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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

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LOCKHEED MARTIN



June 29, 1995

Ms. Joan Kessner
Bechtel Hanford, Inc.
345 Hills
P.O. Box 969
Richland, WA 99352



RE:	Log-in No.:	L4482
	Quotation No.:	Q400000-B
	SAF:	B95-049
	Document File No.:	0511596
	BHI Document File No.:	221
	SDG No.:	LK4482

The attached data report contains the analytical results of samples that were submitted to Lockheed Analytical Services on 11 May 1995.

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 Hall at (509) 943-4423.

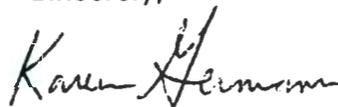
Lockheed Analytical Services

Log-in No.: L4482
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Document File No.: 0511596
BHI Document File No.:221
SDG No.: LK4482
Page1

Release of this data report has been authorized by the Laboratory Director or the Director's designee as evidenced by the following signature.

" 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 Manger or a designee, as verified by the following signature."

Sincerely,


Kathleen M. Hall FOR KMH
Client Services Representative

cc: Client Services
Document Control

Lockheed Analytical Services

Log-in No.: L4482
 Quotation No.: Q400000-B
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 SDG No.: LK4482
 Page2

CASE NARRATIVE INORGANIC NON METALS ANALYSES

The routine calibration and quality control analyses performed for this batch include as applicable: instrument tune (ICP/MS only), initial and continuing calibration verification, initial and continuing calibration blanks, method blank(s), laboratory control sample(s), ICP interference check samples (ICP only), serial dilutions, analytical (post-digestion) spike samples, matrix spike (predigestion) sample(s), duplicate sample(s).

Preparation and Analysis Requirements

- One water sample was received for LK4482 and prepared as batch 511bh and analyzed for selected analytes as requested on the chain of custody. Quality control analysis was performed on the following sample:

Client ID	LAL #		Method
BOFKH6	L4482-5	DUP	160.1 TDS
	L4482-3	MS, DUP	300.0 Orthophosphate, Fluoride, Chloride, Nitrate-N, Nitrite-N, Sulfate
	L4482-4	DUP	310.1 Alkalinity
	L4482-6	MS, DUP	CLP Cyanide

Holding Time Requirements

- All samples were analyzed within the specified holding time.

Method Blanks

- The concentration levels of all the requested analytes in the method blank were below the reporting detection limits.

Internal Quality Control

- All Internal Quality Control were within acceptance limits.

Kay McCann

May 18, 1995

 Prepared By

 Date

Lockheed Analytical Services

Log-in No.: L4482
Quotation No.: Q400000-B
SAF: B95-049
Document File No.: 0511596
BHI Document File No.: 221
SDG No.: LK4482
Page 3

CASE NARRATIVE INORGANIC METALS ANALYSES

The routine calibration and quality control analyses performed for this batch include as applicable: instrument tune (ICP/MS only), initial and continuing calibration verification, initial and continuing calibration blanks, method blank(s), laboratory control sample(s), ICP interference check samples (ICP only), serial dilutions, analytical (post-digestion) spike samples, matrix spike (predigestion) sample(s), duplicate sample(s).

Preparation and Analysis Requirements

The samples were received in on May 11, 1995. They were logged in as L4482 and prepared and analyzed in batches 511 bhT for total metals and 511 bhD for filtered water.

Holding Times-

All samples were analyzed within the method-specific holding times.

Method Blanks-

The method blanks were free of contamination.

Internal Quality Control-

All Internal Quality Control were within acceptance limits with the following exception: The matrix spike recovery for bismuth in the filtered water analysis was outside of acceptance limits (27%). The recovery based on the LCS (99%) support that the analytical system was operating within control limits.

Sample Results-

Bismuth was determined by ICP-MS, as approved by Clay Smith of Bechtel Hanford.

Shellee McGrath
Prepared By

June 29, 1995
Date

CASE NARRATIVE RADIOCHEMICAL ANALYSES

The routine calibration and quality control 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, duplicate samples.

Holding Time Requirements

All holding time requirements were met.

Chemical recoveries and MDAs, where applicable, can be found on the preparation and calculation worksheets of the attached raw data for each method.

Analytical Method

Gamma Spectrum Analysis

The gamma spectrum analysis was performed using LAL-91-SOP-0063. All samples were analyzed on batch #23211, which contains a method blank (MB), two duplicates (DUP1, DUP2), and a laboratory control sample (LCS). The DUP2 for Cs-137 was out of limits; however, since the Cs-137 DUP1 and both Pb-214 duplicates were within limits, the data is considered acceptable. All other QC criteria were met.

Gross Alpha Beta

The gross alpha beta analysis was performed using LAL-91-SOP-0060. All samples were analyzed on batch #23215, which contains an MB, DUP and LCS. No problems were encountered during preparation or analysis, and all QC criteria were met.

Plutonium Isotopic

The plutonium isotopic analysis was performed using LAL-91-SOP-0108. All samples were analyzed on batch #23154, which contains an MB, DUP and LCS. The duplicate (sample #23154DUP1) has a poor chemical recovery and only three counts. The duplicate uncertainty shows that the detected value is not significantly different from zero. No matrix spike analysis (MS) was performed due to insufficient sample. All other QC criteria were met.

Strontium-90

The strontium-90 analysis was performed using LAL-91-SOP-0196. All samples were analyzed on batch #23179, which contains an MB, DUP and LCS. During preparation, the samples were wetashed under the heat lamp with concentrated HNO₃ to get rid of the excess organic materials. This was done in the original conical planchets. After they were dried, they were reweighed. There was insufficient sample for an MS analysis. All other QC criteria were met.

Technetium-99

The technetium-99 analysis was performed using LAL-91-SOP-0169. All samples were analyzed on batch #23139, which contains an MB, DUP1, DUP2, and LCS. The second duplicate (DUP2) was out of limits; however, since DUP1 was within limits, the data is considered acceptable. No matrix spike analysis was performed due to insufficient sample. All other QC criteria were met.

Total Uranium

The total uranium analysis was performed using LAL-91-SOP-0168. All samples were analyzed on batch #23131, which contains an MB, DUP, LCS and MS. No problems were encountered during preparation or analysis, and all QC criteria were met.

Tritium

The tritium analysis was performed using LAL-91-SOP-0066. All samples were analyzed on batch #23181, which contains an MB, DUP, LCS and MS. No problems were encountered during preparation or analysis, and all QC criteria were met.

Yvonne M. Jacoby
Prepared By

June 20, 1995
Date

Lockheed Analytical Services
DATA QUALIFIERS FOR INORGANIC ANALYSES

[Revised 08/28/92]

For Use on the Analytical Data Reporting Forms	
B	<i>For CLP Analyses Only</i> – Reported value is less than the contract required detection limit (CRDL) but greater than or equal to the instrument detection limit (IDL).
C	<i>For Routine, Non-CLP Analyses Only</i> – Any constituent that was also detected in the associated blank whose concentration was greater than the reporting detection limit (RDL).
D	Presence of high levels of interfering constituents required dilution of sample which increased the RDL by the dilution factor.
E	Estimated value due to presence of interference.
H	Sample analysis performed outside of method-or client-specified maximum holding time requirement.
M	<i>For CLP Analyses Only</i> – Duplicate injection precision criterion was not met.
N	Matrix spike recovery exceeded acceptance limits.
S	Reported value was determined from the method of standard addition.
U	<i>For CLP Reporting Only</i> – Constituent was analyzed for but not detected (sample quantitation must be corrected for dilution and percent moisture).
W	<i>For AAS Only</i> – Post-digestion spike for Furnace AAS did not meet acceptance criteria and sample absorbance is less than 50% of spike absorbance.
X, Y, or Z	Analyst-defined qualifier.
*	Relative percent difference (RPD) for duplicate analysis exceeded acceptance limits.
+	Correlation coefficient (r) for the MSA is less than 0.995.
For Use on the QC Data Reporting Forms	
a¹	The spike recovery and/or RPD for matrix spike and matrix spike 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 RDL.

¹ Used as footnote designations on the QC summary form.

Lockheed Analytical Services
DATA QUALIFIERS FOR RADIOCHEMICAL ANALYSES
 [Revised 08/28/92]

For Use on the Analytical Data Reporting Forms	
B	Any constituent that was also detected in the associated blank whose concentration was greater than the reporting detection limit (RDL) and/or minimum detectable activity (MDA).
C	Presence of high TDS in sample required reduction of sample size which increased the MDA.
D	Constituent detected in the diluted sample.
E	Constituent concentration exceeded the calibration or attenuation curve range.
F	<i>For Alpha Spectrometry Only</i> -- FWHM exceeded acceptance limits.
H	Sample analysis performed outside of method-specified maximum holding time requirement.
Y	Chemical yield 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.

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LOCKHEED ANALYTICAL SERVICES
 LOGIN CHAIN OF CUSTODY REPORT (ln01)
 Jun 16 1995, 10:59 am

REVISION

Login Number: L4482
 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
L4482-1 TEMP 2 Location: EXPENDED Water 1 S SCREENING	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95
			Hold:05-NOV-95	
L4482-2 TEMP 2 "ICP METALS=Ca, Mg, Na, K, Fe, Mn, Si, Al, Bi, Se" Location: RFG01-7C Water 1 S CLP FURNACE Water 1 S CLP ICP Water 1 S CLP ICP-MS METALS	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95
			Hold:05-NOV-95	
			Hold:05-NOV-95	
			Hold:05-NOV-95	
L4482-3 TEMP 2 Location: RFG19-103C Water 1 S 300.0 CHLORIDE Water 1 S 300.0 FLUORIDE Water 1 S 300.0 NITRATE Water 1 S 300.0 NITRITE Water 1 S 300.0 PHOSPHATE Water 1 S 300.0 SULFATE	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95
			Hold:06-JUN-95	
			Hold:06-JUN-95	
			Hold:11-MAY-95	
			Hold:11-MAY-95	
			Hold:11-MAY-95	
			Hold:06-JUN-95	
L4482-4 TEMP 2 Location: RFG19-103C Water 1 S 310.1 ALKALINITY	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95
			Hold:23-MAY-95	
L4482-5 TEMP 2 Location: RFG19-127C Water 1 S 160.1 TDS	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95
			Hold:16-MAY-95	
L4482-6 TEMP 2 "ICP METALS=Ca, Mg, Na, K, Fe, Mn, Si, Al, Bi, Se" Location: RFG19-127C Water 1 S CLP CYANIDE	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95
			Hold:23-MAY-95	
L4482-7 TEMP 2 Location: RFG01-7C	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95
L4482-8 TEMP 2 "GAMMA SPEC TO INCLUDE Cs137, Co-60, Ru-106" Location: 155	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95

Page 1

*ADDED CLP ICP-MS METALS (Bi) TO

L4482-2, -21

R.C. 6-16-95

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LOCKHEED ANALYTICAL SERVICES
 LOGIN CHAIN OF CUSTODY REPORT (ln01)
 Jun 16 1995, 10:59 am

Login Number: L4482
 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
Water	1 S GAMMA SPEC LAL-0063	Hold:05-NOV-95		
Water	1 S GR ALP/BETA LAL-0060	Hold:05-NOV-95		
Water	1 S PU-ISOTOPIC LAL-0108	Hold:05-NOV-95		
Water	1 S SR-90 LAL-0196	Hold:05-NOV-95		
Water	1 S U TOTAL KPA LAL-0168	Hold:05-NOV-95		
L4482-9	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95
TEMP 2	"GAMMA SPEC TO INCLUDE Cs137, Co-60, Ru-106"			
Location: 156H-A100				
L4482-10	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95
TEMP 2	"GAMMA SPEC TO INCLUDE Cs137, Co-60, Ru-106"			
Location: 156V-045				
L4482-11	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95
TEMP 2	"GAMMA SPEC TO INCLUDE Cs137, Co-60, Ru-106"			
Location: EXPENDED				
L4482-12	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95
TEMP 2	"GAMMA SPEC TO INCLUDE Cs137, Co-60, Ru-106"			
Location: 156V-045				
L4482-13	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95
TEMP 2	"GAMMA SPEC TO INCLUDE Cs137, Co-60, Ru-106"			
Location: 156H-A100				
L4482-14	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95
TEMP 2	"GAMMA SPEC TO INCLUDE Cs137, Co-60, Ru-106"			
Location: 156V-E032				
L4482-15	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95
TEMP 2	"GAMMA SPEC TO INCLUDE Cs137, Co-60, Ru-106"			
Location: 156V-A035				
L4482-16	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95
TEMP 2				
Location: 156-020				
Water	1 S TRITIUM(H3) LAL-0066	Hold:05-NOV-95		
L4482-17	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95
TEMP 2				
Location: 156CART-4				
Water	1 S TC-99 LAL-0169	Hold:05-NOV-95		

9613446.2196

LOCKHEED ANALYTICAL SERVICES
 LOGIN CHAIN OF CUSTODY REPORT (ln01)
 Jun 16 1995, 10:59 am

Login Number: L4482
 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
L4482-18 TEMP 2 Location: 156H-A100	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95
L4482-19 TEMP 2 Location: 156H-A100	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95
L4482-20 TEMP 2 Location: 156H-A100	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95
L4482-21 TEMP 2 Location: 133 Filt H20 15 S CLP FURNACE Filt H20 15 S CLP ICP Filt H20 15 S CLP ICP-MS METALS	BOFKH7 "ICP METALS=Ca, Mg, Na, K, Fe, Mn, Si, Al, Bi, Se"	09-MAY-95	11-MAY-95	15-JUN-95
L4482-22 Location: Water 1 S EDD - DISK DEL. Water 1 S INORG TYPE 2 RPT + Water 1 S RAD RPT TYPE 2	REPORT TYPE	11-MAY-95	11-MAY-95	15-JUN-95

Page 3

Signature: _____

Date: _____

014

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LOGIN CHAIN OF CUSTODY REPORT (ln01)
May 11 1995, 10:31 am

Login Number: L4482
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
L4482-1 TEMP 2 Location: 157 Water 1 S SCREENING	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95
		Hold:05-NOV-95		
L4482-2 TEMP 2 "ICP METALS=Ca, Mg, Na, K, Fe, Mn, Si, Al, Bi, Se" Location: 157 Water 1 S CLP FURNACE Water 1 S CLP ICP	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95
		Hold:05-NOV-95		
		Hold:05-NOV-95		
L4482-3 TEMP 2 Location: 157 Water 1 S 300.0 CHLORIDE Water 1 S 300.0 FLUORIDE Water 1 S 300.0 NITRATE Water 1 S 300.0 NITRITE Water 1 S 300.0 PHOSPHATE Water 1 S 300.0 SULFATE	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95
		Hold:06-JUN-95		
		Hold:06-JUN-95		
		Hold:11-MAY-95		
		Hold:11-MAY-95		
		Hold:11-MAY-95		
		Hold:06-JUN-95		
L4482-4 TEMP 2 Location: 157 Water 1 S 310.1 ALKALINITY	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95
		Hold:23-MAY-95		
L4482-5 TEMP 2 Location: 157 Water 1 S 160.1 TDS	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95
		Hold:16-MAY-95		
L4482-6 TEMP 2 "ICP METALS=Ca, Mg, Na, K, Fe, Mn, Si, Al, Bi, Se" Location: 157 Water 1 S CLP CYANIDE	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95
		Hold:23-MAY-95		
L4482-7 TEMP 2 Location: 157	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95
L4482-8 TEMP 2 "GAMMA SPEC TO INCLUDE Cs137, Co-60, Ru-106" Location: 157 Water 1 S GAMMA SPEC LAL-0063	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95
		Hold:05-NOV-95		

9613446.2198

LOGIN CHAIN OF CUSTODY REPORT (ln01)
 May 11 1995, 10:31 am

Login Number: L4482
 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
Water	1 S GR ALP/BETA LAL-0060	Hold:05-NOV-95		
Water	1 S PU-ISOTOPIC LAL-0108	Hold:05-NOV-95		
Water	1 S SR-90 LAL-0196	Hold:05-NOV-95		
Water	1 S U TOTAL KPA LAL-0168	Hold:05-NOV-95		
L4482-9	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95
TEMP 2	"GAMMA SPEC TO INCLUDE Cs137, Co-60, Ru-106"			
Location:	157			
L4482-10	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95
TEMP 2	"GAMMA SPEC TO INCLUDE Cs137, Co-60, Ru-106"			
Location:	157			
L4482-11	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95
TEMP 2	"GAMMA SPEC TO INCLUDE Cs137, Co-60, Ru-106"			
Location:	157			
L4482-12	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95
TEMP 2	"GAMMA SPEC TO INCLUDE Cs137, Co-60, Ru-106"			
Location:	157			
L4482-13	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95
TEMP 2	"GAMMA SPEC TO INCLUDE Cs137, Co-60, Ru-106"			
Location:	157			
L4482-14	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95
TEMP 2	"GAMMA SPEC TO INCLUDE Cs137, Co-60, Ru-106"			
Location:	157			
L4482-15	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95
TEMP 2	"GAMMA SPEC TO INCLUDE Cs137, Co-60, Ru-106"			
Location:	157			
L4482-16	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95
TEMP 2				
Location:	157			
Water	1 S TRITIUM(H3) LAL-0066	Hold:05-NOV-95		
L4482-17	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95
TEMP 2				
Location:	157			
Water	1 S TC-99 LAL-0169	Hold:05-NOV-95		

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LOGIN CHAIN OF CUSTODY REPORT (1n01)
 May 11 1995, 10:31 am

Login Number: L4482
 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
L4482-18 TEMP 2 Location: 157	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95
L4482-19 TEMP 2 Location: 157	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95
L4482-20 TEMP 2 Location: 157	BOFKH6	09-MAY-95	11-MAY-95	15-JUN-95
L4482-21 TEMP 2 Location: 157 Filt H2O 15 S CLP FURNACE Filt H2O 15 S CLP ICP	BOFKH7 "ICP METALS=Ca, Mg, Na, K, Fe, Mn, Si, Al, Bi, Se"	09-MAY-95	11-MAY-95	15-JUN-95
L4482-22 Location: Water Water Water	REPORT TYPE 1 S EDD - DISK DEL. 1 S INORG TYPE 2 RPT + 1 S RAD RPT TYPE 2	11-MAY-95	11-MAY-95	15-JUN-95
			Hold:05-NOV-95 Hold:05-NOV-95	

Signature: Paul C. Jones 017
 Date: 5-11-95

0511596

L4482

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

Data Turnaround
 Priority
 Normal

Collector <i>K. Lee</i>	Company Contact G.L. Kasza	Telephone (509) 372-9675
Project Designation 200-BP-5 Groundwater Round 3	Sampling Location 200 East	SAF No. B95-049
Ice Chest No. <i>SML-371</i>	Field Logbook No. <i>ZFL-1129</i>	Method of Shipment Federal Express
Shipped To Lockheed	Offsite Property No. <i>W950-03041-29</i>	Bill of Lading/Air Bill No. <i>7904627844</i>

Possible Sample Hazards/Remarks	Preservation	HNO3	Cool 4°C	Cool 4°C	Cool 4°C	NaOH	HNO3	Cool 4°C	HCl	Cool 4°C	HNO3
	Type of Container	P/G	G	P	P	P	P/G	G	P	P	P/G
	No. of Container(s)	1	1	1	1	2	8	1	4	1	1
Special Handling and/or Storage Maintain samples between 2°C and 6°C.	Volume	1L	500mL	250mL	500mL	1L	1L	500mL	1L	20mL	
SAMPLE ANALYSIS		*1	Anions (Cl-, F-, Co, SO4, NO2, NO3, PO4)	Alkalinity	TDS	Cyanide	*2	Tritium	Tc-99	Activity Scan	*3

Sample No.	Matrix*	Date Sampled	Time Sampled									
B0FKH6	U	5-9-95	1102	X	X	X	X	X	X	X	X	
B2FKH7	U	5-9-95	1102									X

CHAIN OF POSSESSION		Sign/Print Names		SPECIAL INSTRUCTIONS								Matrix*
Relinquished By <i>Kasza</i>	Date/Time <i>5/9/95 1400</i>	Received By <i>ERC</i>	Date/Time <i>1400</i>	*1 ICP Metals - to include Ca, Mg, Na, K, Fe, Mn, Si, Al, and Bi. AA Metals - to include Se (unfiltered). *2 Gross Alpha; Gross Beta; Pu-238,-239/240; Sr-90; Gamma Spec - to include Cs-137, Co-60, Ru-106; Total Uranium. *3 ICP Metals - to include Ca, Mg, Na, K, Fe, Mn, Si, Al, and Bi. AA Metals - to include Se (filtered).								S = Soil
Relinquished By <i>ERC</i>	Date/Time <i>0900</i>	Received By <i>Bill Miller Bwh.Han</i>	Date/Time <i>5-9-95</i>	Sample analysis for PO4, NO2, NO3 by EPA 300.0 is being requested for information only. The ERC Contractor acknowledges that the 48-hour hold time will not be met.								SE = Sediment
Relinquished By <i>Bill Miller Bwh.Han</i>	Date/Time <i>5-10-95</i>	Received By	Date/Time	The Activity Scan is for both sample numbers listed on this chain of custody.								SO = Solid
Relinquished By	Date/Time	Received By	Date/Time									SL = Sludge
Relinquished By	Date/Time	Received By	Date/Time									W = Water

LABORATORY SECTION	Received By <i>Bill Miller</i>	Title <i>Sample Custodian</i>	Date/Time <i>5-11-95 / 0845</i>
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

950546-2200

9613446.2201

WHC/BHI SAMPLE CHECK-IN LIST

Date/Time Received: 5-11-95 / 9:00 am SDG #: MIT

Work Order Number: 112 SAF #: 1395-049

Shipping Container ID: SML-371 Chain of Custody # 112

- 1. Custody Seals on shipping container intact? Yes No
- 2. Custody Seals dated and signed? Yes No
- 3. Chain-of-Custody record present? Yes No
- 4. Cooler temperature 28
- 5. Vermiculite/packing materials is Wet Dry
- 6. Number of samples in shipping container: 21
- 7. Sample holding times exceeded: Yes No
- 8. Samples have: tape hazard labels
 custody seals appropriate sample labels
- 9. Samples are: in good condition leaking
 broken have air bubbles
- 10. Were any anomalies identified in sample receipt? Yes No
- 11. Description of anomalies (include sample numbers):

Sample Custodian: Paulc Davis On: 5-11-95 / 9:00 am

Telephoned To: Kathleen Hall On 5-11-95 / 9:00 am BY Paulc Davis

Sample Login

Login Review Checklist

Lot Number L4482

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

Sample Summary Report

Yes No

N/A

- | | | | | |
|----|---|---|---|---|
| 1. | Are all sample IDs correct? | X | — | — |
| 2. | Are all samples present? | X | — | — |
| 3. | Are all matrices correct?
<small>(e.g., TCLP analyses should be on a TCLP matrix, field blanks should be water)</small> | X | — | — |
| 4. | Are all analyses on the chain of custody/login quotation included? | X | — | — |
| 5. | Are analyses logged in for the correct container?
<small>(e.g., analyses requiring preservation logged in for a preserved container and vice versa)</small> | X | — | — |
| 6. | Are samples logged in according to laboratory batching procedures?
<small>(e.g., TCLP regular leaching and associated metals/semivolatile organics should be logged in on the same bottle)</small> | X | — | — |

Login Chain of Custody Report

- | | | | | |
|----|--|---|---|---|
| 1. | Are the Collect, Receive, and Due dates correct for every sample? | X | — | — |
| 2. | Have appropriate sample comments been included?
<small>(e.g., MS/MSD designation, comments from the client concerning method modifications)</small> | X | — | — |

Sample Receiving Checklist

- | | |
|----|---|
| 1. | Are any discrepancies between the chain of custody and the login noted? — — <u>12/27</u>
<small>(e.g., client IDs differ on chains of custody and bottle labels, samples not seen, samples lost from breakage)</small> |
|----|---|

Frank Davis 5-11-95

M. Miller 5-11-95

Primary review signature

Date

Secondary review signature

Date

**Lockheed Analytical Services
Sample Receiving Checklist**

Client Name: *NPST House - Hartford*

Job No. *L4482*

Cooler ID: *117*

COOLER CONDITION UPON RECEIPT

Temperature of cooler upon receipt: *20*

temperature of temp. blank upon receipt: *1*

	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			<i>N/A</i>
are samples bi-phasic (if so, indicate sample ID'S):			<i>0119</i>

MISCELLANEOUS ITEMS

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

ADDITIONAL COMMENTS/DISCREPANCIES

Completed by / date: *Paul J. Davis 5-11-95*

Sent to the client (date/initials): *5-11-95* ** 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

9613446.2203

0511546

Environmental
Restoration
Contractor

ERC Team
Interoffice Memorandum

Job No. 22192
Written Response Required: NO
CCN: N/A
OU: 200-BP-5
TSD: N/A
ERA: N/A
Subject Code: 1995 Round 3 Sampling

TO: W. S. Thompson N3-06 DATE: April 21, 1995
COMES: D. B. Erb H6-01 FROM: S. K. De Mers
Radiological Controls
N3-06/376-2764
SUBJECT: 1995 Round 3 sampling for 200-BP-5

There is no need to perform total activities prior to offsite shipment to NRC licensed labs of samples taken from the attached list of wells.

The wells listed in the attachment were reviewed for radiological content based on the previous 4 years of sampling data. No well listed has a β activity in excess of 100,000 pCi/l (<.1 uCi/sample based on a 1 liter sample size) nor any α activity in excess of 10,000 pCi/l (<.01 uCi/l based on a 1 liter sample). All wells show activities < 2,000 pCi/gm (< 2 nCi/gm D.O.T. limit). The highest activity in recent samples is 17,000 pCi/l β and 170 pCi/l α .

Radiological monitoring during sampling will only be required if the wells are located in radiological areas or if the wells themselves are labeled with radiological stickers. Monitoring requirements for down hole work such as pump removal will be determined based on the history of each well on a case by case basis.

skd

DISSOLVED METALS RESULTS

Client Sample ID: BOFKH7	Date Collected: 05-09-95	Matrix: filtered water
LAL Batch ID(s): 511 bhD	Date Received: 05-11-95	

Constituents	Method	Concentration (mg/L)	IDL (mg/L)	RDL (mg/L)	Data Qualifier(s)	Date Analyzed	LAL ID
Aluminum	CLP	<0.057	0.057	0.20	U	06-16-95	L4482-21
Bismuth	CLP	0.0014	0.001	0.005	B N	06-28-95	L4482-21
Calcium	CLP	34	0.056	5.0		06-16-95	L4482-21
Iron	CLP	0.019	0.010	0.10	B	06-16-95	L4482-21
Magnesium	CLP	10	0.057	5.0		06-16-95	L4482-21
Manganese	CLP	<0.002	0.002	0.015	U	06-16-95	L4482-21
Potassium	CLP	8.2	0.363	5.0		06-16-95	L4482-21
Selenium	CLP	<0.003	0.003	0.005	W	06-17-95	L4482-21
Silicon	CLP	26	0.012	0.10		06-22-95	L4482-21
Sodium	CLP	23	0.041	5.0		06-16-95	L4482-21

Comments:

TOTAL METALS RESULTS

Client Sample ID: BOFKH6	Date Collected: 05-09-95	Matrix: water
LAL Batch ID(s): 511 bhT	Date Received: 05-11-95	

Constituents	Method	Concentration (mg/L)	IDL (mg/L)	RDL (mg/L)	Data Qualifier(s)	Date Analyzed	LAL ID
Aluminum	CLP	<0.057	0.057	0.20	U	06-20-95	L4482-2
Bismuth	CLP	<0.001	0.001	0.005	U	06-28-95	L4482-2
Calcium	CLP	34	0.056	5.0		06-20-95	L4482-2
Iron	CLP	0.17	0.010	0.10		06-20-95	L4482-2
Magnesium	CLP	10	0.057	5.0		06-20-95	L4482-2
Manganese	CLP	<0.002	0.002	0.015	U	06-20-95	L4482-2
Potassium	CLP	8.8	0.363	5.0		06-20-95	L4482-2
Selenium	CLP	<0.003	0.003	0.005	W	06-19-95	L4482-2
Silicon	CLP	28	0.012	0.10		06-22-95	L4482-2
Sodium	CLP	24	0.041	5.0		06-20-95	L4482-2

Comments:

Sample Results

Client Sample ID: BOFKH6	Date Collected: 09-MAY-95
Matrix: Water	Date Received: 11-MAY-95
Percent Solids: N/A	

Constituent	Units	Method	Result	Project Reporting Limit	Data Qualifier(s)	Date Analyzed	LAS Batch ID	LAS Sample ID
Total Dissolved Solids	mg/L	160.1	280	40.		16-MAY-95	22839	L4482-5
Chloride	mg/L	300.0	8.5	0.020		11-MAY-95	22732	L4482-3
Fluoride	mg/L	300.0	0.33	0.10		11-MAY-95	22737	L4482-3
Nitrate-N	mg/L	300.0	11.	0.020		11-MAY-95	22733	L4482-3
Nitrite-N	mg/L	300.0	< 0.002	0.010	U	11-MAY-95	22734	L4482-3
Ortho Phosphate	mg/L	300.0	< 0.020	0.10	U	11-MAY-95	22736	L4482-3
Sulfate	mg/L	300.0	16.	0.10		11-MAY-95	22735	L4482-3
Alkalinity, total (as CaCO3)	mg/L	310.1	110.	30.		16-MAY-95	22859	L4482-4
Bicarbonate Alka as CaCO3	mg/L	310.1	110	30.		16-MAY-95	22859	L4482-4
Carbonate Alka as CaCO3	mg/L	310.1	< 10.	30.	U	16-MAY-95	22859	L4482-4
Total Cyanide	mg/L	CLP	0.034	0.020	D(1:2)	16-MAY-95	22874	L4482-6

9613446-2208

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

Client Sample Number	LAL Sample Number	SDG Number	Matrix	Method
BOFKH6 -	L4482-1		Water	SCREENING -
	L4482-2		Water	CLP FURNACE -
	L4482-2		Water	CLP ICP -
	L4482-3		Water	300.0 CHLORIDE -
	L4482-3		Water	300.0 FLUORIDE -
	L4482-3		Water	300.0 NITRATE -
	L4482-3		Water	300.0 NITRITE -
	L4482-3		Water	300.0 PHOSPHATE
	L4482-3		Water	300.0 SULFATE -
	L4482-4		Water	310.1 ALKALINIT
	L4482-5		Water	160.1 TDS-
	L4482-6		Water	CLP CYANIDE-
	L4482-8		Water	GAMMA SPEC LAL-(
	L4482-8		Water	GR ALP/BETA LAL-
	L4482-8		Water	PU-ISOTOPIC LAL-
	L4482-8		Water	SR-90 LAL-0196 -
	L4482-8		Water	U TOTAL KPA LAL-
L4482-16		Water	TRITIUM(H3) LAL-	
L4482-17		Water	TC-99 LAL-0169 -	
BOFKH7 -	L4482-21		Filt H2O	CLP FURNACE -
	L4482-21		Filt H2O	CLP ICP -
REPORT TYPE -	L4482-22		Water	EDD - DISK DEL:
	L4482-22		Water	INORG TYPE 2 RPT
	L4482-22		Water	RAD RPT TYPE 2

LOCKHEED ANALYTICAL SERVICES

RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. * Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: B0FKH6

LAL Sample ID: L4482-8

Date Collected: 09-MAY-95

Date Received: 11-MAY-95

Matrix: Water

Login Number: L4482

SDG: LK4482

Constituent	Analyzed	Batch	Activity	Error	MCA	Datadual	Units
Ac-228(Ra-228)	31-MAY-95	GAMMA SPEC LAL-0063_23211	9.	26.	41.		pCi/L
Co-58	31-MAY-95	GAMMA SPEC LAL-0063_23211	2.7	5.1	8.6		pCi/L
Co-60	31-MAY-95	GAMMA SPEC LAL-0063_23211	24.4	7.9	8.9		pCi/L
Cs-137	31-MAY-95	GAMMA SPEC LAL-0063_23211	-7.2	4.0	12.		pCi/L
Eu-152	31-MAY-95	GAMMA SPEC LAL-0063_23211	-13.	13.	49.		pCi/L
Eu-154	31-MAY-95	GAMMA SPEC LAL-0063_23211	-3.	13.	34.		pCi/L
Eu-155	31-MAY-95	GAMMA SPEC LAL-0063_23211	-2.6	6.4	19.		pCi/L
Fe-59	31-MAY-95	GAMMA SPEC LAL-0063_23211	1.9	8.7	19.		pCi/L
Pb-212	31-MAY-95	GAMMA SPEC LAL-0063_23211	5.	12.	16.		pCi/L
Pb-214(Ra-226)	31-MAY-95	GAMMA SPEC LAL-0063_23211	12.	13.	18.		pCi/L
Ra-226(GAMMA)	31-MAY-95	GAMMA SPEC LAL-0063_23211	-100	130	190		pCi/L
Ru-106	31-MAY-95	GAMMA SPEC LAL-0063_23211	10.	43.	73.		pCi/L
U-235(GAMMA)	31-MAY-95	GAMMA SPEC LAL-0063_23211	-7.	30.	44.		pCi/L
Gross Alpha	12-JUN-95	GR ALP/BETA LAL-0060_23215	2.8	2.0	2.7	C	pCi/L
Gross Beta	12-JUN-95	GR ALP/BETA LAL-0060_23215	883.	46.	3.1		pCi/L
Pu-238	12-JUN-95	PU-ISOTOPIC LAL-0108_23154	-0.035	0.034	0.19		pCi/L
Pu-239/40	12-JUN-95	PU-ISOTOPIC LAL-0108_23154	0.05	0.12	0.19		pCi/L
Total radio-strontium	09-JUN-95	SR-90 LAL-0196_23179	-0.21	0.42	0.75		pCi/L
Uranium	09-JUN-95	U TOTAL KPA LAL-0168_23131	3.31	0.17	0.20		ug/L

LOCKHEED ANALYTICAL SERVICES

RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. * Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: B0FKH6

LAL Sample ID: L4482-16

Date Collected: 09-MAY-95

Date Received: 11-MAY-95

Matrix: Water

Login Number: L4482

Constituent	Analyzed	Batch	Activity	Error	MDA	DataQual	Units
H-3	26-MAY-95	TRITIUM(H3) LAL-0066_23181	360	220	260		pCi/L

9613446.2211

LOCKHEED ANALYTICAL SERVICES

RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. * Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: B0FKH6

LAL Sample ID: L4482-17

Date Collected: 09-MAY-95

Date Received: 11-MAY-95

Matrix: Water

Login Number: L4482

Constituent	Analyzed	Batch	Activity	Error	MDA	DataQual	Units
Tc-99	31-MAY-95	TC-99 LAL-0169_23139	1560	130	7.1		pCi/L

SECONDARY / WORKING LEVEL STANDARD DILUTION RECORD

Dilution Source Information

Isotope:	<u>Am-241 and Sr-90</u>
From NIST traceable standard?:	<u>Yes</u>
Vendor or Certificate I.D. # of parent standard:	<u>Am-241 IPL-388-100-1</u> <u>Sr-90 NIST SRM 4919G</u>
Diluted source logbook I.D. #:	<u>Am-241 91-0225-60-1</u> <u>Sr-90 91-0225-30-2</u>
Balance verification?:	<u>Yes</u>
Diluent used:	<u>0.1 N HNO₃</u>

Dilution

*Diluent:	<u>0.1 N HNO₃ + 42 mg Sn(NO₃)₂/mL</u>
*Density of diluent (g/ml):	<u>NA</u>
a. Parent standard activity:	<u>Am-241 9810 pCi/mL</u> <u>Sr-90 6000 pCi/mL on 8/1/90</u>
b. Amount of standard transferred:	<u>Am-241 0.5 mL</u> <u>Sr-90 0.5 mL</u>
c. Total amount of dilution:	<u>500 mL</u>
d. Activity of dilution [a * b / c]:	<u>Am-241 9.81 pCi/mL</u> <u>Sr-90 6.0 pCi/mL on 8/1/90</u> <u>10.7 pCi/mL on 8/1/94</u>
Dilution logbook I.D. #:	<u>93-0474-94</u>

Prepared by: Joe Hutchinson Preparation date: 8/14/94
 Reviewed by: Harold Wong Review date: 8^{AW} 10-4-94

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.

LAL-91-SOP-0174

Read and Understood By

Joe Hutchinson
Signed

3/20/95
Date

Signed

Date

S 1 d. Diluted for / cond to make 91-0225-60-1 AA0030 ✓
9613446.2213

CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Radionuclide	Am-241	Customer:	LOCKHEED ENGINEERING & SCIENCES Co.
Half Life:	432.7 ± 0.5 years	P.O.No.:	06LAB1245
Catalog No.:	7241	Reference Date:	November 1 1991 12:00 PST.
Source No.:	388-100-1	Contained Radioactivity:	0.997 μ Ci.

Description of Solution

a. Mass of solution:	5.0007	grams.
b. Chemical form:	AmCl ₃ in 0.5N HCl	
c. Carrier content:	None added	
d. Density:	1.0077	gram/ml @ 20°C.

Radioimpurities
None detected

Radioactive Daughters
None detected

Radionuclide Concentration
0.1994 μ Ci/gram.

Method of Calibration

Weighed aliquots of the solution were assayed using a liquid scintillation counter.

Uncertainty of Measurement

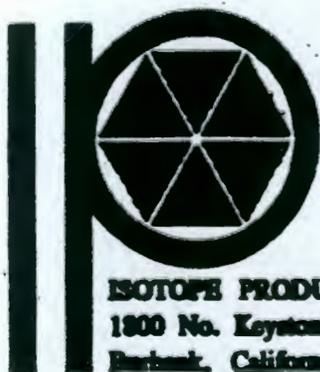
a. Systematic uncertainty in instrument calibration:	±2.0%
b. Random uncertainty in assay:	±0.7%
c. Random uncertainty in weighing(s):	±0.0%
d. Total uncertainty at the 99% confidence level:	±2.7%

NIST Traceability

This calibration is implicitly traceable to the National Institute of Standards and Technology.

Notes

1. Nuclear data were taken from "Table of Isotopes", Seventh Edition, edited by Virginia S. Shirley.
2. IPL participates in an NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials. (As in NRC Regulatory Guide 4.15)



ISOTOPE PRODUCTS LABORATORIES
1800 No. Keystone Street.,
Burbank, California 91504
(818) 843 - 7000

Ray A. Gilmore
QUALITY CONTROL

9613446.2214

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	$4.514 \times 10^3 \text{ Bq g}^{-1}$
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	$28.5 \pm 0.2 \text{ years}$ ⁽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
February, 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 γ s⁻¹g⁻¹ between 50 and 1900 keV.

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

0.05 α s⁻¹g⁻¹.

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

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

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
MST	Subtract	1 hour
MT	Subtract	2 hours
PDT	Subtract	2 hours
PST	Subtract	3 hours
UTC	Add	5 hours

*Salvador
Done*

9613446.2217

WORK GROUP REPORT (wk02)

May 22 1995, 11:01 am

Work Group: PU-ISOTOPIC LAL-0108_23154 for Department: 12 Radiation Prep.

Created: 22-MAY-95 Due: 22-MAY-95 Operator:

Sample	Account Name	ClientID	C Product	Matrix	Stat	QA	Workdate	PR	Location
--------	--------------	----------	-----------	--------	------	----	----------	----	----------

23154DUP1	DUP	L4482-8	S PU-ISOTOPIC LAL-0108	Water	WIP	U	22-MAY-95		
23154LCS1	LCS	Lab Ctrl Sample	S PU-ISOTOPIC LAL-0108	Water	WIP	U	22-MAY-95		
23154MBB1	MB	Method Blank	S PU-ISOTOPIC LAL-0108	Water	WIP	U	22-MAY-95		
L4482-8	Bechtel Hanford, Inc.	BDFKH6	S PU-ISOTOPIC LAL-0108	Water	WIP	U	15-JUN-95		156CART-2

Comments:

L4482-8 TEMP 2 "GAMMA SPEC TO INCLUDE Cs137, Co-60, Ru-106"

9 156H-A100

10 156V 6031

11 2033

12 35

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

Calibration Certificate

Description	Principal radionuclide	PLUTONIUM-239		Half-life	2.4x10 ⁴ years
	Nominal activity	59	nano	curies	
	Nominal volume	5	ml in ampoule/bottle number	2510-1	

Measurement Activity of principal radionuclide

Activity per gram of this solution

11.8	nano	curies	of	Plutonium-239
				at 0400 hours PST on
				December 13, 1990

Activity of daughter radionuclide

The principal activity was accompanied at the quoted time by

	curies	Per gram
of the daughter nuclide		

Total mass of this solution

APPROX. 5.0	grams
-------------	-------

Method of measurement

The activity of the primary solution was measured by an internal gas flow proportional counter.

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

Useful Life

This radionuclide has decayed through half lives since it was obtained by EMSL-LV

We recommend that this solution should not be used after

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) see remarks	less than equal to	<input type="text" value=""/>	% of the principal activity
(2)	less than equal to	<input type="text" value=""/>	% of the principal activity
(3)	less than equal to	<input type="text" value=""/>	% 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 $\pm 0.13\%$ (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

$+2.7\%$ or -2.7%

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 $+3.1\%$, -3.1% 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).

Plutonium-239 and impurities were assumed to decay 100 percent by alpha emission.

Chemical Composition of Solution

Carrier content per gram of solution:

Other components:

4M Nitric acid

Preservative:

Remarks

	Pu-238	0.033%	of the total activity
	Pu-240	$4.6 \times 10^{-5}\%$	of the total activity
IMPURITIES:	Pu-241	$1.5 \times 10^{-3}\%$	of the total activity
	Pu-242	$8.8 \times 10^{-6}\%$	of the total activity
	Pu-244	$6.2 \times 10^{-9}\%$	of the total activity

155

Date Certificate Prepared

December 13, 1990

Approval Signature

Paul B. Nahn

AR0029

ISOTOPE VOLUME DILUTION RECORD

Isotope: Pu-239 Vendor: EPA Reference Date: 0400 PSI 12-13
 Total Activity: 59 Nano Ci Vendor ID: 2510-1 Receive Date: 8-26-1991
 Total wt.(g) 5 NIST traceable Y/N Cert # _____ t½ 2.4 x 10⁴ years
 Activity UNITS/g 11.8 nano Ci/g converted to dpm/g 26196 Receiver's Name J. M.

PRIMARY DILUTION: Prepared by volume - AWDate: 9/23/91 Preparer's Name: LJa: Decay corrected activity: 26196 dpm/g (* if <100yr decay correct to preparation date)b: Wt. of Volumetric: 61.9254 g Balance wt check done c: Wt. Volumetric + source: 67.5322 g Diluent: 4M HNO₃d: Wt. of source transferred (c-b): 5.6068 g e: Wt. of diluent + source: 112.5429 gf: Vol. of diluent + source: 100 mL g: Activity of dilution (a*d/e): 1305 dpm/gh: Density (e/f): 1.1254 g/mL i: Activity by volume (g*h): 1469 dpm/mLDilution Log Book ID: 91-199-53 (91-225-271) ✓
 transferred to ↑Working Level Dilution: Prepared by volumeDate: 9/23/91 Preparer's Name: Lynn JausciA: Decay corrected activity: 1469 dpm/ml (* if <100yr decay correct to preparation date)B: Wt. of Volumetric: N/A g Balance wt check done C: Wt. Volumetric + source: N/A g Diluent: 4M HNO₃D: Wt. of source transferred: N/A g E: Wt. of diluent + source: N/A gF: Vol. of source transferred: 1.0 mL G: Vol. of diluent + source: 100 mLH: Activity of dilution (A*F/E): N/A dpm/g I: Density (E/G): N/A g/mLI: Activity by volume (A*F/G)(H*I) or (A*D/E): 14.7 dpm/mLDilution Log Book ID: 91-199-54 (91-225-81-1) AW 91-225-27-2 ✓Log Book transfer
Reviewed by: [Signature]Date: 4/4/92

SECONDARY/WORKING LEVEL STANDARD DILUTION RECORD

Dilution Source Information

Isotope: Pu-239

Parent Barcode Number: PA0029

Vendor or Certificate I.D. # of Parent Standard: EPA 250-1

Diluted Source Logbook I.D. #: 91-225-27-1

Balance Verification?: yes

Diluent Used: 4M HNO₃

Dilution

*Diluent: 4M HNO₃

*Density of diluent (g/ml): N/A g/ml

a: Parent Specific Activity: 661.71 ^{pu-239} pCi/g pCi/ml

b: Amount of Source Transferred: 1.7491 g

c: Total amount of Dilution: 115.89 g

d: Total Volume of Dilution: N/A ml

e: Activity of Dilution (a * b / c): N/A pCi/g

f: Activity of Dilution (a * b / d): 9.99 pCi/ml

Dilution Logbook I.D. #: ^{NO} 1-21-95-64 94-617-31-1

Prepared By: James Wong

Reviewed By: Joe Hatterson

Preparation Date: 1-21-95

Review Date: 1/26/95

*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



National Institute of Standards & Technology

Certificate

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

Standard Reference Material 4334E

Radioactivity Standard

Radionuclide	Plutonium-242
Source identification	4334E
Source description	Liquid in flame-sealed NIST borosilicate-glass ampoule ⁽¹⁾ *
Solution mass	Approximately 5.8 grams
Solution composition	Plutonium-242 in <u>5 mol·L⁻¹ nitric acid</u> ⁽²⁾
Reference time (Purification time)	1200 EST, 18 December 1989
Radioactivity concentration	26.37 Bq·g ⁻¹
Overall uncertainty	1.12 percent ⁽³⁾
Radionuclidic impurities	See Table 1 ⁽⁴⁾
Half life	$(3.733 \pm 0.012) \times 10^4$ years ⁽⁵⁾
Measuring instrument	Two 4π liquid-scintillation counters, a calibrated germanium detector system, and a silicon surface-barrier detector

This standard reference material was prepared in the Physics Laboratory, Ionizing Radiation Division, Radioactivity Group, J.M. Robin Hutchinson, Acting Group Leader.

Gaithersburg, MD
January 1993

William P. Reed, Chief
Standard Reference Materials Program

*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 1.170 ± 0.001 g·mL⁻¹ at 21.65 °C.

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

a) alpha-particle-emission-rate measurements	0.02 percent
b) background	0.03 percent
c) livetime	0.05 percent
d) detection efficiency	0.25 percent
e) count-rate-vs-energy extrapolation to zero energy	0.25 percent
f) half life	0.00 percent
g) gravimetric measurements	0.10 percent
h) radionuclidic impurities	0.00 percent

(4) Values for ²³⁸Pu + ²⁴¹Am and for ²³⁹Pu + ²⁴⁰Pu were calculated based upon measurements performed at the Lawrence Livermore National Laboratory (LLNL) shortly after purification of the ²⁴²Pu in December of 1989. Values for ²³⁹Pu + ²⁴⁰Pu and for ²⁴¹Pu were calculated based upon measurements performed at the National Institute of Standards and Technology (NIST) in August of 1990.

(5) Evaluated Nuclear Structure Data File (ENSDF), February 1990.

For further information please contact Dr. Larry Lucas at NIST.

Telephone: (301) 975-5546

FAX: (301) 926-7416

TABLE 1

RELATIVE ACTIVITY OF RADIONUCLIDIC IMPURITIES AT REFERENCE TIME 1200 EST, 18 DECEMBER 1989 ^(a)			
RADIONUCLIDE	HALF LIFE (YEARS)	RELATIVE ACTIVITY AS DETERMINED BY	
		LLNL	NIST
²³⁸ Pu	87.74 ± 0.04 ^(b)	²³⁸ Pu + ²⁴¹ Am <0.000 025 ^(c)	-----
²³⁹ Pu	24119 ± 26 ^(b)		
²⁴⁰ Pu	6570 ± 6 ^(b)	²³⁹ Pu + ²⁴⁰ Pu <0.000 005 ^(c)	²³⁹ Pu + ²⁴⁰ Pu <0.000 043 ^(c)
²⁴¹ Pu	14.35 ± 0.10 ^(b)	-----	0.162 ± 0.002(1σ) ^(d)
²⁴² Pu	373300 ± 1200 ^(b)	1.000 000	1.000 000 =
²⁴¹ Am	432.2 ± 0.5 ^(b)	²³⁸ Pu + ²⁴¹ Am <0.000 025 ^(c)	0.000 000 assumed

^(a) Reference time is the time of purification of the plutonium-242.

^(b) Evaluated Nuclear Structure Data File (ENSDF), February 1990.

^(c) Using alpha-particle spectrometry, no alpha-particle emission was detected that could reliably be ascribed to these radionuclides. The value shown is an estimated upper limit based upon background and counting statistics.

^(d) The plutonium-241 relative activity at reference time was calculated from a gamma-ray measurement of the americium-241 ingrowth as of 18 August 1990.



Dear Customer:

The Standard Reference Material(s) (SRM'(s)) for which you have requested a Material Safety Data Sheet (MSDS), 4334E, Pu-242 is excluded from coverage in our regular MSDS system of more than 100 sheets for one or more of the following reasons:

- 1 The SRM is an article, as that word is defined in paragraph (c) of section 1910.1200 of title 29 of the Code of Federal Regulations which does not release or otherwise result in exposure to a hazardous chemical, under normal conditions of use.
- 2 The SRM has been determined to be non-hazardous by the National Institute of Standards and Technology under paragraph (d) of section 1910.1200 of title 29 of the Code of Federal Regulations. The SRM will not release or otherwise result in exposure to a hazardous chemical under normal conditions of use.
- 3 The SRM is a pesticide or hazardous waste labeled according to regulations issued by the Environmental protection Agency.
- 4 The SRM is a food, food additive, or drug labeled according to regulations issued by the Food and Drug Administration.
- 5 The SRM is a wine labeled according to regulations issued by the Bureau of Alcohol, Tobacco, and Firearms.
- 6 The SRM is a radioactive material labeled according to regulations issued by the Nuclear Regulatory Commission. The Shipper's Declaration form included with the shipment states chemical form, physical state, and activity of SRM.
- 7 The SRM is a tobacco or tobacco product, wood, or wood product which is exempted by paragraph (b) (5) (ii) and (iii) of section 1910.1200 of title 29 of the Code of Federal Regulations from the provisions of that section.

If we can be of assistance to you in regard to this matter, or any issue related to SRMs, please do not hesitate to write to me.

Sincerely,

Stanley D. Rasberry
 Chief
 Office of Standard Reference Materials

INITIAL STANDARD DILUTION RECORD

Standard Information:

Isotope:	<u>Pu-242</u>	Vendor:	<u>NIST</u>
Activity of Standard Received:	<u>uCi</u>	Vendor I.D. #	<u>SRM 4334E</u>
Weight of Standard Received (g):	<u>5.8 g</u>	LAL I.D. #:	<u>Am 9805 AC 5292 CP 3/20/95</u>
Standard Activity (pCi/g):	<u>712.70 1-18-95 ^{AW} 1582.2</u> pCi/g	NIST Traceable ?	<u>yes</u>
Half-life in Years or Days:	<u>3.733 ± 10⁵ yrs</u>	Certificate #:	<u>SRM 4334E</u>
Reference Date:	<u>12-18-1989</u>	Receiver's Name:	<u>K. Free</u>
		Date Received:	

Primary Dilution

Balance Verification?:	<u>yes</u>
Diluent Used:	<u>5M HNO₃</u>
a: Decay Corrected Standard Activity (pCi/g):	<u>712.70</u> pCi/g
b: Weight of the Source Transferred (g):	<u>5.5997</u> g
c: Total diluted weight (g):	<u>578.44</u> g
d: Total Diluted Volume (mL)	<u>500</u> mL
e: Activity of Dilution by Weight (pCi/g) (a * b / c):	<u>6.90</u> pCi/g
f: Calculated Density of Solution (g/mL) (c / d):	<u>1-18-95 ^{AW} 1.16 1.157</u> g/mL
g: Activity of Dilution by Volume (pCi/mL) (e * f):	<u>7.98</u> pCi/mL
h. Dilution Logbook I.D. #:	<u>94-677-27-1</u>
Prepared By: <u>Ignes Wony</u>	Preparation Date: <u>1-18-95</u>
Reviewed By: <u>Joe Hitchman</u>	Review Date: <u>2/3/95</u>
Purity/Cross Check Performed By: <u>Ignes Wony</u>	Check Date: <u>2-1-95</u>

Signed

Date

Signed

Date

UNLOADED
DATE

9613446.2228

WORK GROUP REPORT (wk02)

May 22 1995, 12:20 pm

Done

Work Group: SR-90 LAL-0196_23179 for Department: 12 Radiation Prep.

Created: 22-MAY-95 Due: 22-MAY-95 Operator:

Sample	Account Name	ClientID	C Product	Matrix	Stat	UA	Workdate	PR	Location
--------	--------------	----------	-----------	--------	------	----	----------	----	----------

23179DUP1	DUP	L4482-B	S SR-90 LAL-0196	Water	WIP	U	22-MAY-95		
23179LCS1	LCS	Lab Ctr'l Sample	S SR-90 LAL-0196	Water	WIP	U	22-MAY-95		
23179MBB1	MB	Method Blank	S SR-90 LAL-0196	Water	WIP	U	22-MAY-95		
L4482-8	Bechtel Hanford, Inc.	B0FKH6	S SR-90 LAL-0196	Water	WIP	U	10-JUN-95		156CART-2

Comments:

L4482-8 TEMP 2 "GAMMA SPEC TO INCLUDE Cs137, Co-60, Ru-106" 1492

LOCKHEED ANALYTICAL LABORATORY

SAMPLE PREPARATION LOG FOR STRONTIUM ANALYSIS TOTAL RADIOSTRONTIUM - LAL-91-SOP-0196

166

Date Prep Started : 06/07/95

Matrix : Water

WorkGroup : SR-90 LAL-0196 23179

Prep Due Date : 05/22/95

CUSTOMER ID	PARENT LAL ID	NO	QC	CHILD LAL ID	ALIQVOT VOLUME (L)	SR CARRIER (mL)	YTTRIUM SEP DATE	YTTRIUM SEP TIME	PLANCHET TARE WT (grams)	PLANCHET GROSS WT (grams)	*	RESIDUE WEIGHT (grams)	COMMENTS
L4482-8	23179DUP1	1	DUP1	23179-01	0.5000	0.5	06/09/95	14:50	6.88725	6.89978		0.01253	
Lab Ctrl Sample	23179LCS1	2	LCS1	23179-02	0.5000	0.5	06/09/95	14:50	6.57138	6.58424		0.01286	
Method Blank	23179MBB	3	MBB	23179-03	0.5000	0.5	06/09/95	14:50	6.45935	6.47064		0.01129	
BOFKH6	L4482-8	4	SMP	23179-04	0.5000	0.5	06/09/95	14:50	6.54837	6.56114		0.01277	
		5											
		6											
		7											
		8											
		9											
		10											
		11											
		12											
		13											
		14											
		15											
		16											
		17											
		18											
		19											
		20											
		21											
		22											
		23											
		24											
Conc&Vol of Carrier		24.62 mg/mL; 0.5 mL			Act & Vol of LCS		26.78 pCi/mL; 1.0 mL			Prep Anlst		GA	
Carrier Exp Date		05-Jan-96			LCS Ref Date		01-Apr-94			Start Date		06/07/95	
Carrier ID#		94-658-4-1			LCS ID#		94-677-44-1			Count Anlst		CS	

Balance Number : 40020021 ()

Pipette Number : 28875 ()

Carrier and LCS added by: GA

()

115364 ()

Witnessed by : LV

Comments :

Analyst : L. Schwaner for G.A. 6/20/95
(date entry)

Checked by :

LR

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 ampule/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.

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

$\pm 3.8\%$ or $\pm 3.8\%$

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 $\pm [t(sm) + \delta]$, $- [t(sm) + \delta]$ and is $\pm 4.0\%$, $\pm 4.0\%$ 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 170

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>0.1 M 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>536.44 pCi/mL</u>
h. Dilution Logbook I.D. #:	<u>93-474-81-1 ⁷³⁻⁴⁷⁴⁻⁸²⁻¹ 94-474-81-1</u>
Prepared By: <u>Dyane Wong</u>	Preparation Date: <u>6-15-94</u>
Reviewed By: <u>Joe Hutchison</u>	Review Date: <u>6/30/94</u>
Purity/Cross Check Performed By: _____	Check Date: _____

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/ml</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>Agnes Wong</u>	Preparation Date: <u>3-2-95</u>
Reviewed By: <u>[Signature]</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 Agnes Wong 3-3-95 Date _____

Strontium Carrier Standardization

Strontium Carrier (10 mg/mL):

Use commercially available 10,000 $\mu\text{g Sr/mL}$ 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.

Sr Carrier #91-208-100-1 was recalibrated to give a new calibrated value. Prepped on 1-5-95

	Calib # 1	Calib # 2	Calib # 3
Carrier plus planchet wt.	6.60823	6.65050	6.818936 ^{AW}
Tare wt. of planchet	6.59582	6.63805	6.80698
Net wt. of carrier added (mg)	0.01241	0.01245	0.012068

AVERAGE $\text{Sr}(\text{NO}_3)_2 \pm \text{STD DEV.} = \underline{0.01231 \text{ g}}$

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

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

Initial and Date: JW 1-10-95

Read and Understood By

Raymond W. ... 1-10-95

Signed _____ Date _____ Signed _____ Date 173

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.	6.58185 g	6.49626 g	6.56816 g
Tare wt. of planchet	6.56968 g	6.48464 g	6.55620 g
Net wt. of carrier added (mg)	0.01217 g	0.01162	0.01196 g

AVERAGE $\text{Sr}(\text{NO}_3)_2 \pm \text{STD DEV.} = \underline{0.01192 \text{ g} \pm 0.000277}$

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

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

Initial and Date: DW 3-6-94

Continued on Page

Read and Understood By DA Review:

174

Dagmar Wong
Signed

3-15-94
Date

Gina Martinez
Signed

8/11/94
Date

9613446.2237

9660980
DATE

WORK GROUP REPORT (wk02)

May 22 1995, 10:36 am

David

Work Group: TC-99 LAL-0169_23139 for Department: 12 Radiation Prep.

Created: 22-MAY-95 Due: 22-MAY-95 Operator:

Sample	Account Name	ClientID	C Product	Matrix	Stat	UA	Workdate	PR	Location
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Page 1									
231390UP1	DUP	L4467-6	S TC-99 LAL-0169	Water	WIP	U	22-MAY-95		
231390UP2	DUP	L4482-17	S TC-99 LAL-0169	Water	WIP	U	22-MAY-95		
23139LCS1	LCS	Lab Ctrl Sample	S TC-99 LAL-0169	Water	WIP	U	22-MAY-95		
23139MBB1	MB	Method Blank	S TC-99 LAL-0169	Water	WIP	U	22-MAY-95		
L4467-6	Bechtel Hanford, Inc.	BOFBK3	S TC-99 LAL-0169	Water	WIP	U	08-JUN-95		156CART-2
L4482-17	Bechtel Hanford, Inc.	BOFKH6	S TC-99 LAL-0169	Water	WIP	U	10-JUN-95		156CART-2

Comments:

L4467-6 temp 2; SAF# 895-050
L4482-17 TEMP 2

Workgroup Number: TC-99 LAL-0169_23139

Sample	Parameter	Value	Error	MDA
23139DUP1	Tc-99	50.5695	9.28753	6.1273
23139DUP2	Tc-99	2019.27	163.314	6.4628
23139LCS1	Tc-99	843.997	70.9788	5.54817
23139MBB1	Tc-99	-1.23359	4.8096	6.17396
L4467-6	Tc-99	45.3828	8.78159	6.03677
L4482-17	Tc-99	1562.34	128.392	7.1227

LOCKHEED ANALYTICAL LABORATORY

SAMPLE PREPARATION WORKSHEET FOR Tc-99 ANALYSIS

LAL-94-SOP-0169

15 pc/L ROL
45 min

178

Prep Start Date :

Matrix : Water

WorkGroup : TC-99 LAL-0169 23139

Prep Due Date : 22-May-95

CUSTOMER ID	PARENT LAL ID	NO	QC	VIAL LAL ID	FLASK +WET SOIL (grams)	FLASK EMPTY (grams)	WET SOIL NET WT. (grams)	FLASK +DRY SOIL (grams)	DRY SOIL NET WT. (grams)	ALIQOUT VOLUME (g or L)	COMMENTS
L4467-6	23139DUP1	1		23139-01						150 mL	
	23139DUP1	1a		23139-02						↓	
L4482-17	23139DUP2	2		23139-03							
	23139DUP2	2a		23139-04						↓	
Lab Ctrl Sample	23139LCS1	3		23139-05							
	23139LCS1	3a		23139-06							
Method Blank	23139MBB	4		23139-07							
	23139MBB	4a		23139-08							
BOFBK3	L4467-6	5		23139-09						150 mL	
	L4467-6	5a		23139-10						↓	
BOFKH6	L4482-17	6		23139-11							
	L4482-17	6a		23139-12						↓	
		7									
		7a									
		8									
		8a									
		9									
		9a									
		10									
		10a									
		11									
		11a									
		12									
		12a									

9613446-2239

Conc & Vol of Tracer: 9816.37 pCi/mL 0.1 mL
 Tracer Ref Date: 11-1982
 Tc-99 Tracer ID#: 94-677-17-1

Act & Vol of LCS: 111.90 pCi/mL 1.0 mL
 LCS Ref Date: 10-30-91
 Tc-99 LCS ID#: 93-474-96-1

Prep Analyst: RA
 Start Date: 5/26/95
 Count Analyst: LS

Balance Number: 40020021 (✓)

Pipette: # 120697 0.1 mL (✓)
119510 1 mL (✓)

Carrier and LCS added by: RA
 Witnessed by: RA

Comments: Cocktail - Packard Insta-Gel; vial - 20 mL poly.

Analyst: P. Pouch 5/30/95

Checked by: RA 5-30-95

LOCKHEED ANALYTICAL LABORATORY

SAMPLE PREPARATION WORKSHEET FOR Tc-99 ANALYSIS

LAL-94-SOP-0169

179

Prep Start Date : 5/26/95

Matrix : Water

WorkGroup : TC-99 LAL-0169 23139

Prep Due Date : 22-May-95

CUSTOMER ID	PARENT LAL ID	NO	QC	VIAL LAL ID	FLASK + WET SOIL (grams)	FLASK EMPTY (grams)	WET SOIL NET WT. (grams)	FLASK + DRY SOIL (grams)	DRY SOIL NET WT. (grams)	ALIQUOT VOLUME (L)	COMMENTS	
L4467-6	23139DUP1	1	DUP1	23139-01						0.1500		
	23139DUP1	1a		23139-02						0.1500		
L4482-17	23139DUP2	2	DUP2	23139-03						0.1500		
	23139DUP2	2a		23139-04						0.1500		
Lab Ctrl Sample	23139LCS1	3	LCS1	23139-05						0.1500		
	23139LCS1	3a		23139-06						0.1500		
Method Blank	23139MBB	4	MBB1	23139-07						0.1500		
	23139MBB	4a		23139-08						0.1500		
BOFBK3	L4467-6	5	SMP1	23139-09						0.1500		
	L4467-6	5a		23139-10						0.1500		
BOFKH6	L4482-17	6	SMP2	23139-11						0.1500		
	L4482-17	6a		23139-12						0.1500		
		7										
		7a										
		8										
		8a										
		9										
		9a										
		10										
		10a										
		11										
		11a										
		12										
		12a										
Conc & Vol of Tracer		9816.37 mg/mL; 0.1 mL			Act & Vol of LCS		111.90 pCi/mL; 1.0 mL			Prep Analyst		DA
Tracer Ref Date		01-Nov-82			LCS Ref Date		01-Sep-91			Start Date		5/26/95
Tc-99 Tracer ID#		94-677-17-1			Tc-99 LCS ID#		93-474-96-1			Count Analyst		CS

Balance Number : 40020021 ()

Pipette : 120697 ()

Carrier and LCS added by: DA

()

119510 ()

Witnessed by: RS

Comments : Cocktail - Packard Insta-Gel; vial - 20 mL poly.

Analyst : L. Schwesler for DA 5/31/95
(data entry)

Checked by : [Signature]

9613446-2240



SEPARATE COVER.

National Bureau of Standards

Certificate

Standard Reference Material 4288

Radioactivity Standard

Radionuclide	Technetium-99
Source identification	4288- 83
Source description	Liquid in NBS borosilicate-glass ampoule
Solution composition	59.31 μg of Tc(VII) as potassium pertechnetate per gram of approximately 0.001 molar KOH (1)*
Mass	4.910 grams
Radioactivity concentration	$3.759 \times 10^4 \text{ Bq g}^{-1}$
Reference time	November, 1982
Measuring instrument	Liquid-scintillation counter (2)
Random uncertainty	0.27 percent (3)
Systematic uncertainty	1.35 percent (4)
Total uncertainty (Random plus systematic)	1.62 percent
Photon-emitting impurities	None observed (5)
Half life	$(2.111 \pm 0.036) \times 10^5 \text{ years}$ (6)

This Standard Reference Material was prepared in the Center for Radiation Research, Nuclear Radiation Division, Radioactivity Group, Dale D. Hoppes, Group Leader.

Washington, D.C. 20234
November, 1982

George A. Uriano, Chief
Office of Standard Reference Materials

*Notes on back
186

FOOTNOTES

- (1) The KTcO_4 was prepared by M.W. Heitzmann of the U.S. Food and Drug Administration from NH_4TcO_4 obtained from Oak Ridge National Laboratory. The solution density is 0.998 g cm^{-3} at 21.8°C , and the KTcO_4 concentration is 0.00060 molar. The UV spectrum of this material exhibited only the characteristic doublets at 243 and 287 nm (A).[#]
- (2) Two liquid-scintillation counters were calibrated using the method of J.A.B. Gibson (B,C,D). Three different radionuclides were used as the standard: ^3H , ^{14}C , and ^{60}Co . The results obtained using the three radionuclides agreed to within 0.32 percent. The ^{14}C result was used for confirmation only. The value given here is the unweighted mean of the ^3H and ^{60}Co results.
- (3) Half the 99-percent confidence interval for the average of the ^3H result and the ^{60}Co result. The standard deviation of the mean of the ^3H result is 0.15 percent based on 6 degrees of freedom, and the standard deviation of the mean of the ^{60}Co result is 0.09 percent based on 9 degrees of freedom.
- (4) The systematic uncertainty is the average of that for the ^3H result, 1.20 percent, and that for the ^{60}Co result, 1.49 percent. These values are linear sums of estimated upper limits of uncertainties due to the following:

	<u>^3H</u>	<u>^{60}Co</u>
a) reference material for standard radionuclide	0.63	0.68
b) source preparation	0.07	0.17
c) theoretical model	0.30	0.20
d) gamma-ray contribution to beta-particle detector		0.24
e) quenching	0.10	0.10
f) interpolation from calibration curve	<u>0.10</u>	<u>0.10</u>
	1.20	1.49

- (5) The master solution from which these standards were prepared was examined with germanium gamma-ray spectrometers and no impurity was found. Limits of detection as a ratio of gamma-ray-emission rate to technetium-99 activity are

$$1 \times 10^{-6} \quad \text{between 90 and 300 keV}$$

$$1 \times 10^{-7} \quad \text{between 300 and 1900 keV.}$$

- (6) NBS-measured half life based on the formula $T_{1/2} = N \ln(2)/A$, where N is the number of atoms, computed using an atomic mass for technetium-99 of 98.906254 ± 0.000002 grams and the gravimetrically determined mass of technetium-99, and A is the activity determined by liquid-scintillation counting. The value recommended by the Oak Ridge Nuclear Data Project is $(2.13 \pm 0.05) \times 10^5$ years. (E)

[#] References on last page

The following individuals and organizations contributed to the characterization of this Standard Reference Material.

J.A.B. Gibson
Atomic Energy Research Establishment
Environmental and Medical Sciences Division
Harwell
United Kingdom

M.W. Heitzmann
U.S. Food and Drug Administration
Division of Drug Chemistry
Washington, D.C.

J.C. Leak
U.S. Food and Drug Administration
Division of Oncology and
Radiopharmaceutical Drug Products
Rockville, MD

For further information please contact Dr. Bert M. Coursey at (301) 921-2383.

REFERENCES

- A. Boyd, G.E., J. Chem. Ed., 36, 3 (1959).
- B. Gale, H.J. and Gibson, J.A.B., Atomic Energy Research Establishment Report AERE-R5067 (1965), Harwell, United Kingdom.
- C. Gibson, J.A.B. and Marshall, M., Int. J. Appl. Radiat. Isotopes, 23, 321 (1972).
- D. Gibson, J.A.B., Computed counting efficiencies as a function of merit figure for 14 beta-particle-emitting radionuclides (July, 1980). Unpublished data.
- E. Kocher, D.C., Radioactive Decay Data Tables DOC/TIC-11026, p. 108 (1981). Available from NTIS, Springfield, VA.

9613446.2244

#A00128

ISOTOPE WEIGHT DILUTION RECORD

Isotope: Tc-99

Vendor: NIST

Total Received Activity: 1.85 ± 5 Bq

Vendor ID: 4288

Wt. Received: 4.91 (0.001 M KOH)

NIST Traceable Y/N Y Source Cert. # 4288-83

Activity in Units/g: 3.759 × 10⁴ Bq/g

Reference Date: NOV 1982

× 60/2.22 = 1.016 ± 6 pc/g

Receive Date: 3-29-92

Half-life (Yrs or days) t_{1/2} = 2.111 ± 5 yrs

Receiver's Name: J. Males

PRIMARY DILUTION:

Balance wt. check done

a: Source activity: 1.016 ± 6 pc/g dpm/g (if t_{1/2} = <100yr decay to prep. date)

b: Wt. of Source transferred: 4.869g g

AA0128

Diluent used: 0.1 M NH₄OH



Diluted

c: Total diluted weight: 146.81 g

d: Activity of dilution (a*b/c): 3.37 ± 4 pc/g dpm/g

e: Calculated density of solution: .9956 g/mL (4M HNO₃)

100 μL = 99.56 μg

f: Activity by volume = (d*e): 3.355 ± 4 pc/mL dpm/mL

U.S. Department of Commerce
National Institute of Standards
and Technology A.0128

Dilution Log Book ID: LAL: 92-353-100-1

⁹⁹Tc Radioactivity Standard
Amount 3.759 × 10⁴ Bq g⁻¹

Preparation Date: 6/16/93 Preparer's Name: [Signature]

Date November 1, 1982

SRM 4288

CAUTION
RADIOACTIVE



SECONDARY OR WORKING LEVEL DILUTION

Balance wt. check done

Log Book ID of source being diluted: LAL 92-353-100-1

a: Source activity: 3.355 ± 4 pc/mL dpm/mL (if t_{1/2} = <100yr decay to prep. date)

b: Wt. of Source transferred: 2.3211 g

Diluent used: 0.1 M NH₄OH

c: Total diluted weight: 71.89 g

d: Activity of dilution (a*b/c): NA dpm/g

e: Calculated density of solution: NA g/mL (4M HNO₃ = 1.1294 ± .0007 g/mL)

f: Activity by volume = (d*e): 1083 pc/mL dpm/mL

Dilution Log Book ID: LAL 92-353-100-2

Preparer's Name: [Signature] Preparation Date: 6/16/93

Reviewed By: [Signature] Review Date: 6/16/93

SECONDARY/WORKING LEVEL STANDARD DILUTION RECORD

Dilution Source Information	
Isotope:	<u>Tc-99</u>
Parent Barcode Number	<u>AA0128</u>
Vendor or Certificate I.D. # of Parent Standard:	<u>SRM 4288</u>
Diluted Source Logbook I.D. #:	<u>92-353-100-1</u>
Balance Verification?:	<u>yes</u>
Diluent Used:	<u>0.1 M NH₄OH</u>

Dilution	
*Diluent:	<u>0.1 M NH₄OH</u>
*Density of diluent (g/ml):	<u>0.9956</u> g/ml
a: Parent Specific Activity:	<u>3.355 E4</u> ^{BW 11-16-94} pCi/g <u>pCi/ml</u>
b: Amount of Source Transferred:	<u>36.0938</u> g
c: Total amount of Dilution:	<u>123.36</u> g
d: Total Volume of Dilution:	<u>N/A</u> ml
e: Activity of Dilution (a * b / c):	<u>N/A</u> pCi/g
f: Activity of Dilution (a * b / d):	<u>9816.37</u> pCi/ml
Dilution Logbook I.D. #:	<u>94-677-17-1</u>
Prepared By: <u>Agnes Wong</u>	Preparation Date: <u>11-16-94</u>
Reviewed By: <u>Joe Hutchins</u>	Review Date: <u>11/17/94</u>
<small>*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.</small>	

9613446.2246 AA0097

CERTIFICATE OF CALIBRATION BETA STANDARD SOLUTION

Radionuclide: Tc-99 Customer: LOCKHEED ENGINEERING & SCIENCES Co.
Half Life: $(2.13 \pm 0.05) \times 10^5$ years P.O.No.: 06LAB1036
Catalog No.: 7099 Reference Date: September 1 1991 12:00 PST.
Source No.: 389-22-1 Contained Radioactivity: 1.003 μ Ci.

Description of Solution

a. Mass of solution: 4.9929 grams.
b. Chemical form: NH_4TcO_4 in 0.1M NH_4OH
c. Carrier content: None added
d. Density: 0.9974 gram/ml @ 20°C.

Radioimpurities

None detected

Radioactive Daughters

None

Radionuclide Concentration

0.201 μ Ci/gram.

Method of Calibration

Weighed aliquots of the solution were assayed using a liquid scintillation counter.

Uncertainty of Measurement

a. Systematic uncertainty in instrument calibration: $\pm 2.1\%$
b. Random uncertainty in assay: $\pm 1.0\%$
c. Random uncertainty in weighing(s): $\pm 0.0\%$
d. Total uncertainty at the 99% confidence level: $\pm 3.1\%$

NIST Traceability

This calibration is implicitly traceable to the National Institute of Standards and Technology.

Notes

1. Nuclear data were taken from "Table of Isotopes", Seventh Edition, edited by Virginia S. Shirley.
2. IPL participates in an NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials. (As in NRC Regulatory Guide 4.15)



ISOTOPE PRODUCTS LABORATORIES
1800 No. Keystone Street.,
Burbank, California 91504
(818) 843 - 7000

[Signature]
QUALITY CONTROL

9613446-2247

AA0041

AA0047

ISOTOPE WEIGHT DILUTION RECORD

Isotope: Tc-99

Vendor: IPL

Total Received Activity: ~1 μ ci

Vendor ID: 389-22-1

Wt. Received: ~5 g

NIST Traceable (Y) N Cert. # implicitly

Activity in Units/g: ~~0.20~~ 0.20 μ Ci/g

Reference Date: 9-1-91

Activity converted (dpm/g): _____ dpm/g

Receive Date: ^{AW 7-23-93} N/A 10-30-199

Half-life (Yrs or days) $t_{1/2}$ = 2.13×10^5 years

Receiver's Name: ^{AW 1-23-93} N/A Jimmy
Mora

PRIMARY DILUTION:

Balance wt. check done

a: Source activity: 2.01×10^5 pCi/g dpm/g ^{AW} (if $t_{1/2}$ = <100yr decay to prep. date)

b: Wt. of Source transferred: 4.9320 g

Diluent used: 0.1 M NH₄OH

c: Total diluted ^{volume} weight 100 ml g ^{AW}

d: Activity of dilution (a*b/c): N/A dpm/g

e: Calculated density of solution: N/A g/mL (4M HNO₃ = 1.1294 \pm .0007 g/mL)

f: Activity by volume = (d*e): 9910 pCi/ml dpm/mL ^{AW}

Dilution Log Book ID: 91-225-41-1

Preparation Date: 1-23-92 Preparer's Name: Joe Hutchinson

SECONDARY OR WORKING LEVEL DILUTION

Balance wt. check done ()

Log Book ID of source being diluted: 91-225-42-1

a: Source activity: 9910 pCi/ml dpm/g * (if $t_{1/2}$ = <100yr decay to prep. date)

b: Wt. of Source transferred: 1.0051 g

Diluent used: 0.1 M NH₄OH

c: Total diluted weight: 50.621 g

d: Activity of dilution (a*b/c): N/A dpm/g

e: Calculated density of solution: 997 g/ml g/mL (4M HNO₃ = 1.1294 \pm .0007 g/mL)

f: Activity by volume = ^{a*b/c} 196.8 ^{dpm/mL} pCi/mL

Dilution Log Book ID: 91-225-42-1

Preparer's Name: Joe Hutchinson Preparation Date: 1-27-92

Reviewed By: rg3 Review Date: 6/8/93

SECONDARY / WORKING LEVEL STANDARD DILUTION RECORD

Dilution Source Information

Isotope:

Tc-99

From NIST traceable standard?:

Implicitly

Vendor or Certificate I.D. # of parent standard:

AA0047

Diluted source logbook I.D. #:

91-225-41-1

Balance verification?:

yes

Diluent used:

0.1M NH₄OH

Dilution

Diluent:

0.1M NH₄OH

Density of diluent (g/ml):

N/A

a. Parent standard activity:

9910 pCi/ml

b. Amount of standard transferred:

2.8759 g

c. Total amount of dilution:

254.69 g

d. Activity of dilution [a * b / c]:

111.90 pCi/ml as of 9-1

Dilution logbook I.D. #:

93-474-96-1

Prepared by:

Ignes Wong

Preparation date:

8-17-94

Reviewed by:

Joe Hutchison

Review date:

8/25/94

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.

LAL-91-SOP-0174

9613446.2249

AA0047

SECONDARY / WORKING LEVEL STANDARD DILUTION RECORD

Dilution Source Information

Isotope:

Tc-99

From NIST traceable standard?:

Implicitly

Vendor or Certificate I.D. # of parent standard:

AA0047

Diluted source logbook I.D. #:

91-225 -41 -1

Balance verification?:

yes

Diluent used:

0.1 M NH₄OH

Dilution

Diluent:

0.1 M NH₄OH

Density of diluent (g/ml):

N/A

a. Parent standard activity:

9910 pCi/ml

b. Amount of standard transferred:

1.9605 g

c. Total amount of dilution:

166.25 g

d. Activity of dilution [a * b / c]:

116.86 pCi/ml as of 9-1-94

Dilution logbook I.D. #:

93-474 -97 -1

Prepared by:

Pyne Wong

Preparation date:

8-17-94

Reviewed by:

Joe Hatcher

Review date:

8/25/94

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.

LAL-91-SOP-0174

Lockheed Analytical Laboratory

Sample Preparation Worksheet for Total Uranium (KPA) Analysis

Date Prep Started: 6/9/95
 Workgroup Number: U TOTAL KPA LAL-0168 23131

Matrix: Water
 Prep Due Date: 22-May-95 DH 6/3/95

CLIENT ID	LAL ID	QC	ALIQOT (ml, g. sample)	DILUTION	COMMENTS	Client	Collection Date
L4482-8	23131DUP1	1	Dupl 10 ml	↓	RPD = 9.24 7.29. 6/9/95	DUP	05/22/95
Lab Ctrl Sample	23131LCS1	2	LCS1	↓	Rec = 102%	LCS	05/22/95
Method Blank	23131MBB1	3	MB1	↓		MB	05/22/95
L4482-8	23131MS1	4	MS1	(5) ↓	Rec = 60% 6/11/95 @ 5x 113%	MS	05/22/95
BOFKH6	L4482-8	5	SMPI, MS1	↓		Bechtel Hanford, Inc. *	05/09/95
		6					
		7					
		8					
		9					
		10					
		11					
		12					
		13					
		14					
		15					
		16					
		17					
		18					
		19					
		20					
		21					
		22					
		23					
		24					

Units are µg/L not µg/L/L 6/12/95
AMS

COMMENTS:

CCV4 100 µg/L 99-677-53-1

Amount of CCVL	5 µg/L (from 6/9/95)	Amount of LCS	1 ml of 100 µg/L → 10 ml
CCV Activity	5 µg/L	LCS Activity	10 µg/L
CCV ID#	9101373333 A	LCS ID#	9101873333 (6) 95012A

Balance Number: 35120015 6/12/95 (✓)

Pipette Number: J18548N (✓)

Tracer, LCS, & MS added by: DMS

Sample Prep Analyst: P.M. Boyd (✓) 6/9/95

K18222C (✓)

Witnessed by: DMS

LAL-95-LOG-0711

Checked by: Joe Hutchinson

Rm 159

9613446.2250

9613446.2251

WORK GROUP REPORT (wk02)

May 22 1995, 04:42 pm

Tedd

Work Group: U TOTAL KPA LAL-0168_23131 for Department: 12 Radiation Prep.

Created: 22-MAY-95 Due: 22-MAY-95 Operator:

Sample	Account Name	ClientID	C Product	Matrix	Stat	UA	Workdate	PR Location
Page 1								
23131DUP1	DUP	L4482-8	S U TOTAL KPA LAL-0168	Water	WIP	U	22-MAY-95	
23131LCS1	LCS	Lab Ctrl Sample	S U TOTAL KPA LAL-0168	Water	WIP	U	22-MAY-95	
23131HBB1	MB	Method Blank	S U TOTAL KPA LAL-0168	Water	WIP	U	22-MAY-95	
23131MS1	MS	L4482-8	S U TOTAL KPA LAL-0168	Water	WIP	U	22-MAY-95	
L4482-8	Bechtel Hanford, Inc.	BOFKMG	S U TOTAL KPA LAL-0168	Water	WIP	U	10-JUN-95	156CART-2

Comments:

L4482-8 TEMP 2 "GAMMA SPEC TO INCLUDE Cs137, Co-60, Ru-106"

9613446.2252
RADIATION RESULTS CHECK REPORT

Workgroup Number: U TOTAL KPA LAL-0168_23131

Sample	Parameter	Value	Error	MDA
23131DUP1	Uranium	3.08239	0.158985	0.201804
23131LCS1	Uranium	10.2079	0.527096	0.201804
23131MBB1	Uranium	0	0	0
23131MS1	Uranium	14.636	0.755089	1.00902
L4482-8	Uranium	3.31059	0.170834	0.201804

D.M. Boyer 6-12-95

UPLOADED
DIVE

9613446.2253

WORK GROUP REPORT (wk02)

May 22 1995, 12:24 pm

Chert

Work Group: TRITIUM(H3) LAL-0066_23181 for Department: 12 Radiation Prep.

Created: 22-MAY-95 Due: 22-MAY-95 Operator:

Sample	Account Name	ClientID	C Product	Matrix	Stat	UA	Workdate	PR	Location
--------	--------------	----------	-----------	--------	------	----	----------	----	----------

23181DUP1	DUP	L4882-16	S TRITIUM(H3) LAL-0066	Water	WIP	U	22-MAY-95		
23181LCS1	LCS	Lab Ctrl Sample	S TRITIUM(H3) LAL-0066	Water	WIP	U	22-MAY-95		
23181MBB1	MB	Method Blank	S TRITIUM(H3) LAL-0066	Water	WIP	U	22-MAY-95		
23181MS1	MS	L4482-16	S TRITIUM(H3) LAL-0066	Water	WIP	U	22-MAY-95		
L4482-16	Bechtel Hanford, Inc.	BOFKM6	S TRITIUM(H3) LAL-0066	Water	WIP	U	10-JUN-95		156-020

Comments:

L4482-16 TEMP 2

9613446.2254

RADIATION RESULTS CHECK REPORT

Workgroup Number: TRITIUM(H3) LAL-0066_23181

Sample	Parameter	Value	Error	MDA
23181DUP1	H-3	264.866	206.758	256.357
23181LCS1	H-3	2666.84	394.29	256.143
23181MBB1	H-3	-107.663	160.892	251.668
23181MS1	H-3	3945.94	469.989	255.39
L4482-16	H-3	358.866	217.242	257.829

LOCKHEED ANALYTICAL LABORATORY

SAMPLE PREPARATION WORKSHEET FOR H-3 ANALYSIS SOP-0066

215

Prep Start Date : 5/25/95

Matrix : Water

WorkGroup : TRITIUM(H3) LAL-0066 23181

Prep Due Date : 22-May-95

CUSTOMER ID	PARENT LAL ID	NO	QC	VIAL LAL ID	FLASK + WET SOIL (grams)	FLASK EMPTY (grams)	WET SOIL NET WT. (grams)	FLASK + DRY SOIL (grams)	DRY SOIL NET WT. (grams)	DISTILLED VOLUME (L)	ALIQUOT VOLUME (L)	COMMENTS
L4882-16	23181DUP1	1		23181-01							0.010	
Lab Ctrl Sample	23181LCS1	2		23181-02								
Method Blank	23181MBB	3		23181-03								
L4482-16	23181MS1	4		23181-04						0.05049		
BOFKH6	L4482-16	5		23181-05								
		6										
		7										
		8										
		9										
		10										
		11										
		12										
		13										
		14										
		15										
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		18										
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		21										
		22										
		23										
		24										

9615446-2255

Conc & Vol of MS	469 dpm/ml - 1 ml	Conc & Vol of LCS	3448 pCi/L	Prep Analyst	C.A. Schloesslin
MS Ref Date	6-8-93	LCS Ref Date	6-3-92	Start Date	5/25/95
H-3 MS ID#	WL-93-474-18-1	H-3 LCS ID#	LAL-95-0721-E3	Count Analyst	

Balance Number : 40020026 (1) Pipette : 82200 (1) MS and LCS added by: C.A. Schloesslin
4055 (1) Witnessed by: DA 5/25/95

Comments : Cocktail - Packard Ultima Gold XR; vial - 20 mL poly.

Analyst : Cheryl A. Schloesslin 5/25/95

Checked by : [Signature]

LOCKHEED ANALYTICAL LABORATORY

SAMPLE PREPARATION WORKSHEET FOR H-3 ANALYSIS

SOP-0066

216

Prep Start Date : 5/22/95

Matrix : Water

WorkGroup : TRITIUM(H3) LAL-0066 23181

Prep Due Date : 22-May-95

CUSTOMER ID	PARENT LAL ID	NO	QC	VIAL LAL ID	FLASK + WET SOIL (grams)	FLASK EMPTY (grams)	WET SOIL NET WT. (grams)	FLASK + DRY SOIL (grams)	DRY SOIL NET WT. (grams)	DISTILLED VOLUME (L)	ALIQUT VOLUME (L)	COMMENTS
L4882-16	23181DUP1	1	DUP1	23181-01							0.01	
Lab Ctrl Sample	23181LCS1	2	LCS1	23181-02							0.01	
Method Blank	23181MBB	3	MBB	23181-03							0.01	
L4482-16	23181MS1	4	MS1	23181-04							0.01	1 mL MS added to
BOFKH6	L4482-16	5	SMP1	23181-05							0.01	50 mL MSS then distilled.
		6										
		7										
		8										
		9										
		10										
		11										
		12										
		13										
		14										
		15										
		16										
		17										
		18										
		19										
		20										
		21										
		22										
		23										
		24										
Conc&Vol of MS	211.26 pCi/mL; 1.0 mL				Conc & Vol of LCS	3.45 pCi/mL; 10.0 mL				Prep Analyst	CAS	
MS Ref Date	18-Jun-93				LCS Ref Date	03-Jun-92				Start Date	5/22/95	
H-3 MS ID#	93-474-18-1				H-3 LCS ID#	95-721-5-1				Count Analyst	CS	

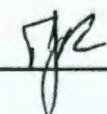
Balance Number : 40020026 ()

Pipette : 82200 ()
4055 ()

MS and LCS added by: CAS
Witnessed by : DA

Comments : Cocktail - Packard Ultima Gold XR; vial - 20 mL poly.

Analyst : L. Schlessler for CAS 5/26/95
(date entry)

Checked by : 



CERTIFICATE OF ANALYSIS

Catalog Number:	PLU2-2X	Lot No. 4-27U
Element and Matrix:	U/HNO ₃ /H ₂ O	
Starting Material:	Uranium Oxide	U ₃ O ₈
Starting Material Lot Number:	12921A	

DC ARC: Trace Metallic Impurities in starting material via DC ARC [40 elements checked; only values detected are listed].

<u>Element</u>	<u>PPM</u>
Pb	3-5
Cu	5-10
Ag	3-7

Traceability Documentation For Solution Standard:

1. Classical Wet Assay: 1,005 ppm.

Gravimetry: Evaporate to dryness, ignite and weigh as U₃O₈.

2. Instrumentation Analysis By Inductively Coupled Plasma Spectrometer[ICP]: 998 ppm via NIST SRM 3164.

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 $\pm 0.5\%$ 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. Kochudakota

Chemical Production Manager,

Date:

AUG 94



Printed on Recycled Paper

20

7

SECONDARY/WORKING LEVEL STANDARD DILUTION RECORD

Dilution Source Information	
Isotope:	<u>U-Natural</u>
Parent Barcode Number	<u>NIA</u>
Vendor or Certificate I.D. # of Parent Standard:	<u>SPEX PL42-2X Lot 4-27U</u>
Diluted Source Logbook I.D. #:	<u>94-677-57-1</u>
Balance Verification?:	<u>NIA</u>
Diluent Used:	<u>1 N HNO₃</u>

Dilution	
*Diluent:	<u>1 N HNO₃ Trace metal Grade</u>
*Density of diluent (g/ml):	<u>NIA g/ml</u>
a: Parent Specific Activity:	<u>10,000 ug/L PC19 g 511795</u>
b: Amount of Source Transferred:	<u>1 mL g pipet # 71008</u>
c: Total amount of Dilution:	<u>NIA g</u>
d: Total Volume of Dilution:	<u>100 ml</u>
e: Activity of Dilution (a * b / c):	<u>100 ^{ug/L} PC19 g 511795</u>
f: Activity of Dilution (a * b / d):	<u>100 ^{ug/L} PC19 g 511795</u>
Dilution Logbook I.D. #:	<u>94-677-58-1</u>
Prepared By: <u>AW</u>	Preparation Date: <u>5/17/95</u>
Reviewed By: <u>AW</u>	Review Date: <u>5-6-18-95</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.

SECONDARY/WORKING LEVEL STANDARD DILUTION RECORD

Dennis Wong

Dilution Source Information

Isotope: Uranium - Natural

Parent Barcode Number: N/A

Vendor or Certificate I.D. # of Parent Standard: PL42-2X Lot 4-27G SPEX

Diluted Source Logbook I.D. #: N/A

Balance Verification?: N/A

Diluent Used: 1 M HNO₃ Trace Metal Grade

Dilution

*Diluent: 1 M HNO₃ Trace Metal Grade

*Density of diluent (g/ml): N/A g/ml

a: Parent Specific Activity: ~~pCi/g~~ ⁵¹¹⁷¹⁵ 1000 ~~μs/mL~~

b: Amount of Source Transferred: 1 mL ~~g~~ pipet # 71008

c: Total amount of Dilution: 100 mL ~~g~~ 511715

d: Total Volume of Dilution: 100 ml Volumetric Flask

e: Activity of Dilution (a * b / c): pCi/g

f: Activity of Dilution (a * b / d): 10,000 ~~pCi/mL~~ ^{μg/L} ~~g~~ 511715

Dilution Logbook I.D. #: 94-0677-57

Prepared By: *JW*Preparation Date: 5/17/95Reviewed By: *AW*Review Date: 6-18-95

*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

209

Signed

Date

Signed

Date



Certificate of Analysis

Standard Reference Material 3164

Spectrometric Standard Solution

Uranium

Batch Code 390709

This Standard Reference Material (SRM) is intended for use in atomic absorption spectrometry, optical emission (plasma) spectrometry, spectrophotometry, or any other analytical technique that requires aqueous standard solutions for calibrating instruments. SRM 3164 is a single element solution prepared gravimetrically to contain 10 mg/mL of uranium with a nitric acid concentration (V/V) of 10 percent. The certified value is based on a gravimetric procedure, i.e., weight per volume composition of the high-purity uranium oxide dissolved in NIST high-purity reagents. The uncertainty listed is based on gravimetric and volumetric uncertainties of the preparation and the effect of solvent transpiration through the container walls for one year after the bottle is removed from the plastic sleeve.

Metal	Concentration (mg/mL)	Source Purity, %	Acid Conc. (V/V) Approximate
U	10.00 ± 0.03	NBL-CRM 129 (99.968%) (formerly SRM 950b)	HNO ₃ , 10%

Procedures for Use

Stability: This certification is valid for one year from the date of shipment from NIST provided the solutions are kept tightly capped and stored under normal laboratory conditions. NIST will monitor the stability of representative solutions from this SRM lot and if changes occur that invalidate this certification, NIST will notify purchasers.

Preparation of Working Standard Solutions: All solutions should be brought to 22 ± 1 °C and all glass or plastic surfaces coming into contact with the standard must have been previously cleaned. A working standard solution can be prepared from the SRM solution by serial dilution. Dilutions should be made with certified volumetric class A flasks and 5 or 10 mL class A pipets. All volumetric transfers of solutions should be performed using a proven analytical technique. Each dilution should be acidified with an appropriate high-purity acid and diluted to calibrated volume using high-purity water. The stability of the working standard solution will depend on the final acid concentration; therefore, care should be exercised to ensure that the final acid concentration of the dilution closely approximates that of the SRM. To achieve the highest accuracy, the analyst should prepare daily working solutions from 100 µg/mL dilutions of the original SRM solution.

SRM 3164 was prepared by T.A. Butler of the NIST Inorganic Analytical Research Division. Inductively coupled plasma emission spectrometric analyses were made by T.A. Butler and L.J. Wood.

The technical and support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by J.S. Kane.

Gaithersburg, MD 20899
October 5, 1993

Thomas E. Gills, Acting Chief
Standard Reference Materials Program

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

Calibration Certificate

Description

Principal radionuclide Half-life
 Nominal activity curies
 Nominal volume ml in ampoule/bottle number

Measurement Activity of principal radionuclide

Activity per gram of this solution

curies of
 at 0400 hours PST on

Activity of daughter radionuclide

The principal activity was accompanied at the quoted time by

Per gram
 of the daughter nuclide

Total mass of this solution

grams

Method of measurement

The activity of the primary solution and this dilution were measured by liquid scintillation counting.

Counting efficiencies for both standardizations were determined by counting solutions directly traceable to the National Institute of Standards & Technology (NIST).

Useful Life

This radionuclide has decayed through half lives since it was obtained by EMSL-LV

We recommend that this solution should not be used after



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) none	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 $\pm 0.4\%$ (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

$+2.9\%$ or -2.9%

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 $+4.3\%$, -4.3% 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).

Tritium decays 100 percent by beta emission. The maximum energy is 18.6 Kev, the average is 5.68 Kev.

Chemical Composition of Solution

Carrier content per gram of solution:

100 percent H_2O

Other components:

Barium less than 0.004 perc
Lead less than 3×10^{-5} perce

Preservative:

Remarks

Date Certificate Prepared

June 17, 1992

221

Approval Signature

George Hulbeck



U.S. DEPARTMENT OF COMMERCE
National Institute of Standards & Technology
Gaithersburg, MD 20899

REPORT OF TRACEABILITY

U.S. Environmental Protection Agency
Environmental Monitoring Systems Laboratory
Las Vegas, Nevada

Radionuclide	Hydrogen-3
Source identification	2606-1, prepared by EMSL
Source description	Liquid in 5-mL flame-sealed glass ampoule
Source mass	Approximately 5.0 grams
Source composition	Hydrogen-3 in water
Reference time	0700 EST June 3, 1992

	<u>NIST DATA</u>	<u>EMSL DATA</u>
Radioactivity concentration	810.5 Bq g ⁻¹	810.3 Bq g ⁻¹
Expanded uncertainty	0.64 percent ^{(1,2)*}	4.3 percent ⁽³⁾
Photon-emitting impurities	None observed ⁽⁴⁾	None observed
Measuring instrument	4 π β liquid-scintillation counters calibrated with SRM 4926D	Liquid-scintillation counting
Half life	12.43 \pm 0.05 years ⁽⁵⁾	
Difference from NIST		-0.05 percent ⁽⁶⁾

For the Director,

J.M. Robin Hutchinson, Acting Group Leader
Radioactivity Group
Physics Laboratory

Gaithersburg, MD 20899
January 1994

*Notes on next page

NOTES

- (1) The uncertainty analysis methodology and nomenclature used for the reported uncertainties are based on uniform NIST guidelines and are compatible with those adopted by the principal international metrology standardization bodies [cf., B.N. Taylor and C.E. Kuyatt, *NIST Technical Note 1129* (1993)].
- (2) The combined standard uncertainty, $u_c = 0.32$ percent, is the quadratic combination of the standard deviation (or standard deviation of the mean where appropriate), or approximations thereof, for the following component uncertainties:
- | | |
|---|--------------|
| a) 11 liquid-scintillation measurements on each of
4 vials | 0.11 percent |
| b) gravimetric | 0.05 percent |
| c) calibration of SRM 4926D | 0.29 percent |
| d) background | 0.00 percent |
| e) half life | 0.03 percent |
- The expanded uncertainty, $U = 0.64$ percent, is obtained by multiplying u_c by a coverage factor of $k = 2$ and is assumed to provide an uncertainty interval of at least 95% confidence.
- (3) Overall uncertainty reported by EMSL.
- (4) The limit of detection for photon-emitting impurities is:
- $0.08 \text{ } \gamma \text{ s}^{-1} \text{ g}^{-1}$ for energies between 90 and 2700 keV.
- (5) Unterwiesing, M.P., Coursey, B.M., Schima, F.J., and Mann, W.B., Int. J. Appl. Radiat. Isot., **31**, 611 (1980).
- (6) This result demonstrates the traceability of EMSL to NIST, for this measurement, to within five percent as specified in the appendix, Traceability Studies, of the EPA-NIST interagency agreement of April 1976, as amended.

For further information call Larry Lucas at 301-975-5546 or Jeffrey Cessna at 301-975-5539.

INITIAL STANDARD DILUTION RECORD

Standard Information:			
Isotope:	H-3	Vendor:	EPA
Activity of Standard Received:	.11 uCi	Vendor I.D. #	947/95
Weight of Standard Received (g):	5 g	LAL I.D. #:	AC 5299
Standard Activity (pCi/g):	21.9 nCi/g pCi/g	NIST Traceable?	Yes
Half-life in Years or Days:	12.43 yrs	Certificate #:	2606-1
Reference Date:	0400, 6/3/92	Receiver's Name:	Kevin Free
		Date Received:	1/25/95

Primary Dilution			
Balance Verification?:	Yes		
Diluent Used:	EPA	Distilled ASTM Type II Water (Deaerated Water)	
a: Decay Corrected Standard Activity (pCi/g):	21.9 nCi/g	4.939 pCi/g	on 6/3/92
b: Weight of the Source Transferred (g):	4.939 g		
c: Total diluted weight (g):	49.377 g		
d: Total Diluted Volume (mL):	50.2 mL	49.5 mL	
e: Activity of Dilution by Weight (pCi/g) [a * b / c]:	2190 pCi/g		
f: Calculated Density of Solution (g/mL) [c / d]:	0.99777 g/mL		
g: Activity of Dilution by Volume (pCi/mL) [e * f]:	2190 pCi/mL		on 6/3/92
h. Dilution Logbook I.D. #:	C. Poniewoz	LAL-95-0721-1	
Prepared By:	Joe Hutchinson / J. Morales	Preparation Date:	2/7/95
Reviewed By:	Joe Hutchinson	Review Date:	2/7/95
Purity/Cross Check Performed By:		Check Date:	

Handwritten notes:
C. Poniewoz
J. Morales

SECONDARY/WORKING LEVEL STANDARD DILUTION RECORD

Handwritten signature

Dilution Source Information

Isotope: H-3 LCS

Parent Barcode Number: AC5299

Vendor or Certificate I.D. # of Parent Standard: 2600-1

Diluted Source Logbook I.D. #: LAL-95-0721-1

Balance Verification?: Yes

Diluent Used: Deep well water - low H3

Dilution

*Diluent: Deep well water - low H3

*Density of diluent (g/ml): 0.99 g/ml

a: Parent Specific Activity: 2190 pCi/g

b: Amount of Source Transferred: 3^{PTA} 5.0 g

c: Total amount of Dilution: 3208 g

d: Total Volume of Dilution: 3176 ml

e: Activity of Dilution (a * b / c): 3.413 pCi/g

f: Activity of Dilution (a * b / d): 3.448 pCi/ml = 3448 pCi/L
on 6/3/92

Dilution Logbook I.D. #: LAL-95-0721-5

Prepared By: G. A. Marshall

Reviewed By: Joe Hutchinson

Preparation Date: 4/14/95

Review Date: 4/14/95

*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

CP

225
5/8/95

Signed

Date

Signed

Date

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

Calibration Certificate

Description

Principal radionuclide Half-life
 Nominal activity curies
 Nominal volume ml in ampoule/bottle number

Measurement Activity of principal radionuclide

Activity per gram of this solution

curies of
 at 0400 hours PST on

Activity of daughter radionuclide

The principal activity was accompanied at the quoted time by

Per gram

of the daughter nuclide

Total mass of this solution

grams

Method of measurement

The activity of the primary solution and this dilution were measured by liquid scintillation counting.

Efficiencies were measured by counting solutions prepared from the National Institute of Standards & Technology.

Useful Life

This radionuclide has decayed through half lives since it was obtained by EMSL-LV

We recommend that this solution should not be used after

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) none 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 $\pm 0.2\%$ (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

$\pm 3.5\%$ or -3.5%

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 $\pm [t(sm) + \delta], - [t(sm) + \delta']$ and is $\pm 4.1\%$, -4.1% 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). Tritium decays 100 percent by beta emission. The maximum energy is 18.6 Kev, the average is 5.68 Kev.

Chemical Composition of Solution

Carrier content per gram of solution:

100 percent H₂O

Other components:

Barium less than 0.002 per cent
Lead less than 2×10^{-5} per cent

Preservative:

Remarks

Date Certificate Prepared August 29, 1989

Approval Signature

227
Paul B. Wahn

U.S. DEPARTMENT OF COMMERCE
 NATIONAL BUREAU OF STANDARDS
 GAITHERSBURG, MD 20899

REPORT OF TRACEABILITY

U.S. Environmental Protection Agency
 Environmental Monitoring Systems Laboratory
 Las Vegas, Nevada

Radionuclide	Hydrogen-3
Source identification	2548-1, prepared by EMSL
Source description	Liquid in 5-ml flame-sealed glass ampoule
Source mass	Approximately 5.0 grams
Source composition	Hydrogen-3 as HTO in water
Reference time	0700 EST, 10 August 1989

	<u>NIST DATA</u>	<u>EMSL DATA</u>
Radioactivity concentration	419.4 Bq g ⁻¹	408.1 Bq g ⁻¹
Overall uncertainty	1.08 percent ^{(1)*}	4.10 percent ⁽²⁾
Beta-particle-emitting impurities (Activities at reference time)	None detected ⁽³⁾	None reported
Measuring instrument	4πβ liquid-scintillation counter calibrated using NIST SRM 4927B	4πβ liquid-scintillation counter
Half life	12.35 ± 0.01 years ⁽⁴⁾	
Difference from NIST		-2.68 percent ⁽⁵⁾

Gaithersburg, MD 20899
 10 May 1990

For the Director,


 Dale D. Hoppes, Group Leader
 Radioactivity Group
 Center for Radiation Research

*Notes on next page

As guidance for the proper use of this Report, it should be emphasized that the National Bureau of Standards is concerned only with fostering good measurements capability and consistency with the national measurements system. The assurance of the proper application of that capability to the ultimate consumer products is the responsibility of each manufacturer of these products and of the Federal regulatory agencies.

A continuing traceability program in radioactivity demonstrates, to the degree established by the periodic assays of calibrated radioactivity samples, a continuing competence to maintain the instrument systems and standards necessary for accurate measurement. Such a program cannot, however, endorse each and every measurement nor the final product, any more than a spot check can vouch for every unchecked item. Care should be taken, therefore, not to imply such endorsement. The proper use of this Report is governed by section 200.114 of Title 15 of the Code of Federal Regulations. These regulations may be met if this Report, if quoted, is quoted in its entirety. Excerpts out of context may be misleading.

NOTES

- (1) Individual uncertainties have the significance of one standard deviation of the mean, or an approximation thereof. The combined uncertainty is the individual uncertainties shown below added in quadrature. The overall uncertainty is taken to be three times the combined uncertainty.

<u>Source of uncertainty</u>	<u>Uncertainty (%)</u>
a) beta-particle-emission-rate measurements	0.05
b) gravimetric measurements	0.20
c) deadtime	0.01
d) background	0.02
e) detection efficiency	0.10
f) count-rate-vs-energy extrapolation to zero energy	0.10
g) half life	0.05
h) beta-particle-emitting impurities	0.10
Combined uncertainty	<u>0.36</u>
	* 3
Overall uncertainty	1.08

- (2) Overall uncertainty reported by EMSL.
- (3) The limit of detection for beta-particle-emitting impurities is $0.4 \text{ } \mu\text{s}^{-1}\text{g}^{-1}$ for energies greater than 20 keV.
- (4) NCRP Report No. 58, Second Edition (1985) p. 365.
- (5) This result demonstrates the traceability of EMSL to NIST, for this measurement, to within five percent as specified in the appendix, Traceability Studies, of the EPA-NIST interagency agreement of April 1976, as amended.

For further information call Larry Lucas at (301) 975-5546 or FTS 879-5546.

9613446 2272

ISOTOPE WEIGHT DILUTION RECORD

Diluted

AA0022



Isotope: ³H

Vendor: EPA

Total Received Activity: 55.2 nanoCi

Vendor ID: 2548-1

Wt. Received: ~ 5.0 g

NIST Traceable Y/N Cert. # implicitly traceable

Activity in Units/g: 11.03 nanoCi/g

Reference Date: 8-10-1989

Activity converted (dpm/g): 24486.6 dpm/g

Receive Date: 7-23-93 ~~N/A~~ 8-23-1993

Half-life (Yrs or days) t_{1/2} = 12.43 year

Receiver's Name: N/A Jimmy
Mora

PRIMARY DILUTION:

Balance wt. check done

a: Source activity: 24486.6 dpm/g * (if t_{1/2} = < 100yr decay to prep. date)

b: Wt. of Source transferred: 4.9376 g 8-10-1989 decay corrected to 6-18-1993

Diluent used: EPA dead water

c: Total diluted weight: 20.06 g

-x = .8055

d: Activity of dilution (a*b/c): 6027.17 dpm/g

e: Calculated density of solution: 1.00 g/mL (4M HNO₃ = 1.1294 ± .0007 g/mL)

f: Activity by volume = (d*e): 6027.17 ^{dpm} 52545 dpm/mL 4859.6 dpm/mL
6-22-93

Dilution Log Book ID: 93-0475-1-1

Preparation Date: 6-18-93 Preparer's Name: Agnes Wong

CAUTION RADIOACTIVE MATERIAL

SOL 2 1 5
AMT. 1 1 1
ISOTOPE 3
DATE 08/10/93; 046

SECONDARY OR WORKING LEVEL DILUTION

Balance wt. check done

ENVIRONMENTAL MONITORING SYSTEMS LABORATORY - LAB 5

Log Book ID of source being diluted: _____

a: Source activity: _____ dpm/g * (if t_{1/2} = < 100yr decay to prep. date)

b: Wt. of Source transferred: _____ g

Diluent used: _____

c: Total diluted weight: _____ g

d: Activity of dilution (a*b/c): _____ dpm/g

e: Calculated density of solution: _____ g/mL (4M HNO₃ = 1.1294 ± .0007 g/mL)

f: Activity by volume = (d*e): _____ dpm/mL

Dilution Log Book ID: _____

Preparer's Name: _____ Preparation Date: _____

Reviewed By: _____ Review Date: _____

ISOTOPE SECONDARY/WORKING LEVEL DILUTION RECORD

ISOTOPE: H-3 from NIST SOURCE, Y / N

Date: 9/17/93 Preparer's Name: G. Swanson

Volumetric/ Gravimetric Method (Circle One)

Pipet Check / Balance Wt. Check Done

Diluted Source ID (log#): 93-475-1-1

Diluent used: Dead Water if the diluent remains unchanged, then a weight dilution of a volume unit source can be performed without a density conversion.

Preparation of
Matrix Spike
Solution

A: Source activity: 4859.6 dpm/mL Ref Date 6-18-93

B: Amount of source transferred: 11.7607g used all remaining solution

C: Total amount of dilution: 121.78g

D: Activity of dilution (A*B/C): 469 dpm/mL on 6-18-93

Dilution Log Book ID: LAL-93-474-18-1

Reviewed by: BW Date: 9-17-93

9613446.2274

DATA VALIDATION REPORT
for
200-BP-5 GROUNDWATER ROUND 3
Radiochemistry Analysis
SDG LK4482-LAS
LATA VB403.73

Bechtel Hanford Inc.
P.O. Box 969
Richland, Washington

July 27, 1995

Table of Contents

Data Validation Narrative	000002
INTRODUCTION	000002
ANALYSES REQUESTED	000002
DATA QUALITY OBJECTIVES	000002
REFERENCES	000004
GLOSSARY OF VALIDATION APPLIED QUALIFIERS (RADIOCHEMISTRY) ..	000005
GLOSSARY OF LABORATORY APPLIED QUALIFIERS	000006
Qualification Summary Table	000007
Data Summary Table	000009
Sample Results	000011
Checklist	000015
Laboratory Case Narrative	000023
Chain-of-Custody Information	000026
Supplemental Information	000029
END OF PACKAGE	000031

**200-BP-5 Groundwater Round 3
Data Validation Narrative**

INTRODUCTION

All samples in Sample Delivery Group (SDG) LK4482-LAS (VB403.73) were validated at level C as defined in the Data Validation Procedures for Radiochemical Analyses (WHC-SD-EN-SPP-001, Rev. 1).

The analyses were performed by Lockheed Analytical Services.

ANALYSES REQUESTED

See Table 1.

DATA QUALITY OBJECTIVES

- Precision:** Goals for precision were met with the exception of those items discussed in the "Qualification Summary Table".
- Accuracy:** Goals for accuracy were met.
- Sample Result Verification:** Not applicable to summary data packages that contain no raw data.
- Detection Limits:** Detection limit goals were met for all sample results as specified in the *Quality Assurance Program Plan for 200-BP-5 Groundwater Operable Unit*, DOE/RL 88-32, Rev. 1. with the exception of those items discussed in the "Qualification Summary Table".
- Completeness:** The data package was 100% complete for all requested analyses.

MAJOR DEFICIENCIES

No major deficiencies were identified during data validation which required qualification of data as unusable.

MINOR DEFICIENCIES

Minor deficiencies were identified during validation which required qualification of data as estimated. See the "Qualification Summary Table".

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Table 1
Chain-of-Custody
Analysis Request

LATA ID #: VB403.73

SDG: LK4482-LAS

Sample Information							Analyses Requested								
SAMPLE NO.	DATE COLLECTED	MATRIX	SAF	SAMPLING LOCATION	FIELD QC INFO	TEMP °C	1	2	3	4	5	6	7	8	9
B0FKH6	9-May-95	WATER	B95-050	299-E33-12	SPLIT/B0FB90	2	X	X	X	X	X	X	X	X	X

Method References:

<u>Analysis</u>	<u>Method</u>
1. Gross Alpha	LAL-91-SOP-0060
2. Gross Beta	LAL-91-SOP-0060
3. Plutonium-238, -239/40	LAL-91-SOP-0108
4. Strontium-90	LAL-91-SOP-0196
5. Gamma Spec (Cs-137, Co-60, Ru-106)	LAL-91-SOP-0063
6. Total Uranium	LAL-91-SOP-0060
7. Technetium-99	LAL-91-SOP-0169
8. Tritium	LAL-91-SOP-0066
9. Activity Scan	Lab Specific

NOTES: (complete documentation of these notes can be found in the Supplemental Information Section of this report)

NOTE 1: The Rad Screen before shipment was deemed unnecessary.

REFERENCES

WHC 1993, *Data Validation Procedures for Radiochemical Analyses*, WHC-SD-EN-SPP-001, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

DOE 1994, *Quality Assurance Program Plan for 200-BP-5 Groundwater Operable Unit*, DOE/RL 88-32, Rev. 1, Department of Energy-Hanford, Richland, Washington.

GLOSSARY OF VALIDATION APPLIED QUALIFIERS (RADIOCHEMISTRY)

Qualifiers which may be applied by data validators in compliance with the procedures herein are as follows.

- U-** Indicates the constituent was analyzed for, but was not detected at a concentration above the Minimum Detectable Activity (MDA). The concentration reported is the sample result corrected for sample aliquot size, dilution factors, and percent solids (in the case of solid matrices) by the laboratory. The associated data should be considered usable for decision making purposes.
- UJ-** Indicates the constituent was analyzed for and was not detected at a concentration above the Minimum Detectable Activity (MDA). Due to a quality control deficiency identified during data validation, the result reported may not accurately reflect the sample concentration. The associated data should be considered usable for decision making purposes.
- J-** Indicates a constituent was analyzed for and detected. The associated value is estimated due to a quality control deficiency identified during validation. The data should be considered usable for decision making purposes.
- R-** Indicates the constituent was analyzed for and detected; however, due to an identified quality control deficiency the data should be considered unusable for decision making purposes.
- UR-** Indicates the constituent was analyzed for and not detected; however, due to an identified quality control deficiency the data should be considered unusable for decision making purposes.

GLOSSARY OF LABORATORY APPLIED QUALIFIERS

Qualifiers which may be applied by the laboratory in compliance with applicable requirements are as follows.

Commonly used laboratory radiochemistry qualifiers:

- U- Indicates the analyte was analyzed for but not detected in the sample.
- J- Indicates the value reported is estimated due to the presence of interference.
- C- Indicates that the presence of high TDS in the sample required reduction of sample size which increased the MDA.

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Qualification Summary Table

Radiochemistry

ANALYTE	TYPE	QUALIFIER	SAMPLES AFFECTED	DQO	REASON
Technetium-99	MINOR	J	B0FKH6	PRECISION	Duplicate precision is outside acceptance criteria.

Comments:

1. A matrix spike for the Technetium-99 procedure was not performed due to lack of sample. No qualification is necessary.
2. The "U" qualifiers added to the Data Summary Tables and Form Is are laboratory concentration qualifiers to indicate that the results are <MDA and have not been applied due to a validation deficiency.
3. The MDA was greater than RDL for the uranium-total analysis of sample B0FKH6. No qualification is necessary.

Radiochemistry Field QC

ANALYTE	TYPE	QUALIFIER	FIELD QC SAMPLES	DQO	ASSESSMENT
Gross Beta	FIELD SPLIT QC	NONE	B0FKH6/B0FB90	PRECISION	Field split precision is unacceptable.

Comments:

1. Data qualification is not required based on field split precision, however field split results are noted here to alert the data user to uncertainties in the data set during decision making processes.

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Data Summary Table

9613446-2204
RADIOCHEMISTRY
DATA SUMMARY TABLE

LATA ID#: VB403.73		HEIS #:	B0FKH6	
		Date:	9-May-95	
		Matrix:	WATER	
Constituent	CAS #	Units	Results	Q
Technetium-99	14133-76-7	pCi/L	1560	J
Tritium	10028-17-8	pCi/L	360	
Gross Alpha	ALPHA	pCi/L	2.8	C
Gross Beta	BETA	pCi/L	883	
Plutonium-238	13981-16-3	pCi/L	-0.035	U
Plutonium-239/240	PU-239/240	pCi/L	0.05	U
Total Strontium-90	10098-97-2	pCi/L	-0.21	U
Uranium-total	7440-61-1	µg/L	3.31	

GAMMA-SCAN

Actinum-228 (Ra-228)	15262-20-1	pCi/L	9	U
Cesium-137	10045-97-3	pCi/L	-7.2	U
Cobalt-58	13981-38-9	pCi/L	2.7	U
Cobalt-60	10198-40-0	pCi/L	24.4	
Europium-152	14683-23-9	pCi/L	-13	U
Europium-154	15585-10-1	pCi/L	-3	U
Europium-155	14391-16-3	pCi/L	-2.6	U
Iron-59	14596-12-4	pCi/L	1.9	U
Lead-212	PB-212	pCi/L	5	U
Lead-214 (Ra-226)	PB-214	pCi/L	12	U
Radium-226 (Gamma)	13982-63-3	pCi/L	-100	U
Ruthenium-106	13967-48-1	pCi/L	10	U
U-235 (Gamma)	15117-96-1	pCi/L	-7	U

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Sample Results (Form I's)

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LOCKHEED ANALYTICAL SERVICES

RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. * Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: B0FKH6

LAL Sample ID: L4482-8

Date Collected: 09-MAY-95

Date Received: 11-MAY-95

Matrix: Water

Login Number: L4482

SDG: LK4482

Constituent	Analyzed	Batch	Activity	Error	MCA	Data/Qual	Units
Ac-228(Ra-228)	31-MAY-95	GAMMA SPEC LAL-0063_23211	9.	26.	41.	u	pCi/L
Co-58	31-MAY-95	GAMMA SPEC LAL-0063_23211	2.7	5.1	8.6	u	pCi/L
Co-60	31-MAY-95	GAMMA SPEC LAL-0063_23211	24.4	7.9	8.9	u	pCi/L
Cs-137	31-MAY-95	GAMMA SPEC LAL-0063_23211	-7.2	4.0	12.	u	pCi/L
Eu-152	31-MAY-95	GAMMA SPEC LAL-0063_23211	-13.	13.	49.	u	pCi/L
Eu-154	31-MAY-95	GAMMA SPEC LAL-0063_23211	-3.	13.	34.	u	pCi/L
Eu-155	31-MAY-95	GAMMA SPEC LAL-0063_23211	-2.6	6.4	19.	u	pCi/L
Fe-59	31-MAY-95	GAMMA SPEC LAL-0063_23211	1.9	8.7	19.	u	pCi/L
Pb-212	31-MAY-95	GAMMA SPEC LAL-0063_23211	5.	12.	16.	u	pCi/L
Pb-214(Ra-226)	31-MAY-95	GAMMA SPEC LAL-0063_23211	12.	13.	18.	u	pCi/L
Ra-226(GAMMA)	31-MAY-95	GAMMA SPEC LAL-0063_23211	-100	130	190	u	pCi/L
Ru-106	31-MAY-95	GAMMA SPEC LAL-0063_23211	10.	43.	73.	u	pCi/L
U-235(GAMMA)	31-MAY-95	GAMMA SPEC LAL-0063_23211	-7.	30.	44.	u	pCi/L
Gross Alpha	12-JUN-95	GR ALP/BETA LAL-0060_23215	2.8	2.0	2.7	c	pCi/L
Gross Beta	12-JUN-95	GR ALP/BETA LAL-0060_23215	883.	46.	3.1	u	pCi/L
Pu-238	12-JUN-95	PU-ISOTOPIC LAL-0108_23154	-0.035	0.034	0.19	u	pCi/L
Pu-239/40	12-JUN-95	PU-ISOTOPIC LAL-0108_23154	0.05	0.12	0.19	u	pCi/L
Total radio-strontium	09-JUN-95	SR-90 LAL-0196_23179	-0.21	0.42	0.75	u	pCi/L
Uranium	09-JUN-95	U TOTAL KPA LAL-0168_23131	3.31	0.17	0.20	u	ug/L

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LOCKHEED ANALYTICAL SERVICES

RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. * Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: B0FKH6

LAL Sample ID: L4482-17

Date Collected: 09-MAY-95

Date Received: 11-MAY-95

Matrix: Water

Login Number: L4482

Constituent	Analyzed	Batch	Activity	Error	MDA	DataQual	Units
Tc-99	31-MAY-95	TC-99 LAL-0169_23139	1560	130	7.1	J	pCi/L

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LOCKHEED ANALYTICAL SERVICES

RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. * Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: B0FKH6

LAL Sample ID: L4482-16

Date Collected: 09-MAY-95

Date Received: 11-MAY-95

Matrix: Water

Login Number: L4482

Constituent	Analyzed	Batch	Activity	Error	MDA	Data/Dual	Units
H-3	26-MAY-95	TRITIUM(H3) LAL-0066_23181	360	220	260		pCi/L

15

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Checklist

VALIDATION LEVEL:	A	B	C	D	E
VALIDATION PROCEDURE:	<input type="checkbox"/> WHC-CM-5-3, Rev. 0		<input checked="" type="checkbox"/> WHC-SD-EN-SPP-001, Rev. 1		
PROJECT:	200-BP-5 ROUND 3		SDG:	LK4482-LAS	
VALIDATOR:	MC WEBB <i>mw</i>	LATA NO:	VB403.73	DATE:	24-Jul-95
REVIEWER:	BJ MORRIS <i>BM</i>	LAB:	LAS	CASE:	N/A
SAF NO:	B95-050	QAPP NO:	N/A	SAP NO:	DOE/RL 88-32,R1

ANALYSES REQUESTED

<input checked="" type="checkbox"/> Gamma Spec LAL-91-SOP-0063	<input checked="" type="checkbox"/> Gross Alpha LAL-91-SOP-0060	<input checked="" type="checkbox"/> Gross Beta LAL-91-SOP-0060	<input checked="" type="checkbox"/> Pu-238 Pu-239/240 LAL-91-SOP-0108	<input checked="" type="checkbox"/> Strontium-90 LAL-91-SOP-0196	<input checked="" type="checkbox"/> Technetium-99 LAL-91-SOP-0169
<input checked="" type="checkbox"/> Uranium-total LAL-91-SOP-0168	<input checked="" type="checkbox"/> Tritium LAL-91-SOP-0066				

SAMPLE NO.	MATRIX	COMMENTS:
B0FKH6	WATER	

1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE YES NO N/A

Is technical verification documentation present?

Is a case narrative present?

2. HOLDING TIMES YES NO N/A

Are sample holding times acceptable?

Are samples preserved correctly?

See HOLDING TIME SUMMARY form

3. INSTRUMENT PERFORMANCE AND CALIBRATIONS YES NO N/A

Were instruments/detectors calibrated within one year of sample analysis?

Are initial calibrations acceptable?

Are standards NIST traceable?

Are standards acceptable?

Comments:

4. CONTINUING CALIBRATION

YES	NO	N/A
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

- Background checked at proper frequency?
- Background check acceptable?
- Efficiency checked at proper frequency?
- Efficiency check acceptable?
- Calibration check standards NIST traceable?
- Calibration check standards acceptable?

If NO(s) are checked, see CALIBRATION DATA SUMMARY form

5. BLANKS

YES	NO	N/A
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

- Were method blanks analyzed?
- Are the method blanks free of analytes?
- Were method blank results acceptable?
- Validation calculation/transcription checks were performed and are acceptable.

If NO(s) are checked, see BLANK DATA SUMMARY form

6. ACCURACY

YES	NO	N/A
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

- Were spike samples analyzed at the proper frequency?
- Are all spike sample recoveries acceptable?
- Were laboratory control standards (LCS) analyzed at the proper frequency?
- Are all LCS recoveries acceptable?
- Was a tracer/chemical carrier added?
- Was the tracer/chemical carrier recovery acceptable?
- Are standard sources traceable?
- Are standards acceptable?
- Validation calculation checks were performed and are acceptable.

If NO(s) are checked, see ACCURACY DATA SUMMARY form

7. PRECISION

YES	NO	N/A
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

- Were laboratory duplicates analyzed at the proper frequency?
- Are all duplicate RPD values acceptable?
- Validation calculation checks were performed and are acceptable.

If NO(s) are checked, see PRECISION DATA SUMMARY form

8. FIELD QC SAMPLES

YES NO N/A

- Were field QC samples (field/trip blanks, duplicates, splits, performance audit) identified? YES NO N/A
- Are field/trip blank results acceptable? (see Blank Data Summary form) YES NO N/A
- Are field duplicate RPD values acceptable? (see Field QC calculations) YES NO N/A
- Are field split RPD values acceptable? (see Field QC calculations) YES NO N/A
- Are performance audit sample results acceptable? YES NO N/A

Comments: BOFKH6 is a split with BOFB90. The split is evaluated in this package.
 BOFB90 was validated in SDG W0548-QES (VB403.71).

9. REPORTED RESULTS AND DETECTION LIMITS

YES NO N/A

- Are results reported for all requested analyses? YES NO N/A
- Are all results supported in the raw data? YES NO N/A
- Are results calculated properly? YES NO N/A
- Do MDAs meet the RDLs? YES NO N/A
- Validation calculation checks were performed and are acceptable. YES NO N/A

Comments: The MDA >RDL for the uranium-total analysis of sample BOFKH6. No qualification is necessary.

VALIDATION SUMMARY

For deficiencies (major and minor) and comments, please refer to the Qualification Summary Table.

HOLDING TIME SUMMARY

SDG: LK4482-LAS			VALIDATOR: MC WEBB					DATE: 24-Jul-95		
PROJECT: 200-BP-5 ROUND 3			REVIEWER: BJ MORRIS					LATA NO.: VB403.73		
HEIS-SN	MATRIX CODE	ANALYSIS	DATE COLLECTED	PREP DATE	ANALYSIS DATE	PREP HT (days)	Required HT (days)	ANALYSIS HT (days)	Required HT (days)	VAL Q
BOFKH6	WATER	Uranium-total	9-May-95	N/A	09-Jun-95	N/A	N/A	31	180	NONE
BOFKH6	WATER	Technetium-9	9-May-95	N/A	31-May-95	N/A	N/A	22	180	NONE
BOFKH6	WATER	Pu-238 Pu-239/240	9-May-95	N/A	12-Jun-95	N/A	N/A	34	180	NONE
BOFKH6	WATER	Strontium-90	9-May-95	N/A	09-Jun-95	N/A	N/A	31	180	NONE
BOFKH6	WATER	Tritium	9-May-95	N/A	26-May-95	N/A	N/A	17	180	NONE
BOFKH6	WATER	Gamma Scan	9-May-95	N/A	31-May-95	N/A	N/A	22	180	NONE
BOFKH6	WATER	Gross Alpha	9-May-95	N/A	12-Jun-95	N/A	N/A	34	180	NONE
BOFKH6	WATER	Gross Beta	9-May-95	N/A	12-Jun-95	N/A	N/A	34	180	NONE

PRECISION DATA SUMMARY

SDG: LK4482-LAS					VALIDATOR: MC WEBB					DATE: 24-Jul-95	
PROJECT: 200-BP-5 ROUND 3					REVIEWER: BJ MORRIS					LATA NO.: VB403.73	
HEIS-SN	ANALYTE	ORIG RESULTS	LAB Q	DUPE RESULTS	LAB Q	UNITS	RDL	DUPE RPD %	DUPE CRDL dif	SAMPLES AFFECTED	VAL Q
BOFKH6	Technetium-99	1560		2020		pCi/L	15	25.7		BOFKH6	J
BOFKH6	Cesium-137	-7.17	U	4.79	U	pCi/L	15		4.79	NONE	NONE

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RADIOCHEMISTRY ANALYTES

QC Data Summary For Duplicate Sample Analysis

Login Number: L4482

Analyte	Batch ID	Client ID	LAL ID	Date Analyzed	Sample Result	Error 2 Sigma	Duplicate Result	Error 2 Sigma	RER	RPD	Q
Uranium	23131	B0FKH6	L4482-8	06/09/95	3.31	0.171	3.08	0.159	0.692	7.2	
Tc-99	23139	B0FBK3	L4467-6	05/31/95	45.4	8.78	50.6	9.29	1.57	10.8	
Tc-99	23139	B0FKH6	L4482-17	05/31/95	1560	128	2020	163	1.57	25.7	*
Pu-238	23154	B0FKH6	L4482-8	06/12/95	-0.0349 μ	0.0343	-0.0527 μ	0.103	0.129	40.6	
Pu-239/40	23154	B0FKH6	L4482-8	06/12/95	0.0489 μ	0.121	0.758	0.859	0.724	176	
Total radio	23179	B0FKH6	L4482-8	06/09/95	-0.213 μ	0.417	-0.154 μ	0.43	0.07	32.2	
Cs-137	23211	B0FBK3	L4467-2	05/31/95	2.94	8.14	1.9	5.72	0.08	43	
Pb-214(Ra-2)	23211	B0FBK3	L4467-2	05/31/95	8.79	13.7	7.97	13.8	0.03	9.79	
Cs-137	23211	B0FKH6	L4482-8	05/30/95	-7.17 μ	3.96	4.79 μ	7.31	1.06	1010	*
Pb-214(Ra-2)	23211	B0FKH6	L4482-8	05/30/95	12.3 μ	13.2	6.32 μ	13.9	0.22	64.2	
Gross Alpha	23215	B0FKH6	L4482-8	06/12/95	2.82	1.99	3.05	1.99	0.058	7.84	
Gross Beta	23215	B0FKH6	L4482-8	06/12/95	883	46.5	885	46.6	0.021	0.226	

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RADIOCHEMISTRY SPLIT EVALUATION
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LATA ID#: VB403.73		HEIS #:	B0FKH6	B0FB90	RPD		DIF		DL
		Date:	9-May-95	9-May-95	W >20%		W >DL		SAME UNITS AS RESULTS
		Matrix:	WATER	WATER	S >35%		S >2*DL		
Constituent	CAS #	Units	ORIGINAL		SPLIT				
			Results	Q	Results	Q			
Technetium-99	14133-76-7	pCi/L	1560		1490		4.6%		15
Tritium	10028-17-8	pCi/L	360		458			98	400
Gross Alpha	ALPHA	pCi/L	2.8	C	2.36			0.44	3
Gross Beta	BETA	pCi/L	883		206		124.3%		4
Plutonium-238	13981-16-3	pCi/L	-0.035	U	-0.123	U			
Plutonium-239/240	PU-239/240	pCi/L	0.05	U	0.246	U			
Strontium-90	10098-97-2	pCi/L	-0.21	U	-0.15	U			
Uranium-total	7440-61-1	µg/L	3.31		2.99		10.2%		0.1

GAMMA-SCAN

Actinium-228 (Ra-228)	15262-20-1	pCi/L	9	U	N/A				
Cesium-137	10045-97-3	pCi/L	-7.2	U	-7.05	U			
Cobalt-58	13981-38-9	pCi/L	2.7	U	-7.28	U			
Cobalt-60	10198-40-0	pCi/L	24.4		31.4			7.0	15
Europium-152	14683-23-9	pCi/L	-13	U	3.13	U			
Europium-154	15585-10-1	pCi/L	-3	U	-0.807	U			
Europium-155	14391-16-3	pCi/L	-2.6	U	8.88	U			
Iron-59	14596-12-4	pCi/L	1.9	U	-10.3	U			
Lead-212	PB-212	pCi/L	5	U	N/A				
Lead-214 (Ra-226)	PB-214	pCi/L	12	U	N/A				
Radium-226 (Gamma)	13982-63-3	pCi/L	-100	U	N/A				
Ruthenium-106	13967-48-1	pCi/L	10	U	18.6	U			
U-235 (Gamma)	15117-96-1	pCi/L	-7	U	N/A				

EVALUATION:

1. Field duplicates are not evaluated for precision if both results are non-detect.
2. If both sample results are >5*DL the RPD is used for evaluation.
3. If either sample result is <5*DL the DIF is used for evaluation.
4. Shaded values in the RPD or DIF column indicate a constituent that is outside acceptance criteria.
5. All other positive results have exhibited acceptable precision.

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Laboratory Case Narrative

CASE NARRATIVE RADIOCHEMICAL ANALYSES

The routine calibration and quality control 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, duplicate samples.

Holding Time Requirements

All holding time requirements were met.

Chemical recoveries and MDAs, where applicable, can be found on the preparation and calculation worksheets of the attached raw data for each method.

Analytical Method

Gamma Spectrum Analysis

The gamma spectrum analysis was performed using LAL-91-SOP-0063. All samples were analyzed on batch #23211, which contains a method blank (MB), two duplicates (DUP1, DUP2), and a laboratory control sample (LCS). The DUP2 for Cs-137 was out of limits; however, since the Cs-137 DUP1 and both Pb-214 duplicates were within limits, the data is considered acceptable. All other QC criteria were met.

Gross Alpha Beta

The gross alpha beta analysis was performed using LAL-91-SOP-0060. All samples were analyzed on batch #23215, which contains an MB, DUP and LCS. No problems were encountered during preparation or analysis, and all QC criteria were met.

Plutonium Isotopic

The plutonium isotopic analysis was performed using LAL-91-SOP-0108. All samples were analyzed on batch #23154, which contains an MB, DUP and LCS. The duplicate (sample #23154DUP1) has a poor chemical recovery and only three counts. The duplicate uncertainty shows that the detected value is not significantly different from zero. No matrix spike analysis (MS) was performed due to insufficient sample. All other QC criteria were met.

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Strontium-90

The strontium-90 analysis was performed using LAL-91-SOP-0196. All samples were analyzed on batch #23179, which contains an MB, DUP and LCS. During preparation, the samples were wetashed under the heat lamp with concentrated HNO₃ to get rid of the excess organic materials. This was done in the original conical planchets. After they were dried, they were reweighed. There was insufficient sample for an MS analysis. All other QC criteria were met.

Technetium-99

The technetium-99 analysis was performed using LAL-91-SOP-0169. All samples were analyzed on batch #23139, which contains an MB, DUP1, DUP2, and LCS. The second duplicate (DUP2) was out of limits; however, since DUP1 was within limits, the data is considered acceptable. No matrix spike analysis was performed due to insufficient sample. All other QC criteria were met.

Total Uranium

The total uranium analysis was performed using LAL-91-SOP-0168. All samples were analyzed on batch #23131, which contains an MB, DUP, LCS and MS. No problems were encountered during preparation or analysis, and all QC criteria were met.

Tritium

The tritium analysis was performed using LAL-91-SOP-0066. All samples were analyzed on batch #23181, which contains an MB, DUP, LCS and MS. No problems were encountered during preparation or analysis, and all QC criteria were met.

Yvonne M. Jacoby
Prepared By

June 20, 1995 *mm*
Date *7-25-95*

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Chain-of-Custody Information

Bechtel Hanford, Inc.

L4482

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

Data Turnaround

Priority Normal

Collector: K. Lee; Company Contact: G.L. Kasza; Telephone: (509) 372-9675; Project Designation: 200-BP-5 Groundwater Round 3; Sampling Location: 200 East; SAF No.: B95-049; Ice Chest No.: SML-371; Field Logbook No.: EFL-1129; Method of Shipment: Federal Express; Shipped To: Lockheed; Offsite Property No.: W950-03041-29; Bill of Lading/Air Bill No.: 7404627744

Table with columns: Preservation, HNO3, Cool 4°C, NaOH, HNO3, Cool 4°C, HCl, Cool 4°C, HNO3. Rows include Type of Container (P/G, G, P, P, P) and No. of Container(s) (1, 1, 1, 1, 2).

SAMPLE ANALYSIS table with columns: Volume, HNO3, Anions (IC-F, Co, SO4, NO2, NO3, PO4), Alkalinity, TDS, Cyanide, HNO3, Tritium, Tc-99, Activity Scan. Includes handwritten notes like *1 and *2.

Table with columns: Sample No., Matrix*, Date Sampled, Time Sampled, and various analysis columns. Rows include B0FKH6 and B0FKH7.

CHAIN OF POSSESSION table with columns: Relinquished By, Date/Time, Received By, Date/Time. Includes handwritten signatures and dates.

SPECIAL INSTRUCTIONS section with text: *1 ICP Metals - to include Ca, Mg, Na, K, Fe, Mn, Si, Al, and Bi. AA Metals - to include Se (unfiltered). *2 Gross Alpha; Gross Beta; Pu-238, -239/240; Sr-90; Gamma Spec - to include Cs-137, Co-60, Ru-106; Total Uranium. *3 ICP Metals - to include Ca, Mg, Na, K, Fe, Mn, Si, Al, and Bi. AA Metals - to include Se (filtered). Sample analysis for PO4, NO2, NO3 by EPA 300.0 is being requested for information only. The ERC Contractor acknowledges that the 48-hour hold time will not be met. The Activity Scan is for both sample numbers listed on this chain of custody.

LABORATORY SECTION and FINAL SAMPLE DISPOSITION table. Includes Received By: [Signature], Title: Sample Custodian, Date/Time: 5-11-95/0845, and Disposal Method.

Handwritten vertical note: 7-25-95

Vertical handwritten note: 10-22-2001

**Lockheed Analytical Services
Sample Receiving Checklist**

Client Name: *NP Stirling House - Hartford*

Job No. *L4482*

Cooler ID: *117*

COOLER CONDITION UPON RECEIPT

Temperature of cooler upon receipt: *22*
 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			
are samples bi-phasic (if so, indicate sample ID'S):			<i>N/A</i> <i>049</i>

MISCELLANEOUS ITEMS

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

ADDITIONAL COMMENTS/DISCREPANCIES

Completed by / date: *Paul C. Davis 5-11-95*

Sent to the client (date/initials): *Paul C. Davis* ** 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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PTT

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Supplemental Information

Environmental
Restoration
Contractor

ERC Team
Interoffice Memorandum

Job No. 22192
Written Response Required: NO
CCN: N/A
OU: 200-BP-5
TSD: N/A
ERA: N/A
Subject Code: 1995 Round 3 Sampling

TO: W. S. Thompson N3-06 DATE: April 21, 1995
COMES: D. B. Erb H6-01 FROM: S. K. De Mers
Radiological Controls
N3-06/376-2764
SUBJECT: 1995 Round 3 sampling for 200-BP-5

There is no need to perform total activities prior to offsite shipment to NRC licensed labs of samples taken from the attached list of wells.

The wells listed in the attachment were reviewed for radiological content based on the previous 4 years of sampling data. No well listed has a β activity in excess of 100,000 pCi/l (< .1 uCi/sample based on a 1 liter sample size) nor any α activity in excess of 10,000 pCi/l (< .01 uCi/l based on a 1 liter sample). All wells show activities < 2,000 pCi/gm (< 2 nCi/gm D.O.T. limit). The highest activity in recent samples is 17,000 pCi/l β and 170 pCi/l α .

Radiological monitoring during sampling will only be required if the wells are located in radiological areas or if the wells themselves are labeled with radiological stickers. Monitoring requirements for down hole work such as pump removal will be determined based on the history of each well on a case by case basis.

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END OF PACKAGE

DATA VALIDATION REPORT
for
200-BP-5 GROUNDWATER ROUND 3
General Chemistry Analysis
SDG LK4482-LAS
LATA VB403.73

Bechtel Hanford Inc.
P. O. Box 969
Richland, Washington

July 27, 1995

Table of Contents

Data Validation Narrative	000002
INTRODUCTION	000002
ANALYSES REQUESTED	000002
DATA QUALITY OBJECTIVES	000002
REFERENCES	000004
GLOSSARY OF VALIDATION APPLIED QUALIFIERS (CHEMISTRY)	000005
GLOSSARY OF LABORATORY APPLIED QUALIFIERS	000006
Qualification Summary Table	000007
Data Summary Table	000009
Sample Results	000011
Checklist	000013
Laboratory Case Narrative	000019
Chain-of-Custody Information	000021
END OF PACKAGE	000023

200-BP-5 Groundwater Round 3
Data Validation Narrative

INTRODUCTION

All samples in Sample Delivery Group (SDG) LK4482-LAS (VB403.73) were validated at level "C" as defined in the Data Validation Procedures for Chemical Analysis (WHC-SD-EN-SPP-002, Rev. 2).

The analyses were performed by Lockheed Analytical Services.

ANALYSES REQUESTED

See Table 1.

DATA QUALITY OBJECTIVES

Precision:	Goals for precision were met.
Accuracy:	Goals for accuracy were met.
Sample Result Verification:	Not applicable to summary data packages that contain no raw data.
Detection Limits:	Detection limit goals were met for all sample results as specified in the <i>Quality Assurance Program Plan for 200-BP-5 Groundwater Operable Unit</i> , DOE/RL 88-32, Rev. 1.
Completeness:	The data package was 100% complete for all requested analyses.

MAJOR DEFICIENCIES

No major deficiencies were identified during data validation which required qualification of data as unusable.

MINOR DEFICIENCIES

No minor deficiencies were identified during data validation which required qualification of data as estimated.

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Table 1
Chain-of-Custody
Analysis Request

LATA ID #: VB403.73

SDG: LK4482-LAS

Sample Information							Analyses Requested			
SAMPLE NO.	DATE COLLECTED	MATRIX	SAF	SAMPLING LOCATION	FIELD QC INFO	TEMP °C	1	2	3	4
BOFKH6	9-May-95	WATER	B95-049	299-E33-12	SPLIT/BOFB90	2	X	X	X	X

Method References:

<u>Analysis</u>	<u>Method</u>
1. Anions (F, Cl, SO ₄ , PO ₄ , NO ₂ , NO ₃)	300.0
2. Alkalinity	310.1
3. TDS	160.1
4. Cyanide	CLP

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REFERENCES

WHC 1993, *Data Validation Procedures for Chemical Analyses*, WHC-SD-EN-SPP-002, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

DOE 1994, *Quality Assurance Program Plan for 200-BP-5 Groundwater Operable Unit*, DOE/RL 88-32, Rev. 1, Department of Energy-Hanford , Richland, Washington.

GLOSSARY OF VALIDATION APPLIED QUALIFIERS (CHEMISTRY)

Qualifiers which may be applied by data validators in compliance with the procedures herein are as follows.

- U- Indicates the compound or analyte was analyzed for and not detected in the sample. The value reported is the sample quantitation limit corrected for sample dilution and moisture content by the laboratory.
- UJ- Indicates the compound or analyte was analyzed for and not detected in the sample. Due to a QC deficiency identified during data validation, the associated quantitation limit is an estimate.
- J- Indicates the compound or analyte was analyzed for and detected. The associated concentration is an estimate, but the data are usable for decision making purposes.
- BJ- Applied to inorganic analyses only. Indicates the analyte concentration was greater than the IDL but less than the CRDL and is considered an estimated value.
- R- Indicates the compound or analyte was analyzed for, detected, and due to an identified QC deficiency the data are unusable.
- UR- Indicates the compound or analyte was analyzed for and not detected in the sample. Additionally, the data are unusable due to an identified QC deficiency.

GLOSSARY OF LABORATORY APPLIED QUALIFIERS

Qualifiers which may be applied by the laboratory in compliance with applicable requirements are as follows.

Commonly used laboratory general chemistry qualifiers:

- U- Indicates the analyte was analyzed for but not detected in the sample.
- D- Indicates a dilution was performed.

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Qualification Summary Table

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Qualification Summary Table

General Chemistry

ANALYTE	TYPE	QUALIFIER	SAMPLES AFFECTED	DQO	REASON
No qualifiers were added by the validator					

General Chemistry Field QC

ANALYTE	TYPE	QUALIFIER	FIELD QC SAMPLES	DQO	ASSESSMENT
All	FIELD QC	NONE	B0FKH6/B0FB90	PRECISION	Field split precision is acceptable

Comments:

1. Data qualification is not required based on field split precision, however field split results are noted here to alert the data user to uncertainties in the data set during decision making processes.

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Data Summary Table

9613446-2316 GENERAL CHEMISTRY
DATA SUMMARY TABLE

LATA ID#: VB403.73		HEIS #:	B0FKH6	
		Date:	9-May-95	
		Matrix:	WATER	
Constituent	CAS #	Units	Results	Q
Total Dissolved Solids	TDS	mg/L	280	
Chloride by IC	16887-00-6	mg/L	8.5	
Fluoride by IC	16984-48-8	mg/L	0.33	
Nitrate-N by IC	14797-55-8	mg/L	11	
Nitrite-N by IC	14797-65-0	mg/L	0.002	U
Ortho Phosphate by IC	14265-44-2	mg/L	0.020	U
Sulfate by IC	14808-79-8	mg/L	16	
Alkalinity, total	ALKALINITY	mg/L	110	
Bicarbonate Alkalinity	188	mg/L	110	
Carbonate Alkalinity	189	mg/L	10	U
Cyanide, total	CYANIDE	mg/L	0.034	

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Sample Results (Form I's)

Sample Results

Client Sample ID: BOFKH6	Date Collected: 09-MAY-95
Matrix: Water	Date Received: 11-MAY-95
Percent Solids: N/A	

Constituent	Units	Method	Result	Project Reporting Limit	Data Qualifier(s)	Date Analyzed	LAS Batch ID	LAS Sample ID
Total Dissolved Solids	mg/L	160.1	280	40.		16-MAY-95	22839	L4482-5
Chloride	mg/L	300.0	8.5	0.020		11-MAY-95	22732	L4482-3
Fluoride	mg/L	300.0	0.33	0.10		11-MAY-95	22737	L4482-3
Nitrate-N	mg/L	300.0	11.	0.020		11-MAY-95	22733	L4482-3
Nitrite-N	mg/L	300.0	< 0.002	0.010	U	11-MAY-95	22734	L4482-3
Ortho Phosphate	mg/L	300.0	< 0.020	0.10	U	11-MAY-95	22736	L4482-3
Sulfate	mg/L	300.0	16.	0.10		11-MAY-95	22735	L4482-3
Alkalinity, total (as CaCO3)	mg/L	310.1	110	30.		16-MAY-95	22859	L4482-4
Bicarbonate Alka as CaCO3	mg/L	310.1	110	30.		16-MAY-95	22859	L4482-4
Carbonate Alka as CaCO3	mg/L	310.1	< 10.	30.	U	16-MAY-95	22859	L4482-4
Total Cyanide	mg/L	CLP	0.034	0.020	D(1:2)	16-MAY-95	22874	L4482-6

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Checklist

9613446 LATA GENERAL CHEMISTRY
DATA VALIDATION CHECKLIST

VALIDATION LEVEL:	A	B	C	D	E		
VALIDATION PROCEDURE:	<input type="checkbox"/> WHC-CM-5-3, Rev. 0		<input checked="" type="checkbox"/> WHC-SD-EN-SPP-002, Rev. 2				
PROJECT:	200-BP-5 ROUND 3		SDG:	LK4482-LAS			
VALIDATOR:	BJ SEYMOUR <i>by 7-26-95</i>	LATA NO:	VB403.73	DATE:	19-Jul-95		
REVIEWER:	BJ MORRIS <i>by 7-26-95</i>	LAB:	LAS	CASE:	N/A		
SAF NO:	B95-049	QAPP NO:	N/A	SAP NO:	DOE/RL 88-32,R1		
ANALYSES REQUESTED							
<input checked="" type="checkbox"/>	Anions 300.0	<input checked="" type="checkbox"/>	Alkalinity 310.1	<input checked="" type="checkbox"/>	TDS 160.1	<input checked="" type="checkbox"/>	Cyanide CLP
SAMPLE NO.	MATRIX	COMMENTS:					
BOFKH6	WATER						

1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE

YES NO N/A

Is technical verification documentation present?

Is a case narrative present?

2. HOLDING TIMES

YES NO N/A

Are sample holding times acceptable?

See HOLDING TIME SUMMARY form

3. INSTRUMENT PERFORMANCE AND CALIBRATIONS

YES NO N/A

Were initial calibrations performed on all instruments?

Are initial calibrations acceptable?

Were calibration checks performed on all instruments?

Are calibration checks acceptable?

Validation calculation checks were performed and are acceptable.

If NO(s) are checked, see CALIBRATION DATA SUMMARY form

4. BLANKS

YES NO N/A

- Were laboratory blanks performed for all applicable analyses?
- Are laboratory blank results acceptable?
- Were preparation blanks analyzed?
- Are preparation blank results acceptable?

<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

If NO(s) are checked, see BLANK AND SAMPLE DATA SUMMARY form

5. ACCURACY

YES NO N/A

- Were spike samples analyzed at the proper frequency?
- Are all spike sample recoveries acceptable?
- Were laboratory control samples (LCS) analyzed at the proper frequency?
- Are all LCS recoveries acceptable?
- Validation calculation checks were performed and are acceptable.

<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

If NO(s) are checked, see ACCURACY DATA SUMMARY form

6. PRECISION

YES NO N/A

- Were laboratory duplicates analyzed at the proper frequency?
- Are all duplicate RPD values acceptable?
- Were MS/MSDs analyzed?
- Are all MS/MSD RPD values acceptable?
- Validation calculation checks were performed and are acceptable.

<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

If NO(s) are checked, see PRECISION DATA SUMMARY form

7. FIELD QC SAMPLES

YES NO N/A

- Were field QC samples (field/trip blanks, duplicates, splits, performance audit) identified?
- Are field/trip blank results acceptable? (see Blank Data Summary form)
- Are field duplicate RPD values acceptable? (see Field QC calculations)
- Are field split RPD values acceptable? (see Field QC calculations)
- Are performance audit sample results acceptable?

<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Comments: B0FKH6 is a field split with B0FB90

The field split is evaluated in this package.

B0FB90 was validated in SDG W0548-QES (VB403.71).

8. ANALYTE QUANTITATION

YES NO N/A

Was analyte quantitation performed properly?

Are results calculated properly?

Validation calculation checks were performed and are acceptable.

Comments:

9. REPORTED RESULTS AND DETECTION LIMITS

YES NO N/A

Are results reported for all requested analyses?

Are all results supported in the raw data?

Do results meet the CRDLs?

Validation calculation checks were performed and are acceptable.

Comments:

VALIDATION SUMMARY

For deficiencies (major and minor) and comments, please refer to the Qualification Summary Table.

HOLDING TIME SUMMARY

SDG: LK4482-LAS			VALIDATOR: BJ SEYMOUR					DATE: 19-Jul-95		
PROJECT: 200-BP-5 ROUND 3			REVIEWER: BJ MORRIS					LATA NO.: VB403.73		
HEIS-SN	MATRIX CODE	ANALYSIS	DATE COLLECTED	PREP DATE	ANALYSIS DATE	PREP HT (days)	<i>Required HT (days)</i>	ANALYSIS HT (days)	<i>Required HT (days)</i>	VAL Q
BOFKH6	WATER	TDS	9-May-95	N/A	16-May-95	N/A	N/A	7	7	NONE
BOFKH6	WATER	Alkalinity	9-May-95	N/A	16-May-95	N/A	N/A	7	14	NONE
BOFKH6	WATER	Cyanide	9-May-95	N/A	16-May-95	N/A	N/A	7	14	NONE
BOFKH6	WATER	Anions (Cl,F,SO ₄)	9-May-95	N/A	11-May-95	N/A	N/A	2	28	NONE
BOFKH6	WATER	Anions (NO ₂ ,NO ₃ ,PO ₄)	9-May-95	N/A	11-May-95	N/A	N/A	2	2	NONE

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GENERAL CHEM FIELD SPLIT EVALUATION

LATA ID#: VB403.73		HEIS #:	B0FB90	B0FKH6	RPD W >20% S >35%	DIF W >DL S >2*DL	DL SAME UNITS AS RESULTS	
		Date:	9-May-95	9-May-95				
		Matrix:	WATER	WATER				
Constituent	CAS #	Units	ORIGINAL	SPLIT				
			Results	Q	Results	Q		
Total Dissolved Solids	TDS	mg/L	266		280		5.1%	5.0
Chloride by IC	16887-00-6	mg/L	7.89		8.5		7.4%	0.5
Fluoride by IC	16984-48-8	mg/L	0.10		0.33			0.5
Nitrate-N by IC	14797-55-8	mg/L	11.8	J	11		0.23	2.5
Nitrite-N by IC	14797-65-0	mg/L	0.020	UR	0.002	U		
Ortho Phosphate by IC	14265-44-2	mg/L	0.5	UR	0.020	U		
Sulfate by IC	14808-79-8	mg/L	16		16		1.3%	0.5
Alkalinity, total	ALKALINITY	mg/L	102		110		7.5%	10.0
Bicarbonate Alkalinity	188	mg/L	N/A		110			
Carbonate Alkalinity	189	mg/L	N/A		10	U		
Cyanide, total	CYANIDE	mg/L	0.021	J	0.034		0.013	0.01

EVALUATION:

1. Field split is not evaluated for precision if both results are non-detect.
2. If both sample results are >5*DL the RPD is used for evaluation.
3. If either sample result is <5*DL the DIF is used for evaluation.
4. All positive results have exhibited acceptable precision.

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Laboratory Case Narrative

Lockheed Analytical Services

Log-in No.: L4482
 Quotation No.: Q400000-B
 SAF: B95-049
 Document File No.: 0511596
 BHI Document File No.: 221
 SDG No.: LK4482
 Page 2

CASE NARRATIVE INORGANIC NON METALS ANALYSES

The routine calibration and quality control analyses performed for this batch include as applicable: instrument tune (ICP/MS only), initial and continuing calibration verification, initial and continuing calibration blanks, method blank(s), laboratory control sample(s), ICP interference check samples (ICP only), serial dilutions, analytical (post-digestion) spike samples, matrix spike (predigestion) sample(s), duplicate sample(s).

Preparation and Analysis Requirements

- One water sample was received for LK4482 and prepared as batch 511bh and analyzed for selected analytes as requested on the chain of custody. Quality control analysis was performed on the following sample:

Client ID	LAL #		Method
BOFKH6	L4482-5	DUP	160.1 TDS
	L4482-3	MS, DUP	300.0 Orthophosphate, Fluoride, Chloride, Nitrate-N, Nitrite-N, Sulfate
	L4482-4	DUP	310.1 Alkalinity
	L4482-6	MS, DUP	CLP Cyanide

Holding Time Requirements

- All samples were analyzed within the specified holding time.

Method Blanks

- The concentration levels of all the requested analytes in the method blank were below the reporting detection limits.

Internal Quality Control

- All Internal Quality Control were within acceptance limits.

Kay McCann

May 18, 1995

Prepared By

Date

Am
7-24-95

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Chain-of-Custody Information

Bechtel Hanford, Inc.

L4482

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

Data Turnaround

- Priority
- Normal

Collector <i>K. Lee</i>	Company Contact G.L. Kasza	Telephone (509) 372-9675
Project Designation 200-BP-5 Groundwater Round 3	Sampling Location 200 East	SAF No. B95-049
Ice Chest No. <i>SML-371</i>	Field Logbook No. <i>Σ FL-1129</i>	Method of Shipment Federal Express
Shipped To Lockheed	Offsite Property No. <i>W95-0-03061-29</i>	Bill of Lading/Air Bill No. <i>7904627841</i>

Possible Sample Hazards/Remarks	Preservation	HNO3	Cool 4°C	Cool 4°C	Cool 4°C	NaOH	HNO3	Cool 4°C	HCl	Cool 4°C	HNO3
	Type of Container	P/G	G	P	P	P	P/G	G	P	P	P/G
	No. of Container(s)	1	1	1	1	2	8	1	4	1	1
Special Handling and/or Storage Maintain samples between 2°C and 6°C.	Volume	1L	500mL	250mL	500mL	1L	1L	500mL	1L	20mL	1L
SAMPLE ANALYSIS		*1	Anions (IC- F, Co, SO4, NO2, NO3, PO4	Alkalinity	TDS	Cyanide	*2	Tritium	Tc-99	Activity Scan	*3

9615445-2528

Sample No.	Matrix*	Date Sampled	Time Sampled									
B0FKH6	U	5-9-95	1102	X	X	X	X	X	X	X	X	X
B2FKH7	U	5-9-95	1102									X

CHAIN OF POSSESSION	Sign/Print Names	SPECIAL INSTRUCTIONS	Matrix*
Relinquished By <i>K. Lee</i> Date/Time <i>5/9/95 1400</i>	Received By <i>ERC</i> Date/Time <i>1400</i>	*1 ICP Metals - to include Ca, Mg, Na, K, Fe, Mn, Si, Al, and Bi. AA Metals - to include Se (unfiltered).	S - Soil
Relinquished By <i>ERC</i> Date/Time <i>0900</i>	Received By <i>Bill Miller Bwh.Han</i> Date/Time <i>5-9-95</i>	*2 Gross Alpha; Gross Beta; Pu-238, -239/240; Sr-90; Gamma Spec - to include Cs-137, Co-60, Ru-106; Total Uranium.	SE - Sediment
Relinquished By <i>Bill Miller Bwh.Han</i> Date/Time <i>5-10-95</i>	Received By	*3 ICP Metals - to include Ca, Mg, Na, K, Fe, Mn, Si, Al, and Bi. AA Metals - to include Se (filtered).	SO - Solid
Relinquished By	Received By	Sample analysis for PO4, NO2, NO3 by EPA 300.0 is being requested for information only. The ERC Contractor acknowledges that the 48-hour hold time will not be met.	SL - Sludge
Relinquished By	Received By	The Activity Scan is for both sample numbers listed on this chain of custody.	W - Water

LABORATORY SECTION	Received By <i>Bill Miller</i>	Title <i>Sample Custodian</i>	Date/Time <i>5-11-95 / 0845</i>
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

9613446.2329

END OF PACKAGE



July 27, 1995
LATA95-153

COPY



Ms. Joan Kessner
Bechtel
345 Hills
Richland, WA 99352

Subject: VB403.73, SDG LK4482-LAS

Dear Ms. Kessner:

Attached is the data validation report for analytical results for 200-BP-5 Groundwater Round 3, (SDG LK4482-LAS). The package was received by Los Alamos Technical Associates on July 10, 1995.

If you have any questions, please feel free to contact me.

Sincerely,

Marsha C. Webb

Marsha C. Webb
Deputy Project Manager

Attachment

cc: Jeanette Duncan, CH2M Hill
Don Smith, LATA
VB403.73
MCW/lb

CS

9613446.2331

DATA VALIDATION REPORT
for
200-BP-5 GROUNDWATER ROUND 3
Metals Analysis
SDG LK4482-LAS
LATA VB403.73

Bechtel Hanford Inc.
P.O. Box 969
Richland, Washington

July 27, 1995

Table of Contents

Data Validation Narrative	000002
INTRODUCTION	000002
ANALYSES REQUESTED	000002
DATA QUALITY OBJECTIVES	000002
REFERENCES	000004
GLOSSARY OF VALIDATION APPLIED QUALIFIERS (CHEMISTRY)	000005
GLOSSARY OF LABORATORY APPLIED QUALIFIERS	000006
Qualification Summary Table	000007
Data Summary Table	000009
Sample Results	000011
Checklist	000014
Laboratory Case Narrative	000024
Chain-of-Custody Information	000026
END OF PACKAGE	000029

200-BP-5 Groundwater Round 3
Data Validation Narrative

INTRODUCTION

All samples in Sample Delivery Group (SDG) LK4482-LAS (VB403.73) were validated at level "C" as defined in the Data Validation Procedures for Chemical Analysis (WHC-SD-EN-SPP-002, Rev. 2).

The analyses were performed by Lockheed Analytical Services.

ANALYSES REQUESTED

See Table 1.

DATA QUALITY OBJECTIVES

Precision:	Goals for precision were met.
Accuracy:	Goals for accuracy were met with the exception of those items discussed in the "Qualification Summary Table".
Sample Result Verification:	Not applicable to summary data packages that contain no raw data.
Detection Limits:	Detection limit goals were met for all sample results as specified in the <i>Quality Assurance Program Plan for 200-BP-5 Groundwater Operable Unit</i> , DOE/RL 88-32, Rev. 1.
Completeness:	The data package was 100% complete for all requested analyses.

MAJOR DEFICIENCIES

No major deficiencies were identified during data validation which required qualification of data as unusable.

MINOR DEFICIENCIES

Minor deficiencies were identified during validation which required qualification of data as estimated. See the "Qualification Summary Table".

9613446.2534
Table 1
Chain-of-Custody
Analysis Request

ATA ID #: VB403.73

SDG: LK4482-LAS

Sample Information							Analyses Requested			
SAMPLE NO.	DATE COLLECTED	MATRIX	SAF	SAMPLING LOCATION	FIELD QC INFO	TEMP °C	1	2	3	4
B0FKH6	9-May-95	WATER	B95-049	299-E33-12	Split w/ B0FB90	2	X		X	
B0FKH7	9-May-95	WATER	B95-049	299-E33-12	Split w/ B0FB91	2		X		X

Method References:

- | <u>Analysis</u> | <u>Method</u> |
|--|---------------|
| 1. ICP Metals (Ca, Mg, Na, K, Fe, Mn, Si, Al, Bi) Unfiltered | CLP |
| 2. ICP Metals (Ca, Mg, Na, K, Fe, Mn, Si, Al, Bi) Filtered | CLP |
| 3. Selenium (Unfiltered) | CLP |
| 4. Selenium (Filtered) | CLP |

Method

CLP
 CLP
 CLP
 CLP

REFERENCES

WHC 1993, *Data Validation Procedures for Chemical Analyses*, WHC-SD-EN-SPP-002, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

DOE 1994, *Quality Assurance Program Plan for 200-BP-5 Groundwater Operable Unit*, DOE/RL 88-32, Rev. 1, Department of Energy-Hanford, Richland, Washington.

GLOSSARY OF VALIDATION APPLIED QUALIFIERS (CHEMISTRY)

Qualifiers which may be applied by data validators in compliance with the procedures herein are as follows.

- U- Indicates the compound or analyte was analyzed for and not detected in the sample. The value reported is the sample quantitation limit corrected for sample dilution and moisture content by the laboratory.
- UJ- Indicates the compound or analyte was analyzed for and not detected in the sample. Due to a QC deficiency identified during data validation, the associated quantitation limit is an estimate.
- J- Indicates the compound or analyte was analyzed for and detected. The associated concentration is an estimate, but the data are usable for decision making purposes.
- BJ- Applied to inorganic analyses only. Indicates the analyte concentration was greater than the IDL but less than the CRDL and is considered an estimated value.
- R- Indicates the compound or analyte was analyzed for, detected, and due to an identified QC deficiency the data are unusable.
- UR- Indicates the compound or analyte was analyzed for and not detected in the sample. Additionally, the data are unusable due to an identified QC deficiency.

GLOSSARY OF LABORATORY APPLIED QUALIFIERS

Qualifiers which may be applied by the laboratory in compliance with applicable requirements are as follows.

Commonly used laboratory metals (inorganic) qualifiers:

- U- Indicates the analyte was analyzed for but not detected in the sample.
- B- Indicates the analyte concentration is less than the CRDL but greater than the IDL.
- E- Indicates the value reported is estimated due to the presence of interference.
- M- Indicates duplicate injection precision criteria were not met during graphite furnace (GFAA) analysis.
- N- Indicates spiked sample recovery was not within the control limits.
- S- Indicates the reported value was determined by the Method of Standard Additions (MSA).
- W- Indicates post-digestion spike for GFAA analysis is outside control limits and the sample absorbance is less than 50% of the spike absorbance.
- *- Indicates duplicate analysis was not within control limits.
- + - Indicates the correlation coefficient (r) for the MSA was less than 0.995.

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Qualification Summary Table

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Qualification Summary Table

Inorganics (Metals)

ANALYTE	TYPE	QUALIFIER	SAMPLES AFFECTED	DQO	REASON
Bismuth	MINOR	BJ	B0FKH7	ACCURACY	Matrix spike recovery is outside acceptance criteria.

Inorganics (Metals) Field QC

ANALYTE	TYPE	QUALIFIER	FIELD QC SAMPLES	DQO	ASSESSMENT
ALL	FIELD QC	NONE	B0FB90/B0FKH6 B0FB91/B0FKH7	PRECISION	Field split precision is acceptable.

Comments:

Data qualification is not required based on field split precision, however, field split results are summarized here to alert the data user to uncertainties in the data set during decision making processes.

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Data Summary Table

9613446.2341 METALS
 DATA SUMMARY TABLE

LATA ID#: VB403.73		HEIS #:	B0FKH6		B0FKH7	
		Date:	9-May-95		9-May-95	
		Matrix:	WATER		WATER	
Constituent	CAS #	Units	Results	Q	Results	Q
Aluminum	7429-90-5	mg/L	0.057	U	0.057	U
Bismuth	7440-69-9	mg/L	0.001	U	0.0014	BJ
Calcium	7440-70-2	mg/L	34		34	
Iron	7439-89-6	mg/L	0.17		0.019	B
Magnesium	7439-95-4	mg/L	10		10	
Manganese	7439-96-5	mg/L	0.002	U	0.002	U
Potassium	7440-09-7	mg/L	8.8		8.2	
Selenium	7782-49-2	mg/L	0.003	U	0.003	U
Silicon	7440-21-3	mg/L	28		26	
Sodium	7440-23-5	mg/L	24		23	

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Sample Results (Form I's)

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TOTAL METALS RESULTS

Client Sample ID: BOFKH6	Date Collected: 05-09-95	Matrix: water
LAL Batch ID(s): 511 bhT	Date Received: 05-11-95	

Constituents	Method	Concentration (mg/L)	IDL (mg/L)	RDL (mg/L)	Data Qualifier(s)	Date Analyzed	LAL ID
Aluminum	CLP	<0.057	0.057	0.20	U	06-20-95	L4482-2
Bismuth	CLP	<0.001	0.001	0.005	U	06-28-95	L4482-2
Calcium	CLP	34	0.056	5.0		06-20-95	L4482-2
Iron	CLP	0.17	0.010	0.10		06-20-95	L4482-2
Magnesium	CLP	10	0.057	5.0		06-20-95	L4482-2
Manganese	CLP	<0.002	0.002	0.015	U	06-20-95	L4482-2
Potassium	CLP	8.8	0.363	5.0		06-20-95	L4482-2
Selenium	CLP	<0.003	0.003	0.005	W	06-19-95	L4482-2
Silicon	CLP	28	0.012	0.10		06-22-95	L4482-2
Sodium	CLP	24	0.041	5.0		06-20-95	L4482-2

Comments:

BM
7-17-95

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DISSOLVED METALS RESULTS

Client Sample ID: BOFKH7	Date Collected: 05-09-95	Matrix: filtered water
LAL Batch ID(s): 511 bhD	Date Received: 05-11-95	

Constituents	Method	Concentration (mg/L)	IDL (mg/L)	RDL (mg/L)	Data Qualifier(s)	Date Analyzed	LAL ID
Aluminum	CLP	<0.057	0.057	0.20	U	06-16-95	L4482-21
Bismuth	CLP	0.0014	0.001	0.005	BN BJ	06-28-95	L4482-21
Calcium	CLP	34	0.056	5.0		06-16-95	L4482-21
Iron	CLP	0.019	0.010	0.10	B	06-16-95	L4482-21
Magnesium	CLP	10	0.057	5.0		06-16-95	L4482-21
Manganese	CLP	<0.002	0.002	0.015	U	06-16-95	L4482-21
Potassium	CLP	8.2	0.363	5.0		06-16-95	L4482-21
Selenium	CLP	<0.003	0.003	0.005	W	06-17-95	L4482-21
Silicon	CLP	26	0.012	0.10		06-22-95	L4482-21
Sodium	CLP	23	0.041	5.0		06-16-95	L4482-21

Comments:

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Checklist

9613446
LATA INORGANIC (METALS)
DATA VALIDATION CHECKLIST

VALIDATION LEVEL:	A	B	C	D	E
VALIDATION PROCEDURE:	<input type="checkbox"/> WHC-CM-5-3, Rev. 0		<input checked="" type="checkbox"/> WHC-SD-EN-SPP-002, Rev. 2		
PROJECT:	200-BP-5 ROUND 3		SDG:	LK4482-QES	
VALIDATOR:	BJ MORRIS ⁷⁻¹⁸⁻⁹⁵	LATA NO:	VB403.73	DATE:	17-Jul-95
REVIEWER:	MC WEBB ⁷⁻²⁵⁻⁹⁵	LAB:	QES	CASE:	N/A
SAF NO:	B95-049	QAPP NO:	N/A	SAP NO:	DOE/RL 88-32,R1
ANALYSES REQUESTED					
<input checked="" type="checkbox"/> ICP Metals Unfiltered CLP	<input checked="" type="checkbox"/> Selenium Unfiltered CLP	<input checked="" type="checkbox"/> ICP Metals Filtered CLP	<input checked="" type="checkbox"/> Selenium Filtered CLP		
SAMPLE NO.	MATRIX	SAMPLE NO.	MATRIX		
BOFKH6	WATER	BOFKH7	WATER		

1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE YES NO N/A

Is technical verification documentation present?

Is a case narrative present?

2. HOLDING TIMES YES NO N/A

Are sample holding times acceptable?

See HOLDING TIME SUMMARY form

3. INSTRUMENT PERFORMANCE AND CALIBRATIONS YES NO N/A

Were initial calibrations performed on all instruments?

Are initial calibrations acceptable?

Are ICP interference checks acceptable?

Were ICV and CCV checks performed on all instruments?

Are ICV and CCV checks acceptable?

Validation calculation checks were performed and are acceptable.

If NO(s) are checked, see CALIBRATION DATA SUMMARY form

4. BLANKS

YES NO N/A

- Were ICB and CCB checks performed for all applicable analyses?
- Are ICB and CCB results acceptable?
- Were preparation blanks analyzed?
- Are preparation blank results acceptable?

<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

If NO(s) are checked, see BLANK AND SAMPLE DATA SUMMARY form

5. ACCURACY

YES NO N/A

- Were spike samples analyzed at the proper frequency?
- Are all spike sample recoveries acceptable?
- Are all elements spiked at an appropriate level?
- Was a post digestion spike analyzed?
- Are all post digestion spike recoveries acceptable?
- Were laboratory control samples (LCS) analyzed at the proper frequency?
- Are all LCS recoveries acceptable?
- Validation calculation checks were performed and are acceptable.

<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

If NO(s) are checked, see ACCURACY DATA SUMMARY form

6. PRECISION

YES NO N/A

- Were laboratory duplicates analyzed at the proper frequency?
- Are all duplicate RPD values acceptable?
- Were MS/MSDs analyzed?
- Are all MS/MSD RPD values acceptable?
- Were ICP serial dilution samples analyzed at the proper frequency?
- Are all ICP serial dilution %D values acceptable?
- Validation calculation checks were performed and are acceptable.

<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

If NO(s) are checked, see PRECISION DATA SUMMARY form

9613446-0018

7. FIELD QC SAMPLES

YES NO N/A

- Were field QC samples (field/trip blanks, duplicates, splits, performance audit) identified? YES NO N/A
- Are field/trip blank results acceptable? (see Blank Data Summary form) YES NO N/A
- Are field duplicate RPD values acceptable? (see Field QC evaluation) YES NO N/A
- Are field split RPD values acceptable? (see Field QC evaluation) YES NO N/A
- Are performance audit sample results acceptable? YES NO N/A

Comments: B0FKH6 is a field split with B0FB90.

B0FKH7 is a field split with B0FB91.

B0FB90 and B0FB91 were validated in SDG W0548-QES (VB403.71).

8. FURNACE AA QUALITY CONTROL

YES NO N/A

- Were duplicate injections required? YES NO N/A
- Are all duplicate injection %RSD values acceptable? YES NO N/A
- Were analytical spikes required? YES NO N/A
- Are all analytical spike recoveries acceptable? YES NO N/A
- Was MSA required? YES NO N/A
- Are all MSA results acceptable? YES NO N/A
- Validation calculation checks were performed and are acceptable. YES NO N/A

Comments:

9. REPORTED RESULTS AND DETECTION LIMITS

YES NO N/A

- Are results reported for all requested analyses? YES NO N/A
- Are all results supported in the raw data? YES NO N/A
- Are results calculated properly? YES NO N/A
- Do results meet the CRDLs? YES NO N/A
- Validation calculation checks were performed and are acceptable. YES NO N/A

Comments:

VALIDATION SUMMARY

For deficiencies (major and minor) and comments, please refer to the Qualification Summary Table.

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LATA INORGANIC (METALS)
DATA VALIDATION CHECKLIST

HOLDING TIME SUMMARY

SDG: LK4482-LAS			VALIDATOR: BJ MORRIS					DATE: 17-Jul-95		
PROJECT: 200-BP-5 ROUND 3			REVIEWER: MC WEBB					LATA NO.: VB403.73		
HEIS-SN	MATRIX CODE	ANALYSIS	DATE COLLECTED	PREP DATE	ANALYSIS DATE	PREP HT (days)	Required HT (days)	ANALYSIS HT (days)	Required HT (days)	VAL Q
BOFKH6	WATER	Aluminum Calcium Iron Magnesium Manganese Potassium Sodium	9-May-95	N/A	16-Jun-95	N/A	N/A	38	180	NONE
BOFKH6	WATER	Bismuth	9-May-95	N/A	28-Jun-95	N/A	N/A	50	180	NONE
BOFKH6	WATER	Selenium	9-May-95	N/A	17-Jun-95	N/A	N/A	39	180	NONE
BOFKH6	WATER	Silicon	9-May-95	N/A	22-Jun-95	N/A	N/A	44	180	NONE
BOFKH7	WATER	Aluminum Calcium Iron Magnesium Manganese Potassium Sodium	9-May-95	N/A	20-Jun-95	N/A	N/A	42	180	NONE
BOFKH7	WATER	Bismuth	9-May-95	N/A	28-Jun-95	N/A	N/A	50	180	NONE
BOFKH7	WATER	Selenium	9-May-95	N/A	19-Jun-95	N/A	N/A	41	180	NONE
BOFKH7	WATER	Silicon	9-May-95	N/A	22-Jun-95	N/A	N/A	44	180	NONE

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ACCURACY DATA SUMMARY

SDG: LK4482-LAS				VALIDATOR: BJ MORRIS				DATE: 17-Jul-95				
PROJECT: 200-BP-5 ROUND 3				REVIEWER: MC WEBB				LATA NO.: VB403.73				
HEIS-SN	ANALYTE	RESULTS	Lab Q	Actual Spiking Level	Minimum Required Spiking Level	Difference	PERCENT RECOVERY (%R)				SAMPLES AFFECTED	VAL Q
							Matrix Spike	Matrix Spike Duplicate	Post Digestion Spike	Laboratory Control Standard		
B0FKH6	Silicon	28.27		2.0	7.0675	-5.0675	NR				NONE	NONE
B0FKH7	Silicon	26.05		2.0	6.5125	-4.5125	NR				NONE	NONE
B0FKH7	Bismuth	0.0014		0.20	0.00035	0.19965	27.4%				B0FKH7	BJ

NOTES:
 (1) A negative number in the difference column indicates the spiking level for that element was not 25% of the sample concentration. The CLP method does not require qualification of sample data when this occurs.
 (2) NR = not reported

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METALS QC DATA SUMMARY

For Matrix Spike Sample Analysis

LAL Batch ID(s): 511 bhT

Constituent	Client Sample ID	LAL Sample ID	Date Analyzed	QC Sample Analyses				
				Matrix Spike Result (mg/L)	Sample Result (mg/L)	Spike Added (mg/L)	(%) Recovery	Data Qualifier
Aluminum	BOFKH6	L4482-2	06-20-95	2.184	<0.057	2.0	109	
Bismuth	BOFKH6	L4482-2	06-28-95	0.1810	<0.001	0.20	91	
Calcium	BOFKH6	L4482-2	06-20-95	140.3	33.91	100	106	
Iron	BOFKH6	L4482-2	06-20-95	1.284	0.1736	1.0	111	
Magnesium	BOFKH6	L4482-2	06-20-95	65.13	10.40	50	109	
Manganese	BOFKH6	L4482-2	06-20-95	0.5374	<0.002	0.50	107	
Potassium	BOFKH6	L4482-2	06-20-95	63.66	8.830	50	110	
Selenium	BOFKH6	L4482-2	06-19-95	0.0117	<0.003	0.010	117	
Silicon	BOFKH6	L4482-2	06-22-95	29.14	28.27	2.0	a	
Sodium	BOFKH6	L4482-2	06-20-95	134.6	24.49	100	110	

"a" - The matrix spike recovery is not reported. The sample concentration was greater than four times the spiking level.

COMMENTS:

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METALS QC DATA SUMMARY

For Matrix Spike Sample Analysis

LAL Batch ID(s): 511 bhD

Constituent	Client Sample ID	LAL Sample ID	Date Analyzed	QC Sample Analyses				
				Matrix Spike Result (mg/L)	Sample Result (mg/L)	Spike Added (mg/L)	(%) Recovery	Data Qualifier
Aluminum	BOFKH7	L4482-21	06-16-95	1.926	<0.057	2.0	96	
Bismuth	BOFKH7	L4482-21	06-28-95	0.05613	0.0014	0.20	27	N
Calcium	BOFKH7	L4482-21	06-16-95	133.4	33.58	100	100	
Iron	BOFKH7	L4482-21	06-16-95	1.036	0.0186	1.0	102	
Magnesium	BOFKH7	L4482-21	06-16-95	59.90	10.10	50	100	
Manganese	BOFKH7	L4482-21	06-16-95	0.5043	<0.002	0.50	101	
Potassium	BOFKH7	L4482-21	06-16-95	55.56	8.164	50	95	
Selenium	BOFKH7	L4482-21	06-17-95	0.0109	<0.003	0.010	109	
Silicon	BOFKH7	L4482-21	06-22-95	27.29	26.05	2.0	a	
Sodium	BOFKH7	L4482-21	06-16-95	117.6	22.74	100	95	

COMMENTS:

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7-17-95

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METALS FIELD SPLIT EVALUATION

LATA ID#: VB403.73		HEIS #:	B0FB90	HEIS #:	B0FKH6	RPD	DIF	DL
		Date:	9-May-95	Date:	9-May-95			
		Matrix:	WATER	Matrix:	WATER			
			ORIGINAL		SPLIT			
Constituent	CAS #	Units	Results	Q	Units	Results	Q	
Aluminum	7429-90-5	µg/L	23.4	U	mg/L	0.057	U	
Antimony	7440-36-0	µg/L	26.3	U	mg/L	N/R		
Arsenic	7440-38-2	µg/L	1.4	BJ	mg/L	N/R		
Barium	7440-39-3	µg/L	87.4	B	mg/L	N/R		
Beryllium	7440-41-7	µg/L	0.60	U	mg/L	N/R		
Cadmium	7440-43-9	µg/L	2.4	UJ	mg/L	N/R		
Calcium	7440-70-2	µg/L	30400	J	mg/L	34		5000
Chromium	7440-47-3	µg/L	4.7	U	mg/L	N/R		
Cobalt	7440-48-4	µg/L	3.4	U	mg/L	N/R		
Copper	7440-50-8	µg/L	9.8	U	mg/L	N/R		
Iron	7439-89-6	µg/L	128		mg/L	0.170		42
Lead	7439-92-1	µg/L	0.80	UJ	mg/L	N/R		
Magnesium	7439-95-4	µg/L	9280	J	mg/L	10		720
Manganese	7439-96-5	µg/L	3.4	B	mg/L	0.002	U	3.4
Nickel	7440-02-0	µg/L	15.4	U	mg/L	N/R		
Potassium	7440-09-7	µg/L	6920	J	mg/L	8.8		1880
Selenium	7782-49-2	µg/L	1.1	U	mg/L	0.003	U	
Silver	7440-22-4	µg/L	4.1	U	mg/L	N/R		
Sodium	7440-23-5	µg/L	21100	J	mg/L	24		2900
Thallium	7440-28-0	µg/L	0.90	U	mg/L	N/R		
Vanadium	7440-62-2	µg/L	18.1	B	mg/L	N/R		
Zinc	7440-66-6	µg/L	12.5	U	mg/L	N/R		
Cyanide	CYANIDE	µg/L	20.7	J	mg/L	N/R		
Silicon	7440-21-3	µg/L	26000		mg/L	28		7.4%
Bismuth	7440-69-9	µg/L	46.4	U	mg/L	0.001	U	

'NR' = Not Requested

EVALUATION:

1. Field duplicates are not evaluated for precision if both results are non-detect.
2. If both sample results are >5*DL the RPD is used for evaluation.
3. If either sample result is <5*DL the DIF is used for evaluation.
4. All positive results have exhibited acceptable precision.

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Shaded areas indicate changes by the validator.
 40373DST.XLS, METALS FIELD SPLIT

9613496.2354

METALS FIELD SPLIT EVALUATION

LATA ID#: VB403.73		HEIS #:	B0FB91	HEIS #:	B0FKH7	RPD	DIF	DL
		Date:	9-May-95	Date:	9-May-95			
		Matrix:	WATER	Matrix:	WATER			
			ORIGINAL		SPLIT			
Constituent	CAS #	Units	Results	Q	Units	Results	Q	
Aluminum	7429-90-5	µg/L	23.4	U	mg/L	0.057	U	
Antimony	7440-36-0	µg/L	26.3	U	mg/L	NR		
Arsenic	7440-38-2	µg/L	1.4	BJ	mg/L	NR		
Barium	7440-39-3	µg/L	84.0	B	mg/L	NR		
Beryllium	7440-41-7	µg/L	0.60	U	mg/L	NR		
Cadmium	7440-43-9	µg/L	2.4	UJ	mg/L	NR		
Calcium	7440-70-2	µg/L	29800	J	mg/L	34		13.2%
Chromium	7440-47-3	µg/L	4.7	U	mg/L	NR		
Cobalt	7440-48-4	µg/L	3.4	U	mg/L	NR		
Copper	7440-50-8	µg/L	13.6	BJ	mg/L	NR		
Iron	7439-89-6	µg/L	37.9	U	mg/L	0.019	B	19.0
Lead	7439-92-1	µg/L	1.0	BJ	mg/L	NR		
Magnesium	7439-95-4	µg/L	9030	J	mg/L	10		970
Manganese	7439-96-5	µg/L	3.2	B	mg/L	0.002	U	3.2
Nickel	7440-02-0	µg/L	15.4	U	mg/L	NR		
Potassium	7440-09-7	µg/L	7430	J	mg/L	8.2		770
Selenium	7782-49-2	µg/L	1.1	U	mg/L	0.003	U	
Silver	7440-22-4	µg/L	4.1	U	mg/L	NR		
Sodium	7440-23-5	µg/L	20300	J	mg/L	23		2700
Thallium	7440-28-0	µg/L	0.90	U	mg/L	NR		
Vanadium	7440-62-2	µg/L	17.2	B	mg/L	NR		
Zinc	7440-66-6	µg/L	12.8	U	mg/L	NR		
Cyanide	CYANIDE	µg/L	NR		mg/L	NR		
Silicon	7440-21-3	µg/L	25400		mg/L	26		2.3%
Bismuth	7440-69-9	µg/L	46.4	U	mg/L	0.0014	BJ	1.4

'NR' = Not Requested

EVALUATION:

1. Field duplicates are not evaluated for precision if both results are non-detect.
2. If both sample results are >5*DL the RPD is used for evaluation.
3. If either sample result is <5*DL the DIF is used for evaluation.
4. All positive results have exhibited acceptable precision.

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Shaded areas indicate changes by the validator.
40373DST.XLS, METALS FIELD SPLIT

9613446.2355

Laboratory Case Narrative

**CASE NARRATIVE
INORGANIC METALS ANALYSES**

The routine calibration and quality control analyses performed for this batch include as applicable: instrument tune (ICP/MS only), initial and continuing calibration verification, initial and continuing calibration blanks, method blank(s), laboratory control sample(s), ICP interference check samples (ICP only), serial dilutions, analytical (post-digestion) spike samples, matrix spike (predigestion) sample(s), duplicate sample(s).

Preparation and Analysis Requirements

The samples were received in on May 11, 1995. They were logged in as L4482 and prepared and analyzed in batches 511 bhT for total metals and 511 bhD for filtered water.

Holding Times-

All samples were analyzed within the method-specific holding times.

Method Blanks-

The method blanks were free of contamination.

Internal Quality Control-

All Internal Quality Control were within acceptance limits with the following exception: The matrix spike recovery for bismuth in the filtered water analysis was outside of acceptance limits (27%). The recovery based on the LCS (99%) support that the analytical system was operating within control limits.

Sample Results-

Bismuth was determined by ICP-MS, as approved by Clay Smith of Bechtel Hanford.

Shellee McGrath
Prepared By

June 29, 1995
Date

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7-25-95
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9613446.2357

Chain-of-Custody Information

L4482

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

Data Turnaround

- Priority
- Normal

Collector <i>K. Lee</i>	Company Contact G.L. Kasza	Telephone (509) 372-9675
Project Designation 200-BP-5 Groundwater Round 3	Sampling Location 200 East	SAF No. B95-049
Ice Chest No. <i>SML-371</i>	Field Logbook No. <i>EFCL-1129</i>	Method of Shipment Federal Express
Shipped To Lockheed	Offsite Property No. <i>W95-0-03041-29</i>	Bill of Lading/Air Bill No. <i>2904627844</i>

Possible Sample Hazards/Remarks	Preservation	HNO3	Cool 4°C	Cool 4°C	Cool 4°C	NaOH	HNO3	Cool 4°C	HCl	Cool 4°C	HNO3
	Type of Container	P/G	G	P	P	P	P/G	G	P	P	P/G
	No. of Container(s)	1	1	1	1	2	8	1	4	1	1
Special Handling and/or Storage Maintain samples between 2°C and 6°C.	Volume	1L	500mL	250mL	500mL	1L	1L	500mL	1L	20mL	1L
SAMPLE ANALYSIS		*1	Anions (IC-F, Co, SO4, NO2, NO3, PO4)	Alkalinity	TDS	Cyanide	*2	Tritium	Tc-99	Activity Scan	*3

Sample No.	Matrix*	Date Sampled	Time Sampled									
<i>B0FKH6</i>	<i>U</i>	<i>5-9-95</i>	<i>1102</i>	<i>X</i>	<i>^</i>	<i>^</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>^</i>	
<i>B0FKH7</i>	<i>U</i>	<i>5-9-95</i>	<i>1102</i>									<i>X</i>

CHAIN OF POSSESSION	Sign/Print Names		SPECIAL INSTRUCTIONS	Matrix*
Relinquished By <i>Kora</i> Date/Time <i>5/9/95 1400</i>	Received By <i>ERC</i> Date/Time <i>1400</i>		<p>*1 ICP Metals - to include Ca, Mg, Na, K, Fe, Mn, Si, Al, and Bi. AA Metals - to include Se (unfiltered).</p> <p>*2 Gross Alpha; Gross Beta; Pu-238, -239/240; Sr-90; Gamma Spec - to include Cs-137, Co-60, Ru-106; Total Uranium.</p> <p>*3 ICP Metals - to include Ca, Mg, Na, K, Fe, Mn, Si, Al, and Bi. AA Metals - to include Se (filtered).</p> <p>Sample analysis for PO4, NO2, NO3 by EPA 300.0 is being requested for information only. The ERC Contractor acknowledges that the 48-hour hold time will not be met.</p> <p>The Activity Scan is for both sample numbers listed on this chain of custody.</p>	<p>S = Soil</p> <p>SE = Sediment</p> <p>SO = Solid</p> <p>SL = Sludge</p> <p>W = Water</p> <p>O = Oil</p> <p>A = Air</p> <p>DS = Drum Solids</p> <p>DL = Drum Liquids</p> <p>T = Tissue</p> <p>WI = Wipe</p> <p>L = Liquid</p> <p>V = Vegetation</p> <p>X = Other</p>
Relinquished By <i>ERC</i> Date/Time <i>0900</i>	Received By <i>Bwh.Hon</i> Date/Time <i>5-9-95</i>			
Relinquished By <i>Bwh.Hon</i> Date/Time <i>5-10-95</i>	Received By	Date/Time		
Relinquished By	Received By	Date/Time		

LABORATORY SECTION	Received By <i>M. Miller</i>	Title <i>Sample Custodian</i>	Date/Time <i>5-11-95 / 0845</i>
FINAL SAMPLE DISPOSITION	Disposal Method <i>da</i>	Disposed By	Date/Time

Lockheed Analytical Services
Sample Receiving Checklist

Client Name: *Nestinghouse Hartford*

Job No. *L4482*

Cooler ID: *117*

COOLER CONDITION UPON RECEIPT

Temperature of cooler upon receipt: *20*
temperature of temp. blank upon receipt: *1*

	Yes	No	* Comments/Discrepancies
custody seals intact	<input checked="" type="checkbox"/>		
chain of custody present	<input checked="" type="checkbox"/>		
blue ice (or equiv.) present/frozen	<input checked="" type="checkbox"/>		
rad survey completed	<input checked="" type="checkbox"/>		

SAMPLE CONDITION UPON RECEIPT

	Yes	No	* Comments/Discrepancies
all bottles labeled	<input checked="" type="checkbox"/>		
samples intact	<input checked="" type="checkbox"/>		
proper container used for sample type	<input checked="" type="checkbox"/>		
sample volume sufficient for analysis	<input checked="" type="checkbox"/>		
proper pres. indicated on the COC	<input checked="" type="checkbox"/>		
VOA's contain headspace			<i>NA</i>
are samples bi-phasic (if so, indicate sample ID'S):			<i>049</i>

MISCELLANEOUS ITEMS

	Yes	No	* Comments/Discrepancies
samples with short holding times	<input checked="" type="checkbox"/>		<i>nitrite/nitrate</i>
samples to subcontract			<i>NA</i>

ADDITIONAL COMMENTS/DISCREPANCIES

Completed by / date: *Paul C. Davis 5-11-95*

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

961346-2359

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MAY 11 1995

END OF PACKAGE