

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

LK 7173-LAS

0046197

LOCKHEED MARTIN 

June 20, 1996

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



RE: Log-in No.: L7173
Quotation No.: Q400000-B
SAF: B96-036
Document File No.: 0606596
BHI Document Control No.: 374
SDG No.: LK7173



The attached data report contains the analytical results of samples that were submitted to Lockheed Analytical Services on June 6, 1996. The temperature of the cooler upon receipt was 2°C. Sample containers received agree with the chain-of-custody documentation. 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 Kathleen M. Hall at (509) 375-4741.

"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,



Kathleen M. Hall
Client Services Representative

cc: Client Services
Document Control

0003

**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 Total Strontium

The total strontium analysis was performed using standard operating procedure, LAL-92-SOP-0196. The samples were analyzed in workgroup 37873. 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.

Yvonne M. Jacoby
Prepared By

June 20, 1996
Date

Lockheed Analytical Services
DATA QUALIFIERS FOR RADIOCHEMICAL ANALYSES

[Revised 04/05/96]

For Use on the Analytical Data Reporting Forms	
B	Any constituent that was detected in the associated method blank at a concentration was greater than the reporting detection limit (RDL).
C	The minimum detectable activity exceeded the RDL due to the residue weight limitations forcing a volume reduction.
D	Constituent detected in the diluted sample.
E	Constituent concentration exceeded the calibration or attenuation curve range.
F	<i>For Alpha Spectrometry Only</i> -- Full width half max exceeded the acceptance limits.
H	Sample analyzed performed outside of method-specified maximum holding time.
Y	Chemical analysis exceeded acceptance limits.
For Use on the QC Data Reporting Forms	
*	QC data (i.e., percent recovery data for laboratory control standard and matrix spike; and RPD for replicate analyses) exceeded acceptance limits.
a¹	The spike recovery and/or RPD for matrix spike and duplicates cannot be evaluated due to insufficient spiking level compared to the elevated sample analyte concentration.
b¹	The RPD cannot be computed because the sample and/or duplicate concentration was below the MDA.

¹ Used as foot note designations on the QC summary form.

LOCKHEED ANALYTICAL SERVICES
 LOGIN CHAIN OF CUSTODY REPORT (ln01)
 Jun 06 1996, 01:19 pm

Login Number: L7173
 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
L7173-1 TEMP 2 Location: 157 Water 1 S SCREENING	BOHG97	04-JUN-96	06-JUN-96	21-JUN-96
		Hold:01-DEC-96		
L7173-2 TEMP 2 Location: 157 Water 1 S SR-90 LAL-0196	BOHG97	04-JUN-96	06-JUN-96	21-JUN-96
		Hold:01-DEC-96		
L7173-3 TEMP 2 Location: 157	BOHG97	04-JUN-96	06-JUN-96	21-JUN-96
L7173-4 TEMP 2 Location: 157	BOHG97	04-JUN-96	06-JUN-96	21-JUN-96
L7173-5 TEMP 2 Location: 157	BOHG97	04-JUN-96	06-JUN-96	21-JUN-96
L7173-6 Location:	REPORT TYPE	06-JUN-96	06-JUN-96	21-JUN-96
Water 1 S EDD - DISK DEL.				
Water 1 S GERMANN				
Water 1 S RAD RPT TYPE 2				

Signature: *Patricia*

Date: 6-06-96

0006

0606596

Bechtel Hanford, Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

L7173

Data Turnaround

- Priority
- Normal

Collector <i>M. Mehlhorn</i>	Company Contact J.V. Borghese	Telephone (509) 373-4790
Project Designation 100-NR-2 Monthly Performance Monitoring - June	Sampling Location 100 N	SAF No. B96-036
Ice Chest No. <i>GWS-008</i>	Field Logbook No. <i>EL-1228</i>	Method of Shipment Hand Delivered
Shipped To Lockheed	Offsite Property No. <i>W96-0-0640-48</i>	Bill of Lading/Air Bill No. <i>2904657804</i>

Possible Sample Hazards/Remarks	Preservation	HNO ₃	Cool 4°C
		Type of Container	P/G
	No. of Container(s)	4	1
Special Handling and/or Storage Maintain samples between 2°C and 6°C.	Volume	1L	20mL
SAMPLE ANALYSIS		Sr-90	Activity Scan

Sample No.	Matrix*	Date Sampled	Time Sampled										
BOHG97	W	6.4.96	1200			X	X						

CHAIN OF POSSESSION		Sign/Print Names	
Relinquished By <i>Monty Mehlhorn</i>	Date/Time <i>6-4-96</i>	Received By <i>ER</i>	Date/Time <i>1435</i>
Relinquished By <i>ERC</i>	Date/Time <i>0900</i>	Received By <i>B. Whitten</i>	Date/Time <i>6-4-96</i>
Relinquished By <i>R. Whitten</i>	Date/Time <i>6-5-96</i>	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time

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 <i>A. Matthe</i>	Title <i>Sample Custodian</i>	Date/Time <i>6-6-96/0845</i>
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

SCALE 500

LOCKHEED MARTIN



Sample Login Login Review Checklist

Lot Number L7173

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>	<u> — </u>	<u> — </u>	
2. Are all samples present?	<u> X </u>	<u> — </u>	<u> — </u>	
3. Are all matrices indicated correctly?	<u> X </u>	<u> — </u>	<u> — </u>	
4. Are all analyses on the COC logged in for the appropriate samples?	<u> X </u>	<u> — </u>	<u> — </u>	
5. Are all analyses logged in for the correct container?	<u> X </u>	<u> — </u>	<u> — </u>	
6. Are samples logged in according to LAS batching procedures?	<u> X </u>	<u> — </u>	<u> — </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>	<u> — </u>	<u> — </u>	
2. Have all appropriate comments been indicated in the comment section?	<u> X </u>	<u> — </u>	<u> — </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> — </u>	<u> — </u>	<u> X </u>	

0008

Paul Davis
primary review signature

 6-06-96
date

Alm
secondary review signature

 6-6-96
date

OL000596

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

Client Sample Number	LAL Sample Number	SDG Number	Matrix	Method
BOHG97 -	L7173-1 L7173-2		Water Water	SCREENING SR-90 LAL-0196
REPORT TYPE -	L7173-6 L7173-6 L7173-6		Water Water Water	EDD - DISK DEL: GERMANN RAD RPT TYPE 2

0010

00006596

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: BOHG97

Date Collected: 04-JUN-96

Matrix: Water

Login Number: L7173

Date Received: 06-JUN-96

Constituent	Method	Batch	Activity	Error	MDA	Qualifier	Units	Analyzed	Lab ID
Sr-89,90	LAL-0196	37873	711.	35.	0.95		pCi/L	17-JUN-96	L7173-2

LOCKHEED ANALYTICAL LABORATORY

SAMPLE PREP/ RATION LOG FOR STRONTIUM ANALYSIS

TOTAL RADIOSTRONTIUM - LAL-91-SOP-0196

Date Prep Started : 6-14-96
 WorkGroup : SR-90 LAL-0196 37873

Matrix : Water
 Prep Due Date : 06/12/96

CUSTOMER ID	PARENT LAL ID	NO	QC	CHILD LAL ID	ALIQOUT 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
L7173-2	37873DUP1	1	DUP1	37873-01	50 ml	0.5	6-17-96	17:53	6.80185g	6.81245		
Lab Ctrl Sample	37873LCS1	2	LCS1	37873-02	↓	↓	↓	↓	6.53710g	6.54717		
Method Blank	37873MBB	3	MBB1	37873-03	↓	↓	↓	↓	6.57622g	6.58659		
BOHG97	L7173-2	4	SMP1	37873-04	↓	↓	↓	↓	6.85310	6.86327		
		5										
		6										
		7										
		8										
		9										
		10										
		11										
		12										
		13										
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		17										
		18										
		19										
		20										
		21										
		22										
		23										
		24										
Conc & Vol of Carrier		0.01225g / 0.5 ml ; 0.5 ml			Act & Vol of LCS		Sr-90 \rightarrow 26.78 pCi/ml		1.0 ml		Prep Anlst : <u>AW</u>	
Carrier Exp Date		9-31-96			LCS Ref Date		4-1-94				Start Date : <u>6-14-96</u>	
Carrier ID#		94-658-30			LCS ID#		44-677-44-1				Count Anlst :	

Balance Number : 4022021 (✓)
 ()

Pipette Number : 134488 (✓)
139746 (✓)

Carrier and LCS added by : AW 6-14-96
 Witnessed by : AW 6/14/96

Comments :

Analyst : AW

Checked by : AW 6/17/96

Cnt Rm Custody/Date : CS 6/18/96

0017

LOCKHEED ANALYTICAL LABORATORY

SAMPLE PREPARATION LOG FOR STRONTIUM ANALYSIS

TOTAL RADIOSTRONTIUM - LAL-91-SOP-0196

Date Prep Started : 6/14/96

Matrix : Water

WorkGroup : SR-90 LAL-0196 37873

Prep Due Date : 06/12/96

CUSTOMER ID	PARENT LAL ID	NO	QC	CHILD LAL ID	ALIQOT VOLUME (L)	SR CARRIER (mL)	YTTRIUM SEP DATE	YTTRIUM SEP TIME	PLANCHET TARE WT (grams)	PLANCHET GROSS WT (grams)	* * *	RESIDUE WEIGHT (grams)	COMMENTS
L7173-2	37873DUP1	1	DUP1	37873-01	0.5	0.5	6/17/96	17:53	6.80185	6.81245		0.0106	
Lab Ctrl Sample	37873LCS1	2	LCS1	37873-02	0.5	0.5	6/17/96	17:53	6.5371	6.54717		0.01007	
Method Blank	37873MBB	3	MBB1	37873-03	0.5	0.5	6/17/96	17:53	6.57622	6.58659		0.01037	
BOHG97	L7173-2	4	SMP1	37873-04	0.5	0.5	6/17/96	17:53	6.8531	6.86327		0.01017	
		5											
		6											
		7											
		8											
		9											
		10											
		11											
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		23											
		24											
Conc&Vol of Carrier		24.50 mg/mL; 0.5 mL			Act & Vol of LCS		26.78 pCi/mL; 1.0 mL			Prep Anlst		AW	
Carrier Exp Date		30-Sep-96			LCS Ref Date		01-Apr-94			Start Date		6/14/96	
Carrier ID#		94-658-20			LCS ID#		94-677-44-1			Count Anlst		WL	

Balance Number : 40020021 ()

Pipette Number : 134488 ()

Carrier and LCS added by: AW

Witnessed by : WL

Comments :

0018

Analyst : SV FOR WL
Outd Entry

Checked by : 

Cnt Rm Custody/Date : _____

KC 14 513177
ACSA
RKS

U.S. Environmental Protection Agency
Environmental Monitoring Systems Laboratory-Las Vegas
Nuclear Radiation Assessment Division

Calibration Certificate

Description

Principal radionuclide **Strontium-90** Half-life **28.6 years**

Nominal activity **27** **nano curies**

Nominal volume **5** ml in ampoule/bottle number **94003-1**

Measurement Activity of principal radionuclide

Activity per gram of this solution

5.40 **nano curies** of **Strontium-90**

at 0400 hours PST on **April 1, 1994**

Activity of daughter radionuclide

The principal activity was accompanied at the quoted time by

5.40 **nano curies** Per gram

of the daughter nuclide **Yttrium-90**

Total mass of this solution

Approximately 5.0 grams

Method of measurement

The activity of the primary solution was measured by liquid scintillation counting.

The activity of the dilution was measured by liquid scintillation counting.

Useful Life This radionuclide has decayed through **0.0** half lives since it was obtained by EMSL-LV

We recommend that this solution should not be used after **August 1994**

This dilution was prepared for the 1994 ASTM Collaborative Study of a test method for the determination of Sr-90 in water.

0021

CST 30

Purity

The manufacturer states that activities other than that of the principal nuclide and of its daughter nuclides, if any, were estimated/known to be.

- (1) less than equal to % of the principal activity
- (2) less than equal to % of the principal activity
- (3) less than equal to % of the principal activity

The activity of impurity (1) is not (2) is not (3) is not included in the quoted figures of the principal activity.

Random Errors

The precision of this standard was such that the certified value of the radioactive concentration of the principal activity had a standard error (sm) not greater than $\pm 0.1\%$ (The 99.7% confidence limits are given by $t(sm)$ where t is obtained from the student t factor for the degree of freedom ($n-1$)).

The maximum uncertainty due to the assessable systematic errors (dilution, counting, and known uncertainty of the standard) is obtained by the separate arithmetic summation of the positive and negative systematic error ($+\delta - \delta'$). These have been estimated not to exceed

$+3.8\%$ or -3.8%

the overall uncertainty (often called accuracy) is an estimate of the possible divergence of the quoted result from the true value. It is a combination of random error $[t(sm)]$ at the 99.7% confidence limits and the worst case estimate of the systematic errors ($+\delta, -\delta'$). The overall uncertainty is therefore calculated on the basis of $+ [t(sm) + \delta], - [t(sm) + \delta']$ and is $+4.0\%, -4.0\%$ of the quoted radioactive concentration.

Decay Schemes

This standardization is based on the following assumptions of the principle nuclide, its daughter nuclides and impurities (no allowance for error in these assumptions or the assumption of quoted half-life have been included in the statement of accuracy above).

Strontium-90 decays 100 percent by beta emission to yttrium-90. Yttrium-90 also decays 100 percent by beta emission.

Chemical Composition of Solution

Carrier content per gram of solution:
30 micrograms strontium

Other components:
0.1 M HCl

Preservative:

Remarks

Date Certificate Prepared April 26, 1994

Approval Signature

Paul B. Fahn 0022

Sr-90

INITIAL STANDARD DILUTION RECORD

Standard Information:	
Isotope: <u>Sr-90</u>	Vendor: <u>EPA</u>
Activity of Standard Received: <u>2.7×10^4 uCi</u>	Vendor I.D. #: <u>94003-1</u>
Weight of Standard Received (g): <u>5.0 g</u>	LAL I.D. #: <u>AC5281</u>
Standard Activity (pCi/g): <u>5.4×10^3 pCi/g</u>	NIST Traceable? <u>yes</u>
Half-life in Years or Days: <u>28.6 yrs</u>	Certificate #: <u>94003-1</u>
Reference Date: <u>4-1-1994</u>	Receiver's Name: <u>K. Free</u>
	Date Received: <u>5-3-94</u>

Primary Dilution	
Balance Verification?:	<u>yes</u>
Diluent Used:	<u>0.1M HCl</u>
a: Decay Corrected Standard Activity (pCi/g):	<u>5.4×10^3 pCi/g</u>
b: Weight of the Source Transferred (g):	<u>4.9670 g</u>
c: Total diluted weight (g):	<u>49.91 g</u>
d: Total Diluted Volume (mL):	<u>50 mL</u>
e: Activity of Dilution by Weight (pCi/g) [a * b / c]:	<u>537.4 pCi/g</u>
f: Calculated Density of Solution (g/mL) [c / d]:	<u>0.9982 g/mL</u>
g: Activity of Dilution by Volume (pCi/mL) [e * f]:	<u>536.4 pCi/mL</u>
h. Dilution Logbook I.D. #:	<u>93-474-81-1 ⁹³⁻⁴⁷⁴⁻⁸²⁻¹ CP47/95</u>
Prepared By: <u>Agnes Wong</u>	Preparation Date: <u>6-15-94</u>
Reviewed By: <u>Joe Hutchinson</u>	Review Date: <u>6/30/94</u>
Purity/Cross Check Performed By: _____	Check Date: _____

Agnes Wong

0023

Signed

Date

Signed

Date

SECONDARY/WORKING LEVEL
STANDARD DILUTION RECORD

Dilution Source Information	
Isotope:	<u>Sr-90</u>
Ref. <u>4-1-94</u> Parent Barcode Number	<u>AC5281</u>
Vendor or Certificate I.D. # of Parent Standard:	<u>EPA 94003 - 1</u>
Diluted Source Logbook I.D. #:	<u>93-474 - 82 - 1</u>
Balance Verification?:	<u>Yes</u>
Diluent Used:	<u>0.1 M HCl</u>

Dilution	
*Diluent:	<u>0.1 M HCl</u>
*Density of diluent (g/ml):	<u>N/A</u>
a: Parent Specific Activity:	<u>536.44 pCi/mls</u>
b: Amount of Source Transferred:	<u>5.0018 g</u>
c: Total amount of Dilution:	<u>100.20 g</u>
d: Total Volume of Dilution:	<u>N/A</u>
e: Activity of Dilution (a * b / c):	<u>N/A</u>
f: Activity of Dilution (a * b / d):	<u>26.78 pCi/ml</u>
Dilution Logbook I.D. #:	<u>94-677-44-1</u>
Prepared By: <u>Dynes Wong</u>	Preparation Date: <u>3-2-95</u>
Reviewed By: <u>Joe H. H.</u>	Review Date: <u>3/3/95</u>
*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.	

Signed

Date

Signed

Date

Dynes Wong 3-3-95 0024

Strontium Carrier Standardization

Strontium Carrier (10 mg/mL):

Use commercially available 10,000 μg Sr/mL ICP Standard or equivalent. Alternately, Dissolve 24.16 g of $\text{Sr}(\text{NO}_3)_2$ in water and dilute to 1 L in a volumetric flask with water.

Perform calibration check on a 0.5 mL pipet and then carefully pipet 3 - 0.5 mL portions of the strontium carrier solution into separate cleaned dried and tared planchets. Dry the planchet under a drying lamp. Cool the planchets in a desiccator and weigh.

	Calib # 1	Calib # 2	Calib # 3
Carrier plus planchet wt. (mg)	6865.84	6562.93	6540.56
Tare wt. of planchet (mg)	6853.57	68 6550.76	6528.26 6520
Net wt. of carrier added (mg)	12.27	12.17	12.30

AVERAGE $\text{Sr}(\text{NO}_3)_2 \pm \text{STD DEV.} = \underline{12.25 \pm 0.0681} \left(0.61225\text{g} \pm 0.0001\text{g} \right)$
Per 0.5mL

Expected mg of $\text{Sr}(\text{NO}_3)_2 = \text{cert. value} (\approx 10\text{mg of Sr/mL}) * 0.5 \text{ mL} * 2.41$

Within 3% of expected (12.08 mg/0.5 mL) value (yes/no) yes

Initial and Date: WL 10-5-95

94-658-20

Walter Lutz 10-11-95

Continued on Page _____

Read and Understood By

WL
Signed

10-11-95
Date

James Wong
Signed

1-16-96
Date **0025**



CERTIFICATE OF ANALYSIS

Catalog Number: PLSR2-3X Lot No. G3-153SR
 Element and Matrix: Sr/HNO₃/H₂O
 Starting Material: Strontium Carbonate SrCO₃
 Starting Material Lot Number: 05941D

Trace Metallic Impurities in the actual solution via ICP of the concentrate.

Element	PPM	Element	PPM	Element	PPM
Ag	<.05	Cu	<.05	P	<.05
Al	<.05	Fe	<.05	Pb	.06
As	<.05	Ga	<.05	Sb	<.10
B	<.05	In	<.05	Si	<.05
Ba	<.05	K	<.05	Sn	<.10
Be	<.05	Li	<.05	Ti	<.05
Bi	<.05	Mg	<.05	Tl	<.05
Ca	<.05	Mn	<.05	V	<.05
Cd	<.05	Mo	<.10	Zn	<.05
Co	<.05	Na	<.05	Zr	<.10
Cr	<.05	Ni	<.05		

Traceability Documentation For Solution Standard:

1. Classical Wet Assay: 10,050 ppm.

Titrimetry: EDTA titration using Methyl Thymol Blue as indicator. EDTA standardized against NIST Pb(NO₃)₂ SRM 928.

2. Instrumentation Analysis By Inductively Coupled Plasma Spectrometer[ICP]: 10,009 ppm via NIST SRM 3153a.

3. Balances are calibrated with NIST weight sets N.J. #92589 and #92550, according to NIST circular 547 3.4.3.

SPEX plasma solution standards are guaranteed stable and accurate to ± 0.5% of labeled concentration for one year from date of shipment. This value is the sum of cumulative errors associated with analytical determinations, pipetting and diluting to final volume. For these solutions we use high purity acids, 18 megohm double deionized water and triple rinsed bottles. All glassware used is class A.

Signed by: N. Kochedakota Chemical Production Manager, Date: SEP 95



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