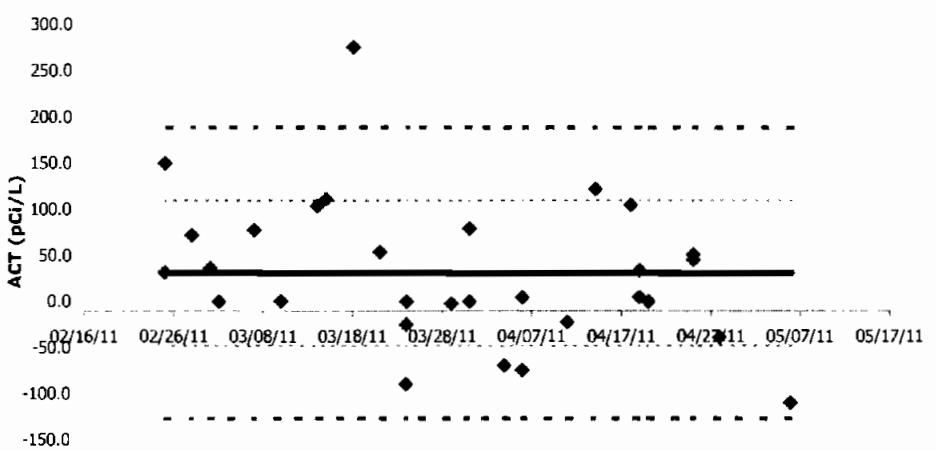

| Average | STDEV | n | UCL | LCL |
|---|---|---|---|---|
| 1.0367 | 0.1907 | 30 | 1.2500 | 0.7500 |

## H-3 RER



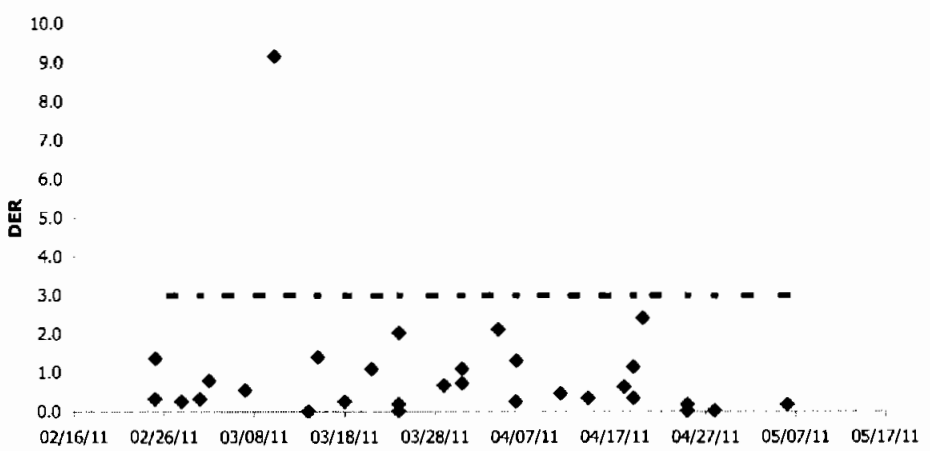

| | | n | UCL | LCL |
|---|---|---|---|---|
| | | 30 | 1.0000 | -1.0000 |

## H-3 Blank




| Average | STDEV | n | UCL | LCL |
|---|---|---|---|---|
| 30.9399 | 78.9231 | 30 | 188.7861 | -126.9063 |

## H-3 DER

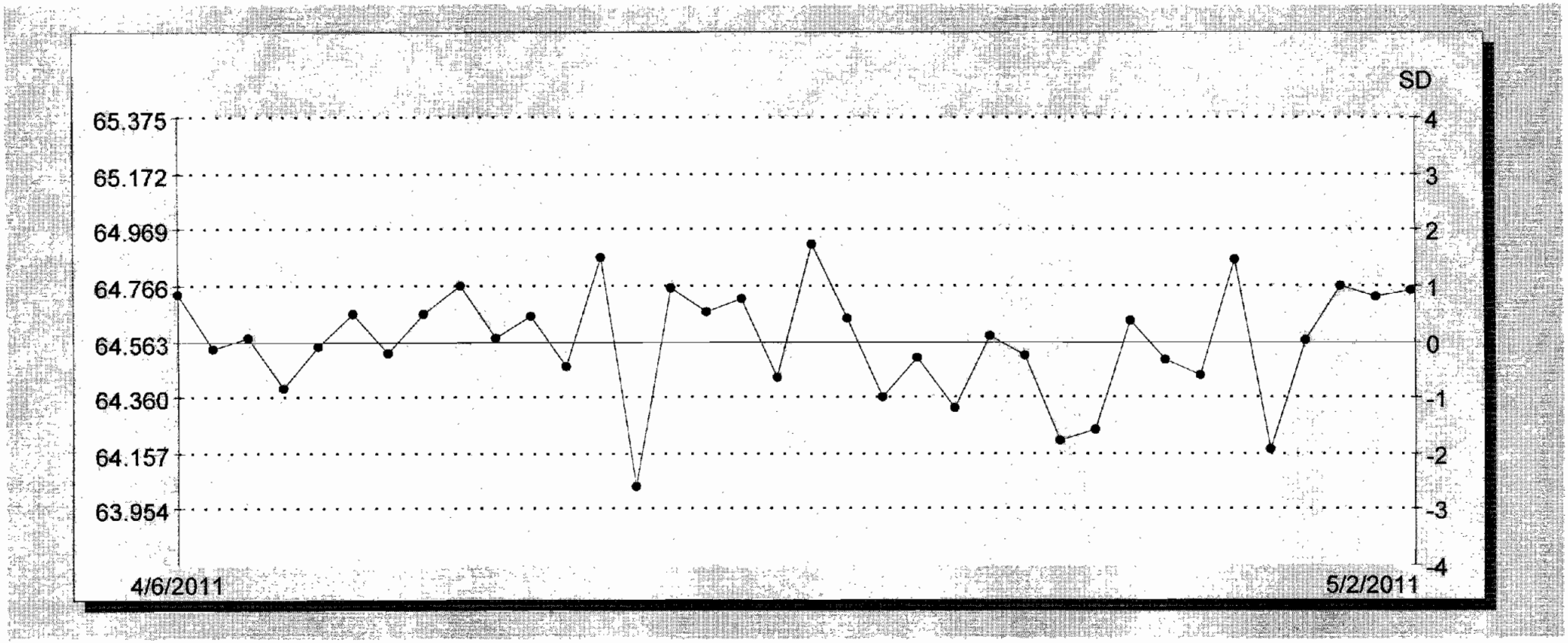



| | | n | UCL | |
|---|---|---|---|---|
| | | 30 | 3.0000 | |

3H Efficiency
Total # pts : 1605
Valid # pts : 36
Mean : 64.56
SD : 0.20

| Date | Value | Valid Pt |
|---|---|---|
| Apr 06, 2011 | 64.74 | X |
| Apr 10, 2011 | 64.54 | X |
| Apr 16, 2011 | 64.58 | X |
| Apr 19, 2011 | 64.39 | X |
| Apr 25, 2011 | 64.54 | X |
| Apr 30, 2011 | 64.67 | X |
| Apr 30, 2011 | 64.52 | X |
| Apr 30, 2011 | 64.66 | X |
| Apr 30, 2011 | 64.76 | X |
| Apr 30, 2011 | 64.58 | X |
| Apr 30, 2011 | 64.66 | X |
| Apr 30, 2011 | 64.47 | X |
| Apr 30, 2011 | 64.87 | X |
| Apr 30, 2011 | 64.03 | X |
| Apr 30, 2011 | 64.76 | X |
| May 01, 2011 | 64.67 | X |
| May 01, 2011 | 64.72 | X |
| May 01, 2011 | 64.44 | X |
| May 01, 2011 | 64.92 | X |
| May 01, 2011 | 64.65 | X |
| May 01, 2011 | 64.36 | X |
| May 01, 2011 | 64.50 | X |
| May 01, 2011 | 64.32 | X |
| May 01, 2011 | 64.58 | X |
| May 01, 2011 | 64.51 | X |
| May 01, 2011 | 64.20 | X |
| May 01, 2011 | 64.24 | X |
| May 01, 2011 | 64.64 | X |
| May 01, 2011 | 64.50 | X |
| May 02, 2011 | 64.44 | X |
| May 02, 2011 | 64.86 | X |
| May 02, 2011 | 64.17 | X |
| May 02, 2011 | 64.57 | X |
| May 02, 2011 | 64.76 | X |
| May 02, 2011 | 64.73 | X |
| May 02, 2011 | 64.75 | X |

3H Efficiency
Total # pts : 1605
Valid # pts : 36
Mean : 64.56
SD : 0.20

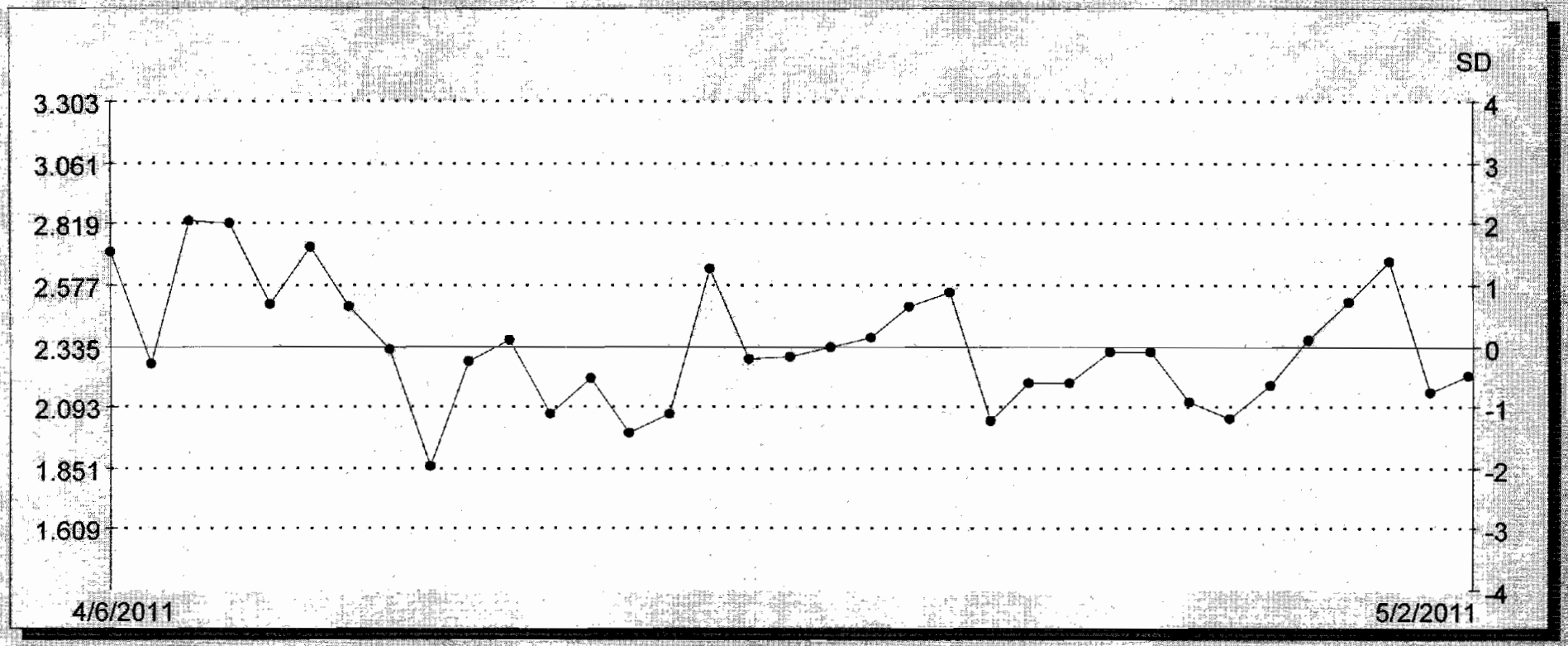


3H Background
Total # pts : 1566
Valid # pts : 35
Mean : 2.34
SD : 0.24

| Date | Value | Valid Pt |
|---|---|---|
| Apr 06, 2011 | 2.70 | X |
| Apr 10, 2011 | 2.27 | X |
| Apr 16, 2011 | 2.84 | X |
| Apr 19, 2011 | 2.82 | X |
| Apr 25, 2011 | 2.50 | X |
| Apr 30, 2011 | 2.73 | X |
| Apr 30, 2011 | 2.49 | X |
| Apr 30, 2011 | 2.32 | X |
| Apr 30, 2011 | 1.86 | X |
| Apr 30, 2011 | 2.27 | X |
| Apr 30, 2011 | 2.36 | X |
| Apr 30, 2011 | 2.07 | X |
| Apr 30, 2011 | 2.20 | X |
| Apr 30, 2011 | 1.99 | X |
| Apr 30, 2011 | 2.07 | X |
| May 01, 2011 | 2.64 | X |
| May 01, 2011 | 2.29 | X |
| May 01, 2011 | 2.29 | X |
| May 01, 2011 | 2.34 | X |
| May 01, 2011 | 2.37 | X |
| May 01, 2011 | 2.49 | X |
| May 01, 2011 | 2.55 | X |
| May 01, 2011 | 2.04 | X |
| May 01, 2011 | 2.19 | X |
| May 01, 2011 | 2.19 | X |
| May 01, 2011 | 2.31 | X |
| May 01, 2011 | 2.32 | X |
| May 01, 2011 | 2.12 | X |
| May 01, 2011 | 2.05 | X |
| May 02, 2011 | 2.18 | X |
| May 02, 2011 | 2.36 | X |
| May 02, 2011 | 2.51 | X |
| May 02, 2011 | 2.67 | X |
| May 02, 2011 | 2.15 | X |
| May 02, 2011 | 2.22 | X |

3H Background

| | |
|---|---|
| Total # pts | : 1566 |
| Valid # pts | : 35 |
| Mean | : 2.34 |
| SD | : 0.24 |



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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Low Level Liquid Scintillation Counting

# Calibration Information

# STD ID: S-0247

ARS INTERNATIONAL

## Add/Edit *Secondary Stds*

| Planning | |
|---|---|
| Planning Comments | Create an H-3 LCS standard |
| Target dpm/g (on dil. date) | 5.56 |
| Target Final volume mL | 2000 |
| Appx mass g of Parent Sol'n | 3.274623294 |
| Appx vol ml of Parent Sol'n | 3.280528244 |
| Expected Addition for Analysis g | 5 |

| Standards Preparation / Dilution | |
|---|---|
| Secondary Solution # | S-0247 |
| Dilution Date (New Ref Date) | 10/11/2010 10:30 |
| Ampoule, Empty (g) | |
| Ampoule /Solution Gross (g) | |
| Net Wt Removed (g) | |
| Transfer Container, empty (g) | 1.7 |
| Container Plus Solution (g) | 4.994 |
| Net Wt Transferred (g) | 3.294 |
| DPM Xferred on 10/11/2010 10:30 | 11185.79962 |
| Diluent/matrix | DI H2O |
| Diluent Density Cont, empty (g) | |
| Test Mass of 5 ml of Diluent (g) | |
| Diluent Density Test - (g/mL) | |
| Dilution Empty Container Mass (g) | 473.96 |
| Dilution Full Cont g (if measured) | 2467.85 |
| Dilution Final Volume ml (if measured) | 2000 |
| Final Dilution Density (g/mL) | 0.996945 |
| Final Dilution Measured Mass g | 1993.89 |

| Comments | Stock H-3 LCS standard. Dilution performed as stated above by B Steffens. -BJS 10/11/10 |
|---|---|
| Final Dilution dpm/g | 5.610038479 |
| Final Dil New Ref Date/Time | 10/11/2010 10:30 |

## Parent Standard Data

| | | | | |
|---|---|---|---|---|
| Parent Solution Reference # | NIST SRM 4927F | | | |
| Parent Solution # | S-0237 | | | |
| Parent Principal Radionuclide | H-3 | Half Life (Days) | 4499.8000000 | |
| Parent Reference Date | 03/22/2010 10:10 | | | |
| Parent Certified Act | 3503.682716 | Certi Act/Vol Units | dpm | g |
| Parent Cert Act Uncert 1 Sigma | 0.0036 | | | |
| Parent Sp. Gravity G/Ml | 0.9982 | | | |
| Parent Supplier | NIST SRM 4927F | | | |
| Parent Date Recvd | 01/03/00 | | | |
| Parent Received By | Unknown | | | |
| Parent Cert Exp Date | | | | |
| Parent Matrix | H2O | | | |
| Certified dpm/g At Ref Date | 3503.682716 | | | |
| Certified dpm/g on 10/11/2010 10:30 | 3395.81045 | | | |
| Parent Comments | Intermediate level H-3 standard for creating LCS solutions and matrix spikes. Dilution performed as stated above by B Steffens. -BJS 3/22/10 | | | |
| Parent Tech | Unknown | | | |
| Is_Primary | FALSE | | | |
| Is_LCS | TRUE | | | |
| Is_Tracer | FALSE | | | |
| Is_Calib | FALSE | | | |

| | | | |
|---|---|---|---|
| S-0247 | | | |
| H-3 | Verified | 10/13/10 | |
| SL | Expires | 10/13/11 | |
| Manufactuer | NIST SRM 4927F | | |
| Sol Matrix | H2O | | |
| Ref No | NIST SRM 4927F | | |
| Tech | Unknown | | |
| Parent ID | S-0237 | | |

ARS INTERNATIONAL

RADIOACTIVE STANDARDS -- BATON ROUGE LABORATORY

ARS INTERNATIONAL

## QUALITY CONTROL PROGRAM

AMERICAN RADIATION SERVICES
RADIOACTIVE REFERENCE SOLUTIONS

# ANNUAL ACTIVITY VERIFICATION

**VERIFICATION DATE** 10/13/2010 20:18 *date counted*
**STANDARD REFERENCE #** S-0247

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

**Radionuclide** H-3 **Dilution Reference Date** 10/11/2010 10:30

| | | | |
|---|---|---|---|
| **Dilution Activity** | 2.53 | pCi per gram ===> dpm/g | 5.61 |
| **Verif. Date Decay Corrected** | 2.53 | pCi per gram ===> dpm/g | 5.61 |

***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-0247-V1 | 16.99 | 1 | LSC | 0.3440 | 6.86 | 5.017 | 5.87 | 2.64 |
| S-0247-V2 | 16.76 | 1 | LSC | 0.3484 | 6.86 | 4.979 | 5.70 | 2.57 |
| S-0247-V3 | 16.97 | 1 | LSC | 0.3465 | 6.86 | 4.972 | 5.87 | 2.64 |
| S-0247-V4 | 16.76 | 1 | LSC | 0.3449 | 6.86 | 4.982 | 5.76 | 2.60 |
| S-0247-V5 | 16.88 | 1 | LSC | 0.3433 | 6.86 | 4.980 | 5.86 | 2.64 |

| | | | |
|---|---|---|---|
| | Average | 5.81 | 2.62 |
| | Two Sigma Uncertainty | 0.15 | 0.07 |
| *10% Max* *PASS* | Standard Deviation percent of known concentration | 1.35% | 1.35% |
| | Target Activity | 5.61 | 2.53 |
| *5% Max* *PASS* | % Diff | 3.66% | 3.66% |

**Verification Expiration Date:** October 13, 2011

Prepared & Counted By [signature] Date: 10/13/2010 20:18

Verified & Approved By Eugene Mulligan Date: 10-14-10 / 1224

QC Approval [signature] Date: 10-14-10/12:30

# STD ID: S-0031

ARS INTERNATIONAL

## Add/Edit *Secondary Stds*

| Planning | |
|---|---|
| Planning Comments | Dilute intermediate level solution from SRM 4927F |
| Target dpm/g (on dil. date) | 267000 |
| Target Final volume mL | 200 |
| Appx mass g of Parent Sol'n | 2.093763934 |
| Appx vol ml of Parent Sol'n | 2.097539505 |
| Expected Addition for Analysis g | |

| Standards Preparation / Dilution | |
|---|---|
| Secondary Solution # | S-0031 |
| Dilution Date (New Ref Date) | 10/19/2005 00:00 |
| Ampoule, Empty (g) | |
| Ampoule /Solution Gross (g) | |
| Net Wt Removed (g) | |
| Transfer Container, empty (g) | 0 |
| Container Plus Solution (g) | 4.7574 |
| Net Wt Transferred (g) | 4.7574 |
| DPM Xferred on 10/19/2005 00:00 | 121334194.3 |
| Diluent/matrix | H20 |
| Diluent Density Cont, empty (g) | |
| Test Mass of 5 ml of Diluent (g) | |
| Diluent Density Test - (g/mL) | |
| Dilution Empty Container Mass (g) | 1 |
| Dilution Full Cont g (if measured) | 200.64 |
| Dilution Final Volume ml (if measured) | 200 |
| Final Dilution Density (g/mL) | 0.9982 |
| Final Dilution Measured Mass g | 199.64 |
| Comments | S-0031 Intermediate dilution - Information entered from dilution records - 4/19/2006 RTS |
| Final Dilution dpm/g | 607764.9486 |
| Final Dil New Ref Date/Time | 10/19/2005 00:00 |

## Parent Standard Data

| | | | | |
|---|---|---|---|---|
| Parent Solution Reference # | NIST SRM 4927F | | | |
| Parent Solution # | S-0107 | | | |
| Parent Principal Radionuclide | H-3 | Half Life (Days) | 4499.5000000 | |
| Parent Reference Date | 09/03/1998 11:00 | | | |
| Parent Certified Act | 38082000 | Certs Act/Vol Units | dpm | g |
| Parent Cert Act Uncert 1 Sigma | 0.0036 | | | |
| Parent Sp. Gravity G/Ml | 0.9982 | | | |
| Parent Supplier | NIST SRM 4927F | | | |
| Parent Date Recvd | 01/02/00 | | | |
| Parent Received By | Unknown | | | |
| Parent Cert Exp Date | | | | |
| Parent Matrix | H2O | | | |
| Certified dpm/g At Ref Date | 38082000 | | | |
| Certified dpm/g on 10/19/2005 00:00 | 25504307.89 | | | |
| Parent Comments | Primary for S-0029 - Information entered from dilution records - 4/18/2006 RTS | | | |
| Parent Tech | Unknown | | | |
| Is_Primary | FALSE | | | |
| Is_LCS | TRUE | | | |
| Is_Tracer | FALSE | | | |
| Is_Calib | FALSE | | | |

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

S-0031

# National Institute of Standards & Technology

# Certificate

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

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

### Radiological Hazard

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

### Chemical Hazard

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

### Storage and Handling

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

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

### Preparation

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

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

Bert M. Coursey, Chief
Ionizing Radiation Division

Nancy M. Trahey, Chief
Standard Reference Materials Program

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



*Notes and references are on pages 5 and 6.

## PROPERTIES OF SRM 4927F

**Certified values**

| | |
|---|---|
| **Solution density** | **(0.996 ± 0.002) g·mL$^{-1}$ at 20.0 °C [b]*** |
| **Radionuclide** | **Hydrogen-3** |
| **Reference time** | **1200 EST, 3 September 1998** 1100 CST |
| **Massic activity of the solution [c]** | **634.7 kBq·g$^{-1}$** |
| **Relative expanded uncertainty ($k$=2)** | **0.72% [d] [e]** |

Uncertified values

| | | | |
|---|---|---|---|
| Physical Properties: | | | |
| Source description | Liquid in flame-sealed NIST borosilicate-glass ampoule | | |
| Ampoule specifications | Body outside diameter<br>Wall Thickness<br>Barium content<br>Lead-oxide content<br>Other heavy elements | (16.5 ± 0.5) mm<br>(0.60 ± 0.04) mm<br>Less than 2.5%<br>Less than 0.02%<br>Trace quantities | |
| Solution mass | Approximately 5.0 g | | |
| Chemical Properties: | | | |
| Solution composition | Chemical Formula | Concentration (mol·L$^{-1}$) | Mass Fraction (g·g$^{-1}$) |
| | $H_2O$<br>$^3HHO$ | 55<br>$6 \times 10^{-7}$ | 1.00<br>$1 \times 10^{-8}$ |
| Radiological Properties: | | | |
| Radionuclidic impurities | None detected [f] | | |
| Half lives used | Hydrogen-3: (4500 ± 8) d [g] | | |
| Calibration method and measuring instrument(s) | 4πβ gas counting of SRM 4927E using the NIST length-compensated internal gas proportional counters and intercomparison of SRMs 4927E/4927F using two 4πβ liquid-scintillation counting systems [h] | | |



*Notes and references are on pages 5 and 6.

## NOTES

[a] The Sievert is the SI unit for dose equivalent. See reference [1]. One $\mu$Sv is equal to 0.1 mrem.

| Distance from Ampoule (cm): | 1 | 30 | 100 |
|---|---|---|---|
| Approximate Dose Rate ($\mu$Sv/h): | <0.1(Not detectable) | | |

[b] The stated uncertainty is two times the standard uncertainty.

[c] **Massic activity** is the preferred name for the quantity activity divided by the total mass of the sample. See reference [1].

[d] The reported value, $y$, of massic activity (activity per unit mass) at the reference time was not measured directly but was derived from measurements and calculations of other quantities. This can be expressed as $y = f(x_1, x_2, x_3, \ldots x_n)$, where $f$ is a mathematical function derived from the assumed model of the measurement process.

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

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

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

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

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

[e] The value of each standard uncertainty component, and hence the value of the expanded uncertainty itself, is a best estimate based upon all available information, but is only approximately known. That is to say, the "uncertainty of the uncertainty" is large and not well known. This is true for uncertainties evaluated by statistical methods (e.g., the relative standard deviation of the standard deviation of the mean for the massic response is approximately 50%) and for uncertainties evaluated by other methods (which could easily be over estimated or under estimated by substantial amounts). The unknown value of the expanded uncertainty is believed to lie in the interval $U/2$ to $2U$ (i.e., within a factor of 2 of the estimated value).

[f] The estimated limit of detection for radionuclidic impurities is 300 $Bq \cdot g^{-1}$.

[g] The stated uncertainty is the standard uncertainty. See reference [5].

[h] Extensive gas-counting measurements were made on the SRM 4927E solution during 1998 and 1999. The SRM 4927F solution was intercompared with the SRM 4927E solution using liquid-scintillation counting.

[i] Relative standard uncertainty of the input quantity $x_i$.

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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Percent Moisture

ARS INTERNATIONAL

2609 North River Road, Port Allen, Louisiana 70767

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

| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00491 | **Request or PO Number:** | 11-1587 |
| **Client Sample ID:** | MD21-11-5600 | **ARS Sample ID:** | ARS1-11-00491-001 |
| **Sample Collection Date:** | 03/09/11 | **Date Received:** | 03/10/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 05/06/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 9.148 | NA | NA | NA | | % | Percent Moisture | 05/03/11 04:39 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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

LELAP Certificate# 01949 NELAP Certificate # E87558

ARS INTERNATIONAL

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00491 | **Request or PO Number:** | 11-1587 |
| **Client Sample ID:** | MD21-11-5601 | **ARS Sample ID:** | ARS1-11-00491-002 |
| **Sample Collection Date:** | 03/09/11 | **Date Received:** | 03/10/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 05/06/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 11.705 | NA | NA | NA | | % | Percent Moisture | 05/03/11 07:49 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00491 | **Request or PO Number:** | 11-1587 |
| **Client Sample ID:** | MD21-11-5602 | **ARS Sample ID:** | ARS1-11-00491-003 |
| **Sample Collection Date:** | 03/09/11 | **Date Received:** | 03/10/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 05/06/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 8.491 | NA | NA | NA | | % | Percent Moisture | 05/03/11 10:58 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00491 | **Request or PO Number:** | 11-1587 |
| **Client Sample ID:** | MD21-11-5603 | **ARS Sample ID:** | ARS1-11-00491-004 |
| **Sample Collection Date:** | 03/09/11 | **Date Received:** | 03/10/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 05/06/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 9.899 | NA | NA | NA | | % | Percent Moisture | 05/03/11 14:08 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00491 | **Request or PO Number:** | 11-1587 |
| **Client Sample ID:** | MD21-11-5605 | **ARS Sample ID:** | ARS1-11-00491-005 |
| **Sample Collection Date:** | 03/09/11 | **Date Received:** | 03/10/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 05/06/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 9.926 | NA | NA | NA | | % | Percent Moisture | 05/03/11 17:17 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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

LELAP Certificate# 01949 NELAP Certificate # E8755B

ARS INTERNATIONAL

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00491 | **Request or PO Number:** | 11-1587 |
| **Client Sample ID:** | MD21-11-5606 | **ARS Sample ID:** | ARS1-11-00491-006 |
| **Sample Collection Date:** | 03/09/11 | **Date Received:** | 03/10/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 05/06/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 9.653 | NA | NA | NA | | % | Percent Moisture | 05/03/11 20:27 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00491 | **Request or PO Number:** | 11-1587 |
| **Client Sample ID:** | MD21-11-5607 | **ARS Sample ID:** | ARS1-11-00491-007 |
| **Sample Collection Date:** | 03/09/11 | **Date Received:** | 03/10/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 05/06/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 7.114 | NA | NA | NA | U | % | Percent Moisture | 05/03/11 23:36 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00491 | **Request or PO Number:** | 11-1587 |
| **Client Sample ID:** | MD21-11-5608 | **ARS Sample ID:** | ARS1-11-00491-008 |
| **Sample Collection Date:** | 03/09/11 | **Date Received:** | 03/10/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 05/06/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 9.189 | NA | NA | NA | | % | Percent Moisture | 05/04/11 02:45 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00491 | **Request or PO Number:** | 11-1587 |
| **Client Sample ID:** | MD21-11-5610 | **ARS Sample ID:** | ARS1-11-00491-009 |
| **Sample Collection Date:** | 03/09/11 | **Date Received:** | 03/10/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 05/06/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 5.521 | NA | NA | NA | U | % | Percent Moisture | 05/04/11 05:55 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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

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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Percent Moisture Laboratory Records

**AMERICAN RADIATION SERVICES**
**Port Allen, LA**
**PERCENT MOISTURE DETERMINATION IN SOILS**

SDG Number ARS1-11-00491, 00622, 00526, 00527
Client LANL

| LANL ID | ARS ID | weight of cylinder with gel (g) | weight of empty cylinder (g) | Weight of gel (g) | amount of liquid collected (ml) | amount of liquid tested (ml) | **% moisture** |
|---|---|---|---|---|---|---|---|
| MD21-11-5600 | ARS1-11-00491-001 | 612 | 446 | 166 | 15.186 | 5.015 | **9.14819277** |
| MD21-11-5601 | ARS1-11-00491-002 | 606 | 438 | 167 | 19.547 | 5.03 | **11.7047904** |
| MD21-11-5602 | ARS1-11-00491-003 | 607 | 428 | 179 | 15.199 | 5.037 | **8.49106145** |
| MD21-11-5603 | ARS1-11-00491-004 | 617 | 454 | 165 | 16.333 | 5.04 | **9.89878788** |
| MD21-11-5605 | ARS1-11-00491-005 | 607 | 443 | 165 | 16.378 | 5.05 | **9.92606061** |
| MD21-11-5606 | ARS1-11-00491-006 | 615 | 450 | 165 | 15.928 | 5.06 | **9.65333333** |
| MD21-11-5607 | ARS1-11-00491-007 | 605 | 450 | 154 | 10.955 | 5.081 | **7.11363636** |
| MD21-11-5608 | ARS1-11-00491-008 | 598 | 436 | 162 | 14.886 | 5.094 | **9.18888889** |
| MD21-11-5610 | ARS1-11-00491-009 | 601 | 447 | 154 | 8.502 | 5.063 | **5.52077922** |
| MD50-11-5957 | ARS1-11-00622-001 | 604 | 443 | 161 | 13.697 | 5.03 | **8.50745342** |
| MD50-11-5958 | ARS1-11-00622-002 | 601 | 443 | 157 | 10.123 | 5.075 | **6.4477707** |
| MD50-11-5959 | ARS1-11-00622-003 | 598 | 440 | 159 | 9.564 | 5.054 | **6.01509434** |
| MD50-11-5960 | ARS1-11-00622-004 | 606 | 442 | 164 | 18.137 | 5.051 | **11.0591463** |
| MD50-11-5961 | ARS1-11-00622-005 | 610 | 444 | 165 | 16.472 | 5.069 | **9.9830303** |
| MD50-11-5962 | ARS1-11-00622-006 | 602 | 441 | 161 | 15.059 | 5.05 | **9.35341615** |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| MD54-11-3767 | ARS1-11-00526-001 | 611 | 455 | 156 | 11.189 | 5.033 | **7.1724359** |
| MD54-11-3766 | ARS1-11-00526-002 | 628 | 455 | 172 | 21.497 | 5.028 | **12.4982558** |
| MD54-11-3768 | ARS1-11-00526-003 | 599 | 438 | 159 | 16.892 | 5.007 | **10.6238994** |
| MD21-11-5604 | ARS1-11-00527-001 | 629 | 461 | 168 | 18.983 | 5.076 | **11.2994048** |
| MD21-11-5605 | ARS1-11-00527-002 | 604 | 435 | 169 | 19.375 | 5.055 | **11.464497** |

Balance ID: 0102/H1331122173560P
Pipettor ID: FJ40469

Signature [illegible] Date 5-6-11

**AMERICAN RADIATION SERVICES**
**Port Allen, LA**
**PERCENT MOISTURE DETERMINATION IN SOILS**

SDG Number ARS1-11-00491, 00622, 00526, 00527
Client LANL

LCS - 5.037
LCSD - 5.027
Blk - 5.044

| LANL ID | ARS ID | weight of cylinder with gel (g) | weight of empty cylinder (g) | Weight of gel (g) | amount of liquid collected (ml) | amount of liquid tested (ml) | % moisture |
|---|---|---|---|---|---|---|---|
| MD21-11-5600 | ARS1-11-00491-001 | 612 | 446 | 166 | 15.186 | 5.015 | #DIV/0! |
| MD21-11-5601 | ARS1-11-00491-002 | 606 | 438 | 167 | 19.547 | 5.030 | #DIV/0! |
| MD21-11-5602 | ARS1-11-00491-003 | 607 | 428 | 179 | 15.199 | 5.037 | #DIV/0! |
| MD21-11-5603 | ARS1-11-00491-004 | 617 | 454 | 165 | 16.333 | 5.040 | #DIV/0! |
| MD21-11-5605 | ARS1-11-00491-005 | 607 | 443 | 165 | 16.378 | 5.050 | #DIV/0! |
| MD21-11-5606 | ARS1-11-00491-006 | 615 | 450 | 165 | 15.928 | 5.060 | #DIV/0! |
| MD21-11-5607 | ARS1-11-00491-007 | 605 | 450 | 154 | 10.955 | 5.081 | #DIV/0! |
| MD21-11-5608 | ARS1-11-00491-008 | 598 | 436 | 162 | 14.886 | 5.094 | #DIV/0! |
| MD21-11-5610 | ARS1-11-00491-009 | 601 | 447 | 154 | 8.502 | 5.063 | #DIV/0! |
| MD50-11-5957 | ARS1-11-00622-001 | 604 | 443 | 161 | 13.697 | 5.030 | #DIV/0! |
| MD50-11-5958 | ARS1-11-00622-002 | 601 | 443 | 157 | 10.123 | 5.075 | #DIV/0! |
| MD50-11-5959 | ARS1-11-00622-003 | 598 | 440 | 159 | 9.564 | 5.054 | #DIV/0! |
| MD50-11-5960 | ARS1-11-00622-004 | 606 | 442 | 164 | 18.137 | 5.051 | #DIV/0! |
| MD50-11-5961 | ARS1-11-00622-005 | 610 | 444 | 165 | 16.472 | 5.069 | #DIV/0! |
| MD50-11-5962 | ARS1-11-00622-006 | 602 | 441 | 161 | 15.059 | 5.050 | #DIV/0! |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| MD54-11-3767 | ARS1-11-00526-001 | 611 | 455 | 156 | 11.189 | 5.033 | #DIV/0! |
| MD54-11-3766 | ARS1-11-00526-002 | 628 | 455 | 172 | 21.497 | 5.028 | #DIV/0! |
| MD54-11-3768 | ARS1-11-00526-003 | 599 | 438 | 159 | 16.892 | 5.007 | #DIV/0! |
| MD21-11-5604 | ARS1-11-00527-001 | 629 | 461 | 168 | 18.983 | 5.076 | #DIV/0! |
| MD21-11-5605 | ARS1-11-00527-002 | 604 | 435 | 169 | 19.375 | 5.055 | #DIV/0! |

Balance ID: 0102/H1331122173560P
Pipettor ID: FJ40469

Signature [illegible] Date 5-3-11

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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Folder Duplicate

# Report Compilation Checklist

**ARS SDG:** 11-00491 **Client Name:** LANL **Sample Matrix:** SI

| LEVEL 1 COMPONENTS | 1st Reviewer | |
|---|---|---|
| 1) Cover Page Complete and Accurate (see ARS-059)? | ~~Yes~~ No N/A | |
| 2) Technical Review Checklist(s) Complete and Accurate? | ~~Yes~~ No N/A | |
| 3) Case Narrative Complete and Accurate (see ARS-059)? | ~~Yes~~ No N/A | |
| 4) Form 1s Present for all Samples and Tests? | ~~Yes~~ No N/A | |
| 5) Client Specific Components are Present and Complete? | ~~Yes~~ No N/A | |

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

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

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

Susan Reese 5-6-11
**Report Generator Signature** **Date**

VM 5-6-11
**Management Review Signature** **Date**

ARS-059
07/03/2009

ARS INTERNATIONAL

# LSC
# Technical Review Checklist

**ARS SDG** 11-00491

**Sample Matrix:** SI **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:** B11-01640 **Batch B:** N/A **Batch C:** N/A

**Test Method(s):** LSC-A-001 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] Date: 5-3-11 Verifier Review Signature: Jamal Brown Date: 5-3-11

## 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: VHM Date: 5-6-11

| | 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] Date: 5-6-11 Technicial Reviewer Signature: N/A Date:

Batch A: B11-01640

# 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): _____

Susan Weese 5-6-11
Project Manager Signature Date

JJM 5-6-11
QA Officer Signature Date

## GENERAL COMMENTS

# SDG Report - Samples and Containers

**SDG Specific Data**

| | | | | | |
|---|---|---|---|---|---|
| SDG | ARS1-11-00491 | TAT Days | 29 | Project Type | Environmental |
| Sample Count | Rpt Level 4 | Date Received | 3/10/2011 | COC Number | 11-1587 |
| Client | Los Alamos National Laboratory | Client Deadline | 4/8/2011 | PO Number | 63641-001-10 |
| Client Code | 114 | Internal Deadline | 4/7/2011 | Job Number | MR2R032NFM00 |
| Profile Number | PN-00094 | Lab Deadline | 4/5/2011 | Job Location | |
| Comments | | | | | |

**Samples and Containers (→) Checked In Thus Far**

| FR | ClientID | Matrix | SampleStartDate | SampleEndDate | Disp | Hold | Arch | Storage | X | Units | Y | Units | Z | Units | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 001 | MD21-11-5600 | SI | 03/09/11 12:00 PM | 03/09/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| → | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 82005 | 1 | | 1.00 | | | 45 | 18 | | N | N/A | | | | |
| 002 | MD21-11-5601 | SI | 03/09/11 12:00 PM | 03/09/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| → | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 82006 | 1 | | 1.00 | | | 45 | 18 | | N | N/A | | | | |
| 003 | MD21-11-5602 | SI | 03/09/11 12:00 PM | 03/09/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| → | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 82007 | 1 | | 1.00 | | | 45 | 18 | | N | N/A | | | | |
| 004 | MD21-11-5603 | SI | 03/09/11 12:00 PM | 03/09/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| → | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 82008 | 1 | | 1.00 | | | 45 | 18 | | N | N/A | | | | |
| 005 | MD21-11-5605 | SI | 03/09/11 12:00 PM | 03/09/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| → | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 82009 | 1 | | 1.00 | | | 45 | 18 | | N | N/A | | | | |
| 006 | MD21-11-5606 | SI | 03/09/11 12:00 PM | 03/09/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| → | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 82010 | 1 | | 1.00 | | | 45 | 18 | | N | N/A | | | | |
| 007 | MD21-11-5607 | SI | 03/09/11 12:00 PM | 03/09/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| → | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 82011 | 1 | | 1.00 | | | 45 | 18 | | N | N/A | | | | |
| 008 | MD21-11-5608 | SI | 03/09/11 12:00 PM | 03/09/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| → | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 82012 | 1 | | 1.00 | | | 45 | 18 | | N | N/A | | | | |
| 009 | MD21-11-5610 | SI | 03/09/11 12:00 PM | 03/09/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| → | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 82013 | 1 | | 1.00 | | | 45 | 18 | | N | N/A | | | | |

# SDG Report - Analysis Assignments

| | | | |
|---|---|---|---|
| Temp SDG | ARS1-11-00491 | Sample Count | |
| Client | Los Alamos National Laboratory | Analysis Count | 1-9 |

**Samples Count Totals per Analysis**

| Analysis Code | Analysis Description | Samples Count |
|---|---|---|
| LSC-A-001 | Tritium in (Water [Aqueous, AQ, SI]) | 9 |

**Analyses Assigned Per Fraction**

| Fraction | Analysis Code | X = Assigned |
|---|---|---|
| 001 | LSC-A-001 | X |
| 002 | LSC-A-001 | X |
| 003 | LSC-A-001 | X |
| 004 | LSC-A-001 | X |
| 005 | LSC-A-001 | X |
| 006 | LSC-A-001 | X |
| 007 | LSC-A-001 | X |
| 008 | LSC-A-001 | X |
| 009 | LSC-A-001 | X |

# DQO Report for SDG
ARS1-11-00491





| Analysis Code | Group | Isotope | Activity Units | Aliquot Units | ProcedureNo | RDL | LCS_LL | LCS_UL | MS_LL | MS_UL | RadY_LL | RadY_UL | GravY_LL | GravY_LL | RER | RPD | DilfionReq | RoughPrepReq | BlankCorrectionMDA | BlankCorrectionAll | CountTimeReq | AliquotRequired |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LSC-A-001 | STD | H-3 | pCi | L | ARS-054 | 2.50E+02 | 80 | 120 | 75 | 125 | 30 | 110 | 40 | 110 | 1.00 | 25 | FALSE | FALSE | FALSE | FALSE | | |

# ARS FILE TRACKING SHEET

SDG: ARS1-11-00491

| Task | Date / Time | Initials |
|---|---|---|
| Date & Time Samples Received | 3/10/2011/10:45 | 2w |
| ICOC Initiated / Storage Location: Q6 | 3/10/2011/11:55 | 2w |
| Technical Checks Performed | See Batch | — |
| Report Written / EDD Generated: 5-6-11/10:12 SDK (Date/Time, Initials) | 5-6-11/10:16 | SDK |
| Quality Assurance Checks Performed on Report | 5-6-11 1022 | VM |
| Management Check Performed on Report | | |
| *Preliminary Report Sent* | | |
| Report E-mailed | | |
| Report Faxed | | |
| Report Reviewed | | |
| Report Mailed | | |
| Invoice Completed Invoice #:_____ | | |
| Report Imaged | | |

***SPECIAL REQUIREMENTS***

| Requirement | Yes | No |
|---|---|---|
| 3 Hour Rush | | ✓ |
| 24 Hour Rush | | ✓ |
| 48 Hour Rush | | ✓ |
| Special Invoicing *see notes* Mgmt. Approval:_____ | | ✓ |

**NOTES:**

ARS-062
04/23/2010

**COMPANY NAME:** LANL **SDG:** ARS 1-11-00

**SHIPPING CONTAINER**

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

**COC PRESENT WITH SAMPLES**

| | | |
|---|---|---|
| COC | ☑ Yes | ☐ No |

**SAMPLE CONTAINER(S)**

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

# Samples Rcv 9

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

**External and Internal Surveys**

| | | | | | |
|---|---|---|---|---|---|
| Exposure Rate Meter: | M3 242861 | Serial No.: | M44-2 PR2642266 | Calibration Due Date: | 4/9/11 |
| Count Rate Meter: | M2 154859 | Serial No.: | M44-9 PR154559 | Calibration Due Date: | 4/6/11 |

| | | | | |
|---|---|---|---|---|
| Background Exposure Rate (µR/hr) | 24 | Max. Exposure Rate on Shipping Containers Externals (Plus Bkgd) | 12 | µR/hr |
| Background Count Rate (cpm) | 70 | Max. Removable Count Rate on Shipping Containers Externals (Plus Bkgd) | 30 | cpm |
| | | Max. Removable Count Rate on Shipping Containers Internals (Plus Bkgd) | 30 | cpm |

| Sample Label/Comments/Notes | pH Orig | pH Final (pH ≤ 2 is Acceptable) | Mark if Preserve | Acid Lot # | Weight(g) / Volume(mL) | µR/hr (Acceptance Limits <500 µR/hr) | cpm (Acceptance Limits <100 cpm/cm²) |
|---|---|---|---|---|---|---|---|
| MD21-11-5610 | | | | | 1 | 18 | 45 |
| MD21-11-5607 | | | | | 1 | 18 | 45 |
| MD21-11-5605 | | | | | 1 | 18 | 45 |
| MD21-11-5608 | | | | | 1 | 18 | 45 |
| MD21-11-5600 | | | | | 1 | 18 | 45 |
| MD21-11-5602 | | | | | 1 | 18 | 45 |
| MD21-11-5603 | | | | | 1 | 18 | 45 |
| MD21-11-5606 | | | | | 1 | 18 | 45 |
| MD21-11-5601 | | | | | 1 | 18 | 45 |

Surveyors' Name: [signature] Date/Time Surveyed: 3-10-11 1108

S:\Procedures_Controlled\Controlled Forms\ARS-062 Sample Receipt Inspection Form

Tuesday, February 08, 2011

REQUEST NUMBER: 11-1296

# LOS ALAMOS
**NATIONAL LABORATORY**

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

These Samples are on:
LANL Request Number:11-1296
Per Agreement Number:63641-001-10
Project Cost Code: MR8R032NFB00

Please analyse the enclosed samples according to the schedule indicated:

**SHIP DATE: 2/8/2011**
**TURNAROUND/REPORT DUE: 3/10/2011**
**TURNAROUND REQ'D: 30 Days**

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

LANL ER SMO CONTACT:
Signature:

| PRIORITY | METHOD CODE | CNTNR | SAMPLE ID | SAMPLE MATRIX | DATE SAMPLED | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| | EPA:906.0 | 1 | MD21-11-4738 | GAS | 2/8/2011 | |
| | | 1 | MD21-11-4739 | GAS | 2/8/2011 | |
| | | 1 | MD21-11-4740 | GAS | 2/8/2011 | |
| | | 1 | MD21-11-4741 | GAS | 2/8/2011 | |
| | | 1 | MD21-11-4742 | GAS | 2/8/2011 | |
| | | 1 | MD21-11-4743 | GAS | 2/8/2011 | |
| | | 1 | MD21-11-4744 | GAS | 2/8/2011 | |
| | | 1 | MD21-11-4745 | GAS | 2/8/2011 | |
| | MD21-11-4746 | 1 | MD21-11-4746 | GAS | 2/8/2011 | |

Tuesday, February 08, 2011

REQUEST NUMBER: 11-1296

| PRIORITY | METHOD CODE | CNTNR | SAMPLE ID | SAMPLE MATRIX | DATE SAMPLED | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| | EPA:906.0 | 1 | MD21-11-4748 | GAS | 2/8/2011 | |

**Final Page of REQUEST NUMBER 11-1296**

Tuesday, February 08, 2011

# LAB CHAIN OF CUSTODY DOCUMENT NUMBER: 11-1296C

**REQUEST NUMBER: 11-1296**

## LOS ALAMOS
**NATIONAL LABORATORY**

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

TURNAROUND/REPORT DUE: 3/10/2011
TURNAROUND REQ'D: 30

LAB REQUEST COMMENTS:

| SAMPLE ID | CTNR | CTNR DESC | ORDER | PRESERV | MATRIX |
|---|---|---|---|---|---|
| MD21-11-4742 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-4740 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-4746 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-4747 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-4741 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-4738 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-4748 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-4739 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-4743 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-4745 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-4744 | 1 | SILICA GEL TUBE | H3 | None | GAS |

| Relinquished By: | Date | Time | Received By: | Date | Time |
|---|---|---|---|---|---|
| Signature | | | Signature | | |
| Jerry W S. | 2/8/11 | 1400 | | | |
| Signature | | | Signature | | |
| Signature | | | Signature | | |

| Received for DISPOSAL By: | Date | Time | Remarks: |
|---|---|---|---|
| Signature | | | |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3365 **EVENT NAME:** MDA T - CU 21-018(a)-99 - Tritium Sampling

**SAMPLE ID:** MD21-11-4738 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 2/8/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 940 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | ~~21-603059~~ 21-24524W | 21-24524W | FIELD QC TYPE: | FB | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | 0 | ~~300' bgs~~ | SAMPLE USAGE: | QC | |
| BOTTOM DEPTH: | 0 | ~~305' bgs~~ | SCREEN/PORT DESC: | | Port 5 FB |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: NA COMPOSITE TIME INTERVAL: NA WATER FLOWING: YES / NO / NA

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90°

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |

SAMPLE DESC: QC Sample of MD21-11-4744

column # 12

initial wt = 591.95g Final wt = 597.33g

silica wt 150.20g vapor wt = 5.38g

SAMPLE COMMENTS:

weather data @ 1310 2/7/11 T = 34°F RH = 44% BP = 30.06 in

@ 930 2/8/11 T = 32°F RH 87% BP = 29.71 in

LOCATION DESC:

NA

FIELD SCREENING/MEASUREMENT RESULTS: multi Rae IP

atm $O_2$ 20.9% $CO_2$ 580 ppm

sub atm $O_2$ 20.9% $CO_2$ 3550 ppm

COLLECTED BY (PRINT) R Onstott M Rains REVIEWED BY (PRINT) M. Rains

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) Megan Rains<br>(Signature) | 2/8/11 1300 | (Printed Name) Melissa Martin<br>(Signature) | 2/8/11 1300 |
| RELINQUISHED BY<br>(Printed Name)<br>(Signature) | Date/Time | RECEIVED BY<br>(Printed Name)<br>(Signature) | Date/Time |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3365 **EVENT NAME:** MDA T - CU 21-018(a)-99 - Tritium Sampling

**SAMPLE ID:** MD21-11-4739 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 2/8/11 | MEDIA: | NA | SG |
| TIME COLLECTED (HH:MM) | | 940 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | ~~21-603059~~ po 21-21A | 21-24524W | FIELD QC TYPE: | FD | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | 0 | 300' bgs | SAMPLE USAGE: | QC | |
| BOTTOM DEPTH: | 0 | 305' bgs | SCREEN/PORT DESC: | | port 5 FD |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: NA COMPOSITE TIME INTERVAL: NA WATER FLOWING: YES / NO / NA

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90°

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |

SAMPLE DESC: QC Sample of MD21-11-4744 initial wt = 611.16g Final wt = 621.54g
Column # 6 ~~Final~~ 2/23/11 silica wt 156.79 vapor wt 10.38g

SAMPLE COMMENTS:
weather data MD21-11-4744

LOCATION DESC:
NA

FIELD SCREENING/MEASUREMENT RESULTS:
see MD21-11-4744

COLLECTED BY (PRINT) R Onsth M Rains REVIEWED BY (PRINT) M. Rains

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) Megan Rains<br>(Signature) | 2/8/11 1300 | (Printed Name) Melissa Montoya<br>(Signature) | 2/8/11 1300 |
| **RELINQUISHED BY**<br>(Printed Name)<br>(Signature) | **Date/Time** | **RECEIVED BY**<br>(Printed Name)<br>(Signature) | **Date/Time** |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3365 **EVENT NAME:** MDA T - CU 21-018(a)-99 - Tritium Sampling

**SAMPLE ID:** MD21-11-4740 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 2/8/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 940 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | 21-24524W | ok | FIELD QC TYPE: | NA | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | ~~0~~ ~~45~~ 42.5 | 42.5' bgs | SAMPLE USAGE: | INV | |
| BOTTOM DEPTH: | 0 | 47.5' bgs | SCREEN/PORT DESC: | | port #1 |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: NA COMPOSITE TIME INTERVAL: NA WATER FLOWING: YES / NO / NA

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90°

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |

SAMPLE DESC: column #1 initial wt = 589.45g Final wt = 606.06g
silica wt = 151.65g vapor wt = 16.61g

SAMPLE COMMENTS:
weather data @ 930 2/8/11 T = 32°F RH = 87% BP = 29.71 in
@ 1320 2/7/11 T = 34°F RH = 44% BP = 30.06 in

LOCATION DESC:
NA

FIELD SCREENING/MEASUREMENT RESULTS: multiRae IR
~~2/8/11 NA~~ atm $O_2$ 20.9% $CO_2$ 490 ppm
Sub atm $O_2$ 15.9% $CO_2$ 1.56%

COLLECTED BY (PRINT) K Onstott M Rains REVIEWED BY (PRINT) M Rains

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) megan Rains | 2/8/11 | (Printed Name) Melissa Martz | 2/8/11 |
| (Signature) | 1300 | (Signature) | 1300 |
| **RELINQUISHED BY** | **Date/Time** | **RECEIVED BY** | **Date/Time** |
| (Printed Name) | | (Printed Name) | |
| (Signature) | | (Signature) | |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3365 **EVENT NAME:** MDA T - CU 21-018(a)-99 - Tritium Sampling

**SAMPLE ID:** MD21-11-4741 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 2/8/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 940 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | 21-24524W | ok | FIELD QC TYPE: | NA | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | ~~9-12.5~~ 2/7/11 | 122.5' bgs | SAMPLE USAGE: | INV | |
| BOTTOM DEPTH: | 0 | 127.5' bgs | SCREEN/PORT DESC: | | port #7 |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: NA COMPOSITE TIME INTERVAL: ~~WATER FLOWING: YES / NO / NA~~

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90°

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |

SAMPLE DESC:
column # 2
initial wt 593.62g
~~final~~ 2/7/11 wt = 152.75g silia
final ~~silicagel~~ wt 614.93g
vapor wt 21.31g

SAMPLE COMMENTS:
weather data @ 1310 2/7/11 T = 34°F RH 44% BP = 30.06 in
@ 930 2/8/11 T = 32°F RH = 87% BP = 29.71 in

LOCATION DESC:
NA

FIELD SCREENING/MEASUREMENT RESULTS: multi RAE IR
atm $O_2$ 20.9% $CO_2$ 520 ppm
Subatm $O_2$ 20.9% $CO_2$ 3150 ppm

COLLECTED BY (PRINT) R Onstott M Rains REVIEWED BY (PRINT) M. Rains

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) Megan Rains | 2/8/11 1300 | (Printed Name) Alise Martin | 2/8/11 1300 |
| (Signature) | | (Signature) | |
| **RELINQUISHED BY** | **Date/Time** | **RECEIVED BY** | **Date/Time** |
| (Printed Name) | | (Printed Name) | |
| (Signature) | | (Signature) | |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3365 **EVENT NAME:** MDA T - CU 21-018(a)-99 - Tritium Sampling

**SAMPLE ID:** MD21-11-4742 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 2/8/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 940 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | 21-24524W | ok | FIELD QC TYPE: | NA | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | ~~0~~ ~~175~~ po 2/8/11 | 172.51' bgs | SAMPLE USAGE: | INV | |
| BOTTOM DEPTH: | 0 | 177.51' bgs | SCREEN/PORT DESC: | | Port 3 |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: NA COMPOSITE TIME INTERVAL: NA WATER FLOWING: YES / NO / NA

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90°

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | | NA |

SAMPLE DESC:
column # 3
initial wt = 588.53g
silica wt = 151.02g
Final wt = 607.44g
vapor wt = 18.91g

SAMPLE COMMENTS:
weather data @ 1310 2/7/11 T=34°F RH=44% BP=30.06in
@ 930 2/8/11 T=32°F RH 67% BP=29.71in

LOCATION DESC:
NA

FIELD SCREENING/MEASUREMENT RESULTS: multi Rae
atm $O_2$ 20.9% $CO_2$ 500ppm
Sub atm $O_2$: 20.6% $CO_2$ 4560ppm

COLLECTED BY (PRINT) R Onstott M Rains REVIEWED BY (PRINT) M. Rains

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) Megan Rains<br>(Signature) | 2/8/11 1300 | (Printed Name) Melissa Martin<br>(Signature) | 2/8/11 1300 |
| RELINQUISHED BY<br>(Printed Name)<br>(Signature) | Date/Time | RECEIVED BY<br>(Printed Name)<br>(Signature) | Date/Time |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3365 **EVENT NAME:** MDA T - CU 21-018(a)-99 - Tritium Sampling

**SAMPLE ID:** MD21-11-4743 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | ~~940~~ 2/8/11 | MEDIA: | NA | OK |
| TIME COLLECTED (HH:MM) | | 940 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | OK | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | 21-24524W | OK | FIELD QC TYPE: | NA | |
| LOCATION TYPE: | BH | OK | FIELD PREP: | NA | |
| TOP DEPTH: | ~~0~~ ~~2400~~ 2/7/11 | 257.5' bgs | SAMPLE USAGE: | INV | |
| BOTTOM DEPTH: | 0 | 262.5' bgs | SCREEN/PORT DESC: | | port #4 |
| FIELD MATRIX: | GAS | OK | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: NA COMPOSITE TIME INTERVAL: NA WATER FLOWING: YES / NO / NA

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90°

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |

SAMPLE DESC: column # 4 initial wt = 594.84g Final wt = 608.65g silica wt = 147.98g vapor wt = 13.81g

SAMPLE COMMENTS: weather data @ 1310 2/7/11 T=34°F RH=44% BP=30.06in @ 930 2/8/11 T=32°F RH 87% BP=29.71in

LOCATION DESC: NA

FIELD SCREENING/MEASUREMENT RESULTS: multi Rae IR atm $O_2$ 20.9% $CO_2$ 520ppm subatm $O_2$ 20.9% $CO_2$ 3700ppm

COLLECTED BY (PRINT) L Onstott M Rains REVIEWED BY (PRINT) M. Rains

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) Megan Rains | 2/8/11 | (Printed Name) Melissa Martin | 2/8/11 |
| (Signature) | 1300 | (Signature) | 1300 |
| **RELINQUISHED BY** | **Date/Time** | **RECEIVED BY** | **Date/Time** |
| (Printed Name) | | (Printed Name) | |
| (Signature) | | (Signature) | |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3365 **EVENT NAME:** MDA T - CU 21-018(a)-99 - Tritium Sampling

**SAMPLE ID:** MD21-11-4744 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 2/8/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 940 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | 21-24524W | ok | FIELD QC TYPE: | NA | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | ~~0~~ ~~302.5~~ 2/7/11 | 300' bgs | SAMPLE USAGE: | INV | |
| BOTTOM DEPTH: | 0 | 305' bgs | SCREEN/PORT DESC: | | port 5 |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: NA COMPOSITE TIME INTERVAL: NA WATER FLOWING: YES / NO / NA

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90°

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |

SAMPLE DESC:
column # 5
initial wt
silica wt
Final wt
vapor wt

SAMPLE COMMENTS:
weather data @ 1310 2/7/11 T=34°F RH=44% BP=30.06 in
@ 930 2/8/11 T=32°F RH 89% BP=~~8~~ 29.71 in

LOCATION DESC:
NA

FIELD SCREENING/MEASUREMENT RESULTS: multi Rae
atm $O_2$ 20.9% $CO_2$ 580 ppm
sub atm $O_2$ 20.9% $CO_2$ 3550 ppm

COLLECTED BY (PRINT) R Onstott M Rains REVIEWED BY (PRINT) M. Rains

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) Megan Rains | 2/8/11 | (Printed Name) Melissa Montoya | 2/8/11 |
| (Signature) | 1300 | (Signature) | 1300 |
| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
| (Printed Name) | | (Printed Name) | |
| (Signature) | | (Signature) | |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3365 **EVENT NAME:** MDA T - CU 21-018(a)-99 - Tritium Sampling

**SAMPLE ID:** MD21-11-4745 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 2/8/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 940 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | 21-24524W | ok | FIELD QC TYPE: | NA | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | ~~0 330~~ 2/7/11 | 327.5' bgs | SAMPLE USAGE: | INV | |
| BOTTOM DEPTH: | 0 | 332.5' bgs | SCREEN/PORT DESC: | | Port 6 |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: NA COMPOSITE TIME INTERVAL: NA WATER FLOWING: YES / NO / NA

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90°

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |

SAMPLE DESC:
column # 7
Initial wt: 590.22g Final wt: 610.13g
Silica wt: 158.93g Vapor wt = 19.91g

SAMPLE COMMENTS:
weather data @ 1310 2/7/11 T = 34°F RH 44% BP = 30.06in
@ 930 2/8/11 T = 32°F RH 87% BP 29.71in

LOCATION DESC:
NA

FIELD SCREENING/MEASUREMENT RESULTS: Multi RAE
atm $O_2$ 20.9% $CO_2$ 500ppm
Sub atm $O_2$ 20.9% $CO_2$ 3950ppm

COLLECTED BY (PRINT) R Onsloh M Rains REVIEWED BY (PRINT) M. Rains

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) Megan Rains<br>(Signature) | 2/8/11 1300 | (Printed Name) Melissa Montoya<br>(Signature) | 2/8/11 1300 |
| RELINQUISHED BY<br>(Printed Name)<br>(Signature) | Date/Time | RECEIVED BY<br>(Printed Name)<br>(Signature) | Date/Time |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3365 **EVENT NAME:** MDA T - CU 21-018(a)-99 - Tritium Sampling

**SAMPLE ID:** MD21-11-4746 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 2/8/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 940 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | 21-24524W | ok | FIELD QC TYPE: | NA | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | ~~0~~ ~~380~~ 2/7/11 | 377.5' bgs | SAMPLE USAGE: | INV | |
| BOTTOM DEPTH: | 0 | 382.5' bgs | SCREEN/PORT DESC: | | Port 7 |
| FIELD MATRIX: | GAS | | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: NA COMPOSITE TIME INTERVAL: NA WATER FLOWING: YES / NO / NA

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90°

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |

SAMPLE DESC: column #8 Initial wt 611.33g Final wt 621.21g
silica wt 150.42g Vapor wt 9.88g

SAMPLE COMMENTS: weather data @1310 2/7/11 T=34°F RH=44% BP=30.06in
@930 2/8/11 T=32°F RH 87% BP=29.71in

LOCATION DESC:

NA

FIELD SCREENING/MEASUREMENT RESULTS: multi Rae
atm $O_2$ 20.9% $CO_2$ 530 ppm
sub atm $O_2$ 20.9% $CO_2$ 3400 ppm

COLLECTED BY (PRINT) R Dreskoff M Rains REVIEWED BY (PRINT) M. Rains

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) Megan Rains<br>(Signature) | 2/8/11 1300 | (Printed Name) Melissa Martz<br>(Signature) | 2/8/11 1300 |
| **RELINQUISHED BY** | **Date/Time** | **RECEIVED BY** | **Date/Time** |
| (Printed Name)<br>(Signature) | | (Printed Name)<br>(Signature) | |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3365 **EVENT NAME:** MDA T - CU 21-018(a)-99 - Tritium Sampling

**SAMPLE ID:** MD21-11-4747 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 2/8/11 | MEDIA: | NA | |
| TIME COLLECTED (HH:MM) | | 940 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | ~~21-24324W~~ 2/2/11 | 21-245245 | FIELD QC TYPE: | NA | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | ~~0 bgs~~ 2/2/11 | 677.5' bgs | SAMPLE USAGE: | INV | |
| BOTTOM DEPTH: | 0 | 682.5' bgs | SCREEN/PORT DESC: | port 10 | |
| FIELD MATRIX: | GAS | | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: NA COMPOSITE TIME INTERVAL: NA WATER FLOWING: YES / NO / NA

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90°

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |

**SAMPLE DESC:**
column #9 initial wt 591.24g Silica wt 155.78g Final wt 601.59g Vapor wt 10.35g

**SAMPLE COMMENTS:**
weather data @ 1310 2/7/11 T=34°F RH=44% BP=30.06in
@ 930 2/8/11 T=32°F RH=87% BP=29.71in

**LOCATION DESC:**
NA

**FIELD SCREENING/MEASUREMENT RESULTS:** Multi RAE
atm $O_2$ 20.9% $CO_2$ 500 ppm
Sub atm $O_2$ 20.9% $CO_2$ 3500 ppm

**COLLECTED BY (PRINT)** Konstantin Mains **REVIEWED BY (PRINT)** M. Rains

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) M. Rains<br>(Signature) | 2/8/11 1300 | (Printed Name) Melissa Martz<br>(Signature) | 2/8/11 1300 |
| **RELINQUISHED BY** | **Date/Time** | **RECEIVED BY** | **Date/Time** |
| (Printed Name)<br>(Signature) | | (Printed Name)<br>(Signature) | |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3365 **EVENT NAME:** MDA T - CU 21-018(a)-99 - Tritium Sampling

**SAMPLE ID:** MD21-11-4748 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 2/8/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 940 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | ok | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | ~~21-24524W~~ ok 2/7/11 | 21-24524S | FIELD QC TYPE: | NA | |
| LOCATION TYPE: | BH | ok | FIELD PREP: | NA | |
| TOP DEPTH: | ~~0~~ ~~715~~ ok 2/7/11 | 712.5' bgs | SAMPLE USAGE: | INV | |
| BOTTOM DEPTH: | 0 | 717.5' bgs | SCREEN/PORT DESC: | | port 11 |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: NA COMPOSITE TIME INTERVAL: NA WATER FLOWING: YES / NO / NA

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: 90°

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |

SAMPLE DESC:
column # 10
initial wt 593.9 g
silica wt = 153.38 g
Final wt 607.75 g
vapor wt 13.84 g

SAMPLE COMMENTS:
weather data @ 2/8/11 1310 T = 34° F RH = 44% BP = 30.06 in
@ 930 2/8/11 T = 32°F RH 87% BP = 29.71 in

LOCATION DESC:
NA

FIELD SCREENING/MEASUREMENT RESULTS: Multi Rae
atm $O_2$ 20.9% $CO_2$ 580 ppm
sub atm $O_2$ 20.9% $CO_2$ 2870 ppm

COLLECTED BY (PRINT) K Onstott / M Rains REVIEWED BY (PRINT) M. Rains

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) Megan Rains | 2/8/11 1300 | (Printed Name) Melissa Montoya | 2/8/11 1300 |
| (Signature) | | (Signature) | |
| **RELINQUISHED BY** | **Date/Time** | **RECEIVED BY** | **Date/Time** |
| (Printed Name) | | (Printed Name) | |
| (Signature) | | (Signature) | |

# DATA VALIDATION COVER SHEET

**5119-1**

**Data Validation Cover Sheet**

Records Use only

Los Alamos NATIONAL LABORATORY EST. 1943

**Section I.**

REQUEST NUMBER: 11-1296 VALIDATION DATE: 03/30/11 LAB CODE: ARS

CONTRACT LABORATORY NAME: American Radiation Services, Inc.

VALIDATOR: David Schwent ORGANIZATION: Analytical Quality Associates, Inc.

ANALYTICAL SUITE (CHECK ALL THAT APPLY):

| | | | |
|---|---|---|---|
| ☐ **TPH-GRO** | ☐ **HIGH EXPLOSIVES** | ☐ **DIOXIN FURANS** | ☐ **LCMSMS PERCHLORATES** |
| ☐ **TPH-DRO** | ☐ **METALS** | ☐ **PCB CONGENERS** | ☐ **ORGANOCHLORINE PESTICIDES/POLYCHLORINATED BIPHENYLS** |
| ☐ **GENERAL CHEMISTRY** | ☒ **RADIOCHEMISTRY** | ☐ **LCMSMS HIGH EXPLOSIVES** | |

☐ **OTHER (DESCRIBE):** Tritium only

**Section II. Completeness Check**

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

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

1. In the MB, tritium was detected. The associated results of samples MD21-11-4742, -4747, -4741, -4748, and -4745 were detects >5X but ≤50X the MB concentration and, thus, was qualified J,R4a. The associated results of samples -4746 and -4738 were NDs and, thus, were not qualified. All other associated sample results were detects >50X the MB concentration and, thus, were not qualified, based on professional judgment.

2. It should be noted that no duplicate or MS samples were analyzed. However, an LCS and LCSD were analyzed and met acceptance criteria and, thus, no sample data were qualified.

3. It should also be noted that the LCS/LCSD RER was hand-calculated using the 2-sigma TPU values and was found to be within specifications. No sample data were qualified as a result.

4. It should also be noted that the tritium analysis for sample -4747 was not listed on the Analytical Request form associated with the COC. No sample data were qualified as a result.

# DATA VALIDATION COVER SHEET

**5119-1**

**Data Validation Cover Sheet**

Records Use only

**Reviewed by:** Susan Ball **Level:** I **Date:** 03/30/11

VALIDATOR'S SIGNATURE: David Schwartz DATE: 03/30/11

Form 5119-1, Revision 0.0

LOS ALAMOS
Environmental Restoration Project

# RAD ANALYTICAL DATA VALIDATION CHECKLIST

**5119-2**

**Rad Analytical Data Validation Checklist**

Records Use only

Los Alamos NATIONAL LABORATORY EST. 1943

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

| RAD ANALYTICAL DATA VALIDATION CHECKLIST | |
|---|---|
| **5119-2**<br>**Rad Analytical Data Validation Checklist** | Records Use only<br>Los Alamos NATIONAL LABORATORY EST. 1943 |

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

| RAD ANALYTICAL DATA VALIDATION CHECKLIST | |
|---|---|
| **5119-2**<br>**Rad Analytical Data Validation Checklist** | Records Use only<br>Los Alamos NATIONAL LABORATORY EST. 1943 |

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

ARS INTERNATIONAL

2609 North River Road, Port Allen, Louisiana 70767

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

| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00256 | **Request or PO Number:** | 11-1296 |
| **Client Sample ID:** | MD21-11-4742 | **ARS Sample ID:** | ARS1-11-00256-001 |
| **Sample Collection Date:** | 02/08/11 | **Date Received:** | 02/09/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 03/18/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 J,R4a | 11316.852 | 608.411 | 212.519 | 104.332 | | pCi/L | ARS-054/EPA 906.0 | 03/15/11 19:25 | AB | NA |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**NOTES: Project Cost Code MR8R032NFB00**

Project Manager Review

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

LELAP Certificate# 01949 NELAP Certificate # E87558



DJS 03/30/11

ARS INTERNATIONAL

2609 North River Road, Port Allen, Louisiana 70767

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

| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00256 | **Request or PO Number:** | 11-1296 |
| **Client Sample ID:** | MD21-11-4740 | **ARS Sample ID:** | ARS1-11-00256-002 |
| **Sample Collection Date:** | 02/08/11 | **Date Received:** | 02/09/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 03/18/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 30698.165 | 1619.537 | 210.569 | 103.374 | | pCi/L | ARS-054/EPA 906.0 | 03/15/11 22:32 | AB | NA |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**NOTES: Project Cost Code MR8R032NFB00**

Project Manager Review

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

LELAP Certificate# 01949 NELAP Certificate # E87558



DJS 03/30/11

ARS INTERNATIONAL

2609 North River Road, Port Allen, Louisiana 70767

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

| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00256 | **Request or PO Number:** | 11-1296 |
| **Client Sample ID:** | MD21-11-4746 | **ARS Sample ID:** | ARS1-11-00256-003 |
| **Sample Collection Date:** | 02/08/11 | **Date Received:** | 02/09/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 03/18/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 152.031 | 64.923 | 210.270 | 103.228 | U | pCi/L | ARS-054/EPA 906.0 | 03/16/11 01:39 | AB | NA |

**NOTES: Project Cost Code MR8R032NFB00**

Project Manager Review

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00256 | **Request or PO Number:** | 11-1296 |
| **Client Sample ID:** | MD21-11-4747 | **ARS Sample ID:** | ARS1-11-00256-004 |
| **Sample Collection Date:** | 02/08/11 | **Date Received:** | 02/09/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 03/18/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 J,R4a | 3477.138 | 204.807 | 211.390 | 103.778 | | pCi/L | ARS-054/EPA 906.0 | 03/16/11 04:46 | AB | NA |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**NOTES: Project Cost Code MR8R032NFB00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00256 | **Request or PO Number:** | 11-1296 |
| **Client Sample ID:** | MD21-11-4741 | **ARS Sample ID:** | ARS1-11-00256-005 |
| **Sample Collection Date:** | 02/08/11 | **Date Received:** | 02/09/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 03/18/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 J,R4a | 9799.779 | 529.351 | 210.245 | 103.215 | | pCi/L | ARS-054/EPA 906.0 | 03/16/11 07:53 | AB | NA |

**NOTES: Project Cost Code MR8R032NFB00**

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

| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00256 | **Request or PO Number:** | 11-1296 |
| **Client Sample ID:** | MD21-11-4738 | **ARS Sample ID:** | ARS1-11-00256-006 |
| **Sample Collection Date:** | 02/08/11 | **Date Received:** | 02/09/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 03/18/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 111.103 | 64.033 | 209.542 | 102.870 | U | pCi/L | ARS-054/EPA 906.0 | 03/16/11 11:00 | AB | NA |

**NOTES: Project Cost Code MR8R032NFB00**

Project Manager Review

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

| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00256 | **Request or PO Number:** | 11-1296 |
| **Client Sample ID:** | MD21-11-4748 | **ARS Sample ID:** | ARS1-11-00256-007 |
| **Sample Collection Date:** | 02/08/11 | **Date Received:** | 02/09/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 03/18/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 J,R4a | 2304.098 | 147.128 | 209.424 | 102.812 | | pCi/L | ARS-054/EPA 906.0 | 03/16/11 14:07 | AB | NA |

**NOTES: Project Cost Code MR8R032NFB00**

Project Manager Review

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00256 | **Request or PO Number:** | 11-1296 |
| **Client Sample ID:** | MD21-11-4739 | **ARS Sample ID:** | ARS1-11-00256-008 |
| **Sample Collection Date:** | 02/08/11 | **Date Received:** | 02/09/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 03/18/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 26870.401 | 1419.539 | 209.945 | 103.068 | | pCi/L | ARS-054/EPA 906.0 | 03/16/11 17:14 | AB | NA |

**NOTES: Project Cost Code MR8R032NFB00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00256 | **Request or PO Number:** | 11-1296 |
| **Client Sample ID:** | MD21-11-4743 | **ARS Sample ID:** | ARS1-11-00256-009 |
| **Sample Collection Date:** | 02/08/11 | **Date Received:** | 02/09/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 03/18/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 24399.350 | 1290.720 | 212.954 | 104.545 | | pCi/L | ARS-054/EPA 906.0 | 03/16/11 20:21 | AB | NA |

**NOTES: Project Cost Code MR8R032NFB00**

Project Manager Review

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00256 | **Request or PO Number:** | 11-1296 |
| **Client Sample ID:** | MD21-11-4745 | **ARS Sample ID:** | ARS1-11-00256-010 |
| **Sample Collection Date:** | 02/08/11 | **Date Received:** | 02/09/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 03/18/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 J,R4a | 7396.100 | 405.078 | 212.889 | 104.513 | | pCi/L | ARS-054/EPA 906.0 | 03/16/11 23:28 | AB | NA |

**NOTES: Project Cost Code MR8R032NFB00**

Project Manager Review

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00256 | **Request or PO Number:** | 11-1296 |
| **Client Sample ID:** | MD21-11-4744 | **ARS Sample ID:** | ARS1-11-00256-011 |
| **Sample Collection Date:** | 02/08/11 | **Date Received:** | 02/09/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 03/18/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 25452.475 | 1345.529 | 210.542 | 103.361 | | pCi/L | ARS-054/EPA 906.0 | 03/17/11 02:35 | AB | NA |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**NOTES: Project Cost Code MR8R032NFB00**

Project Manager Review

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LELAP Certificate# 01949 NELAP Certificate # E87558



DJS 03/30/11

Tuesday, February 08, 2011

# LAB CHAIN OF CUSTODY DOCUMENT NUMBER: 11-1296

**REQUEST NUMBER: 11-1296**

## LOS ALAMOS
**NATIONAL LABORATORY**

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

TURNAROUND/REPORT DUE: 3/10/2011
TURNAROUND REQ'D: 30

LAB REQUEST COMMENTS:

| SAMPLE ID | CTNR | CTNR DESC | ORDER | PRESERV | MATRIX |
|---|---|---|---|---|---|
| MD21-11-4742 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-4740 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-4746 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-4747 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-4741 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-4738 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-4748 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-4739 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-4743 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-4745 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-4744 | 1 | SILICA GEL TUBE | H3 | None | GAS |

| Relinquished By: | Date | Time | Received By: | Date | Time |
|---|---|---|---|---|---|
| Signature | | | Signature | | |
| [illegible] | 2/8/11 | 1400 | [illegible] | 2-9-11 | 09:58 |
| Signature | | | Signature | | |
| Signature | | | Signature | | |

| Received for DISPOSAL By: | Date | Time | Remarks: |
|---|---|---|---|
| Signature | | | |

Tuesday, February 08, 2011

REQUEST NUMBER: 11-1296



# LOS ALAMOS
## NATIONAL LABORATORY

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

These Samples are on:
LANL Request Number:11-1296
Per Agreement Number:63641-001-10
Project Cost Code: MR8R032NFB00

Please analyse the enclosed samples according to the schedule indicated:

**SHIP DATE: 2/8/2011**
**TURNAROUND/REPORT DUE: 3/10/2011**
**TURNAROUND REQ'D: 30 Days**

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

LANL ER SMO CONTACT:
Signature:

| PRIORITY | METHOD CODE | CNTNR | SAMPLE ID | SAMPLE MATRIX | DATE SAMPLED | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| | EPA:906.0 | 1 | MD21-11-4738 | GAS | 2/8/2011 | |
| | | 1 | MD21-11-4739 | GAS | 2/8/2011 | |
| | | 1 | MD21-11-4740 | GAS | 2/8/2011 | |
| | | 1 | MD21-11-4741 | GAS | 2/8/2011 | |
| | | 1 | MD21-11-4742 | GAS | 2/8/2011 | |
| | | 1 | MD21-11-4743 | GAS | 2/8/2011 | |
| | | 1 | MD21-11-4744 | GAS | 2/8/2011 | |
| | | 1 | MD21-11-4745 | GAS | 2/8/2011 | |
| | MD21-11-4746 | 1 | MD21-11-4746 | GAS | 2/8/2011 | |

Tuesday, February 08, 2011

REQUEST NUMBER: 11-1296

| PRIORITY | METHOD CODE | CNTNR | SAMPLE ID | SAMPLE MATRIX | DATE SAMPLED | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| | EPA:906.0 | 1 | MD21-11-4748 | GAS | 2/8/2011 | |

**Final Page of REQUEST NUMBER 11-1296**

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

# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Request Number: 11-1296

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

# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory Request Number: 11-1296

# Original COC

Tuesday, February 08, 2011

# LAB CHAIN OF CUSTODY DOCUMENT NUMBER: 11-1296

**REQUEST NUMBER: 11-1296**

## LOS ALAMOS
**NATIONAL LABORATORY**

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

TURNAROUND/REPORT DUE: 3/10/2011
TURNAROUND REQ'D: 30

LAB REQUEST COMMENTS:

| SAMPLE ID | CTNR | CTNR DESC | ORDER | PRESERV | MATRIX |
|---|---|---|---|---|---|
| MD21-11-4742 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-4740 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-4746 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-4747 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-4741 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-4738 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-4748 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-4739 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-4743 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-4745 | 1 | SILICA GEL TUBE | H3 | None | GAS |
| MD21-11-4744 | 1 | SILICA GEL TUBE | H3 | None | GAS |

| Relinquished By: | Date | Time | Received By: | Date | Time |
|---|---|---|---|---|---|
| Signature | | | Signature | | |
| [illegible] | 2/8/11 | 1400 | [illegible] | 2-9-11 | 09:58 |
| Signature | | | Signature | | |
| Signature | | | Signature | | |

| Received for DISPOSAL By: | Date | Time | Remarks: |
|---|---|---|---|
| Signature | | | |

Tuesday, February 08, 2011

REQUEST NUMBER: 11-1296



# LOS ALAMOS
## NATIONAL LABORATORY

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

These Samples are on:
LANL Request Number:11-1296
Per Agreement Number:63641-001-10
Project Cost Code: MR8R032NFB00

Please analyse the enclosed samples according to the schedule indicated:

**SHIP DATE: 2/8/2011**
**TURNAROUND/REPORT DUE: 3/10/2011**
**TURNAROUND REQ'D: 30 Days**

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

LANL ER SMO CONTACT:
Signature:

| PRIORITY | METHOD CODE | CNTNR | SAMPLE ID | SAMPLE MATRIX | DATE SAMPLED | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| | EPA:906.0 | 1 | MD21-11-4738 | GAS | 2/8/2011 | |
| | | 1 | MD21-11-4739 | GAS | 2/8/2011 | |
| | | 1 | MD21-11-4740 | GAS | 2/8/2011 | |
| | | 1 | MD21-11-4741 | GAS | 2/8/2011 | |
| | | 1 | MD21-11-4742 | GAS | 2/8/2011 | |
| | | 1 | MD21-11-4743 | GAS | 2/8/2011 | |
| | | 1 | MD21-11-4744 | GAS | 2/8/2011 | |
| | | 1 | MD21-11-4745 | GAS | 2/8/2011 | |
| | MD21-11-4746 | 1 | MD21-11-4746 | GAS | 2/8/2011 | |

Tuesday, February 08, 2011

REQUEST NUMBER: 11-1296

| PRIORITY | METHOD CODE | CNTNR | SAMPLE ID | SAMPLE MATRIX | DATE SAMPLED | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| | EPA:906.0 | 1 | MD21-11-4748 | GAS | 2/8/2011 | |

**Final Page of REQUEST NUMBER 11-1296**

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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory Request Number: 11-1296

# Case Narrative

ARS INTERNATIONAL

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

March 18, 2011

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

Request Number: **11-1296**
LANL Sample ID: **MD21-11-4742; MD21-11-4740; MD21-11-4746; MD21-11-4747; MD21-11-4741; MD21-11-4738; MD21-11-4748; MD21-11-4739; MD21-11-4743; MD21-11-4745; MD21-11-4744.**

Dear Mr. Greene;

On February 9, 2011, ARS International received eleven (11) Silica Gel samples to be analyzed for Tritium.

The samples were received in good condition. They were processed and counted using the appropriate counting equipment and QA/QC for this type of analysis. Results of the analysis and QA/QC are attached in the data package.

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

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

Sincerely,

Eugene Mulligan

Laboratory Management
**ARS International**

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

# COVER PAGE

## PROJECT SAMPLE IDENTIFICATION CROSS-REFERENCE TO ARS SAMPLE LABORATORY IDs

Subcontract (LANL Agreement Number) 63641-001-10

| Request Number | LANL PROJECT SAMPLE ID NUMBER | American Radiation Services SAMPLE ID NUMBER(S) |
|---|---|---|
| 11-1296 | MD21-11-4742 | ARS1-11-00256-001 |
| 11-1296 | MD21-11-4740 | ARS1-11-00256-002 |
| 11-1296 | MD21-11-4746 | ARS1-11-00256-003 |
| 11-1296 | MD21-11-4747 | ARS1-11-00256-004 |
| 11-1296 | MD21-11-4741 | ARS1-11-00256-005 |
| 11-1296 | MD21-11-4738 | ARS1-11-00256-006 |
| 11-1296 | MD21-11-4748 | ARS1-11-00256-007 |
| 11-1296 | MD21-11-4739 | ARS1-11-00256-008 |
| 11-1296 | MD21-11-4743 | ARS1-11-00256-009 |
| 11-1296 | MD21-11-4745 | ARS1-11-00256-010 |
| 11-1296 | MD21-11-4744 | ARS1-11-00256-011 |

**ANALYTICAL METHODS**

Tritium analyses were performed using **EPA 906.0.**

**ANALYTICAL RESULTS**

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

**American Radiation Services Project Manager/Laboratory Director's Comments:**

*"I certify that this sample data package is in compliance with SOW requirements, both technically and for completeness, other than the conditions detailed above. Release of the data contained in this sample data package and the computer-readable EDD, as applicable, submitted on diskette or by modem, has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature."*

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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 the LANL specific requirements, both technically and for completeness, other than the conditions detailed above or in the sample data package narrative. Release, by submission through email, the data contained in this electronic image and the computer-readable EDD (as applicable), has been authorized by the laboratory Manager/Technical Director or the Manager's designee."*

| Signature | Title | Date |
|---|---|---|
| Eugene Mulligan | Laboratory Management, ARS International | 3-18-11 |

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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Tritium by Low Level Liquid Scintillation Counting

ARS INTERNATIONAL

2609 North River Road, Port Allen, Louisiana 70767

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

| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00256 | **Request or PO Number:** | 11-1296 |
| **Client Sample ID:** | MD21-11-4742 | **ARS Sample ID:** | ARS1-11-00256-001 |
| **Sample Collection Date:** | 02/08/11 | **Date Received:** | 02/09/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 03/18/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 11316.852 | 608.411 | 212.519 | 104.332 | | pCi/L | ARS-054/EPA 906.0 | 03/15/11 19:25 | AB | NA |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**NOTES: Project Cost Code MR8R032NFB00**

Project Manager Review

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

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00256 | **Request or PO Number:** | 11-1296 |
| **Client Sample ID:** | MD21-11-4740 | **ARS Sample ID:** | ARS1-11-00256-002 |
| **Sample Collection Date:** | 02/08/11 | **Date Received:** | 02/09/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 03/18/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 30698.165 | 1619.537 | 210.569 | 103.374 | | pCi/L | ARS-054/EPA 906.0 | 03/15/11 22:32 | AB | NA |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**NOTES: Project Cost Code MR8R032NFB00**

Project Manager Review

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ARS INTERNATIONAL

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

| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00256 | **Request or PO Number:** | 11-1296 |
| **Client Sample ID:** | MD21-11-4746 | **ARS Sample ID:** | ARS1-11-00256-003 |
| **Sample Collection Date:** | 02/08/11 | **Date Received:** | 02/09/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 03/18/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 152.031 | 64.923 | 210.270 | 103.228 | U | pCi/L | ARS-054/EPA 906.0 | 03/16/11 01:39 | AB | NA |

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00256 | **Request or PO Number:** | 11-1296 |
| **Client Sample ID:** | MD21-11-4747 | **ARS Sample ID:** | ARS1-11-00256-004 |
| **Sample Collection Date:** | 02/08/11 | **Date Received:** | 02/09/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 03/18/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 3477.138 | 204.807 | 211.390 | 103.778 | | pCi/L | ARS-054/EPA 906.0 | 03/16/11 04:46 | AB | NA |
| | | | | | | | | | | |
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**NOTES: Project Cost Code MR8R032NFB00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00256 | **Request or PO Number:** | 11-1296 |
| **Client Sample ID:** | MD21-11-4741 | **ARS Sample ID:** | ARS1-11-00256-005 |
| **Sample Collection Date:** | 02/08/11 | **Date Received:** | 02/09/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 03/18/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 9799.779 | 529.351 | 210.245 | 103.215 | | pCi/L | ARS-054/EPA 906.0 | 03/16/11 07:53 | AB | NA |

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00256 | **Request or PO Number:** | 11-1296 |
| **Client Sample ID:** | MD21-11-4738 | **ARS Sample ID:** | ARS1-11-00256-006 |
| **Sample Collection Date:** | 02/08/11 | **Date Received:** | 02/09/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 03/18/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 111.103 | 64.033 | 209.542 | 102.870 | U | pCi/L | ARS-054/EPA 906.0 | 03/16/11 11:00 | AB | NA |

**NOTES: Project Cost Code MR8R032NFB00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00256 | **Request or PO Number:** | 11-1296 |
| **Client Sample ID:** | MD21-11-4748 | **ARS Sample ID:** | ARS1-11-00256-007 |
| **Sample Collection Date:** | 02/08/11 | **Date Received:** | 02/09/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 03/18/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 2304.098 | 147.128 | 209.424 | 102.812 | | pCi/L | ARS-054/EPA 906.0 | 03/16/11 14:07 | AB | NA |

**NOTES: Project Cost Code MR8R032NFB00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00256 | **Request or PO Number:** | 11-1296 |
| **Client Sample ID:** | MD21-11-4739 | **ARS Sample ID:** | ARS1-11-00256-008 |
| **Sample Collection Date:** | 02/08/11 | **Date Received:** | 02/09/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 03/18/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 26870.401 | 1419.539 | 209.945 | 103.068 | | pCi/L | ARS-054/EPA 906.0 | 03/16/11 17:14 | AB | NA |

**NOTES: Project Cost Code MR8R032NFB00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00256 | **Request or PO Number:** | 11-1296 |
| **Client Sample ID:** | MD21-11-4743 | **ARS Sample ID:** | ARS1-11-00256-009 |
| **Sample Collection Date:** | 02/08/11 | **Date Received:** | 02/09/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 03/18/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 24399.350 | 1290.720 | 212.954 | 104.545 | | pCi/L | ARS-054/EPA 906.0 | 03/16/11 20:21 | AB | NA |
| | | | | | | | | | | |
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**NOTES: Project Cost Code MR8R032NFB00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00256 | **Request or PO Number:** | 11-1296 |
| **Client Sample ID:** | MD21-11-4745 | **ARS Sample ID:** | ARS1-11-00256-010 |
| **Sample Collection Date:** | 02/08/11 | **Date Received:** | 02/09/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 03/18/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 7396.100 | 405.078 | 212.889 | 104.513 | | pCi/L | ARS-054/EPA 906.0 | 03/16/11 23:28 | AB | NA |
| | | | | | | | | | | |
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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00256 | **Request or PO Number:** | 11-1296 |
| **Client Sample ID:** | MD21-11-4744 | **ARS Sample ID:** | ARS1-11-00256-011 |
| **Sample Collection Date:** | 02/08/11 | **Date Received:** | 02/09/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 03/18/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 25452.475 | 1345.529 | 210.542 | 103.361 | | pCi/L | ARS-054/EPA 906.0 | 03/17/11 02:35 | AB | NA |
| | | | | | | | | | | |
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**NOTES: Project Cost Code MR8R032NFB00**

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# QC Results per Analytical Batch

| | |
|---|---|
| Analytical Batch | ARS1-B11-00807 |
| SDG | ARS1-11-00256 |
| Analysis | Tritium (Aqueous) |
| Analysis Test Method | ARS-054/Liquid Scintillation Counter |
| Analysis Code | LSC-A-001 |
| Report Units | pCi/L |

## Acceptable QC Performance Ranges

| QC Sample Type | Performance Items and Ranges | | |
|---|---|---|---|
| Laboratory Control Sample | Recovery (%): | > 80 | < 120 |
| Matrix Spike | Recovery (%): | > 75 | < 125 |
| Duplicate | Replicate Error Ratio (RER): | | < 1 |
| | Duplicate Error Ratio (DER): | | < 3 |
| | Relative Percent Difference (RPD %): | | ≤ 25 |

## Laboratory Control Sample

Analysis Date: 03/15/11 10:04 — Analysis Technician: BSTEFFENS

| Analysis Batch Sample ID | QC Type | Analyte | Results | CSU (1s) | Expected Value | LCS Rec (%) | MDC |
|---|---|---|---|---|---|---|---|
| ARS1-B11-00807-01 | LCS | H-3 | 2670 | 160 | 2467 | 108 | 210 |

## Duplicate RER/DER/RPD

Analysis Date: 03/15/11 13:11 — Analysis Technician: BSTEFFENS

| Analyte | Result LCS | CSU LCS (1s) | Results LCSD | CSU LCSD (1s) | RER | DER | RPD |
|---|---|---|---|---|---|---|---|
| H-3 | 2670 | 165 | 2640 | 163 | 0.05 | 0.13 | 1.1 |

## Method Blank

Analysis Date: 03/15/11 16:18 — Analysis Technician: BSTEFFENS

| Analysis Batch Sample ID | QC Type | Analyte | Results | CSU (1s) | MDC | Qual |
|---|---|---|---|---|---|---|
| ARS1-B11-00807-03 | MBL | H-3 | 276 | 66 | 210 | |

Susan Leese

Susan Leese

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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Tritium by Low Level Liquid Scintillation Counting Samples

# LSC Instrument Data Transfer Report

\\PACKARD3170_NEW\Results\ARS\H-3 Normal Lvl\

| Batch Sample ID | Non-BKG Samples Transferred | Samples Eligible To Save | |
|---|---|---|---|
| ARS1-B11-00807 | 22 | 22 | LSC 2 |

| LIMS Batch Sample ID | LSC P# | LSC PID | LSC S# | LSC SMPL_ID | LSC Count Date | LSC CPMA | LSC ESIE | LSC EFF | LSC Count Dur | Analysis Batch | LIMS SDG | LIMS Run |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BKG | 44 | | 1 | BACKGROUND | 03/15/11 06:57 | 5.52 | 410.50 | 35.3500 | 180.00 | ARS1-B11-00807 | | |
| ARS1-B11-00807-01 | 44 | | 2 | B11-00807-01 | 03/15/11 10:04 | 16.11 | 414.33 | 35.5500 | 180.00 | ARS1-B11-00807 | | |
| ARS1-B11-00807-02 | 44 | | 3 | B11-00807-02 | 03/15/11 13:11 | 16.15 | 426.45 | 36.0800 | 180.00 | ARS1-B11-00807 | | |
| ARS1-B11-00807-03 | 44 | | 4 | B11-00807-03 | 03/15/11 16:18 | 6.63 | 414.68 | 35.5600 | 180.00 | ARS1-B11-00807 | | |
| ARS1-B11-00807-04 | 44 | | 5 | B11-00807-04 | 03/15/11 19:25 | 49.71 | 405.93 | 35.0200 | 180.00 | ARS1-B11-00807 | ARS1-11-00256 | 1 |
| ARS1-B11-00807-05 | 44 | | 6 | B11-00807-05 | 03/15/11 22:32 | 126.50 | 410.94 | 35.3800 | 180.00 | ARS1-B11-00807 | ARS1-11-00256 | 1 |
| ARS1-B11-00807-06 | 44 | | 7 | B11-00807-06 | 03/16/11 01:39 | 6.12 | 411.36 | 35.4100 | 180.00 | ARS1-B11-00807 | ARS1-11-00256 | 1 |
| ARS1-B11-00807-07 | 44 | | 8 | B11-00807-07 | 03/16/11 04:46 | 19.17 | 408.76 | 35.2300 | 180.00 | ARS1-B11-00807 | ARS1-11-00256 | 1 |
| ARS1-B11-00807-08 | 44 | | 9 | B11-00807-08 | 03/16/11 07:53 | 44.20 | 413.36 | 35.5000 | 180.00 | ARS1-B11-00807 | ARS1-11-00256 | 1 |
| ARS1-B11-00807-09 | 44 | | 10 | B11-00807-09 | 03/16/11 11:00 | 5.96 | 413.28 | 35.5000 | 180.00 | ARS1-B11-00807 | ARS1-11-00256 | 1 |
| ARS1-B11-00807-10 | 44 | | 11 | B11-00807-10 | 03/16/11 14:07 | 14.65 | 414.87 | 35.5700 | 180.00 | ARS1-B11-00807 | ARS1-11-00256 | 1 |
| ARS1-B11-00807-11 | 44 | | 12 | B11-00807-11 | 03/16/11 17:14 | 111.73 | 414.53 | 35.5600 | 180.00 | ARS1-B11-00807 | ARS1-11-00256 | 1 |
| ARS1-B11-00807-12 | 44 | | 13 | B11-00807-12 | 03/16/11 20:21 | 100.60 | 407.94 | 35.1700 | 180.00 | ARS1-B11-00807 | ARS1-11-00256 | 1 |
| ARS1-B11-00807-13 | 44 | | 14 | B11-00807-13 | 03/16/11 23:28 | 34.35 | 405.60 | 35.0000 | 180.00 | ARS1-B11-00807 | ARS1-11-00256 | 1 |
| ARS1-B11-00807-14 | 44 | | 15 | B11-00807-14 | 03/17/11 02:35 | 105.84 | 409.73 | 35.3000 | 180.00 | ARS1-B11-00807 | ARS1-11-00256 | 1 |
| ARS1-B11-00807-15 | 44 | | 16 | B11-00807-15 | 03/17/11 05:42 | 13.00 | 397.32 | 34.4000 | 180.00 | ARS1-B11-00807 | ARS1-11-00267 | 1 |
| ARS1-B11-00807-16 | 44 | | 17 | B11-00807-16 | 03/17/11 08:51 | 113.86 | 405.78 | 35.0100 | 180.00 | ARS1-B11-00807 | ARS1-11-00267 | 1 |
| ARS1-B11-00807-17 | 44 | | 18 | B11-00807-17 | 03/17/11 11:58 | 11.68 | 402.60 | 34.7800 | 180.00 | ARS1-B11-00807 | ARS1-11-00267 | 1 |
| ARS1-B11-00807-18 | 44 | | 19 | B11-00807-18 | 03/17/11 15:05 | 12.12 | 381.91 | 33.2900 | 180.00 | ARS1-B11-00807 | ARS1-11-00267 | 1 |
| ARS1-B11-00807-19 | 44 | | 20 | B11-00807-19 | 03/17/11 18:15 | 37.63 | 410.47 | 35.3500 | 180.00 | ARS1-B11-00807 | ARS1-11-00267 | 1 |
| ARS1-B11-00807-20 | 44 | | 21 | B11-00807-20 | 03/17/11 21:22 | 7.57 | 382.91 | 33.3600 | 180.00 | ARS1-B11-00807 | ARS1-11-00268 | 1 |
| ARS1-B11-00807-21 | 44 | | 22 | B11-00807-21 | 03/18/11 00:31 | 13.41 | 405.48 | 34.9900 | 180.00 | ARS1-B11-00807 | ARS1-11-00268 | 1 |
| ARS1-B11-00807-22 | 44 | | 23 | B11-00807-22 | 03/18/11 03:41 | 7.66 | 412.72 | 35.4800 | 180.00 | ARS1-B11-00807 | ARS1-11-00268 | 1 |

American Radiation Services
Baton Rouge Laboratory

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 16.110000 |
| Sample Count Mins | 160.000000 |
| BKG Count Rate | 5.520000 |
| BKG Count Mins | 160.000000 |
| Instrument Efficiency | 0.355500 |
| Sample Aliquot | 5.028000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 3/15/11 10:04 AM |
| Count Date (t2) | 3/15/11 10:04 AM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| 0 **Variables Intact Test** | **OK** |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| **ACT** | **2668.751347** | **2668.751347** | **OK** |
| **CU** | **87.358297** | **87.358297** | **OK** |
| **TPU** | **164.613911** | **164.613911** | **OK** |
| **MDA** | **209.125958** | **209.125958** | **OK** |
| **DL** | **102.665928** | **102.665928** | **OK** |
| **Net Count Rate** | **10.590000** | **10.590000** | **OK** |
| **D t 1 (t2 - t1)** | **0.000000** | **0.000000** | **OK** |
| **DF** | **1.000000** | **1.000000** | **OK** |
| **Sys Err** | **0.052280** | **0.052280** | **OK** |
| **K** | **0.003968** | **0.003968** | **OK** |
| **K MDA** | **0.714267** | **0.714267** | **OK** |

| Batch Identifiers and Other Related Information | |
|---|---|
| **Batch** | ARS1-B11-00807 |
| **Batch ID** | ARS1-B11-00807-01 |
| **Analysis Code** | |
| **SDG** | QC Sample |
| **Fraction** | N/A QC Sample |
| **Run Number** | |
| | |
| **Client** | QC Sample |
| **Client Profile** | |
| **Client ID** | N/A QC Sample |
| **Instr File Name** | 73 |
| **Instr Detector** | P-44-S-2 |
| **Instr keV** | |
| **Version/Date** | 1.0 -- 11/18/2005 |

**Reviewed by:** SCL **Date:** 3-18-11

# Calculation Verification

| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 16.150000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.520000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.360800 |
| Sample Aliquot | 5.028000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 3/15/11 1:11 PM |
| Count Date (t2) | 3/15/11 1:11 PM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.9600 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| 0 Variables Intact Test | OK |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| ACT | 2639.480709 | 2639.480709 | OK |
| CU | 168.863001 | 168.863001 | OK |
| TPU | 318.849379 | 318.849379 | OK |
| MDA | 208.053986 | 208.053986 | OK |
| DL | 101.157809 | 101.157809 | OK |
| Net Count Rate | 10.630000 | 10.630000 | OK |
| D t 1 (t2 - t1) | 0.000000 | 0.000000 | OK |
| DF | 1.000000 | 1.000000 | OK |
| Sys Err | 0.052280 | 0.052280 | OK |
| K | 0.004027 | 0.004027 | OK |
| K MDA | 0.724915 | 0.724915 | OK |

| Batch Identifiers and Other Related Information | |
|---|---|
| Batch | ARS1-B11-00807 |
| Batch ID | ARS1-B11-00807-02 |
| Analysis Code | |
| SDG | QC Sample |
| Fraction | N/A QC Sample |
| Run Number | |
| | |
| Client | QC Sample |
| Client Profile | |
| Client ID | N/A QC Sample |
| Instr File Name | 73 |
| Instr Detector | P-44-S-3 |
| Instr keV | |
| Version/Date | 1.0 -- 11/18/2005 |

Reviewed by: SOh

Date: 3-18-11

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 6.630000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.520000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.355600 |
| Sample Aliquot | 5.100000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 3/15/11 4:18 PM |
| Count Date (t2) | 3/15/11 4:18 PM |
| Activity Units = pCi --> UCF = | 2.2200 |
| CF | 1.9600 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| **Variables Intact Test** | **OK** |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| ACT | 275.700832 | 275.700832 | OK |
| CU | 126.480349 | 126.480349 | OK |
| TPU | 129.596967 | 129.596967 | OK |
| MDA | 206.115612 | 206.115612 | OK |
| DL | 101.188063 | 101.188063 | OK |
| Net Count Rate | 1.110000 | 1.110000 | OK |
| D t 1 (t2 - t1) | 0.000000 | 0.000000 | OK |
| DF | 1.000000 | 1.000000 | OK |
| Sys Err | 0.052280 | 0.052280 | OK |
| K | 0.004026 | 0.004026 | OK |
| K MDA | 0.724699 | 0.724699 | OK |

| Batch Identifiers and Other Related Information | |
|---|---|
| Batch | ARS1-B11-00807 |
| Batch ID | ARS1-B11-00807-03 |
| Analysis Code | |
| SDG | QC Sample |
| Fraction | N/A QC Sample |
| Run Number | |
| | |
| Client | QC Sample |
| Client Profile | |
| Client ID | N/A QC Sample |
| Instr File Name | 73 |
| Instr Detector | P-44-5-4 |
| Instr keV | |
| Version/Date | 1.0 -- 11/18/2005 |

Reviewed by: SCH Date: 3-18-11

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 49.710000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.520000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.350200 |
| Sample Aliquot | 5.050000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 2/8/11 12:00 PM |
| Count Date (t2) | 3/15/11 7:25 PM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| **Variables Intact Test** | **OK** |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| ACT | 11316.851816 | 11316.851812 | OK |
| CU | 141.857694 | 141.857694 | OK |
| TPU | 608.410757 | 608.410756 | OK |
| MDA | 212.518831 | 212.518831 | OK |
| DL | 104.331587 | 104.331587 | OK |
| Net Count Rate | 44.190000 | 44.190000 | OK |
| D t 1 (t2 - t1) | 35.309028 | 35.309028 | OK |
| DF | 0.994576 | 0.994576 | OK |
| Sys Err | 0.052280 | 0.052280 | OK |
| K | 0.003905 | 0.003905 | OK |
| K MDA | 0.702863 | 0.702863 | OK |

| Batch Identifiers and Other Related Information | |
|---|---|
| Batch | ARS1-B11-00807 |
| Batch ID | ARS1-B11-00807-04 |
| Analysis Code | LSC-A-001 |
| SDG | ARS1-11-00256 |
| Fraction | 001 |
| Run Number | 1 |
| | |
| Client | Los Alamos National Laboratory |
| Client Profile | Keith Greene |
| Client ID | MD21-11-4742 |
| Instr File Name | 73 |
| Instr Detector | P-44-5-5 |
| Instr keV | |
| Version/Date | 1.0 -- 11/18/2005 |

Reviewed by: SDL Date: 3-18-11

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 126.500000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.520000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.353800 |
| Sample Aliquot | 5.045000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 2/8/11 12:00 PM |
| Count Date (t2) | 3/15/11 10:32 PM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| **Variables Intact Test** | **OK** |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| ACT | 30698.165001 | 30698.164990 | OK |
| CU | 217.311369 | 217.311369 | OK |
| TPU | 1619.537173 | 1619.537172 | OK |
| MDA | 210.569093 | 210.569093 | OK |
| DL | 103.374405 | 103.374405 | OK |
| Net Count Rate | 120.980000 | 120.980000 | OK |
| D t 1 (t2 - t1) | 35.438889 | 35.438889 | OK |
| DF | 0.994556 | 0.994556 | OK |
| Sys Err | 0.052280 | 0.052280 | OK |
| K | 0.003941 | 0.003941 | OK |
| K MDA | 0.709371 | 0.709371 | OK |

| Batch Identifiers and Other Related Information | |
|---|---|
| Batch | ARS1-B11-00807 |
| Batch ID | ARS1-B11-00807-05 |
| Analysis Code | LSC-A-001 |
| SDG | ARS1-11-00256 |
| Fraction | 002 |
| Run Number | 1 |
| | |
| Client | Los Alamos National Laboratory |
| Client Profile | Keith Greene |
| Client ID | MD21-11-4740 |
| Instr File Name | 73 |
| Instr Detector | P-44-S-6 |
| Instr keV | |
| Version/Date | 1.0 -- 11/18/2005 |

Reviewed by: SCh Date: 3-18-11

American Radiation Services
Baton Rouge Laboratory

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 6.120000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.520000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.354100 |
| Sample Aliquot | 5.048000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 2/8/11 12:00 PM |
| Count Date (t2) | 3/16/11 1:39 AM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| 0 **Variables Intact Test** | **OK** |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| **ACT** | **152.031122** | **152.031122** | **OK** |
| **CU** | **64.434949** | **64.434949** | **OK** |
| **TPU** | **64.923306** | **64.923306** | **OK** |
| **MDA** | **210.269868** | **210.269867** | **OK** |
| **DL** | **103.227506** | **103.227506** | **OK** |
| **Net Count Rate** | **0.600000** | **0.600000** | **OK** |
| **D t 1 (t2 - t1)** | **35.568750** | **35.568750** | **OK** |
| **DF** | **0.994536** | **0.994536** | **OK** |
| **Sys Err** | **0.052280** | **0.052280** | **OK** |
| **K** | **0.003947** | **0.003947** | **OK** |
| **K MDA** | **0.710381** | **0.710381** | **OK** |

| Batch Identifiers and Other Related Information | |
|---|---|
| **Batch** | ARS1-B11-00807 |
| **Batch ID** | ARS1-B11-00807-06 |
| **Analysis Code** | LSC-A-001 |
| **SDG** | ARS1-11-00256 |
| **Fraction** | 003 |
| **Run Number** | 1 |
| | |
| **Client** | Los Alamos National Laboratory |
| **Client Profile** | Keith Greene |
| **Client ID** | MD21-11-4746 |
| **Instr File Name** | 73 |
| **Instr Detector** | P-44-S-7 |
| **Instr keV** | |
| **Version/Date** | 1.0 -- 11/18/2005 |

**Reviewed by:** SOK **Date:** 3-18-11

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 19.170000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.520000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.352300 |
| Sample Aliquot | 5.047000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 2/8/11 12:00 PM |
| Count Date (t2) | 3/16/11 4:46 AM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| 0 Variables Intact Test | OK |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| ACT | 3477.137890 | 3477.137889 | OK |
| CU | 94.343841 | 94.343841 | OK |
| TPU | 204.807485 | 204.807485 | OK |
| MDA | 211.390299 | 211.390299 | OK |
| DL | 103.777558 | 103.777558 | OK |
| Net Count Rate | 13.650000 | 13.650000 | OK |
| D t 1 (t2 - t1) | 35.698611 | 35.698611 | OK |
| DF | 0.994516 | 0.994516 | OK |
| Sys Err | 0.052280 | 0.052280 | OK |
| K | 0.003926 | 0.003926 | OK |
| K MDA | 0.706616 | 0.706616 | OK |

| Batch Identifiers and Other Related Information | |
|---|---|
| Batch | ARS1-B11-00807 |
| Batch ID | ARS1-B11-00807-07 |
| Analysis Code | LSC-A-001 |
| SDG | ARS1-11-00256 |
| Fraction | 004 |
| Run Number | 1 |
| | |
| Client | Los Alamos National Laboratory |
| Client Profile | Keith Greene |
| Client ID | MD21-11-4747 |
| Instr File Name | 73 |
| Instr Detector | P-44-S-8 |
| Instr keV | |
| Version/Date | 1.0 -- 11/18/2005 |

Reviewed by: SDh

Date: 3-18-11

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 44.200000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.520000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.355000 |
| Sample Aliquot | 5.036000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 2/8/11 12:00 PM |
| Count Date (t2) | 3/16/11 7:53 AM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| **Variables Intact Test** | **OK** |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| ACT | 9799.779152 | 9799.779148 | OK |
| CU | 139.155506 | 139.155506 | OK |
| TPU | 529.350639 | 529.350639 | OK |
| MDA | 210.244979 | 210.244979 | OK |
| DL | 103.215283 | 103.215283 | OK |
| Net Count Rate | 38.680000 | 38.680000 | OK |
| D t 1 (t2 - t1) | 35.828472 | 35.828472 | OK |
| DF | 0.994496 | 0.994496 | OK |
| Sys Err | 0.052280 | 0.052280 | OK |
| K | 0.003947 | 0.003947 | OK |
| K MDA | 0.710465 | 0.710465 | OK |

| Batch Identifiers and Other Related Information | |
|---|---|
| Batch | ARS1-B11-00807 |
| Batch ID | ARS1-B11-00807-08 |
| Analysis Code | LSC-A-001 |
| SDG | ARS1-11-00256 |
| Fraction | 005 |
| Run Number | 1 |
| | |
| Client | Los Alamos National Laboratory |
| Client Profile | Keith Greene |
| Client ID | MD21-11-4741 |
| Instr File Name | 73 |
| Instr Detector | P-44 S-9 |
| Instr keV | |
| Version/Date | 1.0 -- 11/18/2005 |

Reviewed by: SDL Date: 3-18-11

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 5.960000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.520000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.355000 |
| Sample Aliquot | 5.053000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 2/8/11 12:00 PM |
| Count Date (t2) | 3/16/11 11:00 AM |
| Activity Units = pCi ---; UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| 0 Variables Intact Test | OK |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| ACT | 111.103467 | 111.103467 | OK |
| CU | 63.769003 | 63.769003 | OK |
| TPU | 64.032991 | 64.032991 | OK |
| MDA | 209.541827 | 209.541827 | OK |
| DL | 102.870090 | 102.870090 | OK |
| Net Count Rate | 0.440000 | 0.440000 | OK |
| D t 1 (t2 - t1) | 35.958333 | 35.958333 | OK |
| DF | 0.994476 | 0.994476 | OK |
| Sys Err | 0.052280 | 0.052280 | OK |
| K | 0.003960 | 0.003960 | OK |
| K MDA | 0.712849 | 0.712849 | OK |

| Batch Identifiers and Other Related Information | |
|---|---|
| Batch | ARS1-B11-00807 |
| Batch ID | ARS1-B11-00807-09 |
| Analysis Code | LSC-A-001 |
| SDG | ARS1-11-00256 |
| Fraction | 006 |
| Run Number | 1 |
| | |
| Client | Los Alamos National Laboratory |
| Client Profile | Keith Greene |
| Client ID | MD21-11-4738 |
| Instr File Name | 73 |
| Instr Detector | P-44-S-10 |
| Instr keV | |
| Version/Date | 1.0 -- 11/18/2005 |

Reviewed by: SCR

Date: 3-18-11

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 14.650000 |
| Sample Count Mins | 160.000000 |
| BKG Count Rate | 5.520000 |
| BKG Count Mins | 160.000000 |
| Instrument Efficiency | 0.355700 |
| Sample Aliquot | 5.046000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 2/8/11 12:00 PM |
| Count Date (t2) | 3/16/11 2:07 PM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| 0 Variables Intact Test | OK |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| ACT | 2304.097957 | 2304.097956 | OK |
| CU | 84.478629 | 84.478629 | OK |
| TPU | 147.128074 | 147.128074 | OK |
| MDA | 209.423760 | 209.423760 | OK |
| DL | 102.812128 | 102.812128 | OK |
| Net Count Rate | 9.130000 | 9.130000 | OK |
| D t 1 (t2 - t1) | 36.088194 | 36.088194 | OK |
| DF | 0.994456 | 0.994456 | OK |
| Sys Err | 0.052280 | 0.052280 | OK |
| K | 0.003963 | 0.003963 | OK |
| K MDA | 0.713251 | 0.713251 | OK |

| Batch Identifiers and Other Related Information | |
|---|---|
| Batch | ARS1-B11-00807 |
| Batch ID | ARS1-B11-00807-10 |
| Analysis Code | LSC-A-001 |
| SDG | ARS1-11-00256 |
| Fraction | 007 |
| Run Number | 1 |
| | |
| Client | Los Alamos National Laboratory |
| Client Profile | Kelth Greene |
| Client ID | MD21-11-4748 |
| Instr File Name | 73 |
| Instr Detector | P-44-S-11 |
| Instr keV | |
| Version/Date | 1.0 -- 11/18/2005 |

Reviewed by: SDL

Date: 3-18-11

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 111.730000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.520000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.355600 |
| Sample Aliquot | 5.035000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 2/8/11 12:00 PM |
| Count Date (t2) | 3/16/11 5:14 PM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| 0 Variables Intact Test | OK |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| ACT | 26870.400637 | 26870.400627 | OK |
| CU | 204.187384 | 204.187384 | OK |
| TPU | 1419.538942 | 1419.538941 | OK |
| MDA | 209.944511 | 209.944511 | OK |
| DL | 103.067779 | 103.067779 | OK |
| Net Count Rate | 106.210000 | 106.210000 | OK |
| D t 1 (t2 - t1) | 36.218056 | 36.218056 | OK |
| DF | 0.994437 | 0.994437 | OK |
| Sys Err | 0.052280 | 0.052280 | OK |
| K | 0.003953 | 0.003953 | OK |
| K MDA | 0.711482 | 0.711482 | OK |

| Batch Identifiers and Other Related Information | |
|---|---|
| Batch | ARS1-B11-00807 |
| Batch ID | ARS1-B11-00807-11 |
| Analysis Code | LSC-A-001 |
| SDG | ARS1-11-00256 |
| Fraction | 008 |
| Run Number | 1 |
| | |
| Client | Los Alamos National Laboratory |
| Client Profile | Keith Greene |
| Client ID | MD21-11-4739 |
| Instr File Name | 73 |
| Instr Detector | P-44-S-12 |
| Instr keV | |
| Version/Date | 1.0 -- 11/18/2005 |

Reviewed by: SDh

Date: 3-18-11

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 100.600000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.520000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.351700 |
| Sample Aliquot | 5.019000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 2/8/11 12:00 PM |
| Count Date (t2) | 3/16/11 8:21 PM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| **Variables Intact Test** | **OK** |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| ACT | 24399.349992 | 24399.349983 | OK |
| CU | 197.038663 | 197.038663 | OK |
| TPU | 1290.719557 | 1290.719557 | OK |
| MDA | 212.953546 | 212.953546 | OK |
| DL | 104.545001 | 104.545001 | OK |
| Net Count Rate | 95.080000 | 95.080000 | OK |
| D t 1 (t2 - t1) | 36.347917 | 36.347917 | OK |
| DF | 0.994417 | 0.994417 | OK |
| Sys Err | 0.052280 | 0.052280 | OK |
| K | 0.003897 | 0.003897 | OK |
| K MDA | 0.701429 | 0.701429 | OK |

| Batch Identifiers and Other Related Information | |
|---|---|
| Batch | ARS1-B11-00807 |
| Batch ID | ARS1-B11-00807-12 |
| Analysis Code | LSC-A-001 |
| SDG | ARS1-11-00256 |
| Fraction | 009 |
| Run Number | 1 |
| | |
| Client | Los Alamos National Laboratory |
| Client Profile | Keith Greene |
| Client ID | MD21-11-4743 |
| Instr File Name | 73 |
| Instr Detector | P-44-S-13 |
| Instr keV | |
| Version/Date | 1.0 -- 11/18/2005 |

Reviewed by: SDK Date: 3-18-11

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 34.350000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.520000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.350000 |
| Sample Aliquot | 5.045000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 2/8/11 12:00 PM |
| Count Date (t2) | 3/16/11 11:28 PM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| 0 **Variables Intact Test** | **OK** |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| **ACT** | **7396.099799** | **7396.099796** | **OK** |
| **CU** | **120.738280** | **120.738280** | **OK** |
| **TPU** | **405.078185** | **405.078185** | **OK** |
| **MDA** | **212.889338** | **212.889338** | **OK** |
| **DL** | **104.513480** | **104.513479** | **OK** |
| **Net Count Rate** | **28.830000** | **28.830000** | **OK** |
| **D t 1 (t2 - t1)** | **36.477778** | **36.477778** | **OK** |
| **DF** | **0.994397** | **0.994397** | **OK** |
| **Sys Err** | **0.052280** | **0.052280** | **OK** |
| **K** | **0.003898** | **0.003898** | **OK** |
| **K MDA** | **0.701640** | **0.701640** | **OK** |

| Batch Identifiers and Other Related Information | |
|---|---|
| **Batch** | ARS1-B11-00807 |
| **Batch ID** | ARS1-B11-00807-13 |
| **Analysis Code** | LSC-A-001 |
| **SDG** | ARS1-11-00256 |
| **Fraction** | 010 |
| **Run Number** | 1 |
| | |
| **Client** | Los Alamos National Laboratory |
| **Client Profile** | Keith Greene |
| **Client ID** | MD21-11-4745 |
| **Instr File Name** | 73 |
| **Instr Detector** | P-44-S-14 |
| **Instr keV** | |
| **Version/Date** | 1.0 -- 11/18/2005 |

**Reviewed by:** SDH **Date:** 3-18-11

American Radiation Services
Baton Rouge Laboratory

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 105.840000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.520000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.353000 |
| Sample Aliquot | 5.058000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 2/8/11 12:00 PM |
| Count Date (t2) | 3/17/11 2:35 AM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| 0 **Variables Intact Test** | **OK** |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| **ACT** | **25452.474780** | **25452.474771** | **OK** |
| **CU** | **199.558785** | **199.558785** | **OK** |
| **TPU** | **1345.529019** | **1345.529019** | **OK** |
| **MDA** | **210.541777** | **210.541777** | **OK** |
| **DL** | **103.360994** | **103.360994** | **OK** |
| **Net Count Rate** | **100.320000** | **100.320000** | **OK** |
| **D t 1 (t2 - t1)** | **36.607639** | **36.607639** | **OK** |
| **DF** | **0.994377** | **0.994377** | **OK** |
| **Sys Err** | **0.052280** | **0.052280** | **OK** |
| **K** | **0.003941** | **0.003941** | **OK** |
| **K MDA** | **0.709463** | **0.709463** | **OK** |

**Batch Identifiers and Other Related Information**

| | |
|---|---|
| **Batch** | ARS1-B11-00807 |
| **Batch ID** | ARS1-B11-00807-14 |
| **Analysis Code** | LSC-A-001 |
| **SDG** | ARS1-11-00256 |
| **Fraction** | 011 |
| **Run Number** | 1 |
| | |
| **Client** | Los Alamos National Laboratory |
| **Client Profile** | Keith Greene |
| **Client ID** | MD21-11-4744 |
| **Instr File Name** | 73 |
| **Instr Detector** | P-44-S-15 |
| **Instr keV** | |
| **Version/Date** | 1.0 -- 11/18/2005 |

**Reviewed by:** SCL **Date:** 3-18-11

ARS INTERNATIONAL

2609 North River Road • Port Allen, Louisiana 70767

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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Tritium by Low Level Liquid Scintillation Counting

# Laboratory Records

# Analysis Batch Report





ARS INTERNATIONAL

**Analysis Batch ID** **ARS1-B11-00807**

| Method | ARS-054 | Analysis | LSC-A-001 | Matrix | SI |
|---|---|---|---|---|---|
| Description | Tritium (Aqueous) | | | | |

| ABatch Sample ID | Type | Blind Iso1 | Blind Iso2 | Blind Iso3 | SDG | FR | Run | Client ID | Isotope Group | Lab Deadline |
|---|---|---|---|---|---|---|---|---|---|---|
| ARS1-B11-00807-01 | LCS | B-11376 | | | | | | | | |
| ARS1-B11-00807-02 | LCSD | B-11377 | | | | | | | | |
| ARS1-B11-00807-03 | MBL | | | | | | | | | |
| ARS1-B11-00807-04 | TRG | | | | **ARS1-11-00256** | 001 | 1 | MD21-11-4742 | STD | 03/08/11 |
| ARS1-B11-00807-05 | TRG | | | | **ARS1-11-00256** | 002 | 1 | MD21-11-4740 | STD | 03/08/11 |
| ARS1-B11-00807-06 | TRG | | | | **ARS1-11-00256** | 003 | 1 | MD21-11-4746 | STD | 03/08/11 |
| ARS1-B11-00807-07 | TRG | | | | **ARS1-11-00256** | 004 | 1 | MD21-11-4747 | STD | 03/08/11 |
| ARS1-B11-00807-08 | TRG | | | | **ARS1-11-00256** | 005 | 1 | MD21-11-4741 | STD | 03/08/11 |
| ARS1-B11-00807-09 | TRG | | | | **ARS1-11-00256** | 006 | 1 | MD21-11-4738 | STD | 03/08/11 |
| ARS1-B11-00807-10 | TRG | | | | **ARS1-11-00256** | 007 | 1 | MD21-11-4748 | STD | 03/08/11 |
| ARS1-B11-00807-11 | TRG | | | | **ARS1-11-00256** | 008 | 1 | MD21-11-4739 | STD | 03/08/11 |
| ARS1-B11-00807-12 | TRG | | | | **ARS1-11-00256** | 009 | 1 | MD21-11-4743 | STD | 03/08/11 |
| ARS1-B11-00807-13 | TRG | | | | **ARS1-11-00256** | 010 | 1 | MD21-11-4745 | STD | 03/08/11 |
| ARS1-B11-00807-14 | TRG | | | | **ARS1-11-00256** | 011 | 1 | MD21-11-4744 | STD | 03/08/11 |
| ARS1-B11-00807-15 | TRG | | | | **ARS1-11-00267** | 001 | 1 | MD50-11-3974 | STD | 03/08/11 |
| ARS1-B11-00807-16 | TRG | | | | **ARS1-11-00267** | 002 | 1 | MD50-11-3983 | STD | 03/08/11 |
| ARS1-B11-00807-17 | TRG | | | | **ARS1-11-00267** | 003 | 1 | MD50-11-3975 | STD | 03/08/11 |
| ARS1-B11-00807-18 | TRG | | | | **ARS1-11-00267** | 004 | 1 | MD50-11-3973 | STD | 03/08/11 |
| ARS1-B11-00807-19 | TRG | | | | **ARS1-11-00267** | 005 | 1 | MD50-11-4164 | STD | 03/08/11 |
| ARS1-B11-00807-20 | TRG | | | | **ARS1-11-00268** | 001 | 1 | MD50-11-3979 | STD | 03/08/11 |
| ARS1-B11-00807-21 | TRG | | | | **ARS1-11-00268** | 002 | 1 | MD50-11-3978 | STD | 03/08/11 |
| ARS1-B11-00807-22 | TRG | | | | **ARS1-11-00268** | 003 | 1 | MD50-11-3977 | STD | 03/08/11 |

**81305** 11-00256-001-1 **WRAD**
**81306** 11-00256-002-1 **WRAD**
**81307** 11-00256-003-1 **WRAD**
**81308** 11-00256-004-1 **WRAD**
**81309** 11-00256-005-1 **WRAD**
**81310** 11-00256-006-1 **WRAD**
**81311** 11-00256-007-1 **WRAD**
**81312** 11-00256-008-1 **WRAD**
**81313** 11-00256-009-1 **WRAD**
**81314** 11-00256-010-1 **WRAD**
**81315** 11-00256-011-1 **WRAD**
**81316** 11-00267-001-1 **WRAD**
**81317** 11-00267-002-1 **WRAD**
**81318** 11-00267-003-1 **WRAD**
**81319** 11-00267-004-1 **WRAD**
**81320** 11-00267-005-1 **WRAD**
**81321** 11-00268-001-1 **WRAD**
**81322** 11-00268-002-1 **WRAD**
**81323** 11-00268-003-1 **WRAD**

# LCS Report
## Analytical Batch: ARS1-B11-00807





| BlindID | ABatch | ABatchSampleID | BlindGroup | StdID | Isotope | ExpectedAddition | ExpectedValue | EmptyWt | GrossWt | NetWt | UserID | ModDate | ExpectedValue_CT | MidPointCountDate | KnownValue |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B-11376 | ARS1-B11-00807 | ARS1-B11-00807-01 | B-H3 | S-0247 | H-3 | 5 | 2.475798889 | 0 | 1 | 1 | BSTEFFENS | 2/21/2011 | 2.467422931 | 3/15/2011 | 2.467422931 |
| B-11377 | ARS1-B11-00807 | ARS1-B11-00807-02 | B-H3 | S-0247 | H-3 | 5 | 2.475798889 | 0 | 1 | 1 | BSTEFFENS | 2/21/2011 | 2.467422931 | 3/15/2011 | 2.467422931 |

# ARS-054



| ID_31001_054 | ABatch | ABatchSampleID | ClientID | Aliquot1 | AliquotUnits1 | IC_ID1 | Aliquot2 | AliquotUnits2 | IC_ID2 | UserID | ModDate |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7871 | ARS1-B11-00807 | ARS1-B11-00807-01 | | | | | 5.028 | g | | BSTEFFENS | 03/01/2011 14:15 |
| 7872 | ARS1-B11-00807 | ARS1-B11-00807-02 | | | | | 5.028 | g | | BSTEFFENS | 03/01/2011 14:15 |
| 7873 | ARS1-B11-00807 | ARS1-B11-00807-03 | | | | | 5.1 | g | | BSTEFFENS | 03/01/2011 14:15 |
| 7874 | ARS1-B11-00807 | ARS1-B11-00807-04 | MD21-11-4742 | | | | 5.05 | g | 81305 | BSTEFFENS | 03/01/2011 14:15 |
| 7875 | ARS1-B11-00807 | ARS1-B11-00807-05 | MD21-11-4740 | | | | 5.045 | g | 81306 | BSTEFFENS | 03/01/2011 14:15 |
| 7876 | ARS1-B11-00807 | ARS1-B11-00807-06 | MD21-11-4746 | | | | 5.048 | g | 81307 | BSTEFFENS | 03/01/2011 14:15 |
| 7877 | ARS1-B11-00807 | ARS1-B11-00807-07 | MD21-11-4747 | | | | 5.047 | g | 81308 | BSTEFFENS | 03/01/2011 14:15 |
| 7878 | ARS1-B11-00807 | ARS1-B11-00807-08 | MD21-11-4741 | | | | 5.036 | g | 81309 | BSTEFFENS | 03/01/2011 14:15 |
| 7879 | ARS1-B11-00807 | ARS1-B11-00807-09 | MD21-11-4738 | | | | 5.053 | g | 81310 | BSTEFFENS | 03/01/2011 14:15 |
| 7880 | ARS1-B11-00807 | ARS1-B11-00807-10 | MD21-11-4748 | | | | 5.046 | g | 81311 | BSTEFFENS | 03/01/2011 14:15 |
| 7881 | ARS1-B11-00807 | ARS1-B11-00807-11 | MD21-11-4739 | | | | 5.035 | g | 81312 | BSTEFFENS | 03/01/2011 14:15 |
| 7882 | ARS1-B11-00807 | ARS1-B11-00807-12 | MD21-11-4743 | | | | 5.019 | g | 81313 | BSTEFFENS | 03/01/2011 14:15 |
| 7883 | ARS1-B11-00807 | ARS1-B11-00807-13 | MD21-11-4745 | | | | 5.045 | g | 81314 | BSTEFFENS | 03/01/2011 14:15 |
| 7884 | ARS1-B11-00807 | ARS1-B11-00807-14 | MD21-11-4744 | | | | 5.058 | g | 81315 | BSTEFFENS | 03/01/2011 14:15 |
| 7885 | ARS1-B11-00807 | ARS1-B11-00807-15 | MD50-11-3974 | | | | 5.073 | g | 81316 | BSTEFFENS | 03/01/2011 14:15 |
| 7886 | ARS1-B11-00807 | ARS1-B11-00807-16 | MD50-11-3983 | | | | 5.06 | g | 81317 | BSTEFFENS | 03/01/2011 14:15 |
| 7887 | ARS1-B11-00807 | ARS1-B11-00807-17 | MD50-11-3975 | | | | 5.061 | g | 81318 | BSTEFFENS | 03/01/2011 14:15 |
| 7888 | ARS1-B11-00807 | ARS1-B11-00807-18 | MD50-11-3973 | | | | 5.067 | g | 81319 | BSTEFFENS | 03/01/2011 14:15 |
| 7889 | ARS1-B11-00807 | ARS1-B11-00807-19 | MD50-11-4164 | | | | 5.024 | g | 81320 | BSTEFFENS | 03/01/2011 14:15 |
| 7890 | ARS1-B11-00807 | ARS1-B11-00807-20 | MD50-11-3979 | | | | 5.052 | g | 81321 | BSTEFFENS | 03/01/2011 14:15 |
| 7891 | ARS1-B11-00807 | ARS1-B11-00807-21 | MD50-11-3978 | | | | 5.06 | g | 81322 | BSTEFFENS | 03/01/2011 14:15 |
| 7892 | ARS1-B11-00807 | ARS1-B11-00807-22 | MD50-11-3977 | | | | 5.071 | g | 81323 | BSTEFFENS | 03/01/2011 14:15 |

# Batch Result Verification Report





| ABatchSampleID | SDG | Fraction | ClientID | Run | Isotope | ACT | TPU | TPU1s | TPU2s | MDA | DL | CU | CU1s | CU2s | ActivityReportUnits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARS1-B11-00807-01 | | | | 1 | H-3 | 2668.751347 | 164.6139114 | 164.6139114 | 322.6432664 | 209.1259578 | 102.6659282 | 87.3582969 | 87.3582969 | 171.2222619 | pCi |
| ARS1-B11-00807-02 | | | | 1 | H-3 | 2639.480709 | 318.8493788 | 162.6782545 | 318.8493788 | 206.0539856 | 101.157809 | 168.8630006 | 86.15459213 | 168.8630006 | pCi |
| ARS1-B11-00807-03 | | | | 1 | H-3 | 275.7008315 | 129.5969675 | 66.12090177 | 129.5969675 | 206.1156123 | 101.1880633 | 126.4803489 | 64.53079025 | 126.4803489 | pCi |
| ARS1-B11-00807-04 | ARS1-11-00256 | 001 | MD21-11-4742 | 1 | H-3 | 11316.85181 | 608.4107563 | 608.4107563 | 1192.485082 | 212.5188314 | 104.3315871 | 141.8576943 | 141.8576943 | 278.0410807 | pCi |
| ARS1-B11-00807-05 | ARS1-11-00256 | 002 | MD21-11-4740 | 1 | H-3 | 30698.16499 | 1619.537172 | 1619.537172 | 3174.292857 | 210.5690934 | 103.3744048 | 217.3113688 | 217.3113688 | 425.9302829 | pCi |
| ARS1-B11-00807-06 | ARS1-11-00256 | 003 | MD21-11-4746 | 1 | H-3 | 152.0311217 | 64.92330559 | 64.92330559 | 127.2496789 | 210.2698675 | 103.2275062 | 64.43494869 | 64.43494869 | 126.2924994 | pCi |
| ARS1-B11-00807-07 | ARS1-11-00256 | 004 | MD21-11-4747 | 1 | H-3 | 3477.137889 | 204.8074849 | 204.8074849 | 401.4226705 | 211.3902993 | 103.7775583 | 94.34384118 | 94.34384118 | 184.9139287 | pCi |
| ARS1-B11-00807-08 | ARS1-11-00256 | 005 | MD21-11-4741 | 1 | H-3 | 9799.779148 | 529.3506391 | 529.3506391 | 1037.527253 | 210.2449701 | 103.2152834 | 133.1555063 | 133.1555063 | 260.9847924 | pCi |
| ARS1-B11-00807-09 | ARS1-11-00256 | 006 | MD21-11-4738 | 1 | H-3 | 111.1034667 | 64.03299065 | 64.03299065 | 125.5046617 | 209.5418265 | 102.8700901 | 63.76900272 | 63.76900272 | 124.9872453 | pCi |
| ARS1-B11-00807-10 | ARS1-11-00256 | 007 | MD21-11-4748 | 1 | H-3 | 2304.097956 | 147.1280735 | 147.1280735 | 288.3710241 | 209.42376 | 102.8121278 | 84.47862911 | 84.47862911 | 165.5781131 | pCi |
| ARS1-B11-00807-11 | ARS1-11-00256 | 008 | MD21-11-4739 | 1 | H-3 | 26870.40063 | 1419.538941 | 1419.538941 | 2782.296325 | 209.944511 | 103.0677794 | 204.1873844 | 204.1873844 | 400.2072734 | pCi |
| ARS1-B11-00807-12 | ARS1-11-00256 | 009 | MD21-11-4743 | 1 | H-3 | 24399.34998 | 1290.719557 | 1290.719557 | 2529.810331 | 212.9535455 | 104.5450007 | 197.0386628 | 197.0386628 | 386.1957792 | pCi |
| ARS1-B11-00807-13 | ARS1-11-00256 | 010 | MD21-11-4745 | 1 | H-3 | 7396.099796 | 405.0781851 | 405.0781851 | 793.9532429 | 212.8893381 | 104.5134795 | 120.7382802 | 120.7382802 | 236.6470292 | pCi |
| ARS1-B11-00807-14 | ARS1-11-00256 | 011 | MD21-11-4744 | 1 | H-3 | 25452.47477 | 1345.529019 | 1345.529019 | 2637.236877 | 210.5417768 | 103.3609943 | 199.5587848 | 199.5587848 | 391.1352183 | pCi |
| ARS1-B11-00807-15 | ARS1-11-00267 | 001 | MD50-11-3974 | 1 | H-3 | 1942.003023 | 131.3130009 | 131.3130009 | 257.3734818 | 215.4488078 | 105.7699965 | 83.27843254 | 83.27843254 | 163.2257278 | pCi |
| ARS1-B11-00807-16 | ARS1-11-00267 | 002 | MD50-11-3983 | 1 | H-3 | 27709.36919 | 1463.535642 | 1463.535642 | 2868.529858 | 212.2431094 | 104.1962273 | 208.2894833 | 208.2894833 | 408.2473872 | pCi |
| ARS1-B11-00807-17 | ARS1-11-00267 | 003 | MD50-11-3975 | 1 | H-3 | 1585.637544 | 114.9056052 | 114.9056052 | 225.2149862 | 213.6087308 | 104.86665 | 79.57033361 | 79.57033361 | 155.9578539 | pCi |
| ARS1-B11-00807-18 | ARS1-11-00267 | 004 | MD50-11-3973 | 1 | H-3 | 1772.870635 | 125.146828 | 125.146828 | 245.2877829 | 222.9096668 | 109.4327461 | 84.09034783 | 84.09034783 | 164.8170818 | pCi |
| ARS1-B11-00807-19 | ARS1-11-00267 | 005 | MD50-11-4164 | 1 | H-3 | 8192.337726 | 446.1381524 | 446.1381524 | 874.4307787 | 211.7207061 | 103.9397645 | 124.9170414 | 124.9170414 | 244.8374011 | pCi |
| ARS1-B11-00807-20 | ARS1-11-00268 | 001 | MD50-11-3979 | 1 | H-3 | 551.0777254 | 78.00754538 | 78.00754538 | 152.8947889 | 223.0769961 | 109.5148928 | 72.4924148 | 72.4924148 | 142.085133 | pCi |
| ARS1-B11-00807-21 | ARS1-11-00268 | 002 | MD50-11-3978 | 1 | H-3 | 2019.015954 | 134.2689067 | 134.2689067 | 263.1670571 | 212.3530676 | 104.2502089 | 82.98542106 | 82.98542106 | 162.6514253 | pCi |
| ARS1-B11-00807-22 | ARS1-11-00268 | 003 | MD50-11-3977 | 1 | H-3 | 538.8929957 | 73.73574629 | 73.73574629 | 144.5220627 | 208.9702956 | 102.5895092 | 68.14126914 | 68.14126914 | 133.5568875 | pCi |

# Batch Result Verification Report





| ABatchSampleID | SDG | Fraction | AliquotReportUnits | ChemRecovery | TracerRecovery | SampleCounts | SampleCountMins | BKG_Counts | BKG_CountMins | EFF | ALIQ | SampleCollDate | MidPointCountDate | BP_DL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARS1-B11-00807-01 | | | L | | | 0.0895 | 180 | 0.030666667 | 180 | 0.3555 | 5.028 | 3/18/2011 | 3/15/2011 | |
| ARS1-B11-00807-02 | | | L | | | 0.089722222 | 180 | 0.030666667 | 180 | 0.3608 | 5.028 | 3/18/2011 | 3/15/2011 | |
| ARS1-B11-00807-03 | | | L | | | 0.036833333 | 180 | 0.030666667 | 180 | 0.3556 | 5.1 | 3/18/2011 | 3/15/2011 | |
| ARS1-B11-00807-04 | ARS1-11-00256 | 001 | L | | | 0.276166667 | 180 | 0.030666667 | 180 | 0.3502 | 5.05 | 2/8/2011 | 3/15/2011 | |
| ARS1-B11-00807-05 | ARS1-11-00256 | 002 | L | | | 0.702777778 | 180 | 0.030666667 | 180 | 0.3538 | 5.045 | 2/8/2011 | 3/15/2011 | |
| ARS1-B11-00807-06 | ARS1-11-00256 | 003 | L | | | 0.034 | 180 | 0.030666667 | 180 | 0.3541 | 5.048 | 2/8/2011 | 3/16/2011 | |
| ARS1-B11-00807-07 | ARS1-11-00256 | 004 | L | | | 0.1065 | 180 | 0.030666667 | 180 | 0.3523 | 5.047 | 2/8/2011 | 3/16/2011 | |
| ARS1-B11-00807-08 | ARS1-11-00256 | 005 | L | | | 0.245555556 | 180 | 0.030666667 | 180 | 0.355 | 5.036 | 2/8/2011 | 3/16/2011 | |
| ARS1-B11-00807-09 | ARS1-11-00256 | 006 | L | | | 0.033111111 | 180 | 0.030666667 | 180 | 0.355 | 5.053 | 2/8/2011 | 3/16/2011 | |
| ARS1-B11-00807-10 | ARS1-11-00256 | 007 | L | | | 0.081388889 | 180 | 0.030666667 | 180 | 0.3557 | 5.046 | 2/8/2011 | 3/16/2011 | |
| ARS1-B11-00807-11 | ARS1-11-00256 | 008 | L | | | 0.620722222 | 180 | 0.030666667 | 180 | 0.3556 | 5.035 | 2/8/2011 | 3/16/2011 | |
| ARS1-B11-00807-12 | ARS1-11-00256 | 009 | L | | | 0.558888889 | 180 | 0.030666667 | 180 | 0.3517 | 5.019 | 2/8/2011 | 3/16/2011 | |
| ARS1-B11-00807-13 | ARS1-11-00256 | 010 | L | | | 0.190833333 | 180 | 0.030666667 | 180 | 0.35 | 5.045 | 2/8/2011 | 3/16/2011 | |
| ARS1-B11-00807-14 | ARS1-11-00256 | 011 | L | | | 0.588 | 180 | 0.030666667 | 180 | 0.353 | 5.058 | 2/8/2011 | 3/17/2011 | |
| ARS1-B11-00807-15 | ARS1-11-00267 | 001 | L | | | 0.072222222 | 180 | 0.030666667 | 180 | 0.344 | 5.073 | 2/7/2011 | 3/17/2011 | |
| ARS1-B11-00807-16 | ARS1-11-00267 | 002 | L | | | 0.632555556 | 180 | 0.030666667 | 180 | 0.3501 | 5.06 | 2/7/2011 | 3/17/2011 | |
| ARS1-B11-00807-17 | ARS1-11-00267 | 003 | L | | | 0.064888889 | 180 | 0.030666667 | 180 | 0.3478 | 5.061 | 2/7/2011 | 3/17/2011 | |
| ARS1-B11-00807-18 | ARS1-11-00267 | 004 | L | | | 0.067333333 | 180 | 0.030666667 | 180 | 0.3329 | 5.067 | 2/7/2011 | 3/17/2011 | |
| ARS1-B11-00807-19 | ARS1-11-00267 | 005 | L | | | 0.209055556 | 180 | 0.030666667 | 180 | 0.3535 | 5.024 | 2/7/2011 | 3/17/2011 | |
| ARS1-B11-00807-20 | ARS1-11-00268 | 001 | L | | | 0.042055556 | 180 | 0.030666667 | 180 | 0.3336 | 5.052 | 2/8/2011 | 3/17/2011 | |
| ARS1-B11-00807-21 | ARS1-11-00268 | 002 | L | | | 0.0745 | 180 | 0.030666667 | 180 | 0.3499 | 5.06 | 2/8/2011 | 3/18/2011 | |
| ARS1-B11-00807-22 | ARS1-11-00268 | 003 | L | | | 0.042555556 | 180 | 0.030666667 | 180 | 0.3548 | 5.071 | 2/8/2011 | 3/18/2011 | |

# Batch Result Verification Report





| ABatchSampleID | SDG | Fraction | BP_MDA | Sb_Val | UCF | CF | GrossCountRate | BKGCountRate | NetCountRate | PlatingRecovery | InstFileName | DetectorID | InstrumentkeV | NuclideAbd | TracerMeasACT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARS1-B11-00807-01 | | | | | 2.22 | 1 | 16.11 | 5.52 | 10.59 | | 73 | P-44-S-2 | | | |
| ARS1-B11-00807-02 | | | | | 2.22 | 1.96 | 16.15 | 5.52 | 10.63 | | 73 | P-44-S-3 | | | |
| ARS1-B11-00807-03 | | | | | 2.22 | 1.96 | 6.63 | 5.52 | 1.11 | | 73 | P-44-S-4 | | | |
| ARS1-B11-00807-04 | ARS1-11-00256 | 001 | | | 2.22 | 1 | 49.71 | 5.52 | 44.19 | | 73 | P-44-S-5 | | | |
| ARS1-B11-00807-05 | ARS1-11-00256 | 002 | | | 2.22 | 1 | 126.5 | 5.52 | 120.98 | | 73 | P-44-S-6 | | | |
| ARS1-B11-00807-06 | ARS1-11-00256 | 003 | | | 2.22 | 1 | 6.12 | 5.52 | 0.6 | | 73 | P-44-S-7 | | | |
| ARS1-B11-00807-07 | ARS1-11-00256 | 004 | | | 2.22 | 1 | 19.17 | 5.52 | 13.65 | | 73 | P-44-S-8 | | | |
| ARS1-B11-00807-08 | ARS1-11-00256 | 005 | | | 2.22 | 1 | 44.2 | 5.52 | 38.68 | | 73 | P-44-S-9 | | | |
| ARS1-B11-00807-09 | ARS1-11-00256 | 006 | | | 2.22 | 1 | 5.96 | 5.52 | 0.44 | | 73 | P-44-S-10 | | | |
| ARS1-B11-00807-10 | ARS1-11-00256 | 007 | | | 2.22 | 1 | 14.65 | 5.52 | 9.13 | | 73 | P-44-S-11 | | | |
| ARS1-B11-00807-11 | ARS1-11-00256 | 008 | | | 2.22 | 1 | 111.73 | 5.52 | 106.21 | | 73 | P-44-S-12 | | | |
| ARS1-B11-00807-12 | ARS1-11-00256 | 009 | | | 2.22 | 1 | 100.6 | 5.52 | 95.08 | | 73 | P-44-S-13 | | | |
| ARS1-B11-00807-13 | ARS1-11-00256 | 010 | | | 2.22 | 1 | 34.35 | 5.52 | 28.83 | | 73 | P-44-S-14 | | | |
| ARS1-B11-00807-14 | ARS1-11-00256 | 011 | | | 2.22 | 1 | 105.84 | 5.52 | 100.32 | | 73 | P-44-S-15 | | | |
| ARS1-B11-00807-15 | ARS1-11-00267 | 001 | | | 2.22 | 1 | 13 | 5.52 | 7.48 | | 73 | P-44-S-16 | | | |
| ARS1-B11-00807-16 | ARS1-11-00267 | 002 | | | 2.22 | 1 | 113.86 | 5.52 | 108.34 | | 73 | P-44-S-17 | | | |
| ARS1-B11-00807-17 | ARS1-11-00267 | 003 | | | 2.22 | 1 | 11.68 | 5.52 | 6.16 | | 73 | P-44-S-18 | | | |
| ARS1-B11-00807-18 | ARS1-11-00267 | 004 | | | 2.22 | 1 | 12.12 | 5.52 | 6.6 | | 73 | P-44-S-19 | | | |
| ARS1-B11-00807-19 | ARS1-11-00267 | 005 | | | 2.22 | 1 | 37.63 | 5.52 | 32.11 | | 73 | P-44-S-20 | | | |
| ARS1-B11-00807-20 | ARS1-11-00268 | 001 | | | 2.22 | 1 | 7.57 | 5.52 | 2.05 | | 73 | P-44-S-21 | | | |
| ARS1-B11-00807-21 | ARS1-11-00268 | 002 | | | 2.22 | 1 | 13.41 | 5.52 | 7.89 | | 73 | P-44-S-22 | | | |
| ARS1-B11-00807-22 | ARS1-11-00268 | 003 | | | 2.22 | 1 | 7.66 | 5.52 | 2.14 | | 73 | P-44-S-23 | | | |

# Batch Result Verification Report





| ABatchSampleID | SDG | Fraction | TracerKnownACT | TracerIsotope | TracerRefDate | TracerRefACT | TracerKnown | Halflife1 | Halflife2 | Halflife3 | TPUF_1 | TPUF_2 | TPUF_3 | TPUF_4 | TPUF_5 | TPUF_6 | DeltaT1 | DeltaT2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARS1-B11-00807-01 | | | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 0 | |
| ARS1-B11-00807-02 | | | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 0 | |
| ARS1-B11-00807-03 | | | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 0 | |
| ARS1-B11-00807-04 | ARS1-11-00256 | 001 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 35.30902778 | |
| ARS1-B11-00807-05 | ARS1-11-00256 | 002 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 35.43888889 | |
| ARS1-B11-00807-06 | ARS1-11-00256 | 003 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 35.56875 | |
| ARS1-B11-00807-07 | ARS1-11-00256 | 004 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 35.69861111 | |
| ARS1-B11-00807-08 | ARS1-11-00256 | 005 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 35.82847222 | |
| ARS1-B11-00807-09 | ARS1-11-00256 | 006 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 35.95833333 | |
| ARS1-B11-00807-10 | ARS1-11-00256 | 007 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 36.08819444 | |
| ARS1-B11-00807-11 | ARS1-11-00256 | 008 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 36.21805556 | |
| ARS1-B11-00807-12 | ARS1-11-00256 | 009 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 36.34791667 | |
| ARS1-B11-00807-13 | ARS1-11-00256 | 010 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 36.47777778 | |
| ARS1-B11-00807-14 | ARS1-11-00256 | 011 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 36.60763889 | |
| ARS1-B11-00807-15 | ARS1-11-00267 | 001 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 37.7375 | |
| ARS1-B11-00807-16 | ARS1-11-00267 | 002 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 37.86944444 | |
| ARS1-B11-00807-17 | ARS1-11-00267 | 003 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 37.99930556 | |
| ARS1-B11-00807-18 | ARS1-11-00267 | 004 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 38.12916667 | |
| ARS1-B11-00807-19 | ARS1-11-00267 | 005 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 38.26041667 | |
| ARS1-B11-00807-20 | ARS1-11-00268 | 001 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 37.39027778 | |
| ARS1-B11-00807-21 | ARS1-11-00268 | 002 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 37.52222222 | |
| ARS1-B11-00807-22 | ARS1-11-00268 | 003 | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 37.65347222 | |

# Batch Result Verification Report





| ABatchSampleID | SDG | Fraction | DeltaT3 | DeltaT4 | DeltaT5 | DeltaT6 | DF1 | DF2 | DF3 | IF1 | IF2 | SysErr | K_Val | K_MDA | AnalysisCode | UserID | ModDate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARS1-B11-00807-01 | | | | | | | 1 | | | | | 0.052279718 | 0.003968148 | 0.714266618 | | BSTEFFENS | 3/18/2011 |
| ARS1-B11-00807-02 | | | | | | | 1 | | | | | 0.052279718 | 0.004027307 | 0.724915319 | | BSTEFFENS | 3/18/2011 |
| ARS1-B11-00807-03 | | | | | | | 1 | | | | | 0.052279718 | 0.004026103 | 0.724698576 | | BSTEFFENS | 3/18/2011 |
| ARS1-B11-00807-04 | ARS1-11-00256 | 001 | | | | | 0.994575778 | | | | | 0.052279718 | 0.003904796 | 0.702863317 | LSC-A-001 | BSTEFFENS | 3/18/2011 |
| ARS1-B11-00807-05 | ARS1-11-00256 | 002 | | | | | 0.994555883 | | | | | 0.052279718 | 0.003940952 | 0.709371391 | LSC-A-001 | BSTEFFENS | 3/18/2011 |
| ARS1-B11-00807-06 | ARS1-11-00256 | 003 | | | | | 0.994535988 | | | | | 0.052279718 | 0.00394656 | 0.710380867 | LSC-A-001 | BSTEFFENS | 3/18/2011 |
| ARS1-B11-00807-07 | ARS1-11-00256 | 004 | | | | | 0.994516094 | | | | | 0.052279718 | 0.003925642 | 0.706615636 | LSC-A-001 | BSTEFFENS | 3/18/2011 |
| ARS1-B11-00807-08 | ARS1-11-00256 | 005 | | | | | 0.9944962 | | | | | 0.052279718 | 0.003947028 | 0.710464991 | LSC-A-001 | BSTEFFENS | 3/18/2011 |
| ARS1-B11-00807-09 | ARS1-11-00256 | 006 | | | | | 0.994476307 | | | | | 0.052279718 | 0.003960272 | 0.712849044 | LSC-A-001 | BSTEFFENS | 3/18/2011 |
| ARS1-B11-00807-10 | ARS1-11-00256 | 007 | | | | | 0.994456414 | | | | | 0.052279718 | 0.003962505 | 0.713250926 | LSC-A-001 | BSTEFFENS | 3/18/2011 |
| ARS1-B11-00807-11 | ARS1-11-00256 | 008 | | | | | 0.994436521 | | | | | 0.052279718 | 0.003952676 | 0.711481763 | LSC-A-001 | BSTEFFENS | 3/18/2011 |
| ARS1-B11-00807-12 | ARS1-11-00256 | 009 | | | | | 0.994416629 | | | | | 0.052279718 | 0.003896825 | 0.701428522 | LSC-A-001 | BSTEFFENS | 3/18/2011 |
| ARS1-B11-00807-13 | ARS1-11-00256 | 010 | | | | | 0.994396737 | | | | | 0.052279718 | 0.003898 | 0.701640073 | LSC-A-001 | BSTEFFENS | 3/18/2011 |
| ARS1-B11-00807-14 | ARS1-11-00256 | 011 | | | | | 0.994376845 | | | | | 0.052279718 | 0.003941463 | 0.709463428 | LSC-A-001 | BSTEFFENS | 3/18/2011 |
| ARS1-B11-00807-15 | ARS1-11-00267 | 001 | | | | | 0.994203796 | | | | | 0.052279718 | 0.003851693 | 0.693304791 | LSC-A-001 | BSTEFFENS | 3/18/2011 |
| ARS1-B11-00807-16 | ARS1-11-00267 | 002 | | | | | 0.994183589 | | | | | 0.052279718 | 0.003909869 | 0.703776397 | LSC-A-001 | BSTEFFENS | 3/18/2011 |
| ARS1-B11-00807-17 | ARS1-11-00267 | 003 | | | | | 0.994163702 | | | | | 0.052279718 | 0.003884873 | 0.699277085 | LSC-A-001 | BSTEFFENS | 3/18/2011 |
| ARS1-B11-00807-18 | ARS1-11-00267 | 004 | | | | | 0.994143815 | | | | | 0.052279718 | 0.003722776 | 0.670099655 | LSC-A-001 | BSTEFFENS | 3/18/2011 |
| ARS1-B11-00807-19 | ARS1-11-00267 | 005 | | | | | 0.994123716 | | | | | 0.052279718 | 0.003919516 | 0.705512906 | LSC-A-001 | BSTEFFENS | 3/18/2011 |
| ARS1-B11-00807-20 | ARS1-11-00268 | 001 | | | | | 0.994256973 | | | | | 0.052279718 | 0.003719983 | 0.669597015 | LSC-A-001 | BSTEFFENS | 3/18/2011 |
| ARS1-B11-00807-21 | ARS1-11-00268 | 002 | | | | | 0.994236766 | | | | | 0.052279718 | 0.003907844 | 0.703411975 | LSC-A-001 | BSTEFFENS | 3/18/2011 |
| ARS1-B11-00807-22 | ARS1-11-00268 | 003 | | | | | 0.994216665 | | | | | 0.052279718 | 0.003971104 | 0.714798676 | LSC-A-001 | BSTEFFENS | 3/18/2011 |

Assay Definition-

Assay Description:
H3 Normal Lvl

Assay Type: DPM (Single)
Report Name: Report1
Output Data Path: C:\Packard\Tricarb\Results\ARS\H-3 Normal Lvl\20110315_0652
Raw Results Path: C:\Packard\Tricarb\Results\ARS\H-3 Normal Lvl\20110315_0652\20110315_0652.results
RTF File Name: C:\Packard\Tricarb\Results\ARS\H-3 Normal Lvl\20110315_0652\H3 Results.rtf
Comma-Delimited File Name: C:\Packard\Tricarb\Results\ARS\H-3 Normal Lvl\20110315_0652\H3 Results.csv
Assay File Name: C:\Packard\TriCarb\Assays\H-3 Normal Lvl.lsa

Count Conditions-

Nuclide: H-3 Normal
Quench Indicator: tSIE/AEC
External Std Terminator (sec): 0.5 2s%
Pre-Count Delay (min): 0.00
Quench Set:
Low Energy: UG STD H-3
Count Time (min): 180.00
Count Mode: Normal
Assay Count Cycles: 1 Repeat Sample Count: 1
#Vials/Sample: 1 Calculate % Reference: Off

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

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

Count Corrections-

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

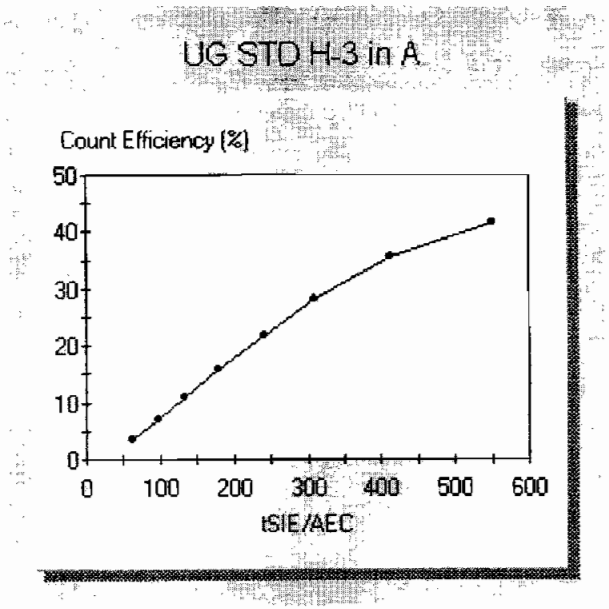
Half Life-

Half Life Correction: Off

| Regions | Half Life | Units | Reference Date | Reference Time |
|---|---|---|---|---|

A
B
C

Cycle 1 Results
Quench Curve Block Data




Date Acquired: 06/30/2010
Date Modified:
UG STD H-3 in A

| tSIE/AEC | Count Efficiency (%) |
|---|---|
| 551.03 | 41.58 |
| 411.38 | 35.42 |
| 310.08 | 28.09 |
| 241.32 | 21.90 |
| 178.11 | 15.75 |
| 132.72 | 11.03 |
| 96.52 | 6.92 |
| 63.58 | 3.36 |

| P# | S# | SMPL_ID | CPMA | DPM1 | tSIE | Eff Nucl In A | Count Time | DATE | TIME | MESSAGES |
|---|---|---|---|---|---|---|---|---|---|---|
| 44 | 1 | BACKGROUND | 5.52 | 15.63 | 410.50 | 35.35 | 180.00 | 3/15/2011 | 6:57:09 AM | |
| 44 | 2 | B11-00807-01 | 16.11 | 45.33 | 414.33 | 35.55 | 180.00 | 3/15/2011 | 10:04:03 AM | |
| 44 | 3 | B11-00807-02 | 16.15 | 44.77 | 426.45 | 36.08 | 180.00 | 3/15/2011 | 1:11:06 PM | |
| 44 | 4 | B11-00807-03 | 6.63 | 18.64 | 414.68 | 35.56 | 180.00 | 3/15/2011 | 4:18:12 PM | |
| 44 | 5 | B11-00807-04 | 49.71 | 141.93 | 405.93 | 35.02 | 180.00 | 3/15/2011 | 7:25:20 PM | |
| 44 | 6 | B11-00807-05 | 126.50 | 357.52 | 410.94 | 35.38 | 180.00 | 3/15/2011 | 10:32:21 PM | |
| 44 | 7 | B11-00807-06 | 6.12 | 17.29 | 411.36 | 35.41 | 180.00 | 3/16/2011 | 1:39:25 AM | |
| 44 | 8 | B11-00807-07 | 19.17 | 54.43 | 408.76 | 35.23 | 180.00 | 3/16/2011 | 4:46:20 AM | |
| 44 | 9 | B11-00807-08 | 44.20 | 124.50 | 413.36 | 35.50 | 180.00 | 3/16/2011 | 7:53:17 AM | |
| 44 | 10 | B11-00807-09 | 5.96 | 16.80 | 413.28 | 35.50 | 180.00 | 3/16/2011 | 11:00:18 AM | |
| 44 | 11 | B11-00807-10 | 14.65 | 41.19 | 414.87 | 35.57 | 180.00 | 3/16/2011 | 2:07:11 PM | |
| 44 | 12 | B11-00807-11 | 111.73 | 314.25 | 414.53 | 35.56 | 180.00 | 3/16/2011 | 5:14:06 PM | |
| 44 | 13 | B11-00807-12 | 100.60 | 286.06 | 407.94 | 35.17 | 180.00 | 3/16/2011 | 8:21:11 PM | |
| 44 | 14 | B11-00807-13 | 34.35 | 98.14 | 405.60 | 35.00 | 180.00 | 3/16/2011 | 11:28:12 PM | |
| 44 | 15 | B11-00807-14 | 105.84 | 299.85 | 409.73 | 35.30 | 180.00 | 3/17/2011 | 2:35:13 AM | |
| 44 | 16 | B11-00807-15 | 13.00 | 37.80 | 397.32 | 34.40 | 180.00 | 3/17/2011 | 5:42:17 AM | |
| 44 | 17 | B11-00807-16 | 113.86 | 325.22 | 405.78 | 35.01 | 180.00 | 3/17/2011 | 8:51:44 AM | |
| 44 | 18 | B11-00807-17 | 11.68 | 33.57 | 402.60 | 34.78 | 180.00 | 3/17/2011 | 11:58:45 AM | |
| 44 | 19 | B11-00807-18 | 12.12 | 36.40 | 381.91 | 33.29 | 180.00 | 3/17/2011 | 3:05:57 PM | |
| 44 | 20 | B11-00807-19 | 37.63 | 106.44 | 410.47 | 35.35 | 180.00 | 3/17/2011 | 6:15:25 PM | |
| 44 | 21 | B11-00807-20 | 7.57 | 22.68 | 382.91 | 33.36 | 180.00 | 3/17/2011 | 9:22:25 PM | |
| 44 | 22 | B11-00807-21 | 13.41 | 38.32 | 405.48 | 34.99 | 180.00 | 3/18/2011 | 12:31:35 AM | |
| 44 | 23 | B11-00807-22 | 7.66 | 21.60 | 412.72 | 35.48 | 180.00 | 3/18/2011 | 3:41:04 AM | |

# Beta Liquid Scintillation Counter Log Book

| Date | Time | ARS Sample I.D. Number | Batch Number | Liquid Scintillation File Number | Technician Initials |
|---|---|---|---|---|---|
| 2-24-11 | 1318 | B11-00704-16 | B11-00704 | 0750 | [illegible] |
| ↓ | ↓ | B11-00704-17 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-00704-18 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-00704-19 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-00704-20 | ↓ | ↓ | [illegible] |
| 2-25-11 | 1114 | SNC 117 | QA | QA | [illegible] |
| ↓ | ↓ | Background | B11-00826 | 2213 | [illegible] |
| ↓ | ↓ | B11-00826-01 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-00826-02 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-00826-03 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-00826-04 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-00826-05 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-00826-06 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-00826-07 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-00826-08 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-00826-09 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-00826-10 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-00826-11 | ↓ | ↓ | [illegible] |
| ~~3-1-11~~ | ~~1446~~ | ~~SNC 117~~ | ~~QA~~ | ~~QA~~ | |
| 3-1-11 | 1446 | Background | B11-00807 | 0652 | [illegible] |

LSW 3-1-11

Page 58 of 100
CE-16

Reviewed By: LSW Date: 3-7-11
Initials

# Beta Liquid Scintillation Counter Log Book

| Date | Time | ARS Sample I.D. Number | Batch Number | Liquid Scintillation File Number | Technician Initials |
|---|---|---|---|---|---|
| 3-1-11 | 1446 | B11-00807-01 | B11-00807 | 0652 | [illegible] |
| ↓ | ↓ | B11-00807-02 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-00807-03 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-00807-04 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-00807-05 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-00807-06 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-00807-07 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-00807-08 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-00807-09 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-00807-10 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-00807-11 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-00807-12 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-00807-13 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-00807-14 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-00807-15 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-00807-16 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-00807-17 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-00807-18 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-00807-19 | ↓ | ↓ | [illegible] |



Reviewed By: LSW Date: 3-16-11
Initials

# Beta Liquid Scintillation Counter Log Book

| Date | Time | ARS Sample I.D. Number | Batch Number | Liquid Scintillation File Number | Technician Initials |
|---|---|---|---|---|---|
| 3-1-11 | 1446 | B11-00807-20 | B11-00807 | 0652 | [illegible] |
| ↓ | ↓ | B11-00807-21 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-00807-22 | ↓ | ↓ | [illegible] |
| 3-2-11 | 1646 | Background | B11-00882 | 2333 | JDR |
| ↓ | ↓ | JDR 3-2-11 ~~B10~~ B11-00882-04 | ↓ | ↓ | JDR |
| ↓ | ↓ | B11-00882-05 | ↓ | ↓ | JDR |
| ↓ | ↓ | B11-00882-06 | ↓ | ↓ | JDR |
| ↓ | ↓ | B11-00882-07 | ↓ | ↓ | JDR |
| ↓ | ↓ | B11-00882-08 | ↓ | ↓ | JDR |
| ↓ | ↓ | B11-00882-09 | ↓ | ↓ | JDR |
| ↓ | ↓ | B11-00882-10 | ↓ | ↓ | JDR |
| ↓ | ↓ | B11-00882-11 | ↓ | ↓ | JDR |
| ↓ | ↓ | B11-00882-12 | ↓ | ↓ | JDR |
| ↓ | ↓ | B11-00882-13 | ↓ | ↓ | JDR |
| ↓ | ↓ | B11-00882-14 | ↓ | ↓ | JDR |
| ↓ | ↓ | B11-00882-15 | ↓ | ↓ | JDR |
| ↓ | ↓ | B11-00882-16 | ↓ | ↓ | JDR |
| ↓ | ↓ | B11-00882-17 | ↓ | ↓ | JDR |
| ↓ | ↓ | B11-00882-18 | ↓ | ↓ | JDR |
| ↓ | ↓ | B11-00882-19 | ↓ | ↓ | JDR |



Reviewed By: [illegible] Date: 3 [illegible]
Initials

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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Tritium by Low Level Liquid Scintillation Counting

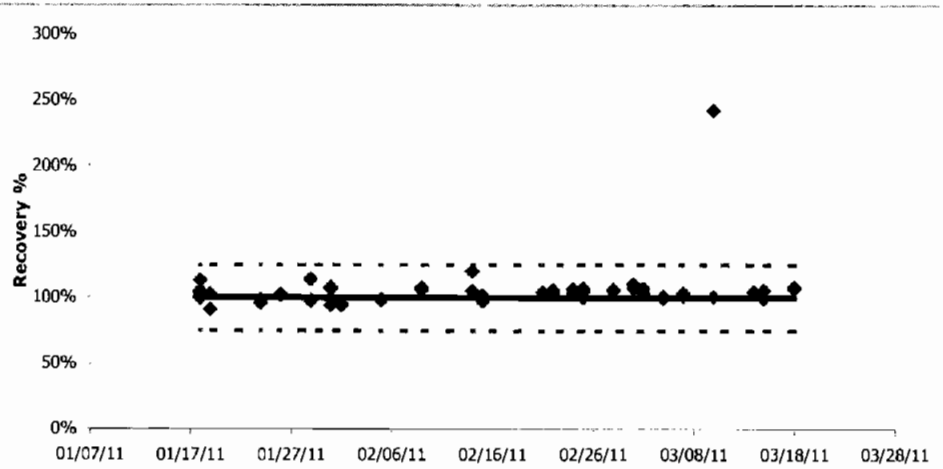
# Control Charts

American Radiation Services
Baton Rouge Laboratory

# QC Chart

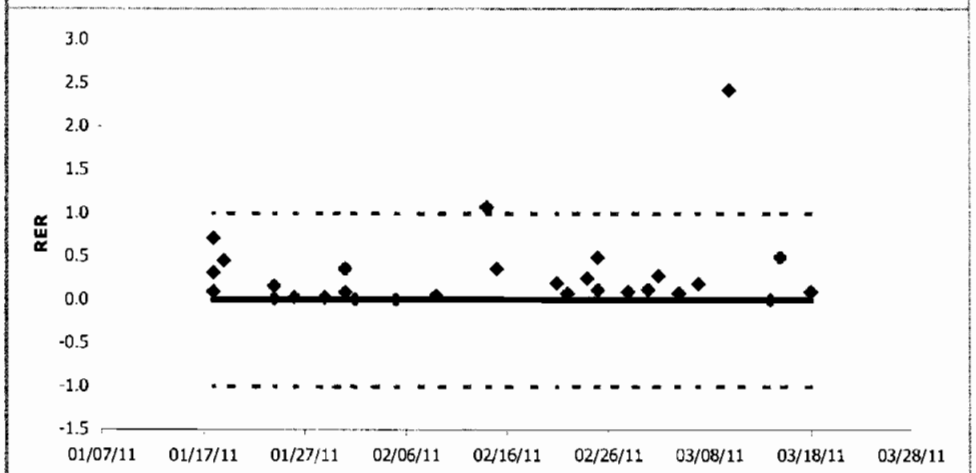
Printed: 3/18/2011 9:49 AM
Page 1 of 1

## H-3 LCS



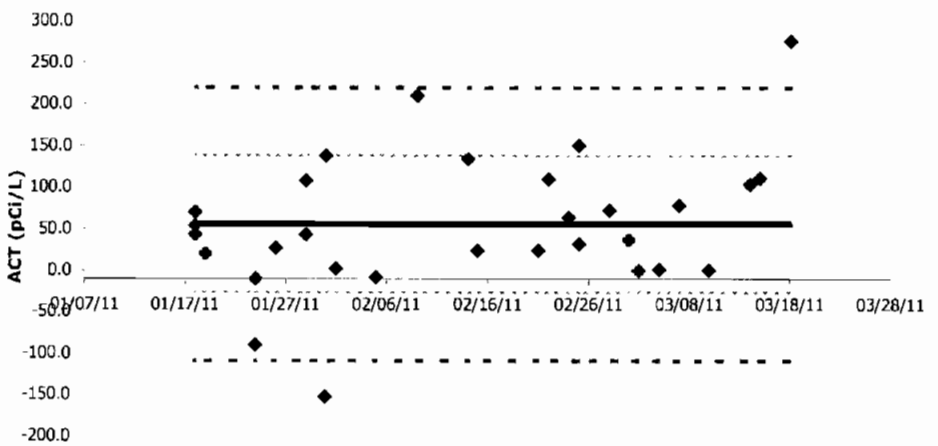

| Average | STDEV | n | UCL | LCL |
|---|---|---|---|---|
| 1.0550 | 0.1878 | 30 | 1.2500 | 0.7500 |

## H-3 RER



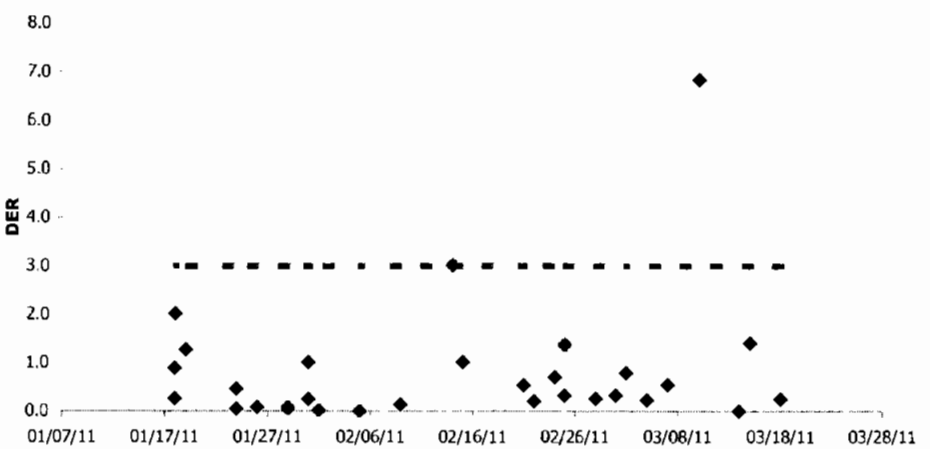

| | | n | UCL | LCL |
|---|---|---|---|---|
| | | 30 | 1.0000 | -1.0000 |

## H-3 Blank




| Average | STDEV | n | UCL | LCL |
|---|---|---|---|---|
| 55.7407 | 82.2822 | 30 | 220.3051 | -108.8236 |

## H-3 DER



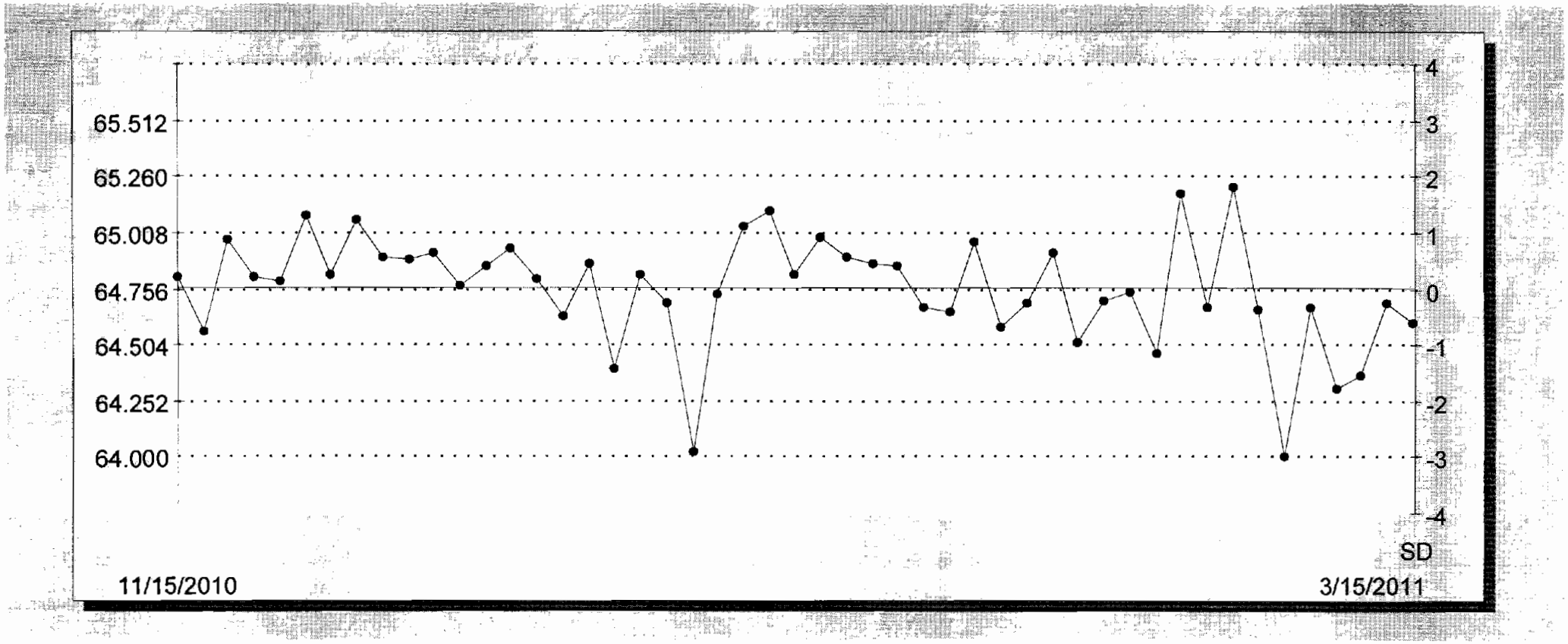

| | | n | UCL | |
|---|---|---|---|---|
| | | 30 | 3.0000 | |

3H Efficiency
Total # pts : 1566
Valid # pts : 49
Mean : 64.76
SD : 0.25

| Date | Value | Valid Pt |
|---|---|---|
| Nov 15, 2010 | 64.81 | X |
| Nov 16, 2010 | 64.56 | X |
| Nov 17, 2010 | 64.97 | X |
| Nov 17, 2010 | 64.81 | X |
| Nov 17, 2010 | 64.79 | X |
| Nov 17, 2010 | 65.08 | X |
| Nov 17, 2010 | 64.82 | X |
| Nov 22, 2010 | 65.07 | X |
| Nov 25, 2010 | 64.90 | X |
| Nov 28, 2010 | 64.89 | X |
| Nov 28, 2010 | 64.92 | X |
| Nov 28, 2010 | 64.77 | X |
| Nov 28, 2010 | 64.86 | X |
| Nov 28, 2010 | 64.94 | X |
| Nov 28, 2010 | 64.80 | X |
| Nov 29, 2010 | 64.63 | X |
| Nov 29, 2010 | 64.87 | X |
| Nov 29, 2010 | 64.40 | X |
| Nov 29, 2010 | 64.82 | X |
| Nov 29, 2010 | 64.69 | X |
| Nov 29, 2010 | 64.02 | X |
| Nov 30, 2010 | 64.73 | X |
| Nov 30, 2010 | 65.03 | X |
| Nov 30, 2010 | 65.11 | X |
| Nov 30, 2010 | 64.82 | X |
| Dec 02, 2010 | 64.99 | X |
| Dec 05, 2010 | 64.90 | X |
| Dec 08, 2010 | 64.87 | X |
| Dec 13, 2010 | 64.86 | X |
| Dec 17, 2010 | 64.68 | X |
| Dec 28, 2010 | 64.65 | X |
| Jan 01, 2011 | 64.97 | X |
| Jan 06, 2011 | 64.58 | X |
| Jan 10, 2011 | 64.70 | X |
| Jan 13, 2011 | 64.92 | X |
| Jan 18, 2011 | 64.51 | X |
| Jan 24, 2011 | 64.70 | X |
| Jan 29, 2011 | 64.74 | X |
| Jan 31, 2011 | 64.46 | X |
| Feb 05, 2011 | 65.19 | X |
| Feb 11, 2011 | 64.68 | X |
| Feb 15, 2011 | 65.22 | X |
| Feb 19, 2011 | 64.66 | X |
| Feb 23, 2011 | 64.01 | X |
| Feb 25, 2011 | 64.68 | X |
| Mar 01, 2011 | 64.31 | X |
| Mar 04, 2011 | 64.37 | X |

| | | |
|---|---|---|
| Mar 09, 2011 | 64.70 | X |
| Mar 15, 2011 | 64.61 | X |

3H Efficiency
Total # pts : 1566
Valid # pts : 49
Mean : 64.76
SD : 0.25



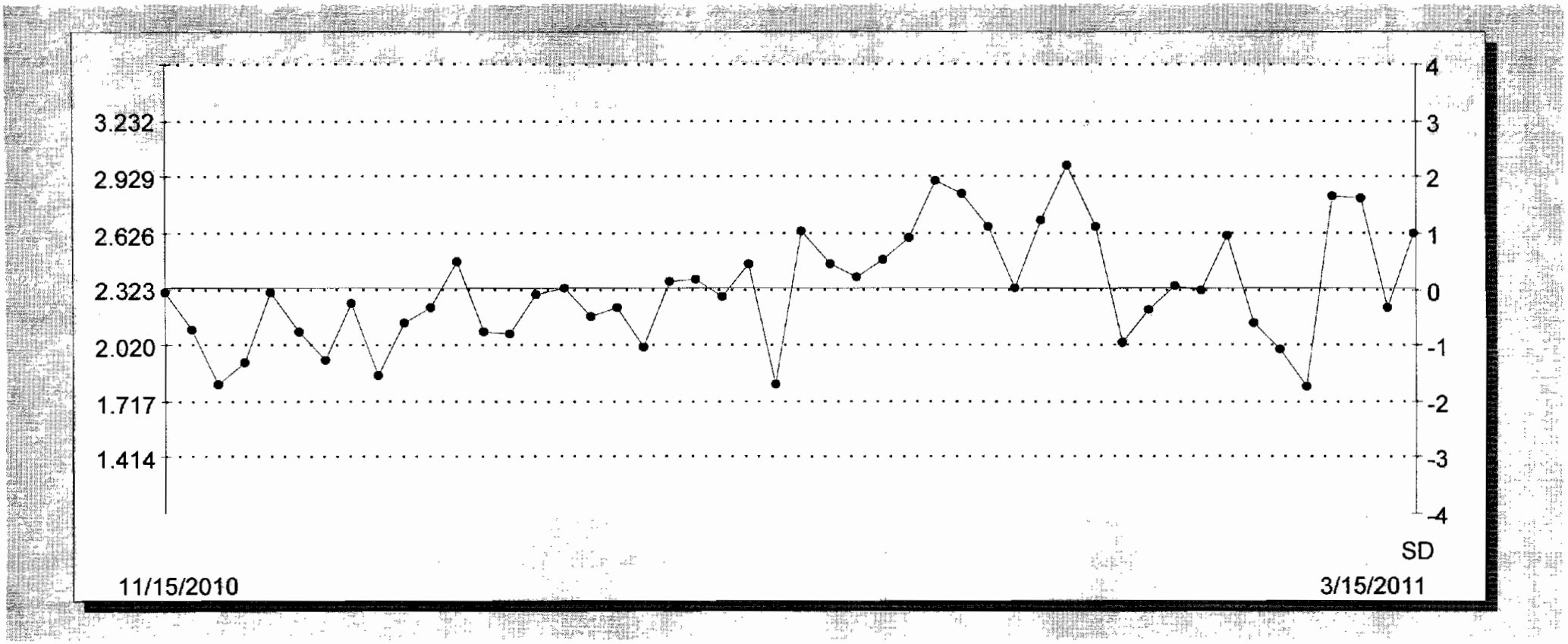
3H Background
Total # pts : 1528
Valid # pts : 48
Mean : 2.32
SD : 0.30

| Date | Value | Valid Pt |
|---|---|---|
| Nov 15, 2010 | 2.31 | X |
| Nov 16, 2010 | 2.10 | X |
| Nov 17, 2010 | 1.80 | X |
| Nov 17, 2010 | 1.93 | X |
| Nov 17, 2010 | 2.30 | X |
| Nov 17, 2010 | 2.09 | X |
| Nov 17, 2010 | 1.94 | X |
| Nov 22, 2010 | 2.25 | X |
| Nov 25, 2010 | 1.85 | X |
| Nov 28, 2010 | 2.14 | X |
| Nov 28, 2010 | 2.23 | X |
| Nov 28, 2010 | 2.47 | X |
| Nov 28, 2010 | 2.09 | X |
| Nov 28, 2010 | 2.08 | X |
| Nov 28, 2010 | 2.29 | X |
| Nov 29, 2010 | 2.33 | X |
| Nov 29, 2010 | 2.18 | X |
| Nov 29, 2010 | 2.22 | X |
| Nov 29, 2010 | 2.01 | X |
| Nov 29, 2010 | 2.36 | X |
| Nov 29, 2010 | 2.38 | X |
| Nov 30, 2010 | 2.28 | X |
| Nov 30, 2010 | 2.45 | X |
| Nov 30, 2010 | 1.81 | X |
| Dec 02, 2010 | 2.63 | X |
| Dec 05, 2010 | 2.46 | X |
| Dec 08, 2010 | 2.39 | X |
| Dec 13, 2010 | 2.48 | X |
| Dec 17, 2010 | 2.60 | X |
| Dec 28, 2010 | 2.90 | X |
| Jan 01, 2011 | 2.84 | X |
| Jan 06, 2011 | 2.66 | X |
| Jan 10, 2011 | 2.33 | X |
| Jan 13, 2011 | 2.69 | X |
| Jan 18, 2011 | 2.99 | X |
| Jan 24, 2011 | 2.65 | X |
| Jan 29, 2011 | 2.04 | X |
| Jan 31, 2011 | 2.21 | X |
| Feb 05, 2011 | 2.34 | X |
| Feb 11, 2011 | 2.31 | X |
| Feb 15, 2011 | 2.61 | X |
| Feb 19, 2011 | 2.14 | X |
| Feb 23, 2011 | 2.00 | X |
| Feb 25, 2011 | 1.80 | X |
| Mar 01, 2011 | 2.83 | X |
| Mar 04, 2011 | 2.81 | X |
| Mar 09, 2011 | 2.23 | X |

| | | |
|---|---|---|
| Mar 15, 2011 | 2.63 | X |

3H Background

| | |
|---|---|
| Total # pts | : 1528 |
| Valid # pts | : 48 |
| Mean | : 2.32 |
| SD | : 0.30 |



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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Low Level Liquid Scintillation Counting

# Calibration Information

# STD ID: S-0247

## Add/Edit *Secondary Stds*

| Planning | |
|---|---|
| Planning Comments | Create an H-3 LCS standard |
| Target dpm/g (on dil. date) | 5.56 |
| Target Final volume mL | 2000 |
| Appx mass g of Parent Sol'n | 3.274623294 |
| Appx vol ml of Parent Sol'n | 3.280528244 |
| Expected Addition for Analysis g | 5 |

| Standards Preparation / Dilution | |
|---|---|
| Secondary Solution # | S-0247 |
| Dilution Date (New Ref Date) | 10/11/2010 10:30 |
| Ampoule, Empty (g) | |
| Ampoule /Solution Gross (g) | |
| Net Wt Removed (g) | |
| Transfer Container, empty (g) | 1.7 |
| Container Plus Solution (g) | 4.994 |
| Net Wt Transferred (g) | 3.294 |
| DPM Xferred on 10/11/2010 10:30 | 11165.79962 |
| Diluent/matrix | DI H2O |
| Diluent Density Cont, empty (g) | |
| Test Mass of 5 ml of Diluent (g) | |
| Diluent Density Test - (g/mL) | |
| Dilution Empty Container Mass (g) | 473.95 |
| Dilution Full Cont g (If measured) | 2467.85 |
| Dilution Final Volume ml (If measured) | 2000 |
| Final Dilution Density (g/mL) | 0.996945 |
| Final Dilution Measured Mass g | 1993.89 |

## Parent Standard Data

| | | | | |
|---|---|---|---|---|
| Parent Solution Reference # | NIST SRM 4927F | | | |
| Parent Solution # | S-0237 | | | |
| Parent Principal Radionuclide | H-3 | Half Life (Days) | 4499.8000000 | |
| Parent Reference Date | 03/22/2010 10:10 | | | |
| Parent Certified Act | 3503.682716 | Certi Act/Vol Units | dpm | g |
| Parent Cert Act Uncert 1 Sigma | 0.0036 | | | |
| Parent Sp. Gravity G/Ml | 0.9982 | | | |
| Parent Supplier | NIST SRM 4927F | | | |
| Parent Date Recvd | 01/02/00 | | | |
| Parent Received By | Unknown | | | |
| Parent Cert Exp Date | | | | |
| Parent Matrix | H2O | | | |
| Certified dpm/g At Ref Date | 3503.682716 | | | |
| Certified dpm/g on 10/11/2010 10:30 | 3395.81045 | | | |
| Parent Comments | Intermediate level H-3 standard for creating LCS solutions and matrix spikes. Dilution performed as stated above by B Steffens. -BJS 3/22/10 | | | |
| Parent Tech | Unknown | | | |
| Is_Primary | FALSE | | | |
| Is_LCS | TRUE | | | |
| Is_Tracer | FALSE | | | |
| Is_Calib | FALSE | | | |

| | |
|---|---|
| Comments | Stock H-3 LCS standard. Dilution performed as stated above by B Steffens. -BJS 10/11/10 |
| Final Dilution dpm/g | 5.610038479 |
| Final Dil New Ref Date/Time | 10/11/2010 10:30 |

| | | |
|---|---|---|
| S-0247 | | |
| H-3 | Verified | 10/13/10 |
| SL | Expires | 10/13/11 |
| Manufactuer | NIST SRM 4927F | |
| Sol Matrix | H2O | |
| Ref No | NIST SRM 4927F | |
| Tech | Unknown | |
| Parent ID | S-0237 | |

RADIOACTIVE STANDARDS -- BATON ROUGE LABORATORY

ARS INTERNATIONAL

## QUALITY CONTROL PROGRAM

AMERICAN RADIATION SERVICES
RADIOACTIVE REFERENCE SOLUTIONS

# ANNUAL ACTIVITY VERIFICATION

**VERIFICATION DATE** 10/13/2010 20:18 *date counted*
**STANDARD REFERENCE #** S-0247

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

**Radionuclide** H-3 **Dilution Reference Date** 10/11/2010 10:30

| | | | |
|---|---|---|---|
| **Dilution Activity** | 2.53 | **pCi per gram ===> dpm/g** | 5.61 |
| **Verif. Date Decay Corrected** | 2.53 | **pCi per gram ===> dpm/g** | 5.61 |

***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-0247-V1 | 16.99 | 1 | LSC | 0.3440 | 6.86 | 5.017 | 5.87 | 2.64 |
| S-0247-V2 | 16.76 | 1 | LSC | 0.3484 | 6.86 | 4.979 | 5.70 | 2.57 |
| S-0247-V3 | 16.97 | 1 | LSC | 0.3465 | 6.86 | 4.972 | 5.87 | 2.64 |
| S-0247-V4 | 16.76 | 1 | LSC | 0.3449 | 6.86 | 4.982 | 5.76 | 2.60 |
| S-0247-V5 | 16.88 | 1 | LSC | 0.3433 | 6.86 | 4.980 | 5.86 | 2.64 |

| | | | |
|---|---|---|---|
| | Average | 5.81 | 2.62 |
| | Two Sigma Uncertainty | 0.15 | 0.07 |
| *10% Max* *PASS* | Standard Deviation percent of known concentration | 1.35% | 1.35% |
| | Target Activity | 5.61 | 2.53 |
| *5% Max* *PASS* | % Diff | 3.66% | 3.66% |

**Verification Expiration Date:** October 13, 2011

Prepared & Counted By [signature] Date: 10/13/2010 20:18

Verified & Approved By [signature] Date: 10-14-10 / 1224

QC Approval [signature] Date: 10-14-10/12:30

# STD ID: S-0031

ARS INTERNATIONAL

## Add/Edit *Secondary Stds*

| Planning | |
|---|---|
| Planning Comments | Dilute intermediate level solution from SRM 4927F |
| Target dpm/g (on dil. date) | 267000 |
| Target Final volume mL | 200 |
| Appx mass g of Parent Sol'n | 2.093763934 |
| Appx vol ml of Parent Sol'n | 2.097539505 |
| Expected Addition for Analysis g | |

| Standards Preparation / Dilution | |
|---|---|
| Secondary Solution # | S-0031 |
| Dilution Date (New Ref Date) | 10/19/2005 00:00 |
| Ampoule, Empty (g) | |
| Ampoule /Solution Gross (g) | |
| Net Wt Removed (g) | |
| Transfer Container, empty (g) | 0 |
| Container Plus Solution (g) | 4.7574 |
| Net Wt Transferred (g) | 4.7574 |
| DPM Xferred on 10/19/2005 00:00 | 121334194.3 |
| Diluent/matrix | H20 |
| Diluent Density Cont, empty (g) | |
| Test Mass of 5 ml of Diluent (g) | |
| Diluent Density Test - (g/mL) | |
| Dilution Empty Container Mass (g) | 1 |
| Dilution Full Cont g (if measured) | 200.64 |
| Dilution Final Volume ml (if measured) | 200 |
| Final Dilution Density (g/mL) | 0.9982 |
| Final Dilution Measured Mass g | 199.64 |
| Comments | S-0031 Intermediate dilution - Information entered from dilution records - 4/19/2006 RTS |
| Final Dilution dpm/g | 607764.9485 |
| Final Dil New Ref Date/Time | 10/19/2005 00:00 |

## Parent Standard Data

| | | | | |
|---|---|---|---|---|
| Parent Solution Reference # | NIST SRM 4927F | | | |
| Parent Solution # | S-0107 | | | |
| Parent Principal Radionuclide | H-3 | Half Life (Days) | 4499.8000000 | |
| Parent Reference Date | 09/03/1998 11:00 | | | |
| Parent Certified Act | 38082000 | Certi Act/Vol Units | dpm | g |
| Parent Cert Act Uncert 1 Sigma | 0.0036 | | | |
| Parent Sp. Gravity G/Ml | 0.9982 | | | |
| Parent Supplier | NIST SRM 4927F | | | |
| Parent Date Recvd | 01/02/00 | | | |
| Parent Received By | Unknown | | | |
| Parent Cert Exp Date | | | | |
| Parent Matrix | H2O | | | |
| Certified dpm/g At Ref Date | 38082000 | | | |
| Certified dpm/g on 10/18/2005 00:00 | 25504307.89 | | | |
| Parent Comments | Primary for S-0029 - Information entered from dilution records - 4/18/2006 RTS | | | |
| Parent Tech | Unknown | | | |
| Is_Primary | FALSE | | | |
| Is_LCS | TRUE | | | |
| Is_Tracer | FALSE | | | |
| Is_Calib | FALSE | | | |

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

S-0031

# National Institute of Standards & Technology

# Certificate

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

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

### Radiological Hazard

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

### Chemical Hazard

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

### Storage and Handling

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

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

### Preparation

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

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

Bert M. Coursey, Chief
Ionizing Radiation Division

Nancy M. Trahey, Chief
Standard Reference Materials Program

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



*Notes and references are on pages 5 and 6.

## PROPERTIES OF SRM 4927F

### Certified values

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

### Uncertified values

| | | | |
|---|---|---|---|
| **Physical Properties:** | | | |
| Source description | Liquid in flame-sealed NIST borosilicate-glass ampoule | | |
| Ampoule specifications | Body outside diameter<br>Wall Thickness<br>Barium content<br>Lead-oxide content<br>Other heavy elements | (16.5 ± 0.5) mm<br>(0.60 ± 0.04) mm<br>Less than 2.5%<br>Less than 0.02%<br>Trace quantities | |
| Solution mass | Approximately 5.0 g | | |
| **Chemical Properties:** | | | |
| Solution composition | Chemical Formula | Concentration (mol·L$^{-1}$) | Mass Fraction (g·g$^{-1}$) |
| | $H_2O$<br>$^3HHO$ | 55<br>$6 \times 10^{-7}$ | 1.00<br>$1 \times 10^{-8}$ |
| **Radiological Properties:** | | | |
| Radionuclidic impurities | None detected [f] | | |
| Half lives used | Hydrogen-3: (4500 ± 8) d [g] | | |
| Calibration method and measuring instrument(s) | 4πβ gas counting of SRM 4927E using the NIST length-compensated internal gas proportional-counters and intercomparison of SRMs 4927E/4927F using two 4πβ liquid-scintillation counting systems [h] | | |



*Notes and references are on pages 5 and 6.

## NOTES

[a] The Sievert is the SI unit for dose equivalent. See reference [1]. One μSv is equal to 0.1 mrem.

| Distance from Ampoule (cm): | 1 | 30 | 100 |
|---|---|---|---|
| Approximate Dose Rate (μSv/h): | <0.1(Not detectable) | | |

[b] The stated uncertainty is two times the standard uncertainty.

[c] **Massic activity** is the preferred name for the quantity activity divided by the total mass of the sample. See reference [1].

[d] The reported value, $y$, of massic activity (activity per unit mass) at the reference time was not measured directly but was derived from measurements and calculations of other quantities. This can be expressed as $y = f(x_1, x_2, x_3, \ldots x_n)$, where $f$ is a mathematical function derived from the assumed model of the measurement process.

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

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

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

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

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

[e] The value of each standard uncertainty component, and hence the value of the expanded uncertainty itself, is a best estimate based upon all available information, but is only approximately known. That is to say, the "uncertainty of the uncertainty" is large and not well known. This is true for uncertainties evaluated by statistical methods (e.g., the relative standard deviation of the standard deviation of the mean for the massic response is approximately 50%) and for uncertainties evaluated by other methods (which could easily be over estimated or under estimated by substantial amounts). The unknown value of the expanded uncertainty is believed to lie in the interval $U/2$ to $2U$ (i.e., within a factor of 2 of the estimated value).

[f] The estimated limit of detection for radionuclidic impurities is 300 $Bq \cdot g^{-1}$.

[g] The stated uncertainty is the standard uncertainty. See reference [5].

[h] Extensive gas-counting measurements were made on the SRM 4927E solution during 1998 and 1999. The SRM 4927F solution was intercompared with the SRM 4927E solution using liquid-scintillation counting.

[i] Relative standard uncertainty of the input quantity $x_i$.

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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Percent Moisture

ARS INTERNATIONAL

2609 North River Road, Port Allen, Louisiana 70767

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

| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00256 | **Request or PO Number:** | 11-1296 |
| **Client Sample ID:** | MD21-11-4742 | **ARS Sample ID:** | ARS1-11-00256-001 |
| **Sample Collection Date:** | 02/08/11 | **Date Received:** | 02/09/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 03/18/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 12.240 | NA | NA | NA | | % | Percent Moisture | 03/15/11 19:25 | AB | NA |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**NOTES: Project Cost Code MR8R032NFB00**

Project Manager Review

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

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ARS INTERNATIONAL

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00256 | **Request or PO Number:** | 11-1296 |
| **Client Sample ID:** | MD21-11-4740 | **ARS Sample ID:** | ARS1-11-00256-002 |
| **Sample Collection Date:** | 02/08/11 | **Date Received:** | 02/09/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 03/18/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 10.069 | NA | NA | NA | | % | Percent Moisture | 03/15/11 22:32 | AB | NA |
| | | | | | | | | | | |
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| | | | | | | | | | | |

**NOTES: Project Cost Code MR8R032NFB00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00256 | **Request or PO Number:** | 11-1296 |
| **Client Sample ID:** | MD21-11-4746 | **ARS Sample ID:** | ARS1-11-00256-003 |
| **Sample Collection Date:** | 02/08/11 | **Date Received:** | 02/09/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 03/18/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 7.796 | NA | NA | NA | U | % | Percent Moisture | 03/16/11 01:39 | AB | NA |
| | | | | | | | | | | |
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**NOTES: Project Cost Code MR8R032NFB00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00256 | **Request or PO Number:** | 11-1296 |
| **Client Sample ID:** | MD21-11-4747 | **ARS Sample ID:** | ARS1-11-00256-004 |
| **Sample Collection Date:** | 02/08/11 | **Date Received:** | 02/09/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 03/18/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 7.977 | NA | NA | NA | | % | Percent Moisture | 03/16/11 04:46 | AB | NA |
| | | | | | | | | | | |
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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00256 | **Request or PO Number:** | 11-1296 |
| **Client Sample ID:** | MD21-11-4741 | **ARS Sample ID:** | ARS1-11-00256-005 |
| **Sample Collection Date:** | 02/08/11 | **Date Received:** | 02/09/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 03/18/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 12.709 | NA | NA | NA | | % | Percent Moisture | 03/16/11 07:53 | AB | NA |
| | | | | | | | | | | |
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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00256 | **Request or PO Number:** | 11-1296 |
| **Client Sample ID:** | MD21-11-4738 | **ARS Sample ID:** | ARS1-11-00256-006 |
| **Sample Collection Date:** | 02/08/11 | **Date Received:** | 02/09/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 03/18/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 4.937 | NA | NA | NA | U | % | Percent Moisture | 03/16/11 11:00 | AB | NA |
| | | | | | | | | | | |
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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00256 | **Request or PO Number:** | 11-1296 |
| **Client Sample ID:** | MD21-11-4748 | **ARS Sample ID:** | ARS1-11-00256-007 |
| **Sample Collection Date:** | 02/08/11 | **Date Received:** | 02/09/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 03/18/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 9.360 | NA | NA | NA | | % | Percent Moisture | 03/16/11 14:07 | AB | NA |

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00256 | **Request or PO Number:** | 11-1296 |
| **Client Sample ID:** | MD21-11-4739 | **ARS Sample ID:** | ARS1-11-00256-008 |
| **Sample Collection Date:** | 02/08/11 | **Date Received:** | 02/09/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 03/18/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 7.465 | NA | NA | NA | | % | Percent Moisture | 03/16/11 17:14 | AB | NA |
| | | | | | | | | | | |
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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00256 | **Request or PO Number:** | 11-1296 |
| **Client Sample ID:** | MD21-11-4743 | **ARS Sample ID:** | ARS1-11-00256-009 |
| **Sample Collection Date:** | 02/08/11 | **Date Received:** | 02/09/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 03/18/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 10.253 | NA | NA | NA | | % | Percent Moisture | 03/16/11 20:21 | AB | NA |
| | | | | | | | | | | |
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**NOTES: Project Cost Code MR8R032NFB00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00256 | **Request or PO Number:** | 11-1296 |
| **Client Sample ID:** | MD21-11-4745 | **ARS Sample ID:** | ARS1-11-00256-010 |
| **Sample Collection Date:** | 02/08/11 | **Date Received:** | 02/09/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 03/18/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 12.163 | NA | NA | NA | | % | Percent Moisture | 03/16/11 23:28 | AB | NA |
| | | | | | | | | | | |
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**NOTES: Project Cost Code MR8R032NFB00**

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| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-00256 | **Request or PO Number:** | 11-1296 |
| **Client Sample ID:** | MD21-11-4744 | **ARS Sample ID:** | ARS1-11-00256-011 |
| **Sample Collection Date:** | 02/08/11 | **Date Received:** | 02/09/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 03/18/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 8.158 | NA | NA | NA | | % | Percent Moisture | 03/17/11 02:35 | AB | NA |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**NOTES: Project Cost Code MR8R032NFB00**

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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Percent Moisture Laboratory Records

**AMERICAN RADIATION SERVICES**
**Port Allen, LA**
**PERCENT MOISTURE DETERMINATION IN SOILS**

SDG Number ARS1-11-00256, 00267, 00268
Client LANL

| LANL ID | ARS ID | weight of cylinder with gel (g) | weight of empty cylinder (g) | Weight of gel (g) | amount of liquid collected (ml) | amount of liquid tested (ml) | **% moisture** |
|---|---|---|---|---|---|---|---|
| MD21-11-4742 | ARS1-11-00256-001 | 609 | 439 | 170 | 20.808 | 5.05 | **12.24** |
| MD21-11-4740 | ARS1-11-00256-002 | 607 | 439 | 167 | 16.816 | 5.045 | **10.0694611** |
| MD21-11-4746 | ARS1-11-00256-003 | 603 | 437 | 166 | 12.941 | 5.048 | **7.79578313** |
| MD21-11-4747 | ARS1-11-00256-004 | 622 | 463 | 160 | 12.763 | 5.047 | **7.976875** |
| MD21-11-4741 | ARS1-11-00256-005 | 617 | 442 | 174 | 22.113 | 5.036 | **12.7086207** |
| MD21-11-4738 | ARS1-11-00256-006 | 599 | 443 | 155 | 7.653 | 5.053 | **4.93741935** |
| MD21-11-4748 | ARS1-11-00256-007 | 609 | 442 | 167 | 15.631 | 5.046 | **9.35988024** |
| MD21-11-4739 | ARS1-11-00256-008 | 623 | 456 | 167 | 12.466 | 5.035 | **7.46467066** |
| MD21-11-4743 | ARS1-11-00256-009 | 610 | 448 | 161 | 16.507 | 5.019 | **10.252795** |
| MD21-11-4745 | ARS1-11-00256-010 | 611 | 433 | 179 | 21.771 | 5.045 | **12.1625698** |
| MD21-11-4744 | ARS1-11-00256-011 | 599 | 439 | 159 | 12.971 | 5.058 | **8.15786164** |
| MD50-11-3974 | ARS1-11-00267-001 | 593 | 437 | 156 | 6.055 | 5.073 | **3.88141026** |
| MD50-11-3983 | ARS1-11-00267-002 | 604 | 441 | 163 | 14.801 | 5.06 | **9.0803681** |
| MD50-11-3975 | ARS1-11-00267-003 | 603 | 441 | 162 | 10.615 | 5.061 | **6.55246914** |
| MD50-11-3973 | ARS1-11-00267-004 | 596 | 439 | 155 | 6.568 | 5.067 | **4.23741935** |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| MD50-11-4164 | ARS1-11-00267-005 | 619 | 437 | 181 | 31.773 | 5.024 | **17.5541436** |
| MD50-11-3979 | ARS1-11-00268-001 | 611 | 443 | 168 | 15.132 | 5.052 | **9.00714286** |
| MD50-11-3978 | ARS1-11-00268-002 | 608 | 441 | 167 | 18.422 | 5.06 | **11.0311377** |
| MD50-11-3977 | ARS1-11-00268-003 | 602 | 438 | 162 | 12.006 | 5.071 | **7.41111111** |

Balance ID: 0102/H1331122173560P
Pipettor ID: FJ40469

Signature [illegible] Date 3-17-11

**AMERICAN RADIATION SERVICES**
**Port Allen, LA**
**PERCENT MOISTURE DETERMINATION IN SOILS**

SDG Number ARS1-11-00256, 00267, 00268
Client LANL

LCS- 5.028
LCSD-5.028
BLK-5.100

| LANL ID | ARS ID | weight of cylinder with gel (g) | weight of empty cylinder (g) | Weight of gel (g) | amount of liquid collected (ml) | amount of liquid tested (ml) | % moisture |
|---|---|---|---|---|---|---|---|
| MD21-11-4742 | ARS1-11-00256-001 | 609 | 439 | 170 | 20.808 | 5.050 | #DIV/0! |
| MD21-11-4740 | ARS1-11-00256-002 | 607 | 439 | 167 | 16.816 | 5.045 | #DIV/0! |
| MD21-11-4746 | ARS1-11-00256-003 | 603 | 437 | 166 | 12.941 | 5.048 | #DIV/0! |
| MD21-11-4747 | ARS1-11-00256-004 | 622 | 463 | 160 | 12.763 | 5.047 | #DIV/0! |
| MD21-11-4741 | ARS1-11-00256-005 | 617 | 442 | 174 | 22.113 | 5.036 | #DIV/0! |
| MD21-11-4738 | ARS1-11-00256-006 | 594 | 443 | 155 | 7.653 | 5.053 | #DIV/0! |
| MD21-11-4748 | ARS1-11-00256-007 | 609 | 442 | 167 | 15.631 | 5.046 | #DIV/0! |
| MD21-11-4739 | ARS1-11-00256-008 | 623 | 456 | 167 | 12.466 | 5.035 | #DIV/0! |
| MD21-11-4743 | ARS1-11-00256-009 | 610 | 448 | 161 | 16.507 | 5.019 | #DIV/0! |
| MD21-11-4745 | ARS1-11-00256-010 | 611 | 433 | 179 | 21.771 | 5.046 | #DIV/0! |
| MD21-11-4744 | ARS1-11-00256-011 | 599 | 439 | 159 | 12.971 | 5.058 | #DIV/0! |
| MD50-11-3974 | ARS1-11-00267-001 | 593 | 437 | 156 | 6.055 | 5.073 | #DIV/0! |
| MD50-11-3983 | ARS1-11-00267-002 | 604 | 441 | 163 | 14.801 | 5.066 | #DIV/0! |
| MD50-11-3975 | ARS1-11-00267-003 | 603 | 441 | 162 | 10.615 | 5.061 | #DIV/0! |
| MD50-11-3973 | ARS1-11-00267-004 | 596 | 439 | 155 | 6.568 | 5.067 | #DIV/0! |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| MD50-11-4164 | ARS1-11-00267-005 | 619 | 437 | 181 | 31.773 | 5.024 | #DIV/0! |
| MD50-11-3979 | ARS1-11-00268-001 | 611 | 443 | 168 | 15.132 | 5.052 | #DIV/0! |
| MD50-11-3978 | ARS1-11-00268-002 | 608 | 441 | 167 | 18.422 | 5.060 | #DIV/0! |
| MD50-11-3977 | ARS1-11-00268-003 | 602 | 438 | 162 | 12.006 | 5.071 | #DIV/0! |

Balance ID: 0102/H1331122173560P
Pipettor ID: FJ40469

Signature [illegible] Date 3-1-11

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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Folder Duplicate

ARS INTERNATIONAL

# Report Compilation Checklist

**ARS SDG:** 11-00256 **Client Name:** LANL **Sample Matrix:** SI

| LEVEL 1 COMPONENTS | 1st Reviewer | |
|---|---|---|
| 1) Cover Page Complete and Accurate (see ARS-059)? | ~~Yes~~ No N/A | |
| 2) Technical Review Checklist(s) Complete and Accurate? | ~~Yes~~ No N/A | |
| 3) Case Narrative Complete and Accurate (see ARS-059)? | ~~Yes~~ No N/A | |
| 4) Form 1s Present for all Samples and Tests? | ~~Yes~~ No N/A | |
| 5) Client Specific Components are Present and Complete? | ~~Yes~~ No N/A | |

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

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

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

Susan Reese 3-18-11
**Report Generator Signature** **Date**

VJM 3-18-11
**Management Review Signature** **Date**

ARS-059
07/03/2009

# LSC
# Technical Review Checklist

**ARS SDG** 11-00256

**Sample Matrix:** SI **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:** B11-00807 **Batch B:** N/A **Batch C:** N/A

**Test Method(s):** LSC-A-001 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 | Date | Verifier Review Signature | Date |
|---|---|---|---|
| [signature] | 3-1-11 | Jamaal Brown | 3-1-11 |

## 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] | Date: 3-18-11 |

| | 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 | Date | Technicial Reviewer Signature | Date |
|---|---|---|---|
| [signature] | 3-18-11 | N/A | |

Batch A: B11-00807

# 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): _____

| Project Manager Signature | Date | QA Officer Signature | Date |
|---|---|---|---|
| Susan Reese | 3-18-11 | VAM | 3-18-11 |

## GENERAL COMMENTS

# DQO Report for SDG

ARS1-11-00256





| Analysis Code | Group | Isotope | Activity Units | Aliquot Units | ProcedureNo | RDL | LCS_LL | LCS_UL | MS_LL | MS_UL | RadY_LL | RadY_UL | GravY_LL | GravY_UL | RER | RPD | DiltionReq | RoughPrepReq | BlankCorrectionMDA | BlankCorrectionAll | CountTimeReq | AliquotRequired |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LSC-A-001 | STD | H-3 | pCi | L | ARS-054 | 2.50E+02 | 80 | 120 | 75 | 125 | 30 | 110 | 40 | 110 | 1.00 | 25 | FALSE | FALSE | FALSE | FALSE | | |

# SDG Report - Samples and Containers

**SDG Specific Data**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| SDG | ARS1-11-00256 | | | TAT Days | 30 | Project Type | Environmental |
| Sample Count | | Rpt Level | 4 | Date Received | 2/9/2011 | COC Number | 11-1296 |
| Client | Los Alamos National Laboratory | | | Client Deadline | 3/11/2011 | PO Number | 63641-001-10 |
| Client Code | 114 | | | Internal Deadline | 3/10/2011 | Job Number | MR8R032NFB00 |
| Profile Number | PN-00094 | | | Lab Deadline | 3/8/2011 | Job Location | |
| Comments | | | | | | | |

**Samples and Containers (➔) Checked In Thus Far**

| FR | ClientID | Matrix | SampleStartDate | SampleEndDate | Disp | Hold | Arch | Storage | X | Units | Y | Units | Z | Units | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 001 | MD21-11-4742 | SI | 02/08/11 12:00 PM | 02/08/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| ➔ | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 79865 | 1 | | 1.00 | | | 30 | 13 | | N | N/A | | | | |
| 002 | MD21-11-4740 | SI | 02/08/11 12:00 PM | 02/08/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| ➔ | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 79866 | 1 | | 1.00 | | | 30 | 12 | | N | N/A | | | | |
| 003 | MD21-11-4746 | SI | 02/08/11 12:00 PM | 02/08/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| ➔ | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 79867 | 1 | | 1.00 | | | 30 | 12 | | N | N/A | | | | |
| 004 | MD21-11-4747 | SI | 02/08/11 12:00 PM | 02/08/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| ➔ | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 79868 | 1 | | 1.00 | | | 35 | 13 | | N | N/A | | | | |
| 005 | MD21-11-4741 | SI | 02/08/11 12:00 PM | 02/08/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| ➔ | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 79869 | 1 | | 1.00 | | | 25 | 12 | | N | N/A | | | | |
| 006 | MD21-11-4738 | SI | 02/08/11 12:00 PM | 02/08/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| ➔ | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 79870 | 1 | | 1.00 | | | 30 | 12 | | N | N/A | | | | |
| 007 | MD21-11-4748 | SI | 02/08/11 12:00 PM | 02/08/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| ➔ | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 79871 | 1 | | 1.00 | | | 25 | 12 | | N | N/A | | | | |
| 008 | MD21-11-4739 | SI | 02/08/11 12:00 PM | 02/08/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| ➔ | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 79872 | 1 | | 1.00 | | | 35 | 13 | | N | N/A | | | | |
| 009 | MD21-11-4743 | SI | 02/08/11 12:00 PM | 02/08/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| ➔ | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 79873 | 1 | | 1.00 | | | 30 | 12 | | N | N/A | | | | |
| 010 | MD21-11-4745 | SI | 02/08/11 12:00 PM | 02/08/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| ➔ | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 79874 | 1 | | 1.00 | | | 30 | 12 | | N | N/A | | | | |
| 011 | MD21-11-4744 | SI | 02/08/11 12:00 PM | 02/08/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| ➔ | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 79875 | 1 | | 1.00 | | | 30 | 12 | | N | N/A | | | | |

# SDG Report - Analysis Assignments

| | | | |
|---|---|---|---|
| Temp SDG | ARS1-11-00256 | Sample Count | |
| Client | Los Alamos National Laboratory | Analysis Count | 1-11 |

**Samples Count Totals per Analysis**

| Analysis Code | Analysis Description | Samples Count |
|---|---|---|
| LSC-A-001 | Tritium in (Water [Aqueous, AQ, SI]) | 11 |

**Analyses Assigned Per Fraction**

| Fraction | Analysis Code | X = Assigned |
|---|---|---|
| 001 | LSC-A-001 | X |
| 002 | LSC-A-001 | X |
| 003 | LSC-A-001 | X |
| 004 | LSC-A-001 | X |
| 005 | LSC-A-001 | X |
| 006 | LSC-A-001 | X |
| 007 | LSC-A-001 | X |
| 008 | LSC-A-001 | X |
| 009 | LSC-A-001 | X |
| 010 | LSC-A-001 | X |
| 011 | LSC-A-001 | X |

# ARS FILE TRACKING SHEET

SDG: ARS1-11-00256

| Task | Date / Time | Initials |
|---|---|---|
| Date & Time Samples Received | 02-09-11/09:58 | CWB |
| ICOC Initiated / Storage Location: Q6 | 02-09-11/11:56 | CWB |
| Technical Checks Performed | See Batch | — |
| Report Written / EDD Generated: 3-18-11 / 1120 (Date/Time) ____ (Initials) | 3-18-11/1115 | SCh |
| Quality Assurance Checks Performed on Report | 3-18-11 1347 | KM |
| Management Check Performed on Report | | |
| *Preliminary Report Sent* | | |
| Report E-mailed | | |
| Report Faxed | | |
| Report Reviewed | | |
| Report Mailed | | |
| Invoice Completed Invoice #:_____ | | |
| Report Imaged | | |

***SPECIAL REQUIREMENTS***

| Requirement | Yes | No |
|---|---|---|
| 3 Hour Rush | | ✓ |
| 24 Hour Rush | | ✓ |
| 48 Hour Rush | | ✓ |
| Special Invoicing *see notes* Mgmt. Approval:_____ | | ✓ |

**NOTES:**

ARS-062
04/23/2010

**COMPANY NAME:** Los Alamos National Lab **SDG:** ARSH1-00256

**SHIPPING CONTAINER**

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

**COC PRESENT WITH SAMPLES**

| | | |
|---|---|---|
| COC | ☑ Yes | ☐ No |

**SAMPLE CONTAINER(S)**

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

# Samples Rcv 11

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

**External and Internal Surveys**

| | | | | | |
|---|---|---|---|---|---|
| Exposure Rate Meter: | M3 242861 | Serial No.: | M414-2 PR264266 | Calibration Due Date: | 4-19-11 |
| Count Rate Meter: | M2 154859 | Serial No.: | M414 PR184559 | Calibration Due Date: | 4-6-11 |
| Background Exposure Rate (µR/hr) | 22 | Max. Exposure Rate on Shipping Containers Externals (Plus Bkgd) | 13 µR/hr | | |
| Background Count Rate (cpm) | 60 | Max. Removable Count Rate on Shipping Containers Externals (Plus Bkgd) | 30 cpm | | |
| | | Max. Removable Count Rate on Shipping Containers Internals (Plus Bkgd) | 30 cpm | | |

pH ≤ 2 is Acceptable

Acceptance Limits <500 µR/hr <100 cpm/cm²

| Sample Label/Comments/Notes | pH Orig | pH Final | Mark if Preserve | Acid Lot # | Weight(g) / Volume(mL) | µR/hr | cpm |
|---|---|---|---|---|---|---|---|
| MD21-11-4742 | | | | | 1 sample | 13 | 30 |
| ↓ -4740 | | | | | ↓ | 12 | 30 |
| ↓ - 4746 | | Cmb | | | ↓ | 12 | 30 |
| ↓ - 4747 | | | 2-9-11 | | ↓ | 13 | 35 |
| ↓ - 4741 | | | | | ↓ | 12 | 25 |
| ↓ - 4738 | | | | | ↓ | 12 | 30 |
| ↓ - 4748 | | | | | ↓ | 12 | 25 |
| ↓ - 4739 | | | | | ↓ | 13 | 35 |
| ↓ - 4743 | | | | | ↓ | 12 | 30 |
| ↓ - 4745 | | | | | ↓ | 12 | 30 |
| ↓ - 4744 | | | | | ↓ | 12 | 30 |
| | | | | | | | |
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| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

Surveyors' Name: [signature] Date/Time Surveyed: 2-9-11 / 10:42

Tuesday, September 20, 2011

REQUEST NUMBER: 11-3646

# LOS ALAMOS
## NATIONAL LABORATORY

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

These Samples are on:
LANL Request Number:11-3646
Per Agreement Number:63641-001-10
Project Cost Code: MR8R032NFM00

Please analyse the enclosed samples according to the schedule indicated:

**SHIP DATE: 9/20/2011**
**TURNAROUND/REPORT DUE: 10/20/2011**
**TURNAROUND REQ'D: 30 Days**

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

LANL ER SMO CONTACT:
Signature:

| PRIORITY | METHOD CODE | CNTNR | SAMPLE ID | SAMPLE MATRIX | DATE SAMPLED | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| | EPA:906.0 | 1 | MD21-11-26394 | GAS | 9/15/2011 | |

**Final Page of REQUEST NUMBER 11-3646**

Tuesday, September 20, 2011

# LAB CHAIN OF CUSTODY DOCUMENT NUMBER: 11-3646C

## LOS ALAMOS

**NATIONAL LABORATORY**

**REQUEST NUMBER: 11-3646**

ATTN: Danny Coleman

American Radiation Services - Primary

1726 Wooddale Court

Baton Rouge, LA 70806

LAB REQUEST COMMENTS:

TURNAROUND/REPORT DUE: 10/20/2011

TURNAROUND REQ'D: 30

| SAMPLE ID | CTNR | CTNR DESC | ORDER | PRESERV | MATRIX |
|---|---|---|---|---|---|
| MD21-11-26394 | 1 | SILICA GEL TUBE | H3 | None | GAS |

| Relinquished By: | Date | Time | Received By: | Date | Time |
|---|---|---|---|---|---|
| Signature | | | Signature | | |
| Jay W S 9/20/11 1450 | | | | | |
| Signature | | | Signature | | |
| Signature | | | Signature | | |

| Received for DISPOSAL By: | Date | Time | Remarks: |
|---|---|---|---|
| Signature | | | |

# SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

**EVENT ID:** 3592 **EVENT NAME:** MDA V Pore Gas Sampling - CU 21-018(a)-99

**SAMPLE ID:** MD21-11-26394 **WORK ORDER:**

| | AS PLANNED | AS COLLECTED | | AS PLANNED | AS COLLECTED |
|---|---|---|---|---|---|
| DATE COLLECTED(MM/DD/YYYY): | | 9/15/11 | MEDIA: | NA | ok |
| TIME COLLECTED (HH:MM) | | 1100 | SUB-MEDIA: | OTHER | |
| PRS ID: | 21-018(a)-99 | | SAMPLE TECH CODE: | VOST | |
| LOCATION ID: | UNK 21-24524W | ok | FIELD QC TYPE: | FB | |
| LOCATION TYPE: | GENERIC | ok | FIELD PREP: | NA | |
| TOP DEPTH: | 0 | ok | SAMPLE USAGE: | QC | |
| BOTTOM DEPTH: | 0 | ok | SCREEN/PORT DESC: | | FB |
| FIELD MATRIX: | GAS | ok | EXCAVATED: YES / NO / NA | | |

COMPOSITE TYPE: NA COMPOSITE TIME INTERVAL: NA WATER FLOWING: YES / NO / NA

BOREHOLE: YES / NO / NA BOREHOLE DECLINATION: NA BOREHOLE DIRECTION: NA

| # | PRIORITY | ORDER | CNTNR | PRESERVATIVE | COLLECTED Y/N | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| 1 | | H3 | 1 EA SILICA GEL TUBE | None | Y | NA |
| ~~1~~ | | ~~TO15~~ | ~~6 LITER SUMMA CANISTER~~ | ~~None~~ | LO 8/19/11 | Not Collected, Not sampled for |

SAMPLE DESC: QC Sample of MD21-11-26386

Column # 12 initial wt 576.84g Final wt = 586.99g

Silica 145.64g ~~Vapor wt~~ DI = 10.15g LO 9/15/11

SAMPLE COMMENTS:

NA weather @ 1055 T = 55°F RH 77% BP = 30.29 in

LOCATION DESC:

NA

FIELD SCREENING/MEASUREMENT RESULTS:

NA

COLLECTED BY (PRINT) R. Onstott M Giorgi REVIEWED BY (PRINT) M Giorgi

| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
|---|---|---|---|
| (Printed Name) Rance Onstott<br>(Signature) Rance Onstott | ~~9/16/11~~ LO 9/16/11<br>9/19/11<br>~~1500~~ LO 9/19/11 | (Printed Name) Sherri Sherwood<br>(Signature) Sherri Sherwood | 9/19/11<br>1700 |
| RELINQUISHED BY | Date/Time | RECEIVED BY | Date/Time |
| (Printed Name)<br>(Signature) | 1700 | (Printed Name)<br>(Signature) | |

# DATA VALIDATION COVER SHEET

**5119-1**

Data Validation Cover Sheet

Records Use only

Los Alamos NATIONAL LABORATORY EST. 1943

**Section I.**

REQUEST NUMBER: 11-3646 VALIDATION DATE: 11/01/11 LAB CODE: ARS

CONTRACT LABORATORY NAME: American Radiation Services

VALIDATOR: Kris Chupka ORGANIZATION: Analytical Quality Associates, Inc.

ANALYTICAL SUITE (CHECK ALL THAT APPLY):

| | | | |
|---|---|---|---|
| ☐ **TPH-GRO** | ☐ **HIGH EXPLOSIVES** | ☐ **DIOXIN FURANS** | ☐ **LCMSMS PERCHLORATES** |
| ☐ **TPH-DRO** | ☐ **METALS** | ☐ **PCB CONGENERS** | ☐ **ORGANOCHLORINE PESTICIDES/POLYCHLORINATED BIPHENYLS** |
| ☐ **GENERAL CHEMISTRY** | ☒ **RADIOCHEMISTRY** | ☐ **LCMSMS HIGH EXPLOSIVES** | |

☒ **OTHER (DESCRIBE):** tritium only

**Section II. Completeness Check**

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

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

1. An MS was not analyzed. However, an LCS was analyzed and met acceptance criteria; thus, no sample data were qualified.
2. An LCSD was analyzed instead of a sample duplicate. Acceptance criteria were met and, thus, no sample data were qualified.
3. The LCS/LCSD RER was hand-calculated using the 2-sigma TPU values and was found to be within specifications. No sample data were qualified as a result.

**Reviewed by:** Susan Ball **Level:** I **Date:** 11/02/11

VALIDATOR'S SIGNATURE: DATE: 11/01/11

| RAD ANALYTICAL DATA VALIDATION CHECKLIST | |
|---|---|
| **5119-2**<br>Rad Analytical Data Validation Checklist | Records Use only<br>Los Alamos NATIONAL LABORATORY EST. 1943 |

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

| RAD ANALYTICAL DATA VALIDATION CHECKLIST | |
|---|---|
| **5119-2**<br>Rad Analytical Data Validation Checklist | Records Use only<br>Los Alamos NATIONAL LABORATORY EST. 1943 |

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

| RAD ANALYTICAL DATA VALIDATION CHECKLIST | |
|---|---|
| **5119-2**<br>Rad Analytical Data Validation Checklist | Records Use only<br>Los Alamos NATIONAL LABORATORY EST. 1943 |

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

ARS INTERNATIONAL

2609 North River Road, Port Allen, Louisiana 70767

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

| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-02040 | **Request or PO Number:** | 11-3646 |
| **Client Sample ID:** | MD21-11-26394 | **ARS Sample ID:** | ARS1-11-02040-001 |
| **Sample Collection Date:** | 09/15/11 | **Date Received:** | 09/21/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 10/18/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 285.230 | 65.023 | 201.657 | 99.009 | | pCi/L | ARS-054/EPA 906.0 | 10/06/11 06:49 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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

LELAP Certificate# 01949 NELAP Certificate # E87558



KWC
11/1/11

Tuesday, September 20, 2011

REQUEST NUMBER: 11-3646

**LOS ALAMOS**
**NATIONAL LABORATORY**

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

These Samples are on:
LANL Request Number:11-3646
Per Agreement Number:63641-001-10
Project Cost Code: MR8R032NFM00

Please analyse the enclosed samples
according to the schedule indicated:

**SHIP DATE: 9/20/2011**
**TURNAROUND/REPORT DUE: 10/20/2011**
**TURNAROUND REQ'D: 30 Days**

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

LANL ER SMO CONTACT:
Signature:

| PRIORITY | METHOD CODE | CNTNR | SAMPLE ID | SAMPLE MATRIX | DATE SAMPLED | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| | EPA:906.0 | 1 | MD21-11-26394 | GAS | 9/15/2011 | |

**Final Page of REQUEST NUMBER 11-3646**

Tuesday, September 20, 2011

# LAB CHAIN OF CUSTODY DOCUMENT NUMBER: 11-3646C

**REQUEST NUMBER: 11-3646**

## LOS ALAMOS
**NATIONAL LABORATORY**

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

TURNAROUND/REPORT DUE: 10/20/2011
TURNAROUND REQ'D: 30

| SAMPLE ID | CTNR | CTNR DESC | ORDER | PRESERV | MATRIX |
|---|---|---|---|---|---|
| MD21-11-26394 | 1 | SILICA GEL TUBE | H3 | None | GAS |

| Relinquished By: | Date | Time | Received By: | Date | Time |
|---|---|---|---|---|---|
| Signature | | | Signature | | |
| [illegible] | 9/20/11 | 1450 | [illegible] | 9-24-11 | 10:00 |
| Signature | | | Signature | | |
| Signature | | | Signature | | |

| Received for DISPOSAL By: | Date | Time | Remarks: |
|---|---|---|---|
| Signature | | | |

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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Request Number: 11-3646

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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory Request Number: 11-3646

# Original COC

Tuesday, September 20, 2011

REQUEST NUMBER: 11-3646

**LOS ALAMOS**
**NATIONAL LABORATORY**

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

These Samples are on:
LANL Request Number:11-3646
Per Agreement Number:63641-001-10
Project Cost Code: MR8R032NFM00

Please analyse the enclosed samples
according to the schedule indicated:

**SHIP DATE: 9/20/2011**
**TURNAROUND/REPORT DUE: 10/20/2011**
**TURNAROUND REQ'D: 30 Days**

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

LANL ER SMO CONTACT:
Signature:

| PRIORITY | METHOD CODE | CNTNR | SAMPLE ID | SAMPLE MATRIX | DATE SAMPLED | SPECIAL INSTRUCTIONS |
|---|---|---|---|---|---|---|
| | EPA:906.0 | 1 | MD21-11-26394 | GAS | 9/15/2011 | |

**Final Page of REQUEST NUMBER 11-3646**

Tuesday, September 20, 2011

# LAB CHAIN OF CUSTODY DOCUMENT NUMBER: 11-3646C

**REQUEST NUMBER: 11-3646**

## LOS ALAMOS
**NATIONAL LABORATORY**

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

TURNAROUND/REPORT DUE: 10/20/2011
TURNAROUND REQ'D: 30

| SAMPLE ID | CTNR | CTNR DESC | ORDER | PRESERV | MATRIX |
|---|---|---|---|---|---|
| MD21-11-26394 | 1 | SILICA GEL TUBE | H3 | None | GAS |

| Relinquished By: | Date | Time | Received By: | Date | Time |
|---|---|---|---|---|---|
| Signature | | | Signature | | |
| [illegible] | 9/20/11 | 1450 | [illegible] | 9-24-11 | 10:00 |
| Signature | | | Signature | | |
| Signature | | | Signature | | |

| Received for DISPOSAL By: | Date | Time | Remarks: |
|---|---|---|---|
| Signature | | | |

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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory Request Number: 11-3646

# Case Narrative

ARS INTERNATIONAL

2609 North River Road • Port Allen, Louisiana 70767
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October 18, 2011

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

Request Number: **11-3646**
LANL Sample ID: MD21-11-26394.

Dear Mr. Greene;

On September 21, 2011, ARS International received one (1) Silica Gel sample to be analyzed for Tritium.

The sample was received in good condition. It was processed and counted using the appropriate counting equipment and QA/QC for this type of analysis. Results of the analysis and QA/QC are attached in the data package.

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

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

Sincerely,

Eugene Mulligan

Laboratory Management
**ARS International**

ARS INTERNATIONAL

2609 North River Road • Port Allen, Louisiana 70767

1 (800) 401-4277 • Fax (225) 381-2996

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

| Request Number | LANL PROJECT SAMPLE ID NUMBER | American Radiation Services SAMPLE ID NUMBER(S) |
|---|---|---|
| 11-3646 | MD21-11-26394 | ARS1-11-02040-001 |

**ANALYTICAL METHODS**
Tritium analyses were performed using **EPA 906.0.**

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

**American Radiation Services Project Manager/Laboratory Director's Comments:**
*"I certify that this sample data package is in compliance with SOW requirements, both technically and for completeness, other than the conditions detailed above. Release of the data contained in this sample data package and the computer-readable EDD, as applicable, submitted on diskette or by modem, has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature."*

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

| Eugene Mulligan | Laboratory Management, ARS International | 10-18-11 |
|---|---|---|
| **Signature** | **Title** | **Date** |

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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Tritium by Low Level Liquid Scintillation Counting

ARS INTERNATIONAL

2609 North River Road, Port Allen, Louisiana 70767

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

| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-02040 | **Request or PO Number:** | 11-3646 |
| **Client Sample ID:** | MD21-11-26394 | **ARS Sample ID:** | ARS1-11-02040-001 |
| **Sample Collection Date:** | 09/15/11 | **Date Received:** | 09/21/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 10/18/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| H-3 | 285.230 | 65.023 | 201.657 | 99.009 | | pCi/L | ARS-054/EPA 906.0 | 10/06/11 06:49 | BS | NA |

**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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

LELAP Certificate# 01949 NELAP Certificate # E87558

ARS INTERNATIONAL

# QC Results per Analytical Batch

| | |
|---|---|
| Analytical Batch | ARS1-B11-03714 |
| SDG | ARS1-11-02040 |
| Analysis | Tritium (Aqueous) |
| Analysis Test Method | ARS-054/Liquid Scintillation Counter |
| Analysis Code | LSC-A-001 |
| Report Units | pCi/L |

## Acceptable QC Performance Ranges

| QC Sample Type | Performance Items and Ranges | | |
|---|---|---|---|
| Laboratory Control Sample | Recovery (%): | > 80 | < 120 |
| Matrix Spike | Recovery (%): | > 75 | < 125 |
| Duplicate | Replicate Error Ratio (RER): | | < 1 |
| | Duplicate Error Ratio (DER): | | < 3 |
| | Relative Percent Difference (RPD %): | | ≤ 25 |

## Laboratory Control Sample

Analysis Date: 10/05/11 21:21 — Analysis Technician: BSTEFFENS

| Analysis Batch Sample ID | QC Type | Analyte | Results | CSU (1s) | Expected Value | LCS Rec (%) | MDC |
|---|---|---|---|---|---|---|---|
| ARS1-B11-03714-01 | LCS | H-3 | 2400 | 150 | 2568 | 93 | 200 |

## Duplicate RER/DER/RPD

Analysis Date: 10/06/11 00:30 — Analysis Technician: BSTEFFENS

| Analyte | Result LCS | CSU LCS (1s) | Results LCSD | CSU LCSD (1s) | RER | DER | RPD |
|---|---|---|---|---|---|---|---|
| H-3 | 2400 | 149 | 2430 | 151 | 0.05 | 0.14 | 1.2 |

## Method Blank

Analysis Date: 10/06/11 03:39 — Analysis Technician: BSTEFFENS

| Analysis Batch Sample ID | QC Type | Analyte | Results | CSU (1s) | MDC | Qual |
|---|---|---|---|---|---|---|
| ARS1-B11-03714-03 | MBL | H-3 | 52 | 59 | 200 | U |

Susan Leese

Susan Leese

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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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Tritium by Low Level Liquid Scintillation Counting

# Samples

# LSC Instrument Data Transfer Report

\\PACKARD3170_NEW\Results\ARS\H-3 Normal Lvl\

ARS1-B11-03714 | 22 | 22 | LSC 2

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BKG | 44 | | 1 | BACKGROUND | 10/05/11 18:11 | 5.58 | 427.23 | 37.6000 | 180.00 | ARS1-B11-03714 | | |
| ARS1-B11-03714-01 | 44 | | 2 | B11-03714-01 | 10/05/11 21:20 | 15.82 | 439.96 | 38.1900 | 180.00 | ARS1-B11-03714 | | |
| ARS1-B11-03714-02 | 44 | | 3 | B11-03714-02 | 10/06/11 00:30 | 15.83 | 431.68 | 37.8100 | 180.00 | ARS1-B11-03714 | | |
| ARS1-B11-03714-03 | 44 | | 4 | B11-03714-03 | 10/06/11 03:39 | 5.80 | 432.66 | 37.8500 | 180.00 | ARS1-B11-03714 | | |
| ARS1-B11-03714-04 | 44 | | 5 | B11-03714-04 | 10/06/11 06:48 | 6.76 | 417.01 | 37.1300 | 180.00 | ARS1-B11-03714 | ARS1-11-02040 | 1 |
| ARS1-B11-03714-05 | 44 | | 6 | B11-03714-05 | 10/06/11 09:58 | 8.63 | 417.82 | 37.1600 | 180.00 | ARS1-B11-03714 | ARS1-11-02041 | 1 |
| ARS1-B11-03714-06 | 44 | | 7 | B11-03714-06 | 10/06/11 13:07 | 8.96 | 425.05 | 37.5000 | 180.00 | ARS1-B11-03714 | ARS1-11-02041 | 1 |
| ARS1-B11-03714-07 | 44 | | 8 | B11-03714-07 | 10/06/11 16:16 | 118.78 | 422.42 | 37.3800 | 180.00 | ARS1-B11-03714 | ARS1-11-02041 | 1 |
| ARS1-B11-03714-08 | 44 | | 9 | B11-03714-08 | 10/06/11 19:26 | 19.25 | 424.53 | 37.4800 | 180.00 | ARS1-B11-03714 | ARS1-11-02041 | 1 |
| ARS1-B11-03714-09 | 44 | | 10 | B11-03714-09 | 10/06/11 22:35 | 6.61 | 414.72 | 37.0200 | 180.00 | ARS1-B11-03714 | ARS1-11-02041 | 1 |
| ARS1-B11-03714-10 | 44 | | 11 | B11-03714-10 | 10/07/11 01:45 | 18.26 | 416.63 | 37.1100 | 180.00 | ARS1-B11-03714 | ARS1-11-02041 | 1 |
| ARS1-B11-03714-11 | 44 | | 12 | B11-03714-11 | 10/07/11 04:54 | 9.69 | 418.11 | 37.1800 | 180.00 | ARS1-B11-03714 | ARS1-11-02042 | 1 |
| ARS1-B11-03714-12 | 44 | | 13 | B11-03714-12 | 10/07/11 08:03 | 559.35 | 417.63 | 37.1600 | 180.00 | ARS1-B11-03714 | ARS1-11-02042 | 1 |
| ARS1-B11-03714-13 | 44 | | 14 | B11-03714-13 | 10/07/11 11:13 | 6.49 | 416.56 | 37.1100 | 180.00 | ARS1-B11-03714 | ARS1-11-02042 | 1 |
| ARS1-B11-03714-14 | 44 | | 15 | B11-03714-14 | 10/07/11 14:22 | 43.59 | 416.46 | 37.1000 | 180.00 | ARS1-B11-03714 | ARS1-11-02042 | 1 |
| ARS1-B11-03714-15 | 44 | | 16 | B11-03714-15 | 10/07/11 17:32 | 6.34 | 414.05 | 36.9900 | 180.00 | ARS1-B11-03714 | ARS1-11-02042 | 1 |
| ARS1-B11-03714-16 | 44 | | 17 | B11-03714-16 | 10/07/11 20:41 | 447.09 | 416.63 | 37.1100 | 180.00 | ARS1-B11-03714 | ARS1-11-02042 | 1 |
| ARS1-B11-03714-17 | 44 | | 18 | B11-03714-17 | 10/07/11 23:51 | 382.70 | 416.13 | 37.0900 | 180.00 | ARS1-B11-03714 | ARS1-11-02042 | 1 |
| ARS1-B11-03714-18 | 44 | | 19 | B11-03714-18 | 10/08/11 03:00 | 38.07 | 421.35 | 37.3300 | 180.00 | ARS1-B11-03714 | ARS1-11-02054 | 1 |
| ARS1-B11-03714-19 | 44 | | 20 | B11-03714-19 | 10/08/11 06:09 | 7.02 | 408.88 | 36.7500 | 180.00 | ARS1-B11-03714 | ARS1-11-02054 | 1 |
| ARS1-B11-03714-20 | 44 | | 21 | B11-03714-20 | 10/08/11 09:19 | 6.00 | 412.56 | 36.9200 | 180.00 | ARS1-B11-03714 | ARS1-11-02054 | 1 |
| ARS1-B11-03714-21 | 44 | | 22 | B11-03714-21 | 10/08/11 12:28 | 6.35 | 413.05 | 36.9400 | 180.00 | ARS1-B11-03714 | ARS1-11-02054 | 1 |
| ARS1-B11-03714-22 | 44 | | 23 | B11-03714-22 | 10/08/11 15:38 | 6.45 | 409.98 | 36.8000 | 180.00 | ARS1-B11-03714 | ARS1-11-02054 | 1 |

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 15.820000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.580000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.381900 |
| Sample Aliquot | 5.034200 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 10/5/11 9:21 PM |
| Count Date (t2) | 10/5/11 9:21 PM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| **Variables Intact Test** | **OK** |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | | **VBA** | **V/V** |
| **ACT** | **2399.202241** | **2399.202241** | **OK** |
| **CU** | **80.786266** | **80.786266** | **OK** |
| **TPU** | **149.194536** | **149.194536** | **OK** |
| **MDA** | **195.464447** | **195.464447** | **OK** |
| **DL** | **95.968487** | **95.968487** | **OK** |
| **Net Count Rate** | **10.240000** | **10.240000** | **OK** |
| **D t 1 (t2 - t1)** | **0.000000** | **0.000000** | **OK** |
| **DF** | **1.000000** | **1.000000** | **OK** |
| **Sys Err** | **0.052280** | **0.052280** | **OK** |
| **K** | **0.004268** | **0.004268** | **OK** |
| **K MDA** | **0.768255** | **0.768255** | **OK** |

| Batch Identifiers and Other Related Information | |
|---|---|
| **Batch** | ARS1-B11-03714 |
| **Batch ID** | ARS1-B11-03714-01 |
| **Analysis Code** | |
| **SDG** | QC Sample |
| **Fraction** | N/A QC Sample |
| **Run Number** | |
| **Client** | QC Sample |
| **Client Profile** | |
| **Client ID** | N/A QC Sample |
| **Instr File Name** | 73 |
| **Instr Detector** | P-44-S-2 |
| **Instr keV** | |
| **Version/Date** | 1.0 -- 11/18/2005 |

**Reviewed By:** SQh **Date:** 10-17-11

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 15.830000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.580000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.378100 |
| Sample Aliquot | 5.019400 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 10/6/11 12:30 AM |
| Count Date (t2) | 10/6/11 12:30 AM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.9600 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| **Variables Intact Test** | **OK** |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Excel** | **VBA** | **V/V** |
| **ACT** | **2432.833611** | **2432.833611** | **OK** |
| **CU** | **160.441493** | **160.441493** | **OK** |
| **TPU** | **296.455860** | **296.455860** | **OK** |
| **MDA** | **198.011045** | **198.011045** | **OK** |
| **DL** | **97.218807** | **97.218807** | **OK** |
| **Net Count Rate** | **10.250000** | **10.250000** | **OK** |
| **D t 1 (t2 - t1)** | **0.000000** | **0.000000** | **OK** |
| **DF** | **1.000000** | **1.000000** | **OK** |
| **Sys Err** | **0.052280** | **0.052280** | **OK** |
| **K** | **0.004213** | **0.004213** | **OK** |
| **K MDA** | **0.758375** | **0.758375** | **OK** |

| Batch Identifiers and Other Related Information | |
|---|---|
| **Batch** | ARS1-B11-03714 |
| **Batch ID** | ARS1-B11-03714-02 |
| **Analysis Code** | |
| **SDG** | QC Sample |
| **Fraction** | N/A QC Sample |
| **Run Number** | |
| **Client** | QC Sample |
| **Client Profile** | |
| **Client ID** | N/A QC Sample |
| **Instr File Name** | 73 |
| **Instr Detector** | P-44-S-3 |
| **Instr keV** | |
| **Version/Date** | 1.0 -- 11/18/2005 |



**Reviewed by:** SDL **Date:** 10-17-11

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 5.800000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.580000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.378500 |
| Sample Aliquot | 5.037900 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 10/6/11 3:39 AM |
| Count Date (t2) | 10/6/11 3:39 AM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.9600 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| **Variables Intact Test** | **OK** |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | **Spike** | **VBA** | **V/V** |
| **ACT** | **51.970187** | **51.970187** | **OK** |
| **CU** | **116.418647** | **116.418647** | **OK** |
| **TPU** | **116.540380** | **116.540380** | **OK** |
| **MDA** | **197.075426** | **197.075426** | **OK** |
| **DL** | **96.759440** | **96.759440** | **OK** |
| **Net Count Rate** | **0.220000** | **0.220000** | **OK** |
| **D t 1 (t2 - t1)** | **0.000000** | **0.000000** | **OK** |
| **DF** | **1.000000** | **1.000000** | **OK** |
| **Sys Err** | **0.052280** | **0.052280** | **OK** |
| **K** | **0.004233** | **0.004233** | **OK** |
| **K MDA** | **0.761975** | **0.761975** | **OK** |

| Batch Identifiers and Other Related Information | |
|---|---|
| **Batch** | ARS1-B11-03714 |
| **Batch ID** | ARS1-B11-03714-03 |
| **Analysis Code** | |
| **SDG** | QC Sample |
| **Fraction** | N/A QC Sample |
| **Run Number** | |
| **Client** | QC Sample |
| **Client Profile** | |
| **Client ID** | N/A QC Sample |
| **Instr File Name** | 73 |
| **Instr Detector** | P-44-S-4 |
| **Instr keV** | |
| **Version/Date** | 1.0 -- 11/18/2005 |



**Reviewed by:** SDh **Date:** 10-17-11

# Calculation Verification



| Procedure | ARS-054 |
|---|---|
| **Variable** | **Value** |
| Gross Count Rate | 6.760000 |
| Sample Count Mins | 180.000000 |
| BKG Count Rate | 5.580000 |
| BKG Count Mins | 180.000000 |
| Instrument Efficiency | 0.371300 |
| Sample Aliquot | 5.035000 |
| Dilution Factor | 1.000000 |
| Aliquot Conversion Factor | 0.001000 |
| | |
| Sample Collection Date (t1) | 9/15/11 12:00 PM |
| Count Date (t2) | 10/6/11 6:49 AM |
| Activity Units = pCi --- UCF = | 2.2200 |
| CF | 1.0000 |
| Nuclide Abundance | 1.000000 |
| Halflife Days 1 - Result Isotope | 4499.800000 |
| TPUF_Calibration Factor | 0.041330 |
| TPUF_Aliquoting Factor | 0.020000 |
| TPUF_Yield Factor | 0.000000 |
| TPUF_Decay Ingrowth Factor | 0.025000 |
| TPUF_Analysis Factor | 0.000000 |
| TPUF_Unassigned Factor | 0.000000 |
| Activity Units | pCi |
| Aliquot Units | L |
| **Variables Intact Test** | **OK** |

| Isotope | H-3 | | |
|---|---|---|---|
| **Calculated Values** | | **VBA** | **V/V** |
| **ACT** | **285.229887** | **285.229887** | **OK** |
| **CU** | **63.289891** | **63.289891** | **OK** |
| **TPU** | **65.022844** | **65.022844** | **OK** |
| **MDA** | **201.657276** | **201.657276** | **OK** |
| **DL** | **99.009022** | **99.009022** | **OK** |
| **Net Count Rate** | **1.180000** | **1.180000** | **OK** |
| **D t 1 (t2 - t1)** | **20.784028** | **20.784028** | **OK** |
| **DF** | **0.996804** | **0.996804** | **OK** |
| **Sys Err** | **0.052280** | **0.052280** | **OK** |
| **K** | **0.004137** | **0.004137** | **OK** |
| **K MDA** | **0.744662** | **0.744662** | **OK** |

| Batch Identifiers and Other Related Information | |
|---|---|
| **Batch** | ARS1-B11-03714 |
| **Batch ID** | ARS1-B11-03714-04 |
| **Analysis Code** | LSC-A-001 |
| **SDG** | ARS1-11-02040 |
| **Fraction** | 001 |
| **Run Number** | 1 |
| **Client** | Los Alamos National Laboratory |
| **Client Profile** | Keith Greene |
| **Client ID** | MD21-11-26394 |
| **Instr File Name** | 73 |
| **Instr Detector** | P-44-S-5 |
| **Instr keV** | |
| **Version/Date** | 1.0 -- 11/18/2005 |



**Reviewed by:** SDL **Date:** 10-17-11

ARS INTERNATIONAL

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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Tritium by Low Level Liquid Scintillation Counting

# Laboratory Records

# Analysis Batch Report





ARS INTERNATIONAL

**Analysis Batch ID** **ARS1-B11-03714**

| Method | ARS-054 | Analysis | LSC-A-001 | Matrix | SI |
|---|---|---|---|---|---|
| Description | Tritium (Aqueous) | | | | |

| ABatch Sample ID | Type | Blind Iso1 | Blind Iso2 | Blind Iso3 | SDG | FR | Run | Client ID | Isotope Group | Lab Deadline |
|---|---|---|---|---|---|---|---|---|---|---|
| ARS1-B11-03714-01 | LCS | B-12515 | | | | | | | | |
| ARS1-B11-03714-02 | LCSD | B-12516 | | | | | | | | |
| ARS1-B11-03714-03 | MBL | | | | | | | | | |
| ARS1-B11-03714-04 | TRG | | | | **ARS1-11-02040** | 001 | 1 | MD21-11-26394 | STD | 10/18/11 |
| ARS1-B11-03714-05 | TRG | | | | **ARS1-11-02041** | 001 | 1 | MD21-11-26401 | STD | 10/18/11 |
| ARS1-B11-03714-06 | TRG | | | | **ARS1-11-02041** | 002 | 1 | MD21-11-26398 | STD | 10/18/11 |
| ARS1-B11-03714-07 | TRG | | | | **ARS1-11-02041** | 003 | 1 | MD21-11-26399 | STD | 10/18/11 |
| ARS1-B11-03714-08 | TRG | | | | **ARS1-11-02041** | 004 | 1 | MD21-11-26395 | STD | 10/18/11 |
| ARS1-B11-03714-09 | TRG | | | | **ARS1-11-02041** | 005 | 1 | MD21-11-26397 | STD | 10/18/11 |
| ARS1-B11-03714-10 | TRG | | | | **ARS1-11-02041** | 006 | 1 | MD21-11-26400 | STD | 10/18/11 |
| ARS1-B11-03714-11 | TRG | | | | **ARS1-11-02042** | 001 | 1 | MD21-11-26417 | STD | 10/18/11 |
| ARS1-B11-03714-12 | TRG | | | | **ARS1-11-02042** | 002 | 1 | MD21-11-26415 | STD | 10/18/11 |
| ARS1-B11-03714-13 | TRG | | | | **ARS1-11-02042** | 003 | 1 | MD21-11-26402 | STD | 10/18/11 |
| ARS1-B11-03714-14 | TRG | | | | **ARS1-11-02042** | 004 | 1 | MD21-11-26414 | STD | 10/18/11 |
| ARS1-B11-03714-15 | TRG | | | | **ARS1-11-02042** | 005 | 1 | MD21-11-26420 | STD | 10/18/11 |
| ARS1-B11-03714-16 | TRG | | | | **ARS1-11-02042** | 006 | 1 | MD21-11-26419 | STD | 10/18/11 |
| ARS1-B11-03714-17 | TRG | | | | **ARS1-11-02042** | 007 | 1 | MD21-11-26416 | STD | 10/18/11 |
| ARS1-B11-03714-18 | TRG | | | | **ARS1-11-02054** | 001 | 1 | MD21-11-26436 | STD | 10/18/11 |
| ARS1-B11-03714-19 | TRG | | | | **ARS1-11-02054** | 002 | 1 | MD21-11-26437 | STD | 10/18/11 |
| ARS1-B11-03714-20 | TRG | | | | **ARS1-11-02054** | 003 | 1 | MD21-11-26438 | STD | 10/18/11 |
| ARS1-B11-03714-21 | TRG | | | | **ARS1-11-02054** | 004 | 1 | MD21-11-26435 | STD | 10/18/11 |
| ARS1-B11-03714-22 | TRG | | | | **ARS1-11-02054** | 005 | 1 | MD21-11-26434 | STD | 10/18/11 |

**96929** 11-02040-001-1 **WRAD**
**96930** 11-02041-001-1 **WRAD**
**96931** 11-02041-002-1 **WRAD**
**96932** 11-02041-003-1 **WRAD**
**96933** 11-02041-004-1 **WRAD**
**96934** 11-02041-005-1 **WRAD**
**96935** 11-02041-006-1 **WRAD**
**96936** 11-02042-001-1 **WRAD**
**96937** 11-02042-002-1 **WRAD**
**96938** 11-02042-003-1 **WRAD**
**96939** 11-02042-004-1 **WRAD**
**96940** 11-02042-005-1 **WRAD**
**96941** 11-02042-006-1 **WRAD**
**96942** 11-02042-007-1 **WRAD**
**96943** 11-02054-001-1 **XRAD**
**96944** 11-02054-002-1 **XRAD**
**96945** 11-02054-003-1 **XRAD**
**96946** 11-02054-004-1 **XRAD**
**96947** 11-02054-005-1 **XRAD**

American Radiation Services
Baton Rouge Laboratory

# LCS Report
## Analytical Batch: ARS1-B11-03714



| BlindID | ABatch | ABatchSampleID | BlindGroup | StdID | Isotope | ExpectedAddition | ExpectedValue | EmptyWt | GrossWt | NetWt | UserID | ModDate | ExpectedValue_CT | MidPointCountDate | KnownValue |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B-12515 | ARS1-B11-03714 | ARS1-B11-03714-01 | B-H3 | S-0262 | H-3 | 5 | 2.573293477 | 0 | 1 | 1 | BSTEFFENS | 9/22/2011 | 2.568145577 | 10/5/2011 | 2.568145577 |
| B-12516 | ARS1-B11-03714 | ARS1-B11-03714-02 | B-H3 | S-0262 | H-3 | 5 | 2.573293477 | 0 | 1 | 1 | BSTEFFENS | 9/22/2011 | 2.567750012 | 10/6/2011 | 2.567750012 |

# ARS-054





| ID_31001_054 | ABatch | ABatchSampleID | ClientID | Aliquot1 | AliquotUnits1 | IC_ID1 | Aliquot2 | AliquotUnits2 | IC_ID2 | UserID | ModDate |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10114 | ARS1-B11-03714 | ARS1-B11-03714-01 | | | | | 5.0342 | g | | BSTEFFENS | 10/05/2011 12:27:12 |
| 10115 | ARS1-B11-03714 | ARS1-B11-03714-02 | | | | | 5.0194 | g | | BSTEFFENS | 10/05/2011 12:27:12 |
| 10116 | ARS1-B11-03714 | ARS1-B11-03714-03 | | | | | 5.0379 | g | | BSTEFFENS | 10/05/2011 12:27:13 |
| 10117 | ARS1-B11-03714 | ARS1-B11-03714-04 | MD21-11-26394 | | | | 5.035 | g | 96929 | BSTEFFENS | 10/05/2011 12:27:13 |
| 10118 | ARS1-B11-03714 | ARS1-B11-03714-05 | MD21-11-26401 | | | | 5.0843 | g | 96930 | BSTEFFENS | 10/05/2011 12:27:13 |
| 10119 | ARS1-B11-03714 | ARS1-B11-03714-06 | MD21-11-26398 | | | | 5.0076 | g | 96931 | BSTEFFENS | 10/05/2011 12:27:13 |
| 10120 | ARS1-B11-03714 | ARS1-B11-03714-07 | MD21-11-26399 | | | | 5.0468 | g | 96932 | BSTEFFENS | 10/05/2011 12:27:13 |
| 10121 | ARS1-B11-03714 | ARS1-B11-03714-08 | MD21-11-26395 | | | | 5.025 | g | 96933 | BSTEFFENS | 10/05/2011 12:27:13 |
| 10122 | ARS1-B11-03714 | ARS1-B11-03714-09 | MD21-11-26397 | | | | 5.0285 | g | 96934 | BSTEFFENS | 10/05/2011 12:27:13 |
| 10123 | ARS1-B11-03714 | ARS1-B11-03714-10 | MD21-11-26400 | | | | 5.0336 | g | 96935 | BSTEFFENS | 10/05/2011 12:27:13 |
| 10124 | ARS1-B11-03714 | ARS1-B11-03714-11 | MD21-11-26417 | | | | 5.0391 | g | 96936 | BSTEFFENS | 10/05/2011 12:27:13 |
| 10125 | ARS1-B11-03714 | ARS1-B11-03714-12 | MD21-11-26415 | | | | 5.0334 | g | 96937 | BSTEFFENS | 10/05/2011 12:27:13 |
| 10126 | ARS1-B11-03714 | ARS1-B11-03714-13 | MD21-11-26402 | | | | 5.0575 | g | 96938 | BSTEFFENS | 10/05/2011 12:27:13 |
| 10127 | ARS1-B11-03714 | ARS1-B11-03714-14 | MD21-11-26414 | | | | 5.0409 | g | 96939 | BSTEFFENS | 10/05/2011 12:27:13 |
| 10128 | ARS1-B11-03714 | ARS1-B11-03714-15 | MD21-11-26420 | | | | 5.0515 | g | 96940 | BSTEFFENS | 10/05/2011 12:27:14 |
| 10129 | ARS1-B11-03714 | ARS1-B11-03714-16 | MD21-11-26419 | | | | 5.0361 | g | 96941 | BSTEFFENS | 10/05/2011 12:27:14 |
| 10130 | ARS1-B11-03714 | ARS1-B11-03714-17 | MD21-11-26416 | | | | 5.0389 | g | 96942 | BSTEFFENS | 10/05/2011 12:27:14 |
| 10131 | ARS1-B11-03714 | ARS1-B11-03714-18 | MD21-11-26436 | | | | 5.0188 | g | 96943 | BSTEFFENS | 10/05/2011 12:27:14 |
| 10132 | ARS1-B11-03714 | ARS1-B11-03714-19 | MD21-11-26437 | | | | 5.0442 | g | 96944 | BSTEFFENS | 10/05/2011 12:27:14 |
| 10133 | ARS1-B11-03714 | ARS1-B11-03714-20 | MD21-11-26438 | | | | 5.0567 | g | 96945 | BSTEFFENS | 10/05/2011 12:27:14 |
| 10134 | ARS1-B11-03714 | ARS1-B11-03714-21 | MD21-11-26435 | | | | 5.0341 | g | 96946 | BSTEFFENS | 10/05/2011 12:27:14 |
| 10135 | ARS1-B11-03714 | ARS1-B11-03714-22 | MD21-11-26434 | | | | 5.0295 | g | 96947 | BSTEFFENS | 10/05/2011 12:27:14 |

# Batch Result Verification Report



| ABatchSampleID | SDG | Fraction | ClientID | Run | Isotope | ACT | TPU | TPU1s | TPU2s | MDA | DL | CU | CU1s | CU2s | ActivityReportUnits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARS1-B11-03714-01 | | | | 1 | H-3 | 2399.202241 | 149.1945356 | 149.1945356 | 292.4212897 | 195.4644473 | 95.96848721 | 80.78626615 | 80.7862661 | 158.341082 | pCi |
| ARS1-B11-03714-02 | | | | 1 | H-3 | 2432.833611 | 296.4558601 | 151.2529899 | 296.4558601 | 198.0110451 | 97.21880733 | 160.4414929 | 81.8579045 | 160.441493 | pCi |
| ARS1-B11-03714-03 | | | | 1 | H-3 | 51.97018704 | 116.5403801 | 59.45937761 | 116.5403801 | 197.0754256 | 96.75943997 | 116.4186473 | 59.397269 | 116.418647 | pCi |
| ARS1-B11-03714-04 | ARS1-11-02040 | 001 | MD21-11-26394 | 1 | H-3 | 285.2298868 | 65.02284419 | 65.02284419 | 127.4447746 | 201.6572759 | 99.00902169 | 63.28989126 | 63.2898913 | 124.048187 | pCi |
| ARS1-B11-03714-05 | ARS1-11-02041 | 001 | MD21-11-26401 | 1 | H-3 | 729.4109757 | 77.26090169 | 77.26090169 | 151.4313673 | 199.5139784 | 97.95671255 | 67.19442487 | 67.1944249 | 131.701073 | pCi |
| ARS1-B11-03714-06 | ARS1-11-02041 | 002 | MD21-11-26398 | 1 | H-3 | 813.287237 | 80.52695818 | 80.52695818 | 157.832838 | 200.7373242 | 98.55734681 | 68.38694564 | 68.3869456 | 134.038413 | pCi |
| ARS1-B11-03714-07 | ARS1-11-02041 | 003 | MD21-11-26399 | 1 | H-3 | 27113.64909 | 1431.406707 | 1431.406707 | 2805.557146 | 199.8215936 | 98.10774445 | 199.0882588 | 199.088259 | 390.212987 | pCi |
| ARS1-B11-03714-08 | ARS1-11-02041 | 004 | MD21-11-26395 | 1 | H-3 | 3279.733699 | 193.2360883 | 193.2360883 | 378.7427331 | 200.1570731 | 98.27245707 | 89.10912412 | 89.1091241 | 174.653883 | pCi |
| ARS1-B11-03714-09 | ARS1-11-02041 | 005 | MD21-11-26397 | 1 | H-3 | 250.0212365 | 64.50734859 | 64.50734859 | 126.4344032 | 202.5072369 | 99.42633272 | 63.16918508 | 63.1691851 | 123.811603 | pCi |
| ARS1-B11-03714-10 | ARS1-11-02041 | 006 | MD21-11-26400 | 1 | H-3 | 3067.417716 | 182.9405082 | 182.9405082 | 358.5633961 | 201.8155111 | 99.08671146 | 88.03807563 | 88.0380756 | 172.554628 | pCi |
| ARS1-B11-03714-11 | ARS1-11-02042 | 001 | MD21-11-26417 | 1 | H-3 | 990.8567395 | 87.25865188 | 87.25865188 | 171.0269577 | 201.1267889 | 98.74856491 | 70.21862351 | 70.2186235 | 137.628502 | pCi |
| ARS1-B11-03714-12 | ARS1-11-02042 | 002 | MD21-11-26415 | 1 | H-3 | 133731.1285 | 7004.503224 | 7004.503224 | 13728.82632 | 201.4670183 | 98.91560964 | 427.8230223 | 427.823022 | 838.533124 | pCi |
| ARS1-B11-03714-13 | ARS1-11-02042 | 003 | MD21-11-26402 | 1 | H-3 | 219.1110387 | 63.39407564 | 63.39407564 | 124.2523882 | 200.8740053 | 98.62445409 | 62.35054411 | 62.3505441 | 122.207066 | pCi |
| ARS1-B11-03714-14 | ARS1-11-02042 | 004 | MD21-11-26414 | 1 | H-3 | 9180.656119 | 496.2858367 | 496.2858367 | 972.7202399 | 201.5007768 | 98.93218426 | 126.2378828 | 126.237883 | 247.42625 | pCi |
| ARS1-B11-03714-15 | ARS1-11-02042 | 005 | MD21-11-26420 | 1 | H-3 | 183.7280757 | 62.94767087 | 62.94767087 | 123.3774349 | 201.6799886 | 99.0201731 | 62.21051682 | 62.2105168 | 121.932613 | pCi |
| ARS1-B11-03714-16 | ARS1-11-02042 | 006 | MD21-11-26419 | 1 | H-3 | 106716.2727 | 5592.248393 | 5592.248393 | 10960.80685 | 201.6466344 | 99.00379695 | 383.3051972 | 383.305197 | 751.278186 | pCi |
| ARS1-B11-03714-17 | ARS1-11-02042 | 007 | MD21-11-26416 | 1 | H-3 | 91153.05368 | 4778.660373 | 4778.660373 | 9366.17433 | 201.6473557 | 99.00415108 | 354.999642 | 354.999642 | 695.799298 | pCi |
| ARS1-B11-03714-18 | ARS1-11-02054 | 001 | MD21-11-26436 | 1 | H-3 | 7831.610718 | 426.2940778 | 426.2940778 | 835.5363926 | 201.0954548 | 98.73318062 | 118.7017857 | 118.701786 | 232.6555 | pCi |
| ARS1-B11-03714-19 | ARS1-11-02054 | 002 | MD21-11-26437 | 1 | H-3 | 350.8172107 | 67.01516467 | 67.01516467 | 131.3497228 | 203.2447205 | 99.78841998 | 64.45660384 | 64.4566038 | 126.334944 | pCi |
| ARS1-B11-03714-20 | ARS1-11-02054 | 003 | MD21-11-26438 | 1 | H-3 | 101.600824 | 61.58674594 | 61.58674594 | 120.710022 | 201.8128491 | 99.08540449 | 61.35726133 | 61.3572613 | 120.260232 | pCi |
| ARS1-B11-03714-21 | ARS1-11-02054 | 004 | MD21-11-26435 | 1 | H-3 | 187.0069053 | 63.28434424 | 63.28434424 | 124.0373147 | 202.6132264 | 99.47837109 | 62.52459504 | 62.524595 | 122.548206 | pCi |
| ARS1-B11-03714-22 | ARS1-11-02054 | 005 | MD21-11-26434 | 1 | H-3 | 212.2956276 | 64.05277182 | 64.05277182 | 125.5434328 | 203.5741692 | 99.95017159 | 63.08387436 | 63.0838744 | 123.644394 | pCi |

# Batch Result Verification Report



| ABatchSampleID | SDG | Fraction | AliquotReportUnits | ChemRecovery | TracerRecovery | SampleCounts | SampleCountMins | BKG_Counts | BKG_CountMins | EFF | ALIQ | SampleCollDate | MidPointCountDate | BP_DL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARS1-B11-03714-01 | | | L | | | 0.087888889 | 180 | 0.031 | 180 | 0.3819 | 5.0342 | 10/10/2011 | 10/5/2011 | |
| ARS1-B11-03714-02 | | | L | | | 0.087944444 | 180 | 0.031 | 180 | 0.3781 | 5.0194 | 10/10/2011 | 10/6/2011 | |
| ARS1-B11-03714-03 | | | L | | | 0.032222222 | 180 | 0.031 | 180 | 0.3785 | 5.0379 | 10/10/2011 | 10/6/2011 | |
| ARS1-B11-03714-04 | ARS1-11-02040 | 001 | L | | | 0.037555556 | 180 | 0.031 | 180 | 0.3713 | 5.035 | 9/15/2011 | 10/6/2011 | |
| ARS1-B11-03714-05 | ARS1-11-02041 | 001 | L | | | 0.047944444 | 180 | 0.031 | 180 | 0.3716 | 5.0843 | 9/16/2011 | 10/6/2011 | |
| ARS1-B11-03714-06 | ARS1-11-02041 | 002 | L | | | 0.049777778 | 180 | 0.031 | 180 | 0.375 | 5.0076 | 9/16/2011 | 10/6/2011 | |
| ARS1-B11-03714-07 | ARS1-11-02041 | 003 | L | | | 0.659888889 | 180 | 0.031 | 180 | 0.3738 | 5.0468 | 9/16/2011 | 10/6/2011 | |
| ARS1-B11-03714-08 | ARS1-11-02041 | 004 | L | | | 0.106944444 | 180 | 0.031 | 180 | 0.3748 | 5.025 | 9/16/2011 | 10/6/2011 | |
| ARS1-B11-03714-09 | ARS1-11-02041 | 005 | L | | | 0.036722222 | 180 | 0.031 | 180 | 0.3702 | 5.0285 | 9/16/2011 | 10/6/2011 | |
| ARS1-B11-03714-10 | ARS1-11-02041 | 006 | L | | | 0.101444444 | 180 | 0.031 | 180 | 0.3711 | 5.0336 | 9/16/2011 | 10/7/2011 | |
| ARS1-B11-03714-11 | ARS1-11-02042 | 001 | L | | | 0.053833333 | 180 | 0.031 | 180 | 0.3718 | 5.0391 | 9/19/2011 | 10/7/2011 | |
| ARS1-B11-03714-12 | ARS1-11-02042 | 002 | L | | | 3.1075 | 180 | 0.031 | 180 | 0.3716 | 5.0334 | 9/19/2011 | 10/7/2011 | |
| ARS1-B11-03714-13 | ARS1-11-02042 | 003 | L | | | 0.036055556 | 180 | 0.031 | 180 | 0.3711 | 5.0575 | 9/16/2011 | 10/7/2011 | |
| ARS1-B11-03714-14 | ARS1-11-02042 | 004 | L | | | 0.242166667 | 180 | 0.031 | 180 | 0.371 | 5.0409 | 9/19/2011 | 10/7/2011 | |
| ARS1-B11-03714-15 | ARS1-11-02042 | 005 | L | | | 0.035222222 | 180 | 0.031 | 180 | 0.3699 | 5.0515 | 9/19/2011 | 10/7/2011 | |
| ARS1-B11-03714-16 | ARS1-11-02042 | 006 | L | | | 2.483833333 | 180 | 0.031 | 180 | 0.3711 | 5.0361 | 9/19/2011 | 10/7/2011 | |
| ARS1-B11-03714-17 | ARS1-11-02042 | 007 | L | | | 2.126111111 | 180 | 0.031 | 180 | 0.3709 | 5.0389 | 9/19/2011 | 10/7/2011 | |
| ARS1-B11-03714-18 | ARS1-11-02054 | 001 | L | | | 0.2115 | 180 | 0.031 | 180 | 0.3733 | 5.0188 | 9/21/2011 | 10/8/2011 | |
| ARS1-B11-03714-19 | ARS1-11-02054 | 002 | L | | | 0.039 | 180 | 0.031 | 180 | 0.3675 | 5.0442 | 9/21/2011 | 10/8/2011 | |
| ARS1-B11-03714-20 | ARS1-11-02054 | 003 | L | | | 0.033333333 | 180 | 0.031 | 180 | 0.3692 | 5.0567 | 9/21/2011 | 10/8/2011 | |
| ARS1-B11-03714-21 | ARS1-11-02054 | 004 | L | | | 0.035277778 | 180 | 0.031 | 180 | 0.3694 | 5.0341 | 9/21/2011 | 10/8/2011 | |
| ARS1-B11-03714-22 | ARS1-11-02054 | 005 | L | | | 0.035833333 | 180 | 0.031 | 180 | 0.368 | 5.0295 | 9/21/2011 | 10/8/2011 | |

# Batch Result Verification Report



| ABatchSampleID | SDG | Fraction | BP_MDA | Sb_Val | UCF | CF | GrossCountRate | BKGCountRate | NetCountRate | PlatingRecovery | InstFileName | DetectorID | InstrumentkeV | NuclideAbd | TracerMeasACT | TracerKnownACT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARS1-B11-03714-01 | | | | | 2.22 | 1 | 15.82 | 5.58 | 10.24 | | 73 | P-44-S-2 | | | | |
| ARS1-B11-03714-02 | | | | | 2.22 | 1.96 | 15.83 | 5.58 | 10.25 | | 73 | P-44-S-3 | | | | |
| ARS1-B11-03714-03 | | | | | 2.22 | 1.96 | 5.8 | 5.58 | 0.22 | | 73 | P-44-S-4 | | | | |
| ARS1-B11-03714-04 | ARS1-11-02040 | 001 | | | 2.22 | 1 | 6.76 | 5.58 | 1.18 | | 73 | P-44-S-5 | | | | |
| ARS1-B11-03714-05 | ARS1-11-02041 | 001 | | | 2.22 | 1 | 8.63 | 5.58 | 3.05 | | 73 | P-44-S-6 | | | | |
| ARS1-B11-03714-06 | ARS1-11-02041 | 002 | | | 2.22 | 1 | 8.96 | 5.58 | 3.38 | | 73 | P-44-S-7 | | | | |
| ARS1-B11-03714-07 | ARS1-11-02041 | 003 | | | 2.22 | 1 | 118.78 | 5.58 | 113.2 | | 73 | P-44-S-8 | | | | |
| ARS1-B11-03714-08 | ARS1-11-02041 | 004 | | | 2.22 | 1 | 19.25 | 5.58 | 13.67 | | 73 | P-44-S-9 | | | | |
| ARS1-B11-03714-09 | ARS1-11-02041 | 005 | | | 2.22 | 1 | 6.61 | 5.58 | 1.03 | | 73 | P-44-S-10 | | | | |
| ARS1-B11-03714-10 | ARS1-11-02041 | 006 | | | 2.22 | 1 | 18.26 | 5.58 | 12.68 | | 73 | P-44-S-11 | | | | |
| ARS1-B11-03714-11 | ARS1-11-02042 | 001 | | | 2.22 | 1 | 9.69 | 5.58 | 4.11 | | 73 | P-44-S-12 | | | | |
| ARS1-B11-03714-12 | ARS1-11-02042 | 002 | | | 2.22 | 1 | 559.35 | 5.58 | 553.77 | | 73 | P-44-S-13 | | | | |
| ARS1-B11-03714-13 | ARS1-11-02042 | 003 | | | 2.22 | 1 | 6.49 | 5.58 | 0.91 | | 73 | P-44-S-14 | | | | |
| ARS1-B11-03714-14 | ARS1-11-02042 | 004 | | | 2.22 | 1 | 43.59 | 5.58 | 38.01 | | 73 | P-44-S-15 | | | | |
| ARS1-B11-03714-15 | ARS1-11-02042 | 005 | | | 2.22 | 1 | 6.34 | 5.58 | 0.76 | | 73 | P-44-S-16 | | | | |
| ARS1-B11-03714-16 | ARS1-11-02042 | 006 | | | 2.22 | 1 | 447.09 | 5.58 | 441.51 | | 73 | P-44-S-17 | | | | |
| ARS1-B11-03714-17 | ARS1-11-02042 | 007 | | | 2.22 | 1 | 382.7 | 5.58 | 377.12 | | 73 | P-44-S-18 | | | | |
| ARS1-B11-03714-18 | ARS1-11-02054 | 001 | | | 2.22 | 1 | 38.07 | 5.58 | 32.49 | | 73 | P-44-S-19 | | | | |
| ARS1-B11-03714-19 | ARS1-11-02054 | 002 | | | 2.22 | 1 | 7.02 | 5.58 | 1.44 | | 73 | P-44-S-20 | | | | |
| ARS1-B11-03714-20 | ARS1-11-02054 | 003 | | | 2.22 | 1 | 6 | 5.58 | 0.42 | | 73 | P-44-S-21 | | | | |
| ARS1-B11-03714-21 | ARS1-11-02054 | 004 | | | 2.22 | 1 | 6.35 | 5.58 | 0.77 | | 73 | P-44-S-22 | | | | |
| ARS1-B11-03714-22 | ARS1-11-02054 | 005 | | | 2.22 | 1 | 6.45 | 5.58 | 0.87 | | 73 | P-44-S-23 | | | | |

# Batch Result Verification Report



| ABatchSampleID | SDG | Fraction | TracerIsotope | TracerRefDate | TracerRefACT | TracerKnown | Halflife1 | Halflife2 | Halflife3 | TPUF_1 | TPUF_2 | TPUF_3 | TPUF_4 | TPUF_5 | TPUF_6 | DeltaT1 | DeltaT2 | DeltaT3 | DeltaT4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARS1-B11-03714-01 | | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 0 | | | |
| ARS1-B11-03714-02 | | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 0 | | | |
| ARS1-B11-03714-03 | | | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 0 | | | |
| ARS1-B11-03714-04 | ARS1-11-02040 | 001 | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 20.78402778 | | | |
| ARS1-B11-03714-05 | ARS1-11-02041 | 001 | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 19.91527778 | | | |
| ARS1-B11-03714-06 | ARS1-11-02041 | 002 | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 20.04722222 | | | |
| ARS1-B11-03714-07 | ARS1-11-02041 | 003 | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 20.17847222 | | | |
| ARS1-B11-03714-08 | ARS1-11-02041 | 004 | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 20.30972222 | | | |
| ARS1-B11-03714-09 | ARS1-11-02041 | 005 | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 20.44166667 | | | |
| ARS1-B11-03714-10 | ARS1-11-02041 | 006 | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 20.57291667 | | | |
| ARS1-B11-03714-11 | ARS1-11-02042 | 001 | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 17.70416667 | | | |
| ARS1-B11-03714-12 | ARS1-11-02042 | 002 | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 17.83611111 | | | |
| ARS1-B11-03714-13 | ARS1-11-02042 | 003 | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 20.96736111 | | | |
| ARS1-B11-03714-14 | ARS1-11-02042 | 004 | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 18.09930556 | | | |
| ARS1-B11-03714-15 | ARS1-11-02042 | 005 | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 18.23055556 | | | |
| ARS1-B11-03714-16 | ARS1-11-02042 | 006 | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 18.36180556 | | | |
| ARS1-B11-03714-17 | ARS1-11-02042 | 007 | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 18.49375 | | | |
| ARS1-B11-03714-18 | ARS1-11-02054 | 001 | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 16.62569444 | | | |
| ARS1-B11-03714-19 | ARS1-11-02054 | 002 | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 16.75694444 | | | |
| ARS1-B11-03714-20 | ARS1-11-02054 | 003 | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 16.88819444 | | | |
| ARS1-B11-03714-21 | ARS1-11-02054 | 004 | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 17.02013889 | | | |
| ARS1-B11-03714-22 | ARS1-11-02054 | 005 | | | | | 4499.8 | | | 0.04133 | 0.02 | 0 | 0.025 | 0 | 0 | 17.15138889 | | | |

# Batch Result Verification Report





| ABatchSampleID | SDG | Fraction | DeltaT5 | DeltaT6 | DF1 | DF2 | DF3 | IF1 | IF2 | SysErr | K_Val | K_MDA | AnalysisCode | UserID | ModDate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARS1-B11-03714-01 | | | | | 1 | | | | | 0.052279718 | 0.004268085 | 0.768255368 | | BSTEFFENS | 10/10/2011 |
| ARS1-B11-03714-02 | | | | | 1 | | | | | 0.052279718 | 0.004213194 | 0.758374922 | | BSTEFFENS | 10/10/2011 |
| ARS1-B11-03714-03 | | | | | 1 | | | | | 0.052279718 | 0.004233196 | 0.761975322 | | BSTEFFENS | 10/10/2011 |
| ARS1-B11-03714-04 | ARS1-11-02040 | 001 | | | 0.996803557 | | | | | 0.052279718 | 0.004137014 | 0.744662498 | LSC-A-001 | BSTEFFENS | 10/10/2011 |
| ARS1-B11-03714-05 | ARS1-11-02041 | 001 | | | 0.99693696 | | | | | 0.052279718 | 0.004181456 | 0.752662104 | LSC-A-001 | BSTEFFENS | 10/10/2011 |
| ARS1-B11-03714-06 | ARS1-11-02041 | 002 | | | 0.996916698 | | | | | 0.052279718 | 0.004155973 | 0.748075185 | LSC-A-001 | BSTEFFENS | 10/10/2011 |
| ARS1-B11-03714-07 | ARS1-11-02041 | 003 | | | 0.996896543 | | | | | 0.052279718 | 0.004175019 | 0.751503419 | LSC-A-001 | BSTEFFENS | 10/10/2011 |
| ARS1-B11-03714-08 | ARS1-11-02041 | 004 | | | 0.996876388 | | | | | 0.052279718 | 0.004168021 | 0.750243839 | LSC-A-001 | BSTEFFENS | 10/10/2011 |
| ARS1-B11-03714-09 | ARS1-11-02041 | 005 | | | 0.996856127 | | | | | 0.052279718 | 0.00411965 | 0.741537009 | LSC-A-001 | BSTEFFENS | 10/10/2011 |
| ARS1-B11-03714-10 | ARS1-11-02041 | 006 | | | 0.996835973 | | | | | 0.052279718 | 0.00413377 | 0.744078639 | LSC-A-001 | BSTEFFENS | 10/10/2011 |
| ARS1-B11-03714-11 | ARS1-11-02042 | 001 | | | 0.997276574 | | | | | 0.052279718 | 0.004147926 | 0.746626602 | LSC-A-001 | BSTEFFENS | 10/10/2011 |
| ARS1-B11-03714-12 | ARS1-11-02042 | 002 | | | 0.997256304 | | | | | 0.052279718 | 0.004140921 | 0.745365728 | LSC-A-001 | BSTEFFENS | 10/10/2011 |
| ARS1-B11-03714-13 | ARS1-11-02042 | 003 | | | 0.996775407 | | | | | 0.052279718 | 0.004153145 | 0.74756617 | LSC-A-001 | BSTEFFENS | 10/10/2011 |
| ARS1-B11-03714-14 | ARS1-11-02042 | 004 | | | 0.997215874 | | | | | 0.052279718 | 0.004140227 | 0.745240853 | LSC-A-001 | BSTEFFENS | 10/10/2011 |
| ARS1-B11-03714-15 | ARS1-11-02042 | 005 | | | 0.997195713 | | | | | 0.052279718 | 0.004136548 | 0.744578636 | LSC-A-001 | BSTEFFENS | 10/10/2011 |
| ARS1-B11-03714-16 | ARS1-11-02042 | 006 | | | 0.997175552 | | | | | 0.052279718 | 0.004137232 | 0.744701796 | LSC-A-001 | BSTEFFENS | 10/10/2011 |
| ARS1-B11-03714-17 | ARS1-11-02042 | 007 | | | 0.997155285 | | | | | 0.052279718 | 0.004137217 | 0.744699132 | LSC-A-001 | BSTEFFENS | 10/10/2011 |
| ARS1-B11-03714-18 | ARS1-11-02054 | 001 | | | 0.997442262 | | | | | 0.052279718 | 0.004148572 | 0.746742938 | LSC-A-001 | BSTEFFENS | 10/10/2011 |
| ARS1-B11-03714-19 | ARS1-11-02054 | 002 | | | 0.997422096 | | | | | 0.052279718 | 0.004104702 | 0.738846305 | LSC-A-001 | BSTEFFENS | 10/10/2011 |
| ARS1-B11-03714-20 | ARS1-11-02054 | 003 | | | 0.997401931 | | | | | 0.052279718 | 0.004133825 | 0.744088454 | LSC-A-001 | BSTEFFENS | 10/10/2011 |
| ARS1-B11-03714-21 | ARS1-11-02054 | 004 | | | 0.997381659 | | | | | 0.052279718 | 0.004117495 | 0.741149102 | LSC-A-001 | BSTEFFENS | 10/10/2011 |
| ARS1-B11-03714-22 | ARS1-11-02054 | 005 | | | 0.997361495 | | | | | 0.052279718 | 0.004098059 | 0.737650614 | LSC-A-001 | BSTEFFENS | 10/10/2011 |

Assay Definition-

Assay Description:
H3 Normal Lvl

Assay Type: DPM (Single)
Report Name: Report1
Output Data Path: C:\Packard\Tricarb\Results\ARS\H-3 Normal Lvl\20111005_1806
Raw Results Path: C:\Packard\Tricarb\Results\ARS\H-3 Normal Lvl\20111005_1806\20111005_1806.results
RTF File Name: C:\Packard\Tricarb\Results\ARS\H-3 Normal Lvl\20111005_1806\H3 Results.rtf
Comma-Delimited File Name: C:\Packard\Tricarb\Results\ARS\H-3 Normal Lvl\20111005_1806\H3 Results.csv
Assay File Name: C:\Packard\TriCarb\Assays\H-3 Normal Lvl.lsa

Count Conditions-

Nuclide: H-3 Normal
Quench Indicator: tSIE/AEC
External Std Terminator (sec): 0.5 2s%
Pre-Count Delay (min): 0.00
Quench Set:
Low Energy: UG STD H-3
Count Time (min): 180.00
Count Mode: Normal
Assay Count Cycles: 1 Repeat Sample Count: 1
#Vials/Sample: 1 Calculate % Reference: Off

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

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

Count Corrections-

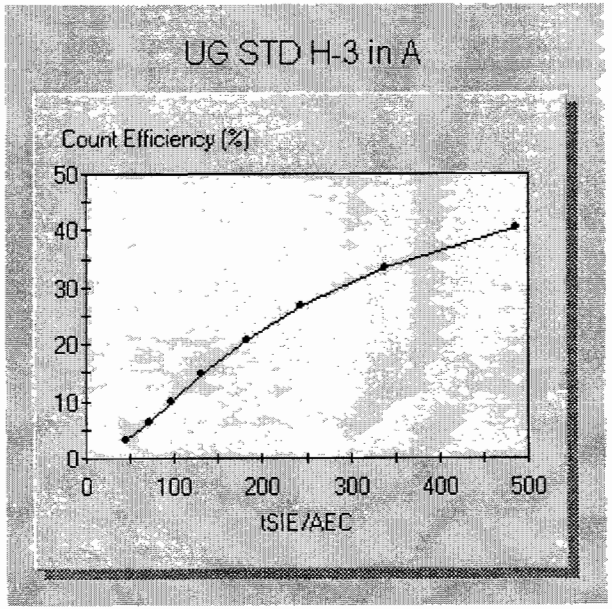
Static Controller: On Luminescence Correction: Off
Colored Samples: Off Heterogeneity Monitor: Off
Coincidence Time (nsec): 18 Delay Before Burst (nsec): 75

Half Life-

Half Life Correction: Off

| Regions | Half Life | Units | Reference Date | Reference Time |
|---|---|---|---|---|

Cycle 1 Results
Quench Curve Block Data




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

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

| P# | S# | SMPL_ID | CPMA | DPM1 | tSIE | Eff Nucl In A | Count Time | DATE | TIME | MESSAGES |
|---|---|---|---|---|---|---|---|---|---|---|
| 44 | 1 | BACKGROUND | 5.58 | 14.85 | 427.23 | 37.60 | 180.00 | 10/5/2011 | 6:11:55 PM | |
| 44 | 2 | B11-03714-01 | 15.82 | 41.43 | 439.96 | 38.19 | 180.00 | 10/5/2011 | 9:20:44 PM | |
| 44 | 3 | B11-03714-02 | 15.83 | 41.87 | 431.68 | 37.81 | 180.00 | 10/6/2011 | 12:30:05 AM | |
| 44 | 4 | B11-03714-03 | 5.80 | 15.32 | 432.66 | 37.85 | 180.00 | 10/6/2011 | 3:39:26 AM | |
| 44 | 5 | B11-03714-04 | 6.76 | 18.22 | 417.01 | 37.13 | 180.00 | 10/6/2011 | 6:48:47 AM | |
| 44 | 6 | B11-03714-05 | 8.63 | 23.23 | 417.82 | 37.16 | 180.00 | 10/6/2011 | 9:58:10 AM | |
| 44 | 7 | B11-03714-06 | 8.96 | 23.89 | 425.05 | 37.50 | 180.00 | 10/6/2011 | 1:07:33 PM | |
| 44 | 8 | B11-03714-07 | 118.78 | 317.78 | 422.42 | 37.38 | 180.00 | 10/6/2011 | 4:16:53 PM | |
| 44 | 9 | B11-03714-08 | 19.25 | 51.37 | 424.53 | 37.48 | 180.00 | 10/6/2011 | 7:26:18 PM | |
| 44 | 10 | B11-03714-09 | 6.61 | 17.86 | 414.72 | 37.02 | 180.00 | 10/6/2011 | 10:35:41 PM | |
| 44 | 11 | B11-03714-10 | 18.26 | 49.20 | 416.63 | 37.11 | 180.00 | 10/7/2011 | 1:45:04 AM | |
| 44 | 12 | B11-03714-11 | 9.69 | 26.07 | 418.11 | 37.18 | 180.00 | 10/7/2011 | 4:54:24 AM | |
| 44 | 13 | B11-03714-12 | 559.35 | 1505.43 | 417.63 | 37.16 | 180.00 | 10/7/2011 | 8:03:52 AM | |
| 44 | 14 | B11-03714-13 | 6.49 | 17.48 | 416.56 | 37.11 | 180.00 | 10/7/2011 | 11:13:17 AM | |
| 44 | 15 | B11-03714-14 | 43.59 | 117.50 | 416.46 | 37.10 | 180.00 | 10/7/2011 | 2:22:35 PM | |
| 44 | 16 | B11-03714-15 | 6.34 | 17.14 | 414.05 | 36.99 | 180.00 | 10/7/2011 | 5:32:01 PM | |
| 44 | 17 | B11-03714-16 | 447.09 | 1204.81 | 416.63 | 37.11 | 180.00 | 10/7/2011 | 8:41:29 PM | |
| 44 | 18 | B11-03714-17 | 382.70 | 1031.94 | 416.13 | 37.09 | 180.00 | 10/7/2011 | 11:51:02 PM | |
| 44 | 19 | B11-03714-18 | 38.07 | 102.00 | 421.35 | 37.33 | 180.00 | 10/8/2011 | 3:00:30 AM | |
| 44 | 20 | B11-03714-19 | 7.02 | 19.10 | 408.88 | 36.75 | 180.00 | 10/8/2011 | 6:09:58 AM | |
| 44 | 21 | B11-03714-20 | 6.00 | 16.25 | 412.56 | 36.92 | 180.00 | 10/8/2011 | 9:19:26 AM | |
| 44 | 22 | B11-03714-21 | 6.35 | 17.19 | 413.05 | 36.94 | 180.00 | 10/8/2011 | 12:28:54 PM | |
| 44 | 23 | B11-03714-22 | 6.45 | 17.53 | 409.98 | 36.80 | 180.00 | 10/8/2011 | 3:38:22 PM | |

# Beta Liquid Scintillation Counter Log Book

| Date | Time | ARS Sample I.D. Number | Batch Number | Liquid Scintillation File Number | Technician Initials |
|---|---|---|---|---|---|
| 9-29-11 | 1019 | B11-03628-14 | B11-03628 | 1320 | |
| 10-3-11 | 0738 | SNC117 | ~~B11-03628~~ QA | QA | |
| ↓ | ↓ | Background | B11-03628 ↓ | 0917 | |
| ↓ | ↓ | B11-03628-18 | ↓ | ↓ | |
| 10-3-11 | 0756 | B11-03628-18 | B11-03628 | 0757 | |
| ↓ | 0844 | SNC117 | QA | QA | |
| ↓ | ↓ | B11-03628-18 | B11-03628 | 1023 | |
| 10-5-11 | 1613 | SNC117 | QA | QA | |
| ↓ | ↓ | Background | B11-03714 | 1806 | |
| ↓ | ↓ | B11-03714-01 | ↓ | ↓ | |
| ↓ | ↓ | B11-03714-02 | ↓ | ↓ | |
| ↓ | ↓ | B11-03714-03 | ↓ | ↓ | |
| ↓ | ↓ | B11-03714-04 | ↓ | ↓ | |
| ↓ | ↓ | B11-03714-05 | ↓ | ↓ | |
| ↓ | ↓ | B11-03714-06 | ↓ | ↓ | |
| ↓ | ↓ | B11-03714-07 | ↓ | ↓ | |
| ↓ | ↓ | B11-03714-08 | ↓ | ↓ | |
| ↓ | ↓ | B11-03714-09 | ↓ | ↓ | |
| ↓ | ↓ | B11-03714-10 | ↓ | ↓ | |
| ↓ | ↓ | B11-03714-11 | ↓ | ↓ | |



Reviewed By: SDL Date: 10-18-11
Initials

# Beta Liquid Scintillation Counter Log Book

| Date | Time | ARS Sample I.D. Number | Batch Number | Liquid Scintillation File Number | Technician Initials |
|---|---|---|---|---|---|
| 10-5-11 | 1613 | B11-03714-12 | B11-03714 | 1806 | [illegible] |
| ↓ | ↓ | B11-03714-13 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-03714-14 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-03714-15 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-03714-16 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-03714-17 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-03714-18 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-03714-19 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-03714-20 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-03714-21 | ↓ | ↓ | [illegible] |
| ↓ | ↓ | B11-03714-22 | ↓ | ↓ | [illegible] |
| 10-7-11 | 1241 | SNC 117 | QA | QA | RJR |
| 10-7-11 | 1243 | Background | B11-03814 | 2021 | RJR |
| ↓ | ↓ | B11-03814-01 | ↓ | ↓ | RJR |
| ↓ | ↓ | B11-03814-02 | ↓ | ↓ | RJR |
| ↓ | ↓ | B11-03814-03 | ↓ | ↓ | RJR |
| ↓ | ↓ | B11-03814-04 | ↓ | ↓ | RJR |
| ↓ | ↓ | B11-03814-05 | ↓ | ↓ | RJR |
| ↓ | ↓ | B11-03814-06 | ↓ | ↓ | RJR |
| ↓ | ↓ | B11-03814-07 | ↓ | ↓ | RJR |



Reviewed By: SDL Date: 10-18-11
Initials

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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Tritium by Low Level Liquid Scintillation Counting

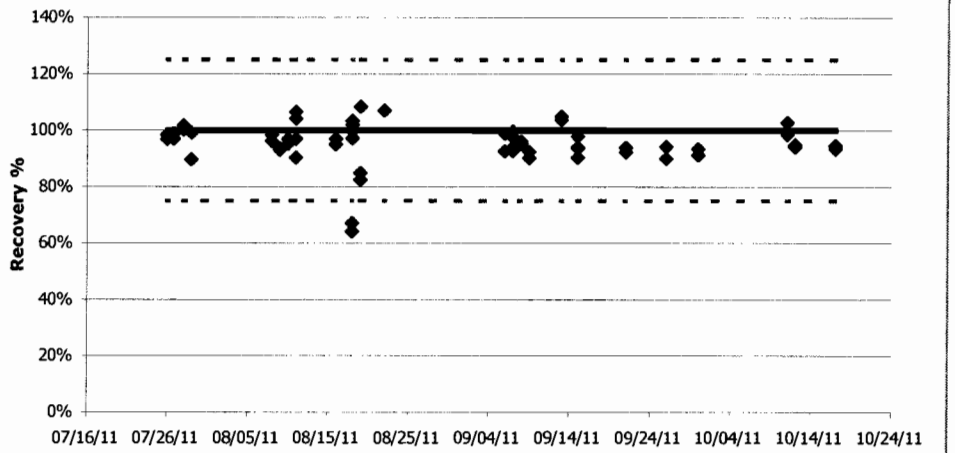
# Control Charts

# QC Chart



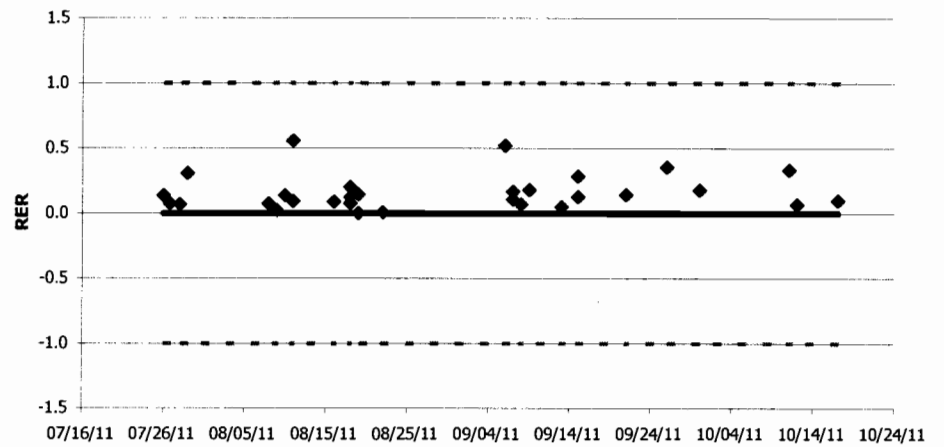


## H-3 LCS



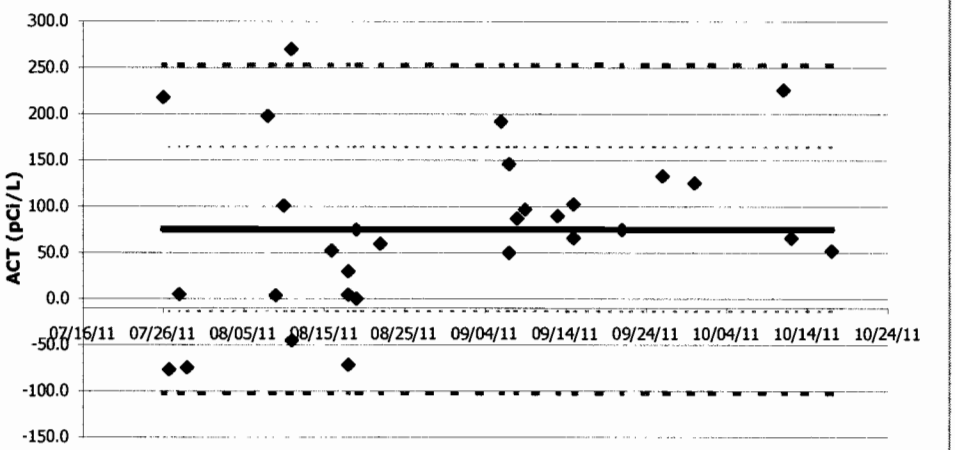

| Average | STDEV | n | UCL | LCL |
|---|---|---|---|---|
| 0.9572 | 0.0779 | 30 | 1.2500 | 0.7500 |

## H-3 RER



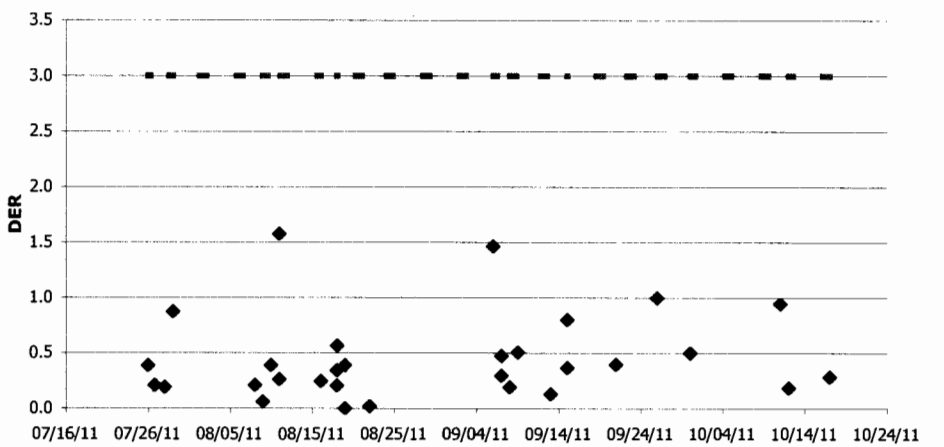

| | | n | UCL | LCL |
|---|---|---|---|---|
| | | 30 | 1.0000 | -1.0000 |

## H-3 Blank




| Average | STDEV | n | UCL | LCL |
|---|---|---|---|---|
| 75.2596 | 88.8538 | 30 | 252.9672 | -102.4480 |

## H-3 DER



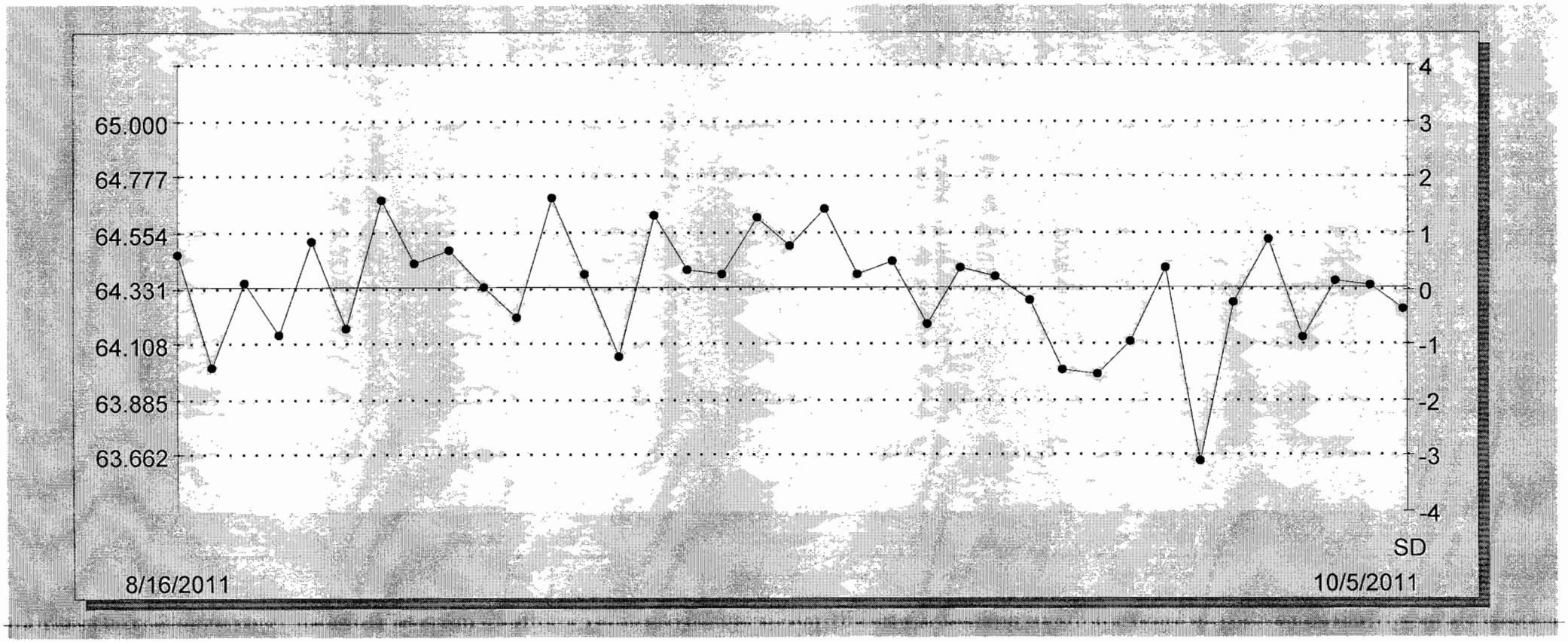

| | | n | UCL | |
|---|---|---|---|---|
| | | 30 | 3.0000 | |

3H Efficiency
Total # pts : 1690
Valid # pts : 37
Mean : 64.33
SD : 0.22

| Date | Value | Valid Pt |
|---|---|---|
| Aug 16, 2011 | 64.46 | X |
| Aug 19, 2011 | 64.01 | X |
| Aug 22, 2011 | 64.35 | X |
| Aug 24, 2011 | 64.14 | X |
| Aug 26, 2011 | 64.52 | X |
| Aug 29, 2011 | 64.17 | X |
| Aug 29, 2011 | 64.69 | X |
| Aug 29, 2011 | 64.43 | X |
| Sep 01, 2011 | 64.48 | X |
| Sep 03, 2011 | 64.33 | X |
| Sep 06, 2011 | 64.21 | X |
| Sep 10, 2011 | 64.69 | X |
| Sep 14, 2011 | 64.39 | X |
| Sep 17, 2011 | 64.06 | X |
| Sep 19, 2011 | 64.62 | X |
| Sep 21, 2011 | 64.41 | X |
| Sep 24, 2011 | 64.38 | X |
| Sep 25, 2011 | 64.61 | X |
| Sep 25, 2011 | 64.50 | X |
| Sep 25, 2011 | 64.65 | X |
| Sep 25, 2011 | 64.39 | X |
| Sep 25, 2011 | 64.44 | X |
| Sep 25, 2011 | 64.18 | X |
| Sep 25, 2011 | 64.41 | X |
| Sep 25, 2011 | 64.38 | X |
| Sep 25, 2011 | 64.28 | X |
| Sep 26, 2011 | 64.00 | X |
| Sep 26, 2011 | 63.99 | X |
| Sep 26, 2011 | 64.12 | X |
| Sep 26, 2011 | 64.41 | X |
| Sep 26, 2011 | 63.64 | X |
| Sep 26, 2011 | 64.28 | X |
| Sep 27, 2011 | 64.53 | X |
| Sep 29, 2011 | 64.14 | X |
| Oct 03, 2011 | 64.36 | X |
| Oct 04, 2011 | 64.35 | X |
| Oct 05, 2011 | 64.24 | X |

3H Efficiency
Total # pts : 1690
Valid # pts : 37
Mean : 64.33
SD : 0.22



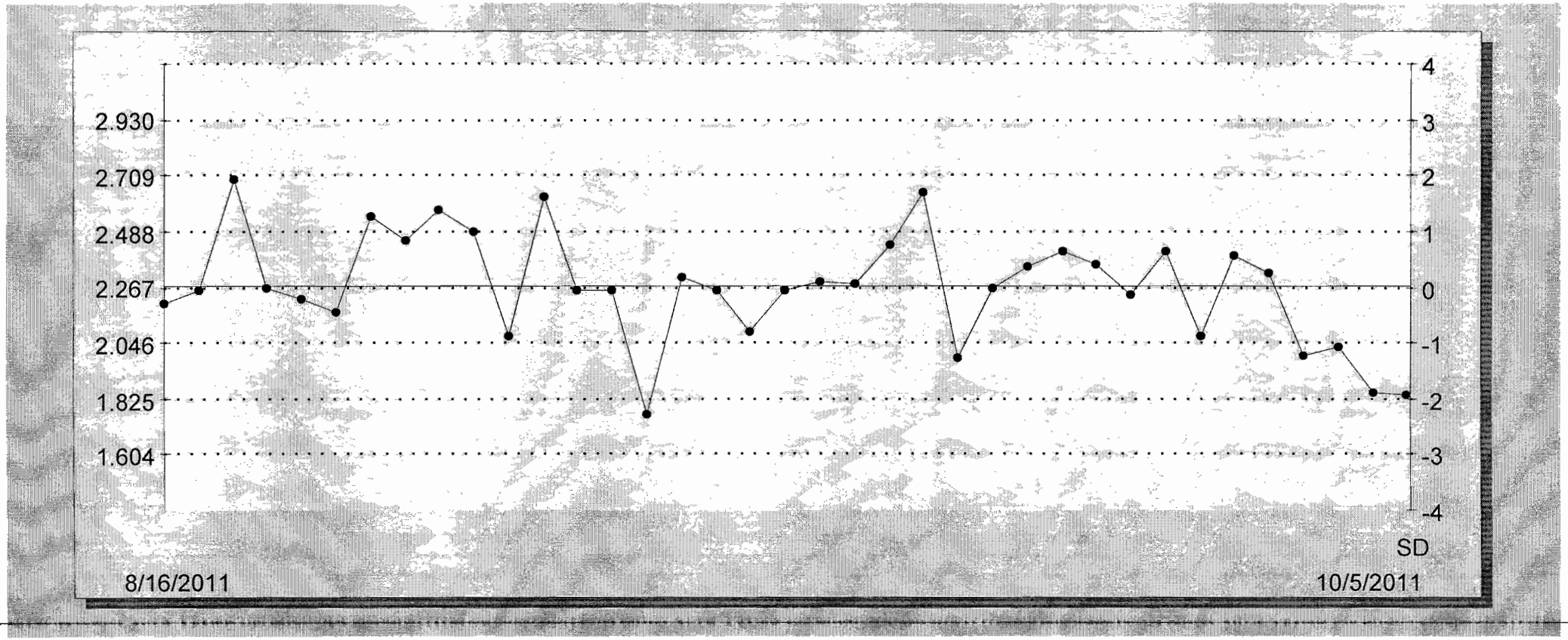


3H Background
Total # pts : 1646
Valid # pts : 37
Mean : 2.27
SD : 0.22

| Date | Value | Valid Pt |
|---|---|---|
| Aug 16, 2011 | 2.20 | X |
| Aug 19, 2011 | 2.26 | X |
| Aug 22, 2011 | 2.69 | X |
| Aug 24, 2011 | 2.26 | X |
| Aug 26, 2011 | 2.22 | X |
| Aug 29, 2011 | 2.17 | X |
| Aug 29, 2011 | 2.55 | X |
| Aug 29, 2011 | 2.45 | X |
| Sep 01, 2011 | 2.57 | X |
| Sep 03, 2011 | 2.48 | X |
| Sep 06, 2011 | 2.07 | X |
| Sep 10, 2011 | 2.63 | X |
| Sep 14, 2011 | 2.25 | X |
| Sep 17, 2011 | 2.25 | X |
| Sep 19, 2011 | 1.76 | X |
| Sep 21, 2011 | 2.30 | X |
| Sep 24, 2011 | 2.25 | X |
| Sep 25, 2011 | 2.09 | X |
| Sep 25, 2011 | 2.25 | X |
| Sep 25, 2011 | 2.29 | X |
| Sep 25, 2011 | 2.28 | X |
| Sep 25, 2011 | 2.43 | X |
| Sep 25, 2011 | 2.64 | X |
| Sep 25, 2011 | 1.99 | X |
| Sep 25, 2011 | 2.26 | X |
| Sep 25, 2011 | 2.35 | X |
| Sep 26, 2011 | 2.41 | X |
| Sep 26, 2011 | 2.35 | X |
| Sep 26, 2011 | 2.24 | X |
| Sep 26, 2011 | 2.41 | X |
| Sep 26, 2011 | 2.07 | X |
| Sep 26, 2011 | 2.39 | X |
| Sep 27, 2011 | 2.32 | X |
| Sep 29, 2011 | 1.99 | X |
| Oct 03, 2011 | 2.03 | X |
| Oct 04, 2011 | 1.85 | X |
| Oct 05, 2011 | 1.84 | X |

3H Background
Total # pts : 1646
Valid# pts : 37
Mean : 2.27
SD : 0.22





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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Low Level Liquid Scintillation Counting

# Calibration Information

# STD ID: S-0262

| ARS INTERNATIONAL | Add/Edit *Secondary Stds* | Parent Standard Data | | | | |
|---|---|---|---|---|---|---|
| **Planning** | | Parent Solution Reference # | NIST SRM 4927F | | | |
| Planning Comments | Create an H3 LCS stock solution. | Parent Solution # | S-0237 | | | |
| Target dpm/g (on dil. date) | 5.5 | Parent Principal Radionuclide | H-3 | Half Life (Days) | 4499.8000000 | |
| Target Final volume mL | 2000 | Parent Reference Date | 03/22/2010 10:10 | | | |
| Appx mass g of Parent Sol'n | 3.408758506 | Parent Certified Act | 3503.682716 | Certi Act/Vol Units | dpm | g |
| Appx vol ml of Parent Sol'n | 3.414905335 | Parent Cert Act Uncert 1 Sigma | 0.0036 | | | |
| Expected Addition for Analysis g | 5 | Parent Sp. Gravity G/Ml | 0.9982 | | | |
| **Standards Preparation / Dilution** | | Parent Supplier | NIST SRM 4927F | | | |
| Secondary Solution # | S-0262 | Parent Date Recvd | 01/02/00 | | | |
| Dilution Date (New Ref Date) | 09/07/2011 11:47 | Parent Received By | Unknown | | | |
| Ampoule, Empty (g) | | Parent Cert Exp Date | | | | |
| Ampoule /Solution Gross (g) | | Parent Matrix | H2O | | | |
| Net Wt Removed (g) | | Certified dpm/g At Ref Date | 3503.682716 | | | |
| Transfer Container, empty (g) | 13.352 | Certified dpm/g on 09/07/2011 11:47 | 3226.981313 | | | |
| Container Plus Solution (g) | 16.889 | Parent Comments | Intermediate level H-3 standard for creating LCS solutions and matrix spikes. Dilution performed as stated above by B Steffens. -BJS 3/22/10 | | | |
| Net Wt Transferred (g) | 3.537 | | | | | |
| DPM Xferred on 09/07/2011 11:47 | 11413.83291 | | | | | |
| Diluent/matrix | Dead H2O | Parent Tech | Unknown | | | |
| Diluent Density Cont, empty (g) | | Is_Primary | FALSE | | | |
| Test Mass of 5 ml of Diluent (g) | | Is_LCS | TRUE | | | |
| Diluent Density Test - (g/mL) | | Is_Tracer | FALSE | | | |
| Dilution Empty Container Mass (g) | 473.97 | Is_Calib | FALSE | | | |
| Dilution Full Cont g (if measured) | 2467.33 | | | | | |
| Dilution Final Volume ml (if measured) | 2000 | | | | | |
| Final Dilution Density (g/mL) | 0.99668 | | | | | |
| Final Dilution Measured Mass g | 1993.36 | | | | | |
| Comments | H3 LCS stock solution dilution performed as stated above by B Steffens. -BJS 9/7/11 | | | | | |
| Final Dilution dpm/g | 5.725926529 | | | | | |
| Final Dil New Ref Date/Time | 09/07/2011 11:47 | | | | | |

| | | |
|---|---|---|
| S-0262 | | |
| H-3 | Verified | 9/7/11 |
| SL | Expires | 9/7/12 |
| Manufactuer | NIST SRM 4927F | |
| Sol Matrix | H2O | |
| Ref No | NIST SRM 4927F | |
| Tech | Unknown | |
| Parent ID | S-0237 | |

ARS INTERNATIONAL

RADIOACTIVE STANDARDS -- BATON ROUGE LABORATORY

ARS INTERNATIONAL

## QUALITY CONTROL PROGRAM

AMERICAN RADIATION SERVICES
RADIOACTIVE REFERENCE SOLUTIONS

# ANNUAL ACTIVITY VERIFICATION

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

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

Radionuclide: H-3 Dilution Reference Date: 9/7/2011 11:47

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

***Minimum of 3 Required***

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

| | | |
|---|---|---|
| Average | 5.49 | 2.47 |
| Two Sigma Uncertainty | 0.52 | 0.24 |
| Standard Deviation percent of known concentration | 4.66% | 4.66% |
| Target Activity | 5.72 | 2.58 |
| % Diff | -4.13% | -4.13% |

***10% Max*** ***PASS***

***5% Max*** ***PASS***

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

Prepared & Counted By: B Pohff Date: 9/13/2011 7:43

Verified & Approved By: Douglas Mullegan Date: 9-13-11

QC Approval: DH Mullegan Date: 9-13-11

| S-0262 | |
|---|---|
| H-3 | Verified 9/7/11 |
| SL | Expires 9/7/12 |
| Manufactuer | NIST SRM 4927F |
| Sol Matrix | H2O |
| Ref No | NIST SRM 4927F |
| Tech | Unknown |
| Parent ID | S-0237 |

ARS INTERNATIONAL

RADIOACTIVE STANDARDS -- BATON ROUGE LABORATORY

**H-3 Standard Verification**

**Verifier's Name:** Brian Steffens **Date:** 9/7/2011

**Pipettor ID:** FJ40469

**Pipettor ID:** Auto-pipettor

**Pipettor ID:** na

**Standard ID:** S-0262

**Standard ID:** N/A

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

15mL of Ultima Gold added to standard

| | Weight of Standard |
|---|---|
| S-0262-V1 | 5.050 g |
| S-0262-V2 | 5.037 g |
| S-0262-V3 | 5.035 g |
| S-0262-V4 | 5.022 g |
| S-0262-V5 | 5.019 g |
| | |
| | |
| | |
| | |
| | |

**Balance ID:** H1331122173560P

Assay Definition-

Assay Description:
H-3 Normal Level Assay

Assay Type: DPM (Single)
Report Name: Report1
Output Data Path: C:\Packard\Tricarb\Results\ARS\H-3 Normal Lvl 3\20110912_2059
Raw Results Path: C:\Packard\Tricarb\Results\ARS\H-3 Normal Lvl 3\20110912_2059\20110912_2059.results
RTF File Name: C:\Packard\Tricarb\Results\ARS\H-3 Normal Lvl 3\20110912_2059\H-3 Results.rtf
Comma-Delimited File Name: C:\Packard\Tricarb\Results\ARS\H-3 Normal Lvl 3\20110912_2059\H-3 Results.csv
Assay File Name: C:\Packard\TriCarb\Assays\H-3 Normal Lvl 3.lsa

Count Conditions-

Nuclide: H-3 Normal
Quench Indicator: tSIE/AEC
External Std Terminator (sec): 0.5 2s%
Pre-Count Delay (min): 0.00
Quench Set:
Low Energy: UG STD H-3
Count Time (min): 120.00
Count Mode: Normal
Assay Count Cycles: 1 Repeat Sample Count: 1
#Vials/Sample: 1 Calculate % Reference: Off

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

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

Count Corrections-

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

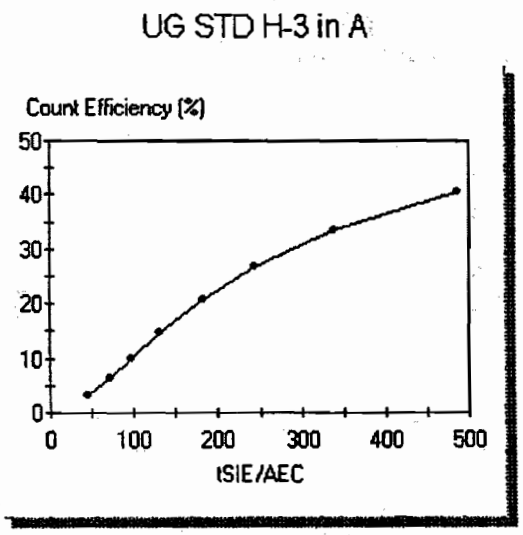
Half Life-

Half Life Correction: Off

| Regions | Half Life | Units | Reference Date | Reference Time |
|---|---|---|---|---|

A
B
C

Cycle 1 Results
Quench Curve Block Data




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

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

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

# National Institute of Standards & Technology

# Certificate

## Standard Reference Material 4927F

### Hydrogen-3 Radioactivity Standard

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

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

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

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

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

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

This Standard Reference Material was prepared in the Physics Laboratory, Ionizing Radiation Division, Radioactivity Group, Dr. M.P Unterweger, Acting Group Leader. The overall technical direction and physical measurements leading to certification were provided by Drs. L.L. Lucas and M.P Unterweger of the Radioactivity Group. The support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program.

Lisa R. Karam, Deputy Chief
Ionizing Radiation Division

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

Gaithersburg, Maryland 20899
May 2008
*See Certificate Revision History on Last Page*



*Notes and references are on page 4

Table 1. Properties of SRM 4927F

**Certified values**

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

Uncertified information

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



*Notes and references are on page 4

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

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

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

## NOTES

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

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

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

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

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

Note 6. Extensive gas-counting measurements were made on the SRM 4927E solution during 1998 and 1999. The SRM 4927F solution was intercompared with the SRM 4927E using LS counting.

## REFERENCES


[1] International Organization for Standardization (ISO), *Guide to the Expression of Uncertainty in Measurement*, 1993 (corrected and reprinted, 1995). Available from Global Engineering Documents, 12 Inverness Way East, Englewood, CO 80112, U.S.A. Telephone 1-800-854-7179.

[2] B. N. Taylor and C. E. Kuyatt, *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*, NIST Technical Note 1297, 1994. Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20407, U.S.A.

[3] L.L Lucas and M.P. Unterweger, *Comprehensive Review and Critical Evaluation of the Half-Life of Tritium*, J. Res. Natl. Inst. Stand. Technol. **105**, 541-549 (2000)



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

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# American Radiation Services Analytical Reports

## for

## Los Alamos National Laboratory

# Percent Moisture

ARS INTERNATIONAL

2609 North River Road, Port Allen, Louisiana 70767

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

| | | | |
|---|---|---|---|
| **ARS Sample Delivery Group:** | ARS1-11-02040 | **Request or PO Number:** | 11-3646 |
| **Client Sample ID:** | MD21-11-26394 | **ARS Sample ID:** | ARS1-11-02040-001 |
| **Sample Collection Date:** | 09/15/11 | **Date Received:** | 09/21/11 |
| **Sample Matrix:** | Silica | **Report Date:** | 10/18/11 |

| Analysis Description | Analysis Results | Analysis Error +/- 1 s | MDC | DLC | Qual | Analysis Units | Analysis Test Method | Analysis Date/Time | Analysis Technician | Tracer/Chem Recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| Percent Moisture | 8.577 | NA | NA | NA | | % | Percent Moisture | 10/06/11 06:49 | BS | NA |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**NOTES: Project Cost Code MR8R032NFM00**

Project Manager Review

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

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# American Radiation Services Analytical Reports

for

# Los Alamos National Laboratory

# Percent Moisture Laboratory Records

**AMERICAN RADIATION SERVICES**
**Port Allen, LA**
**PERCENT MOISTURE DETERMINATION IN SOILS**

SDG Number ARS1-11-02040, 02041, 02042, 02054
Client LANL

| LANL ID | ARS ID | weight of cylinder with gel (g) | weight of empty cylinder (g) | Weight of gel (g) | amount of liquid collected (ml) | amount of liquid tested (ml) | % moisture |
|---|---|---|---|---|---|---|---|
| MD21-11-26394 | ARS1-11-02040-001 | 588 | 432 | 155 | 13.2936 | 5.035 | **8.576516129** |
| MD21-11-26401 | ARS1-11-02041-001 | 601 | 443 | 158 | 19.6278 | 5.0843 | **12.42265823** |
| MD21-11-26398 | ARS1-11-02041-002 | 620 | 438 | 182 | 37.5767 | 5.0076 | **20.64653846** |
| MD21-11-26399 | ARS1-11-02041-003 | 624 | 443 | 181 | 37.8642 | 5.0468 | **20.91944751** |
| MD21-11-26395 | ARS1-11-02041-004 | 627 | 439 | 187 | 42.7506 | 5.025 | **22.86128342** |
| MD21-11-26397 | ARS1-11-02041-005 | 630 | 441 | 188 | 41.0583 | 5.0285 | **21.83952128** |
| MD21-11-26400 | ARS1-11-02041-006 | 628 | 457 | 170 | 27.2601 | 5.0336 | **16.03535294** |
| MD21-11-26417 | ARS1-11-02042-001 | 618 | 439 | 179 | 34.7754 | 5.0391 | **19.42759777** |
| MD21-11-26415 | ARS1-11-02042-002 | 625 | 433 | 191 | 44.7769 | 5.0334 | **23.44340314** |
| MD21-11-26402 | ARS1-11-02042-003 | 605 | 440 | 164 | 20.6431 | 5.0575 | **12.5872561** |
| MD21-11-26414 | ARS1-11-02042-004 | 653 | 448 | 203 | 48.6434 | 5.0409 | **23.96226601** |
| MD21-11-26420 | ARS1-11-02042-005 | 615 | 452 | 162 | 17.4901 | 5.0515 | **10.79635802** |
| MD21-11-26419 | ARS1-11-02042-006 | 642 | 450 | 191 | 41.838 | 5.0361 | **21.90471204** |
| MD21-11-26416 | ARS1-11-02042-007 | 623 | 443 | 180 | 42.1155 | 5.0389 | **23.3975** |
| MD21-11-26436 | ARS1-11-02054-001 | 620 | 450 | 169 | 21.3451 | 5.0188 | **12.63023669** |
| MD21-11-26437 | ARS1-11-02054-002 | 605 | 438 | 167 | 23.3721 | 5.0442 | **13.99526946** |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| MD21-11-26438 | ARS1-11-02054-003 | 620 | 455 | 164 | 19.2483 | 5.0567 | **11.73676829** |
| MD21-11-26435 | ARS1-11-02054-004 | 621 | 451 | 170 | 24.9414 | 5.0341 | **14.67141176** |
| MD21-11-26434 | ARS1-11-02054-005 | 617 | 447 | 171 | 25.1074 | 5.0295 | **14.68269006** |

Balance ID: 0102/H1331122173560P

Pipettor ID: FJ40469

Signature _____ Date 10-10-11

**AMERICAN RADIATION SERVICES**
**Port Allen, LA**
**PERCENT MOISTURE DETERMINATION IN SOILS**

SDG Number ARS1-11-02040, 02041, 02042, 02054
Client LANL

LCS- 5.0342
LCSD-5.0194
BLK-5.0379

| LANL ID | ARS ID | weight of cylinder with gel (g) | weight of empty cylinder (g) | Weight of gel (g) | amount of liquid collected (ml) | amount of liquid tested (ml) | % moisture |
|---|---|---|---|---|---|---|---|
| MD21-11-26394 | ARS1-11-02040-001 | 588 | 432 | 155 | 13.2936 | 5.0350 | #DIV/0! |
| MD21-11-26401 | ARS1-11-02041-001 | 601 | 443 | 158 | 19.6278 | 5.0843 | #DIV/0! |
| MD21-11-26398 | ARS1-11-02041-002 | 620 | 438 | 182 | 37.5767 | 5.0076 | #DIV/0! |
| MD21-11-26399 | ARS1-11-02041-003 | 624 | 443 | 181 | 37.8642 | 5.0468 | #DIV/0! |
| MD21-11-26395 | ARS1-11-02041-004 | 627 | 439 | 187 | 42.7506 | 5.0250 | #DIV/0! |
| MD21-11-26397 | ARS1-11-02041-005 | 630 | 441 | 188 | 41.0583 | 5.0285 | #DIV/0! |
| MD21-11-26400 | ARS1-11-02041-006 | 628 | 457 | 170 | 37.2601 | 5.0336 | #DIV/0! |
| MD21-11-26417 | ARS1-11-02042-001 | 618 | 439 | 179 | 34.7754 | 5.0391 | #DIV/0! |
| MD21-11-26415 | ARS1-11-02042-002 | 625 | 433 | 191 | 44.7769 | 5.0334 | #DIV/0! |
| MD21-11-26402 | ARS1-11-02042-003 | 605 | 440 | 164 | 20.6431 | 5.0575 | #DIV/0! |
| MD21-11-26414 | ARS1-11-02042-004 | 653 | 448 | 203 | 48.6434 | 5.0409 | #DIV/0! |
| MD21-11-26420 | ARS1-11-02042-005 | 615 | 452 | 162 | 17.4901 | 5.0515 | #DIV/0! |
| MD21-11-26419 | ARS1-11-02042-006 | 642 | 450 | 191 | 41.8380 | 5.0361 | #DIV/0! |
| MD21-11-26416 | ARS1-11-02042-007 | 623 | 443 | 180 | 42.1155 | 5.0389 | #DIV/0! |
| MD21-11-26436 | ARS1-11-02054-001 | 620 | 450 | 169 | 21.3451 | 5.0188 | #DIV/0! |
| MD21-11-26437 | ARS1-11-02054-002 | 605 | 438 | 167 | 23.3721 | 5.0442 | #DIV/0! |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| MD21-11-26438 | ARS1-11-02054-003 | 620 | 455 | 164 | 19.2483 | 5.0567 | #DIV/0! |
| MD21-11-26435 | ARS1-11-02054-004 | 621 | 451 | 170 | 24.9414 | 5.0341 | #DIV/0! |
| MD21-11-26434 | ARS1-11-02054-005 | 617 | 447 | 171 | 25.1074 | 5.0295 | #DIV/0! |

Balance ID: 0102/H1331122173560P

Pipettor ID: FJ40469

Signature

Date 10-4-11

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# American Radiation Services Analytical Reports

## for

# Los Alamos National Laboratory

# Folder Duplicate

# Report Compilation Checklist

**ARS SDG:** 11-02040 **Client Name:** LANL **Sample Matrix:** SI

| LEVEL 1 COMPONENTS | 1st Reviewer | |
|---|---|---|
| 1) Cover Page Complete and Accurate (see ARS-059)? | ~~Yes~~ No N/A | |
| 2) Technical Review Checklist(s) Complete and Accurate? | ~~Yes~~ No N/A | |
| 3) Case Narrative Complete and Accurate (see ARS-059)? | ~~Yes~~ No N/A | |
| 4) Form 1s Present for all Samples and Tests? | ~~Yes~~ No N/A | |
| 5) Client Specific Components are Present and Complete? | ~~Yes~~ No N/A | |

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

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

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

Susan Reese 10-18-11
**Report Generator Signature** **Date**

VJM 10-18-11
**Management Review Signature** **Date**

# LSC
# Technical Review Checklist

**ARS SDG** 11-02040

**Sample Matrix:** SI **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:** B11-03714 **Batch B:** N/A **Batch C:** N/A

**Test Method(s):** LSC-A-001 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] Date: 10-5-11 Verifier Review Signature: [signature] Date: 10-5-11

## 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] Date: 10-18-11

| | 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] Date: 10-10-11 Technicial Reviewer Signature: N/A Date: 10-18-11

Batch A: B11-03714

# 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): _____

| Project Manager Signature | Date | QA Officer Signature | Date |
|---|---|---|---|
| Susan Reese | 10-18-11 | VM | 10-18-11 |

## GENERAL COMMENTS

# SDG Report - Samples and Containers

69

**SDG Specific Data**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| SDG | ARS1-11-02040 | | | TAT Days | 30 | Project Type | Environmental |
| Sample Count | 1 | Rpt Level | 4 | Date Received | 9/21/2011 | COC Number | 11-3646 |
| Client | Los Alamos National Laboratory | | | Client Deadline | 10/20/2011 | PO Number | 63641-001-10 |
| Client Code | 114 | | | Internal Deadline | 10/20/2011 | Job Number | MR8A032NFM00 |
| Profile Number | PN-00094 | | | Lab Deadline | 10/18/2011 | Job Location | |
| Comments | | | | | | | |

**Samples and Containers (→) Checked In Thus Far**

| FR | ClientID | Matrix | SampleStartDate | SampleEndDate | Disp | Hold | Arch | Storage | X | Units | Y | Units | Z | Units | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 001 | MD21-11-26394 | SI | 09/15/11 12:00 PM | 09/15/11 12:00 PM | H | 90 | 5 | Q6 | | | | | | | |
| → | IC_ID | Cnt | Volume_mL | Wt_g | pH_Orig | pH_Final | CPM | uR_Hr | Storage | VOA | Head Sp | AF Units | AF Rate | AF Mins | AF Total Vol |
| | 96094 | 1 | | 1.00 | | | 40 | 20 | | N | N/A | | | | |

# SDG Report - Analysis Assignments

| | | | |
|---|---|---|---|
| Temp SDG | ARS1-11-02040 | Sample Count | 1 |
| Client | Los Alamos National Laboratory | Analysis Count | 1-1 |

**Samples Count Totals per Analysis**

| Analysis Code | Analysis Description | Samples Count |
|---|---|---|
| LSC-A-001 | Tritium in (Water [Aqueous, AQ, SI]) | 1 |

**Analyses Assigned Per Fraction**

| Fraction | Analysis Code | X = Assigned |
|---|---|---|
| 001 | LSC-A-001 | X |

American Radiation Services
Baton Rouge Laboratory

# DQO Report for SDG

ARS1-11-02040



| Analysis Code | Group | Isotope | Activity Units | Aliquot Units | ProcedureNo | RDL | LCS_LL | LCS_UL | MS_LL | MS_UL | RadY_LL | RadY_UL | GravY_LL | GravY_LL | RER | RPD | DiltionReq | RoughPrepReq | BlankCorrectionMDA | BlankCorrectionAlf | CountTimeReq | AliquotRequired |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LSC-A-001 | STD | H-3 | pCi | L | ARS-054 | 2.50E+02 | 80 | 120 | 75 | 125 | 30 | 110 | 40 | 110 | 1.00 | 25 | FALSE | FALSE | FALSE | FALSE | | |

# ARS FILE TRACKING SHEET

SDG: ARS1-11-02040

| Task | Date / Time | Initials |
|---|---|---|
| Date & Time Samples Received | 09-21-11/10:00 | CMB |
| ICOC Initiated / Storage Location: Q6 | 09-21-11/15:43 | CMB |
| Technical Checks Performed | See Batch | — |
| Report Written / EDD Generated: 10-18-11 10:15 SDL (Date/Time, Initials) | 10-18-11/10:11 | SDL |
| Quality Assurance Checks Performed on Report | 10-18-11 1357 | VM |
| Management Check Performed on Report | | |
| *Preliminary Report Sent* | | |
| Report E-mailed | | |
| Report Faxed | | |
| Report Reviewed | | |
| Report Mailed | | |
| Invoice Completed Invoice #:_____ | | |
| Report Imaged | | |

***SPECIAL REQUIREMENTS***

| Requirement | Yes | No |
|---|---|---|
| 3 Hour Rush | | ✓ |
| 24 Hour Rush | | ✓ |
| 48 Hour Rush | | ✓ |
| Special Invoicing *see notes* Mgmt. Approval:_____ | | ✓ |

**NOTES:**

ARS-062
04/23/2010

**COMPANY NAME:** Los Alamos National Lab **SDG:** ARSM102040

**SHIPPING CONTAINER**

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

**COC PRESENT WITH SAMPLES**

| | | |
|---|---|---|
| COC | ☑ Yes | ☐ No |

**SAMPLE CONTAINER(S)**

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

# Samples Rcv 1

Matrix [ AF , AQ , BI , FE , LT , SL , SO , UR , VG ]

**External and Internal Surveys**

| | | | | | |
|---|---|---|---|---|---|
| Exposure Rate Meter: | M3 242824 | Serial No.: | UA-2 PK2642266 | Calibration Due Date: | 4-2012 |
| Count Rate Meter: | M2 154859 | Serial No.: | UA-9 PR154559 | Calibration Due Date: | 4-2012 |

| | | | | |
|---|---|---|---|---|
| Background Exposure Rate (µR/hr) | 30 | Max. Exposure Rate on Shipping Containers Externals (Plus Bkgd) | 16 | µR/hr |
| Background Count Rate (cpm) | 60 | Max. Removable Count Rate on Shipping Containers Externals (Plus Bkgd) | 20 | cpm |
| | | Max. Removable Count Rate on Shipping Containers Internals (Plus Bkgd) | 20 | cpm |

| Sample Label/Comments/Notes | pH Orig (pH ≤ 2 is Acceptable) | pH Final | Mark if Preserve | Acid Lot # | Weight(g) / Volume(mL) | µR/hr (Acceptance Limits <500 µR/hr) | cpm (Acceptance Limits <100 cpm/cm²) |
|---|---|---|---|---|---|---|---|
| MD2H11-26394 | | CUPSA-2H-11 | | | 1 sample | 20 | 40 |
| | | | | | | | |
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Surveyors Name: [signature] Date/Time Surveyed: 9-21-11 | 10:32

**Well Name:** 21-24524W and 21-24524S **Tritium columns, pump on for…** **Tritium co**
**Number of ports:** 9 13:29 on 9/13/2011
**Date (s):** 9/13/2011 - 9/15/2011

| Port number | Sample ID | QC Sample of | Port top depth (ft bgs) | Port depth (ft bgs) | Port bottom depth (ft bgs) | Total purge (sl) |
|---|---|---|---|---|---|---|
| 1 | MD21-11-26384 | - | 42.5 | 45.0 | 47.5 | 4554.711 |
| 2 | MD21-11-26385 | - | 122.5 | 125.0 | 127.5 | 5351.990 |
| 3 | MD21-11-26386 | - | 172.5 | 175.0 | 177.5 | 4860.325 |
| 4 | MD21-11-26387 | - | 257.5 | 260.0 | 262.5 | 4710.202 |
| 5 | MD21-11-26388 | - | 300.0 | 302.5 | 305.0 | 5438.468 |
| 6 | MD21-11-26389 | - | 327.5 | 330.0 | 332.5 | 5378.187 |
| 7 | MD21-11-26390 | - | 377.5 | 380.0 | 382.5 | 4439.372 |
| 10 | MD21-11-26391 | - | 677.5 | 680.0 | 682.5 | 4470.526 |
| 11 | MD21-11-26392 | - | 712.5 | 715.0 | 717.5 | 3677.981 |
| 3 (FD) | MD21-11-26393 | MD21-11-26386 | 172.5 | 175.0 | 177.5 | 3790.398 |
| FB | MD21-11-26394 | MD21-11-26386 | NA | NA | NA | NA |

***Notes:*** First 7 ports located in 21-24524W, ports 10 and 11 located in 21-24524S. All tritium sampling occurrec

***Elapsed Time Calculation***

| | 9/13/2011 | 9/15/2011 | Time elapsed | |
|---|---|---|---|---|
| | Start time | End time | runtime (d) | runtime (hrs) |
| 1 | 9/13/11 13:29 | 9/15/11 11:00 | 1.89652778 | 45.5166667 |
| 2 | 9/13/11 13:29 | 9/15/11 11:00 | 1.89652778 | 45.5166667 |
| 3 | 9/13/11 13:29 | 9/15/11 11:00 | 1.89652778 | 45.5166667 |
| 4 | 9/13/11 13:29 | 9/15/11 11:00 | 1.89652778 | 45.5166667 |
| 5 | 9/13/11 13:29 | 9/15/11 11:00 | 1.89652778 | 45.5166667 |
| 6 | 9/13/11 13:29 | 9/15/11 11:00 | 1.89652778 | 45.5166667 |
| 7 | 9/13/11 13:29 | 9/15/11 11:00 | 1.89652778 | 45.5166667 |
| 8 | 9/13/11 13:29 | 9/15/11 11:00 | 1.89652778 | 45.5166667 |
| 9 | 9/13/11 13:29 | 9/15/11 11:00 | 1.89652778 | 45.5166667 |
| 10 | 9/13/11 13:29 | 9/15/11 11:00 | 1.89652778 | 45.5166667 |
| 11 | 9/13/11 13:29 | 9/15/11 11:00 | 1.89652778 | 45.5166667 |

**lumns, pump off for…**
11:00 on 9/15/2011

**Barometric Pressure* (in Hg):** 30.29
**Relative Humidity* (%):** 77
**Temperature* (F):** 55
**At:** 9/15/2011 at 10:55

| Hours of purge | Average flow rate (slpm) | Tritium cylinder # | Silica Gel Mass in the cylinder (gm) | Tritium cylinder initial weight (gm) | Tritium cylinder weight w/moisture (gm) | Accumulated moisture weight (gm) | Port Subatm. Pressure O2 (%)** |
|---|---|---|---|---|---|---|---|
| 45.500 | 1.7 | 221 | 146.96 | 602.52 | 654.13 | 51.61 | 15.0 |
| 45.500 | 2.0 | 198 | 152.22 | 599.20 | 649.10 | 49.90 | 20.0 |
| 45.500 | 1.8 | 209 | 151.92 | 603.63 | 622.23 | 18.60 | 20.1 |
| 45.500 | 1.7 | 213 | 146.04 | 582.57 | 627.68 | 45.11 | 20.2 |
| 45.500 | 2.0 | 230 | 151.77 | 602.91 | 645.04 | 42.13 | 20.3 |
| 45.500 | 2.0 | 218 | 151.92 | 598.58 | 636.13 | 37.55 | 20.4 |
| 45.500 | 1.6 | 226 | 146.02 | 587.40 | 620.47 | 33.07 | 20.4 |
| 45.500 | 1.6 | 224 | 153.32 | 612.07 | 650.33 | 38.26 | 20.4 |
| 45.500 | 1.3 | 26 | 151.02 | 591.39 | 625.88 | 34.49 | 20.5 |
| 45.500 | 1.4 | 212 | 152.22 | 600.96 | 640.67 | 39.71 | 20.1 |
| NA | NA | 12 | 145.64 | 576.84 | 586.99 | 10.15 | NA |

d at the same time. Port subatmospheric measurements were taken on 9/13/2011 after purging each port for

| Port Subatm. Pressure CO2 (ppm)** | Summa canister # | Summa's Initial Vacuum (in Hg) | Comments |
|---|---|---|---|
| 2.19 | NA | NA | CO2= 2.19%, 21-24524W |
| 5110 | NA | NA | 21-24524W |
| 4560 | NA | NA | 21-24524W |
| 5110 | NA | NA | 21-24524W |
| 5050 | NA | NA | 21-24524W |
| 4750 | NA | NA | 21-24524W |
| 4500 | NA | NA | 21-24524W |
| 3500 | NA | NA | 21-24524S |
| 3400 | NA | NA | 21-24524S |
| 4560 | NA | NA | 21-24524W |
| NA | NA | NA | NA |

r a minimum of 10 minutes per port. **Entered by** R. Onstott

**Reviewed by** *Jlinville 10/4/2011*

| Analysis Result ID | Request Number | Sample ID | Excavated | Sample Technique | Sample Usage | Field Prep | Field QC Type | Site | Location ID | Depth Range (ft) |
|---|---|---|---|---|---|---|---|---|---|---|
| 7978435 | 11-1296 | MD21-11-4740 | N | VOST | INV | na | na | PRS 21-018(a)-99 Sample association | 21-24524W | 42.5-47.5 |
| 7978436 | 11-1296 | MD21-11-4741 | N | VOST | INV | na | na | PRS 21-018(a)-99 Sample association | 21-24524W | 122.5-127.5 |
| 7978437 | 11-1296 | MD21-11-4748 | N | VOST | INV | na | na | PRS 21-018(a)-99 Sample association | 21-24524S | 712.5-717.5 |
| 7978438 | 11-1296 | MD21-11-4744 | N | VOST | INV | na | na | PRS 21-018(a)-99 Sample association | 21-24524W | 300-305 |
| 7978439 | 11-1296 | MD21-11-4746 | N | VOST | INV | na | na | PRS 21-018(a)-99 Sample association | 21-24524W | 377.5-382.5 |
| 7978440 | 11-1296 | MD21-11-4742 | N | VOST | INV | na | na | PRS 21-018(a)-99 Sample association | 21-24524W | 172.5-177.5 |
| 7978442 | 11-1296 | MD21-11-4747 | N | VOST | INV | na | na | PRS 21-018(a)-99 Sample association | 21-24524S | 677.5-682.5 |
| 7978443 | 11-1296 | MD21-11-4745 | N | VOST | INV | na | na | PRS 21-018(a)-99 Sample association | 21-24524W | 327.5-332.5 |
| 7978444 | 11-1296 | MD21-11-4743 | N | VOST | INV | na | na | PRS 21-018(a)-99 Sample association | 21-24524W | 257.5-262.5 |
| 8091244 | 11-1611 | MD21-11-5604 | N | VOST | INV | na | na | PRS 21-018(a)-99 Sample association | 21-24524W | 300-305 |
| 8091245 | 11-1587 | MD21-11-5602 | N | VOST | INV | na | na | PRS 21-018(a)-99 Sample association | 21-24524W | 172.5-177.5 |
| 8091246 | 11-1587 | MD21-11-5605 | N | VOST | INV | na | na | PRS 21-018(a)-99 Sample association | 21-24524W | 327.5-332.5 |
| 8091248 | 11-1587 | MD21-11-5608 | N | VOST | INV | na | na | PRS 21-018(a)-99 Sample association | 21-24524S | 712.5-717.5 |
| 8091249 | 11-1587 | MD21-11-5603 | N | VOST | INV | na | na | PRS 21-018(a)-99 Sample association | 21-24524W | 257.5-262.5 |
| 8091250 | 11-1587 | MD21-11-5607 | N | VOST | INV | na | na | PRS 21-018(a)-99 Sample association | 21-24524S | 677.5-682.5 |
| 8091251 | 11-1587 | MD21-11-5606 | N | VOST | INV | na | na | PRS 21-018(a)-99 Sample association | 21-24524W | 377.5-382.5 |
| 8091252 | 11-1587 | MD21-11-5600 | N | VOST | INV | na | na | PRS 21-018(a)-99 Sample association | 21-24524W | 42.5-47.5 |
| 8091253 | 11-1587 | MD21-11-5601 | N | VOST | INV | na | na | PRS 21-018(a)-99 Sample association | 21-24524W | 122.5-127.5 |
| 8309277 | 11-2668 | MD21-11-14524 | N | VOST | INV | na | na | PRS 21-018(a)-99 Sample association | 21-24524W | 42.5-47.5 |
| 8309278 | 11-2668 | MD21-11-14527 | N | VOST | INV | na | na | PRS 21-018(a)-99 Sample association | 21-24524W | 257.5-262.5 |
| 8309280 | 11-2668 | MD21-11-14529 | N | VOST | INV | na | na | PRS 21-018(a)-99 Sample association | 21-24524W | 327.5-332.5 |
| 8309281 | 11-2668 | MD21-11-14530 | N | VOST | INV | na | na | PRS 21-018(a)-99 Sample association | 21-24524W | 377.5-382.5 |
| 8309282 | 11-2668 | MD21-11-14531 | N | VOST | INV | na | na | PRS 21-018(a)-99 Sample association | 21-24524S | 677.5-682.5 |
| 8309283 | 11-2668 | MD21-11-14526 | N | VOST | INV | na | na | PRS 21-018(a)-99 Sample association | 21-24524W | 172.5-177.5 |
| 8309285 | 11-2668 | MD21-11-14532 | N | VOST | INV | na | na | PRS 21-018(a)-99 Sample association | 21-24524S | 712.5-717.5 |
| 8309286 | 11-2668 | MD21-11-14525 | N | VOST | INV | na | na | PRS 21-018(a)-99 Sample association | 21-24524W | 122.5-127.5 |
| 8309287 | 11-2668 | MD21-11-14528 | N | VOST | INV | na | na | PRS 21-018(a)-99 Sample association | 21-24524W | 300-305 |
| 8543782 | 11-3626 | MD21-11-26388 | N | VOST | INV | na | na | PRS 21-018(a)-99 Sample association | 21-24524W | 300-305 |
| 8543783 | 11-3626 | MD21-11-26385 | N | VOST | INV | na | na | PRS 21-018(a)-99 Sample association | 21-24524W | 122.5-127.5 |
| 8543784 | 11-3626 | MD21-11-26392 | N | VOST | INV | na | na | PRS 21-018(a)-99 Sample association | 21-24524S | 712.5-717.5 |
| 8543785 | 11-3626 | MD21-11-26391 | N | VOST | INV | na | na | PRS 21-018(a)-99 Sample association | 21-24524S | 677.5-682.5 |
| 8543786 | 11-3626 | MD21-11-26384 | N | VOST | INV | na | na | PRS 21-018(a)-99 Sample association | 21-24524W | 42.5-47.5 |
| 8543787 | 11-3626 | MD21-11-26386 | N | VOST | INV | na | na | PRS 21-018(a)-99 Sample association | 21-24524W | 172.5-177.5 |
| 8543788 | 11-3626 | MD21-11-26387 | N | VOST | INV | na | na | PRS 21-018(a)-99 Sample association | 21-24524W | 257.5-262.5 |
| 8543789 | 11-3626 | MD21-11-26390 | N | VOST | INV | na | na | PRS 21-018(a)-99 Sample association | 21-24524W | 377.5-382.5 |
| 8543791 | 11-3626 | MD21-11-26389 | N | VOST | INV | na | na | PRS 21-018(a)-99 Sample association | 21-24524W | 327.5-332.5 |

| Field Matrix | Media | RFI Class | Analyte Code | Analyte | Percent Moisture | Standard MDL | Standard MDA | Dilution Factor | Standard Result | Standard Uncertainty |
|---|---|---|---|---|---|---|---|---|---|---|
| GAS | na | RAD | H-3 | Tritium | 10.069 | | 333.6094045 | 1 | 48635.8 | 2565.87 |
| GAS | na | RAD | H-3 | Tritium | 12.709 | | 306.6952637 | 1 | 14295.4 | 772.191 |
| GAS | na | RAD | H-3 | Tritium | 9.36 | | 357.9621697 | 1 | 3938.33 | 251.482 |
| GAS | na | RAD | H-3 | Tritium | 8.158 | | 410.0896112 | 1 | 49575.9 | 2620.8 |
| GAS | na | RAD | H-3 | Tritium | 7.796 | | 415.1528043 | 1 | 300.167 | 128.183 |
| GAS | na | RAD | H-3 | Tritium | 12.24 | | 321.141418 | 1 | 17101.1 | 919.382 |
| GAS | na | RAD | H-3 | Tritium | 7.977 | | 415.0177763 | 1 | 6826.59 | 402.094 |
| GAS | na | RAD | H-3 | Tritium | 12.163 | | 321.6491078 | 1 | 11174.6 | 612.022 |
| GAS | na | RAD | H-3 | Tritium | 10.253 | | 358.9942655 | 1 | 41132.1 | 2175.88 |
| GAS | na | RAD | H-3 | Tritium | 11.299 | | 349.2230975 | 1 | 51584.1 | 2719.58 |
| GAS | na | RAD | H-3 | Tritium | 8.491 | | 429.3491662 | 1 | 16958.9 | 920.867 |
| GAS | na | RAD | H-3 | Tritium | 9.926 | | 375.1029194 | 1 | 9402.42 | 525.561 |
| GAS | na | RAD | H-3 | Tritium | 9.189 | | 413.4932443 | 1 | 506.616 | 131.436 |
| GAS | na | RAD | H-3 | Tritium | 9.899 | | 380.7264392 | 1 | 38421.7 | 2034.47 |
| GAS | na | RAD | H-3 | Tritium | 7.114 | | 493.3720668 | 1 | 227.375 | 150.251 |
| GAS | na | RAD | H-3 | Tritium | 9.653 | | 376.8276856 | 1 | 7467.57 | 427.394 |
| GAS | na | RAD | H-3 | Tritium | 9.148 | | 389.9284945 | 1 | 32368.3 | 1719.29 |
| GAS | na | RAD | H-3 | Tritium | 11.705 | | 334.8691991 | 1 | 12718.8 | 691.919 |
| GAS | na | RAD | H-3 | Tritium | 13.88 | | 295.7612361 | 1 | 60184.3 | 3166.05 |
| GAS | na | RAD | H-3 | Tritium | 12.08 | | 321.9498543 | 1 | 50589.4 | 2666.54 |
| GAS | na | RAD | H-3 | Tritium | 14.556 | | 297.228671 | 1 | 13345.3 | 721.468 |
| GAS | na | RAD | H-3 | Tritium | 10.874 | | 315.3680528 | 1 | 9394.12 | 519.03 |
| GAS | na | RAD | H-3 | Tritium | 12.724 | | 316.6963879 | 1 | 245.417 | 98.0456 |
| GAS | na | RAD | H-3 | Tritium | 13.116 | | 302.3645184 | 1 | 19334.2 | 1033.43 |
| GAS | na | RAD | H-3 | Tritium | 12.389 | | 317.0356634 | 1 | 74.4486 | 95.5491 |
| GAS | na | RAD | H-3 | Tritium | 14.43 | | 293.3486015 | 1 | 16587.8 | 889.639 |
| GAS | na | RAD | H-3 | Tritium | 12.154 | | 310.5462141 | 1 | 71323.9 | 3749.27 |
| GAS | na | RAD | H-3 | Tritium | 23.598 | | 249.1754408 | 1 | 71489.1 | 3753.89 |
| GAS | na | RAD | H-3 | Tritium | 25.626 | | 237.854886 | 1 | 17890.6 | 952.887 |
| GAS | na | RAD | H-3 | Tritium | 22.825 | | 259.0251912 | 1 | 2478.91 | 164.377 |
| GAS | na | RAD | H-3 | Tritium | 21.895 | | 252.9293454 | 1 | 1866.61 | 135.445 |
| GAS | na | RAD | H-3 | Tritium | 26.929 | | 239.0457494 | 1 | 64292 | 3377.01 |
| GAS | na | RAD | H-3 | Tritium | 13.106 | | 308.9149112 | 1 | 20135.7 | 1076 |
| GAS | na | RAD | H-3 | Tritium | 24.348 | | 245.3199821 | 1 | 65310.8 | 3430.69 |
| GAS | na | RAD | H-3 | Tritium | 19.925 | | 259.5323904 | 1 | 15106.5 | 809.726 |
| GAS | na | RAD | H-3 | Tritium | 21.832 | | 253.2757535 | 1 | 14564.5 | 780.947 |

| Standard Quant Limit | Standard Units | Qualifier | Lab Sample Type | Analytical Suite | Analytical Method | Lab Code | Analysis Date | Collection Date |
|---|---|---|---|---|---|---|---|---|
| | pCi/L | NQ | CS | H3 | EPA:906.0 | ARSL | 03/08/2011 | 02/08/2011 |
| | pCi/L | J | CS | H3 | EPA:906.0 | ARSL | 03/08/2011 | 02/08/2011 |
| | pCi/L | J | CS | H3 | EPA:906.0 | ARSL | 03/08/2011 | 02/08/2011 |
| | pCi/L | NQ | CS | H3 | EPA:906.0 | ARSL | 03/08/2011 | 02/08/2011 |
| | pCi/L | U | CS | H3 | EPA:906.0 | ARSL | 03/08/2011 | 02/08/2011 |
| | pCi/L | J | CS | H3 | EPA:906.0 | ARSL | 03/08/2011 | 02/08/2011 |
| | pCi/L | J | CS | H3 | EPA:906.0 | ARSL | 03/08/2011 | 02/08/2011 |
| | pCi/L | J | CS | H3 | EPA:906.0 | ARSL | 03/08/2011 | 02/08/2011 |
| | pCi/L | NQ | CS | H3 | EPA:906.0 | ARSL | 03/08/2011 | 02/08/2011 |
| | pCi/L | NQ | CS | H3 | EPA:906.0 | ARSL | 03/30/2011 | 03/10/2011 |
| | pCi/L | NQ | CS | H3 | EPA:906.0 | ARSL | 03/30/2011 | 03/09/2011 |
| | pCi/L | NQ | CS | H3 | EPA:906.0 | ARSL | 03/30/2011 | 03/09/2011 |
| | pCi/L | NQ | CS | H3 | EPA:906.0 | ARSL | 03/30/2011 | 03/09/2011 |
| | pCi/L | NQ | CS | H3 | EPA:906.0 | ARSL | 03/30/2011 | 03/09/2011 |
| | pCi/L | U | CS | H3 | EPA:906.0 | ARSL | 03/30/2011 | 03/09/2011 |
| | pCi/L | NQ | CS | H3 | EPA:906.0 | ARSL | 03/30/2011 | 03/09/2011 |
| | pCi/L | NQ | CS | H3 | EPA:906.0 | ARSL | 03/30/2011 | 03/09/2011 |
| | pCi/L | NQ | CS | H3 | EPA:906.0 | ARSL | 03/30/2011 | 03/09/2011 |
| | pCi/L | NQ | CS | H3 | EPA:906.0 | ARSL | 07/04/2011 | 06/15/2011 |
| | pCi/L | NQ | CS | H3 | EPA:906.0 | ARSL | 07/03/2011 | 06/15/2011 |
| | pCi/L | NQ | CS | H3 | EPA:906.0 | ARSL | 07/04/2011 | 06/15/2011 |
| | pCi/L | NQ | CS | H3 | EPA:906.0 | ARSL | 07/05/2011 | 06/15/2011 |
| | pCi/L | U | CS | H3 | EPA:906.0 | ARSL | 07/04/2011 | 06/15/2011 |
| | pCi/L | NQ | CS | H3 | EPA:906.0 | ARSL | 07/04/2011 | 06/15/2011 |
| | pCi/L | U | CS | H3 | EPA:906.0 | ARSL | 07/04/2011 | 06/15/2011 |
| | pCi/L | NQ | CS | H3 | EPA:906.0 | ARSL | 07/04/2011 | 06/15/2011 |
| | pCi/L | NQ | CS | H3 | EPA:906.0 | ARSL | 07/05/2011 | 06/15/2011 |
| | pCi/L | NQ | CS | H3 | EPA:906.0 | ARSL | 09/30/2011 | 09/15/2011 |
| | pCi/L | NQ | CS | H3 | EPA:906.0 | ARSL | 09/30/2011 | 09/15/2011 |
| | pCi/L | NQ | CS | H3 | EPA:906.0 | ARSL | 10/01/2011 | 09/15/2011 |
| | pCi/L | NQ | CS | H3 | EPA:906.0 | ARSL | 09/30/2011 | 09/15/2011 |
| | pCi/L | NQ | CS | H3 | EPA:906.0 | ARSL | 09/30/2011 | 09/15/2011 |
| | pCi/L | NQ | CS | H3 | EPA:906.0 | ARSL | 09/30/2011 | 09/15/2011 |
| | pCi/L | NQ | CS | H3 | EPA:906.0 | ARSL | 10/01/2011 | 09/15/2011 |
| | pCi/L | NQ | CS | H3 | EPA:906.0 | ARSL | 10/01/2011 | 09/15/2011 |
| | pCi/L | NQ | CS | H3 | EPA:906.0 | ARSL | 09/30/2011 | 09/15/2011 |

| Analysis Result ID | Request Number | Sample ID | Excavated | Sample Technique | Sample Usage | Field Prep | Field QC Type | Site | Location ID |
|---|---|---|---|---|---|---|---|---|---|
| 7978434 | 11-1296 | MD21-11-4738 | N | VOST | QC | na | FB | PRS 21-018(a)-99 | 21-24524W |
| 7978441 | 11-1296 | MD21-11-4739 | N | VOST | QC | na | FD | PRS 21-018(a)-99 | 21-24524W |
| 8091243 | 11-1611 | MD21-11-5609 | N | VOST | QC | na | FD | PRS 21-018(a)-99 | 21-24524W |
| 8091247 | 11-1587 | MD21-11-5610 | N | VOST | QC | na | FB | PRS 21-018(a)-99 | 21-24524W |
| 8309279 | 11-2668 | MD21-11-14534 | N | VOST | QC | na | FB | PRS 21-018(a)-99 | 21-24524W |
| 8309284 | 11-2668 | MD21-11-14533 | N | VOST | QC | na | FD | PRS 21-018(a)-99 | 21-24524W |
| 8543790 | 11-3626 | MD21-11-26393 | N | VOST | QC | na | FD | PRS 21-018(a)-99 | 21-24524W |
| 8543792 | 11-3646 | MD21-11-26394 | N | VOST | QC | na | FB | PRS 21-018(a)-99 | 21-24524W |

| Depth Range (ft) | Field Matrix | Media | RFI Class | Analyte Code | Analyte | Percent Moisture | Standard MDL | Standard MDA |
|---|---|---|---|---|---|---|---|---|
| 0-0 | GAS | na | RAD | H-3 | Tritium | 4.937 | | 583.9439218 |
| 300-305 | GAS | na | RAD | H-3 | Tritium | 7.465 | | 412.9021765 |
| 300-305 | GAS | na | RAD | H-3 | Tritium | 11.464 | | 336.6091939 |
| 0-0 | GAS | na | RAD | H-3 | Tritium | 5.521 | | 560.0990784 |
| 0-0 | GAS | na | RAD | H-3 | Tritium | 4.79 | | 565.0742812 |
| 300-305 | GAS | na | RAD | H-3 | Tritium | 13.007 | | 308.6965684 |
| 172.5-177.5 | GAS | na | RAD | H-3 | Tritium | 22.896 | | 251.6221706 |
| 0-0 | GAS | na | RAD | H-3 | Tritium | 8.577 | | 386.8434701 |

| Dilution Factor | Standard Result | Standard Uncertainty | Standard Quant Limit | Standard Units | Qualifier | Lab Sample Type | Analytical Suite |
|---|---|---|---|---|---|---|---|
| 1 | 309.619 | 178.445 | | pCi/L | U | CS | H3 |
| 1 | 52846.6 | 2791.84 | | pCi/L | NQ | CS | H3 |
| 1 | 57496.2 | 3027.6 | | pCi/L | NQ | CS | H3 |
| 1 | 6.29576 | 167.428 | | pCi/L | U | CS | H3 |
| 1 | -139.33 | 167.349 | | pCi/L | U | CS | H3 |
| 1 | 70797.6 | 3721.63 | | pCi/L | NQ | CS | H3 |
| 1 | 20564.4 | 1093.48 | | pCi/L | NQ | CS | H3 |
| 1 | 547.163 | 124.735 | | pCi/L | NQ | CS | H3 |

| Analytical Method | Lab Code | Analysis Date | Collection Date |
|---|---|---|---|
| EPA:906.0 | ARSL | 03/08/2011 | 02/08/2011 |
| EPA:906.0 | ARSL | 03/08/2011 | 02/08/2011 |
| EPA:906.0 | ARSL | 03/30/2011 | 03/10/2011 |
| EPA:906.0 | ARSL | 03/30/2011 | 03/09/2011 |
| EPA:906.0 | ARSL | 07/04/2011 | 06/15/2011 |
| EPA:906.0 | ARSL | 07/04/2011 | 06/15/2011 |
| EPA:906.0 | ARSL | 09/30/2011 | 09/15/2011 |
| EPA:906.0 | ARSL | 10/06/2011 | 09/15/2011 |