START

9713531.2159

Lockheed Environmental Systems & Technologies Co.
Lockheed Analytical Services
975 Kelly Johnson Drive Las Vegas, Nevada 89119-3705
Telephone 702-361-0220 800-582-7605 Facsimile 702-361-8146

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

FEB 1997 RECEIVED EDMC

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 B. Ford 9/3/96

for Mary K. Wolf
Client Services Representative

cc: Client Services
Document Control

Lockheed Analytical Services

Log-in No.: L7638
Quotation No.: Q400000-B
SAF: B96-147
Document File No.: 0808596
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SDG No.: LK7638
Page No.: 1

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

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LOCKHEED ANALYTICAL SERVICES
LOGIN CHAIN OF CUSTODY REPORT (ln01)
Aug 08 1996, 07:02 pm

BH1-393

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	PR	Due Date
L7638-1	B0HYM3	06-AUG-96	08-AUG-96		23-AUG-96
TEMP 2; SAF# B96-147					
Location: 157					
Water 1 S SCREENING		Hold:02-FEB-97			
L7638-2	B0HYM3	06-AUG-96	08-AUG-96		23-AUG-96
TEMP 2; SAF# B96-147					
Location: 157					
Water 1 S SR-TOTAL LAL-0065		Hold:02-FEB-97			
L7638-3	B0HYM3	06-AUG-96	08-AUG-96		23-AUG-96
TEMP 2; SAF# B96-147					
Location: 157					
L7638-4	B0HYM3	06-AUG-96	08-AUG-96		23-AUG-96
TEMP 2; SAF# B96-147					
Location: 157					
L7638-5	B0HYM3	06-AUG-96	08-AUG-96		23-AUG-96
TEMP 2; SAF# B96-147					
Location: 157					
L7638-6	REPORT TYPE	08-AUG-96	08-AUG-96		23-AUG-96
SAF# B96-147					
Location:					
Water 1 S EDD - DISK DEL.					
Water 1 S RAD RPT TYPE 2					

Signature: [signature]

Date: 8-8-96 200007

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Bechtel Hanford Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

L7638

B96-147-37 | Page 1 of 1

Data Turnaround: [X] Priority [ ] Normal

Collector A. Rizzo	**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. EFS-101	**Field Logbook No.** EFC 1[illegible]	**Method of Shipment** Federal Express
Shipped To Lockheed	**Offsite Property No.** W96-0-0314-4	**Bill of Lading/Air Bill No.** 2904661873

POSSIBLE SAMPLE HAZARDS/REMARKS

Special Handling and/or Storage
Maintain samples between 2 degrees C and 6 degrees C.

Preservation	HNO3 to pH <2	None										
Type of Container	P	P										
No. of Container(s)	4	1										
Volume	1000ml	20ml										
SAMPLE ANALYSIS	Strontium-89,90 – Total Sr	Activity Scan										

Sample No.	Matrix *	Sample Date	Sample Time										
B0HYM3	Water	8-6-96	0934	X	X								

CHAIN OF POSSESSION — **Sign/Print Names**

Relinquished By	Date/Time	Received By	Date/Time
A.G. Rizzo (EFC)	8-6-96 1500	[signature] EFC B.Whitten	8-6-96 1500
[signature] EFC B.Whitten	8-7-96 0900		

SPECIAL INSTRUCTIONS

Matrix *
- 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 [signature]	Title Sample Custodian	Date/Time 8-8-96 / 0900
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

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LOCKHEED MARTIN

Sample Login
Login Review Checklist

Lot Number L7638

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

LOGIN CHAIN OF CUSTODY	YES	NO	N/A	Comment
1. Are the collect, receive, and due dates correct for every sample?	X			
2. Have all appropriate comments been indicated in the comment section?			X	

SAMPLE RECEIVING CHECKLIST	YES	NO	N/A	Comment
1. Are all discrepancies between the COC and the login noted (if applicable)?			X	

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

[signature] 000009 8-8-96
secondary review signature — date

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SAMPLE CHECK-IN LIST

Date/Time Received: 8-8-96/0900 SDG#: NL

Work Order Number: NL SAF #: B96-147

Shipping Container ID: EFS-101 Chain of Custody # NL

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

7. Samples have:
   - ___ tape
   - X custody seals
   - ___ hazard labels
   - X appropriate sample labels

8. Samples are:
   - X in good condition
   - ___ broken
   - ___ leaking
   - ___ have air bubbles

9. Is the information on the COC and Sample bottles in agreement?

   Yes [X] No [ ]

Notes: _____

Sample Custodian/Laboratory: [signature] Date: 8-8-96

Telephoned To: Kathleen Hall On 8-8-96 By Anthony Miller

Lockheed Analytical Services

Sample Receiving Checklist

Page of

Client Name: Bechtel - Hanford Job No. L7638 Cooler ID:

COOLER CONDITION UPON RECEIPT			
Temperature of cooler upon receipt:	2°C		
temperature of temp. blank upon receipt:			
	Yes	No	* Comments/Discrepancies
custody seals intact	X		
chain of custody present	X		
blue ice (or equiv.) present/frozen	X		
rad survey completed	X		

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

MISCELLANEOUS ITEMS			
	Yes	No	* Comments/Discrepancies
samples with short holding times		X	
samples to subcontract		X	

ADDITIONAL COMMENTS/DISCREPANCIES

Completed by / date: [signature] 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*

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version 2.0 (11/11/94)

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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		Water	SCREENING
	L7638-2		Water	SR-TOTAL LAL-0065
REPORT TYPE	L7638-6		Water	EDD - DISK DEL.
	L7638-6		Water	RAD RPT TYPE 2

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LOCKHEED ANALYTICAL SERVICES

RADIOCHEMISTRY DATA REPORT
Account Name: Bechtel Hanford, Inc. * Richland, WA
Project Name: BECHTEL-HANFORD
Project Desc: Bechtel Hanford Project

Client Sample ID: BOHYM3
Date Collected: 06-AUG-96
Matrix: Water

Login Number: L7638
Date Received: 08-AUG-96

Constituent	Method	Batch	Activity	Error	MDA	Qualifier	Units	Analyzed	Lab ID
Sr-89,90	LAL-0065	40317	1396.	70.	0.46		pCi/L	26-AUG-96	L7638-2

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	ALIQUOT 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
1a	L7638-2	40317DUP1	1	DUP1	40317-01	1.03	2	8/28/96	18:55	8.6960	8.7360			Calc Value for
2a	Lab Ctrl Sample	40317LCS1	2	LCS1	40317-02	1	1	↓	↓	8.2696	8.3089			2.0mL of Sr-carrier
3a	Method Blank	40317MBB	3	MBB1	40317-03	1	1			8.6988	8.7394			10mg Sr^{++}/mL
4a	B0HYM3	L7638-2	4	SMP1	40317-04	1.03	1	↓	↓	8.6145	8.6491			= 0.0425
			5											[LOL-94-206-0658-35]
			6											
			7											
			8											
			9											
			10											
			11											
			12											
			13											
			14											
			15											
			16											
			17											
			18											
			19											
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			21											
			22											
			23											
			24											

Conc&Vol of Carrier	2.0mL ~~0.02mg/mL~~ 10mg/mL	Act & Vol of LCS	40.00 pCi/mL 1.0mL	Prep Anlst	DLT
Carrier Exp Date	93-509-61	LCS Ref Date	8/1/90	Start Date	8/21/96
Carrier ID#	6/16/97	LCS ID#	95-721-33	Count Anlst	CS

Balance Number : _____ ( ) Pipette Number : 71008 ( ) Carrier and LCS added by: DLT

_____ ( ) _____ ( ) Witnessed by : RAP 8/21/96

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

V96024

Analyst : NN Checked by : [signature] Cnt Rm Custody\Date : CS 8/26/96

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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	
B0HYM3	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											
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		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 :

V96024

Analyst : SV for NV DATA ENTRY Checked by : [signature] Cnt Rm Custody\Date :

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LOCKHEED ANALYTICAL LABORATORY

COUNT DATA AND CALCULATIONS FOR STRONTIUM ANALYSIS
TOTAL RADIOSTRONTIUM - LAL-91-SOP-0065

WorkGroup : SR-90 LAL-0065_40317

Det	Planchet LAL ID Sr	QC	Chem Recov	Count Time (min)	Beta Counts	Bkg Counts	EFF Sr-90	Count Start Date	Count Start Time	Yttrium Ingrow To Count	Bkg Corr Activity pCi/L	Count Error 2 Sigma	Total Error 2 Sigma	LLD pCi/L	MDA pCi/L
LB1-B1	40317-01	DUP1	0.941	150	201632	156	0.384	08/26/96	10:18	1.165	1396.51	6.10	70.09	0.40	0.42
LB1-B2	40317-02	LCS1	0.925	150	4724	146	0.390	08/26/96	10:18	1.165	32.74	0.98	1.91	0.40	0.42
LB1-B3	40317-03	MBB1	0.955	150	156	158	0.397	08/26/96	10:18	1.165	-0.01	0.24	0.24	0.40	0.42
LB1-B4	40317-04	SMP1	0.814	150	178834	145	0.394	08/26/96	10:18	1.165	1396.09	6.49	70.11	0.44	0.46

COMMENTS : 40317LCS1 LCS Recovery = 32.74/34.61 = 94.6 %.
L7638-2, 40317DUP1 RPD = 0.03 %, RER = 0.003

MBB = -0.014 pCi/L => less than RDL(HAMDC).

V96024

Date Completed : 8-27-96
Analyst's Signature : SV

Checked by : [signature]

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AA 004

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 (1)*
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 (2)
Mass	Approximately 5.0 grams
Radioactivity concentration	4.514×10^9 Bq g^{-1}
Reference time	1200 EST August 1, 1990
Overall uncertainty	1.05 percent (3)
Photon-emitting impurities	None observed (4)
Alpha-particle-emitting impurities	None observed (5)
Half life	28.5 ± 0.2 years (6)
Measuring instrument	$4\pi\beta$ 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
[illegible]uary, 1991

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

*Notes on back

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:

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

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

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

(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

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:

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

PROJECT Sr-90 LCS 9713531 2174

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:	6000.69 pCi/ml ~~pCi/g~~ @ 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):	40.00	pCi/ml
Dilution Logbook I.D. #:	95-0721-33-1	

Prepared By: [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

Signed _____ Date _____ Signed [signature] Date 7/9/96