

LK7638

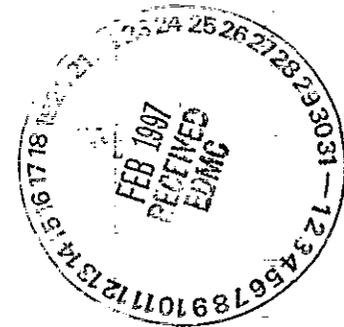
0046718

LOCKHEED MARTIN 

August 29, 1996

Ms. Joan Kessner  
Bechtel Hanford, Inc.  
3350 George Washington Way  
MS B1-35  
Richland, WA 99352

RE: Log-in No.: L7638  
Quotation No.: Q400000-B  
SAF: B96-147  
Document File No.: 0808596  
BHI Document Control No.: 393  
SDG No.: LK7638



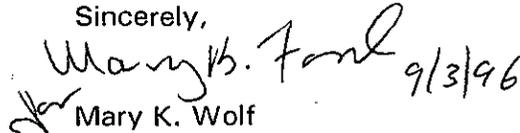
The attached data report contains the analytical results of samples that were submitted to Lockheed Analytical Services on August 8, 1996. The temperature of the cooler upon receipt was 2. Sample containers received coincided with the chain-of-custody documentation. All sample containers were received intact. Samples were received in time to meet the analytical holding time requirements.

The case narratives included in the following attachments provide a detailed description of all events that occurred during sample preparation, analysis, and data review specific to the samples and analytical methods requested.

A list of data qualifiers, chain-of-custody forms, sample receiving checklist, and log-in report are also enclosed representing the samples received within this group.

If you have any questions concerning the analysis or the data please call Mary Wolf at (702) 361-3955, extension 311. If you are unable to contact the client services representative, please call Mary B. Ford, client services manager, at extension 326.

"I certify that this data package is in compliance with the SOW, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package has been authorized by the Laboratory Manager or a designee, as verified by the following signature."

Sincerely,  
  
Mary K. Wolf  
Client Services Representative

cc: Client Services  
Document Control

000003

**CASE NARRATIVE  
RADIOCHEMICAL ANALYSES**

The routine calibration and quality control (QC) analyses performed for this batch include as applicable: instrument calibration, initial and continuing calibration verification, quench monitoring standards, instrument background analysis, method blanks, yield tracer, laboratory control samples, matrix spike samples, and duplicate samples.

NOTE: Chemical recoveries and minimum detectable activities can be found on the preparation sheets and calculation sheets of the attached raw data.

**Holding Time Requirements**

All holding time requirements were met.

**Analytical Method Strontium-90**

The strontium-90 analysis was performed using standard operating procedure, LAL-91-SOP-0065. The samples were analyzed in workgroup 40317. The instrument calibration verification met criteria. The method blank was within QC criteria. The laboratory control sample recovery was within QC criteria. The duplicate recoveries were within QC criteria. No re-analyses were performed.

Andrea Tippett  
Prepared By

August 28, 1996  
Date

**000004**

LOCKHEED ANALYTICAL SERVICES  
 LOGIN CHAIN OF CUSTODY REPORT (ln011-  
 Aug 08 1996, 07:02 pm BHL-  
393

Login Number: L7638  
 Account: 596 Bechtel Hanford, Inc. \* Richland, WA  
 Project: BECHTEL-HANFORD Bechtel Hanford Project

Laboratory Sample Number	Client Sample Number	Collect Date	Receive Date	Due PR Date
L7638-1 TEMP 2; SAF# B96-147 Location: 157 Water 1 S SCREENING	BOHYM3	06-AUG-96	08-AUG-96	23-AUG-96
		Hold:02-FEB-97		
L7638-2 TEMP 2; SAF# B96-147 Location: 157 Water 1 S SR-TOTAL LAL-0065	BOHYM3	06-AUG-96	08-AUG-96	23-AUG-96
		Hold:02-FEB-97		
L7638-3 TEMP 2; SAF# B96-147 Location: 157	BOHYM3	06-AUG-96	08-AUG-96	23-AUG-96
L7638-4 TEMP 2; SAF# B96-147 Location: 157	BOHYM3	06-AUG-96	08-AUG-96	23-AUG-96
L7638-5 TEMP 2; SAF# B96-147 Location: 157	BOHYM3	06-AUG-96	08-AUG-96	23-AUG-96
L7638-6 SAF# B96-147 Location: Water 1 S EDD - DISK DEL. Water 1 S RAD RPT TYPE 2	REPORT TYPE	08-AUG-96	08-AUG-96	23-AUG-96

Signature: *[Signature]*  
 Date: 8-8-9600007

0808546

Bechtel Hanford Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

**L7638**

Data Turnaround

Priority  
 Normal

Collector <i>A. K...</i>	Company Contact Borghese, JV	Telephone No. (509) 373-4790
Project Designation 100-NR-2 Pump and Treat Treatability Study	Sampling Location 100 N	SAF No. B96-147
Ice Chest No. <i>EFS-101</i>	Field Logbook No. <i>EFC 1248</i>	Method of Shipment Federal Express
Shipped To Lockheed	Offsite Property No. <i>W96-0-0314-4</i>	Bill of Lading/Air Bill No. <i>2904661873</i>

POSSIBLE SAMPLE HAZARDS/REMARKS	Preservation	HNO3 to pH <	None											
	Type of Container	P	P											
	No. of Container(s)	4	1											
Special Handling and/or Storage Maintain samples between 2 degrees C and 6 degrees C.	Volume	1000ml	20ml											

SAMPLE ANALYSIS		Strontium-90.90 -- Total Sr	Activity Scan											
-----------------	--	-----------------------------	---------------	--	--	--	--	--	--	--	--	--	--	--

Sample No.	Matrix *	Sample Date	Sample Time											
B0HYM3	Water	<i>8-6-96</i>	<i>0934</i>	X	X									

CHAIN OF POSSESSION	Sign/Print Names	SPECIAL INSTRUCTIONS	Matrix *
Relinquished By <i>A.G. Rizzo</i>	Date/Time <i>8-6-96</i>	Received By <i>W. H. ER</i>	Date/Time <i>1500</i>
Relinquished By <i>A.G. Rizzo</i>	Date/Time <i>8-6-96</i>	Received By <i>B. White</i>	Date/Time <i>8-6-96</i>
Relinquished By <i>W. H. ER</i>	Date/Time <i>0900</i>	Received By	Date/Time
Relinquished By <i>B. White</i>	Date/Time <i>8-7-96</i>	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time

- S - Soil
- SE - Sediment
- SO - Solid
- SL - Sludge
- W - Water
- O - Oil
- A - Air
- DS - Drum Solids
- DL - Drum Liquids
- T - Tissue
- WI - Wipe
- L - Liquid
- V - Vegetation
- X - Other

LABORATORY SECTION	Received By <i>B. White</i>	Title <i>So. M. Custodian</i>	Date/Time <i>8-8-96 / 0900</i>
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

0658596

# LOCKHEED MARTIN



## Sample Login Login Review Checklist

Lot Number L7628

The login review should be conducted by that person logging in the samples as well as a peer. Please use this checklist to ensure that such reviews occur in a uniform basis. Please sign and date below to verify that a login review has occurred. This checklist should be affixed to each login package prior to distribution.

For effective login review, at a minimum, five reports from the login process are required. These are the COC (or equivalent), the login COC report, the sample summary report, the sample receiving checklist, and the login quotation. Before beginning review, ensure that these five components are available. Jobs with single component samples, the sample summary report may be omitted.

### SAMPLE SUMMARY REPORT

	<u>YES</u>	<u>NO</u>	<u>N/A</u>	<u>Comment</u>
1. Are all sample ID's correct?	<u>X</u>	—	—	_____
2. Are all samples present?	<u>X</u>	—	—	_____
3. Are all matrices indicated correctly?	<u>X</u>	—	—	_____
4. Are all analyses on the COC logged in for the appropriate samples?	<u>X</u>	—	—	_____
5. Are all analyses logged in for the correct container?	<u>X</u>	—	—	_____
6. Are samples logged in according to LAS batching procedures?	<u>X</u>	—	—	_____

### LOGIN CHAIN OF CUSTODY

	<u>YES</u>	<u>NO</u>	<u>N/A</u>	<u>Comment</u>
1. Are the collect, receive, and due dates correct for every sample?	<u>X</u>	—	—	_____
2. Have all appropriate comments been indicated in the comment section?	—	—	<u>X</u>	_____

### SAMPLE RECEIVING CHECKLIST

	<u>YES</u>	<u>NO</u>	<u>N/A</u>	<u>Comment</u>
1. Are all discrepancies between the COC and the login noted (if applicable)?	—	—	<u>X</u>	_____

[Signature]      8-8-96  
primary review signature      date

[Signature]  
secondary review signature

000009  
8-8-96  
date

0808596

### SAMPLE CHECK-IN LIST

Date/Time Received: 8-8-96/0900 SDG#: ML  
 Work Order Number: ML SAF #: B9L-147  
 Shipping Container ID: EPS-107 Chain of Custody #: ML

- 1. Custody Seals on shipping container intact? Yes  No [ ]
- 2. Custody Seals dated and signed? Yes  No [ ]
- 3. Sample temperature 2°C
- 4. Vermiculite/packing materials is Wet [ ] Dry
- 5. Each sample is in a plastic bag? Yes  No [ ]
- 6. Sample holding times exceeded? Yes [ ] No

7.	Samples have: <input checked="" type="checkbox"/> tape custody seals <input checked="" type="checkbox"/> hazard labels appropriate sample labels
8.	Samples are: <input checked="" type="checkbox"/> in good condition <input type="checkbox"/> leaking <input type="checkbox"/> broken <input type="checkbox"/> have air bubbles

9. Is the information on the COC and Sample bottles in agreement?  
 Yes  No [ ]

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Sample Custodian/Laboratory: ML Date: 8-8-96  
 Telephoned To: Kashleen Hall On 8-8-96 By Anthony Miller

Sample Receiving Checklist

Client Name: *Bechtel-Hanford*

Job No. *L7638*

Cooler ID:

COOLER CONDITION UPON RECEIPT

Temperature of cooler upon receipt:	<i>22</i>		
temperature of temp. blank upon receipt:			
	Yes	No	* Comments/Discrepancies
custody seals intact	<i>X</i>		
chain of custody present	<i>X</i>		
blue ice (or equiv.) present/frozen	<i>X</i>		
rad survey completed	<i>X</i>		

SAMPLE CONDITION UPON RECEIPT

	Yes	No	* Comments/Discrepancies
all bottles labeled	<i>X</i>		
samples intact	<i>X</i>		
proper container used for sample type	<i>X</i>		
sample volume sufficient for analysis	<i>X</i>		
proper pres. indicated on the COC	<i>X</i>		
VOA's contain headspace			<i>MF</i>
are samples bi-phasic (if so, indicate sample ID'S):			<i>MF</i>

MISCELLANEOUS ITEMS

	Yes	No	* Comments/Discrepancies
samples with short holding times		<i>X</i>	
samples to subcontract		<i>X</i>	

ADDITIONAL COMMENTS/DISCREPANCIES

Completed by / date: *h... 8-8-96*

Sent to the client (date/initials): **\*\* Client's signature upon receipt:**

Notes: \* = contact the appropriate CSR of any discrepancies immediately upon receipt  
 \*\* = please review this information and return via facsimile to the appropriate CSR (702) 361-8146

0808596  
000011  
version 2.0 (11/11/94)

Lockheed Analytical Laboratory  
SAMPLE SUMMARY REPORT (su02)  
Bechtel Hanford, Inc. \* Richland, WA

Client Sample Number	LAL Sample Number	SDG Number	Matrix	Method
BOHYM3	L7638-1 L7638-2		Water Water	SCREENING SR-TOTAL LAL-0065
REPORT TYPE	L7638-6 L7638-6		Water Water	EDD - DISK DEL. RAD RPT TYPE 2

000012

0808596

# LOCKHEED ANALYTICAL LABORATORY

## SAMPLE PREPARATION LOG FOR STRONTIUM ANALYSIS

TOTAL RADIOSTRONTIUM - LAL-91-SOP-0065

Date Prep Started :

Matrix : Water

WorkGroup : SR-90 LAL-0065 40317

Prep Due Date : 08/22/96

CUSTOMER ID	PARENT LAL ID	NO	QC	CHILD LAL ID	ALLOQUOT VOLUME (g or L)	SR CARRIER (ml)	YTTRIUM SEP DATE	YTTRIUM SEP TIME	PLANCHET TARE WT (grams)	PLANCHET GROSS WT (grams)	* RESIDUE WEIGHT (grams)	COMMENTS
L7638-2	40317DUP1	1	DUP1	40317-01	1.03	2	8/25/96	18:55	8.6960	8.7360		Calc value for
Lab Ctrl Sample	40317LCS1	2	LCS1	40317-02	1		↓	↓	8.2696	8.3089		2.0ml of 1.0 carrier
Method Blank	40317MBB	3	MBB1	40317-03	1		↓	↓	8.6988	8.7394		10mg Sr <sup>90</sup> /ml
BOHYM3	L7638-2	4	SMP1	40317-04	1.03		↓	↓	8.6145	8.6491		= 0.0425
		5										[LAL-91-LOG-0658-35]
		6										
		7										
		8										
		9										
		10										
		11										
		12										
		13										
		14										
		15										
		16										
		17										
		18										
		19										
		20										
		21										
		22										
		23										
		24										
Conc & Vol of Carrier	2.0ml carrier 10mg/ml				Act & Vol of LCS	40.00 10mg/ml 1.0ml				Prep Anlst	DHT	
Carrier Exp Date	93-509-61				LCS Ref Date	8/1/90				Start Date	8/21/96	
Carrier ID#	41697				LCS ID#	95-721-33				Count Anlst	CS	

Balance Number : \_\_\_\_\_ ( )

Pipette Number : 71007 ( )

Carrier and LCS added by : DHT

Witnessed by : R.A. 8/21/96

Comments : Setup by D.H. ; Final Analysis by NN.

Analyst : no

Checked by : [Signature]

Cnt Rm Custody/Date : CS 8/26/96

000019

# LOCKHEED ANALYTICAL LABORATORY

## SAMPLE PREPARATION LOG FOR STRONTIUM ANALYSIS TOTAL RADIOSTRONTIUM - LAL-91-SOP-0065

Date Prep Started : 8/21/96

Matrix : Water

WorkGroup : SR-90 LAL-0065 40317

Prep Due Date : 08/22/96

CUSTOMER ID	PARENT LAL ID	NO	QC	CHILD LAL ID	ALIQUOT VOLUME (L)	SR CARRIER (mL)	YTTRIUM SEP DATE	YTTRIUM SEP TIME	PLANCHET TARE WT (grams)	PLANCHET GROSS WT (grams)	* * *	RESIDUE WEIGHT (grams)	COMMENTS
L7638-2	40317DUP1	1	DUP1	40317-01	1.03	2	8/25/96	18:55	8.696	8.736		0.04	
Lab Ctrl Sample	40317LCS1	2	LCS1	40317-02	1	2	8/25/96	18:55	8.2696	8.3089		0.0393	
Method Blank	40317MBB	3	MBB1	40317-03	1	2	8/25/96	18:55	8.6988	8.7394		0.0406	
BOHYM3	L7638-2	4	SMP1	40317-04	1.03	2	8/25/96	18:55	8.6145	8.6491		0.0346	
		5											
		6											
		7											
		8											
		9											
		10											
		11											
		12											
		13											
		14											
		15											
		16											
		17											
		18											
		19											
		20											
		21											
		22											
		23											
		24											
Conc & Vol of Carrier	21.25 mg/mL; 2.0 mL		Act & Vol of LCS		40.00 pCi/mL; 1.0 mL		Prep Anlst		DH				
Carrier Exp Date	29-Apr-97		LCS Ref Date		01-Aug-90		Start Date		8/21/96				
Carrier ID#	94-658-35		LCS ID#		95-721-33		Count Anlst		CS				

Balance Number : \_\_\_\_\_ ( )  
 \_\_\_\_\_ ( )

Pipette Number : 71008 ( )  
 \_\_\_\_\_ ( )

Carrier and LCS added by: DH  
 Witnessed by : RM

Comments : \_\_\_\_\_

000020

Analyst : SV46K NV  
DATA ENTRY

Checked by : 

Cnt Rm Custody/Date : \_\_\_\_\_





THIS IS A PHOTOCOPY OF THE CERTIFICATE WHICH IS BEING MAILED TO YOU UNDER SEPARATE COVER.

# National Institute of Standards & Technology

## Certificate

### Standard Reference Material 4919-G Radioactivity Standard

Radionuclide	Strontium-90
Source identification	4919-G
Source description	Solution in NIST borosilicate-glass ampoule <sup>(1)</sup> *
Solution composition	Strontium-90 plus yttrium-90 plus approximately 95 µg each of non-radioactive strontium and yttrium per gram of 1-molar hydrochloric acid <sup>(2)</sup>
Mass	Approximately 5.0 grams
Radioactivity concentration	4.514 x 10 <sup>3</sup> Bq g <sup>-1</sup>
Reference time	1200 EST August 1, 1990
Overall uncertainty	1.05 percent <sup>(3)</sup>
Photon-emitting impurities	None observed <sup>(4)</sup>
Alpha-particle-emitting impurities	None observed <sup>(5)</sup>
Half life	28.5 ± 0.2 years <sup>(6)</sup>
Measuring instrument	4πβ liquid-scintillation counter

This standard reference material was prepared in the Center for Radiation Research, Ionizing Radiation Division, Radioactivity Group, Dale D. Hoppes, Group Leader.

Gaithersburg, MD 20899  
January, 1991

William P. Reed, Acting Chief  
Office of Standard Reference Materials

\*Notes on back

000024

## NOTES

- (1) Approximately five milliliters of solution. Ampoule specifications:

body diameter	16.5 ± 0.5 mm
wall thickness	0.60 ± 0.04 mm
barium content	less than 2.5 percent
lead oxide content	less than 0.02 percent
other heavy elements	trace quantities

- (2) Solution density is 1.014 ± 0.002 g/mL at 21.5 °C.

- (3) The overall uncertainty was formed by taking three times the quadratic combination of standard deviations of the mean, or approximations thereof, for the following:

a) liquid-scintillation measurements	0.01 percent
b) gravimetric measurements	0.05 percent
c) dead time	0.10 percent
d) background	0.01 percent
e) detection efficiency	0.30 percent
f) decay-scheme data	0.10 percent
g) half life	0.01 percent
h) radionuclidic impurities	0.10 percent

- (4) The limit of detection for photon-emitting impurities is:

$$0.01 \gamma \text{ s}^{-1}\text{g}^{-1} \text{ between } 50 \text{ and } 1900 \text{ keV.}$$

- (5) The limit of detection for alpha-particle-emitting impurities is:

$$0.05 \alpha \text{ s}^{-1}\text{g}^{-1}.$$

- (6) NCRP Report No. 58, 2nd Edition, February 1985, p. 365.

For further information please contact Dr. Larry Lucas at (301) 975-5546.

4919-G

000025

NOTES ON THE USE  
OF  
STANDARD REFERENCE MATERIAL 4919G, STRONTIUM-90

The activity of the strontium-90 in the ampoule is given per gram of solution. If transfers are made by volume, the density given on the certificate can be used to compute the activity per unit volume. The activity given is the strontium-90 activity only. Because the strontium-90 is in equilibrium with its yttrium-90 daughter, which is also a beta-particle emitter, the activity given should be doubled to get the corresponding total beta-particle-emission rate.

If the solution is to be used for making quantitative sources, it should be kept tightly sealed so that evaporation, and the consequent change in the radioactivity concentration, is minimized. Glass containers are best for storage.

Dilute solutions of strontium-90 are often assayed by liquid-scintillation counting. We recommend that carrier solution containing approximately 1 mg of non-radioactive strontium be added first to the liquid-scintillation cocktail. We typically use a carrier solution containing 4 mg of strontium per mL of 0.5- molar hydrochloric acid. When 0.25 mL of this solution is added to 10 mL of emulsion-type liquid-scintillation cocktail, the resulting 1 mg of strontium per vial is generally sufficient to prevent the radioactive strontium-90 from plating out on the vial walls. A set of liquid-scintillation vials that cover a range of sample-solution masses should be prepared and monitored over several days to ensure that the efficiency is constant.

The beta-particle counting efficiency will be somewhat less than unity. A correction for the loss of low-energy beta particles can be computed using the integral-discriminator-extrapolation technique (G. Goldstein, *Nucleonics* 23 (1965) 67) or using the liquid-scintillation efficiency-tracing technique with tritium (B.M. Coursey et al, *Int. J. Radiat. Isotopes* 37 (1986) 403).

The activity concentration given on the certificate is as of 1200 hours Eastern Standard Time, August 9, 1990. To convert from EST to your local time, the table given below can be used.

**TO CONVERT FROM EST TO:**

<b>EDT</b>	<b>Add</b>	<b>1 hour</b>
<b>CDT</b>	<b>Same as EST</b>	
<b>CST</b>	<b>Subtract</b>	<b>1 hour</b>
<b>MDT</b>	<b>Subtract</b>	<b>1 hour</b>
<b>MST</b>	<b>Subtract</b>	<b>2 hours</b>
<b>PDT</b>	<b>Subtract</b>	<b>2 hours</b>
<b>PST</b>	<b>Subtract</b>	<b>3 hours</b>
<b>UTC</b>	<b>Add</b>	<b>5 hours</b>

000026

PROJECT \_\_\_\_\_

Sr-90 LCS

Continued From Page \_\_\_\_\_

## SECONDARY/WORKING LEVEL STANDARD DILUTION RECORD

### Dilution Source Information

Isotope: Sr-90

Parent Barcode Number: AA0046

Vendor or Certificate I.D. # of Parent Standard: -

Diluted Source Logbook I.D. #: 91-0225-30-2

Balance Verification?: y

Diluent Used: 1.0 M HCl

### Dilution

\*Diluent: 1 M HCl

\*Density of diluent (g/ml): 1.0121 g/ml

a: Parent Specific Activity: 10000.67 pCi/ml - cert # 8/1/90

b: Amount of Source Transferred: 2.00 2.01 g

c: Total amount of Dilution: 303.63 g

d: Total Volume of Dilution: 300 0 ml

e: Activity of Dilution (a \* b / c): 40.49 pCi/g 8/1/90

f: Activity of Dilution (a \* b / d): 40.60 pCi/ml

Dilution Logbook I.D. #: 95-0721-33-1

Prepared By: AJC. M. [Signature] Preparation Date: 7/9/96

Reviewed By: [Signature] Review Date: 7/9/96

\*If the diluent remains unchanged from the diluent used for the dilution source, then a weight dilution of a volume unit source can be performed without a density conversion. If the diluent changes, a weighted proportion density conversion is necessary.

Read and Understood By \_\_\_\_\_

**000027**

Signed \_\_\_\_\_

Date \_\_\_\_\_

Signed \_\_\_\_\_

Date \_\_\_\_\_