

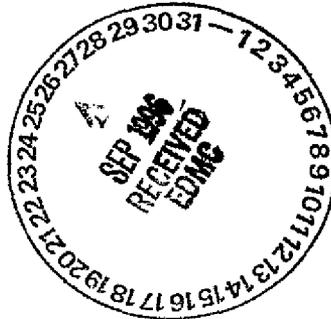
Lockheed Environmental Systems & Technologies Co.
Lockheed Analytical Services
975 Kelly Johnson Drive Las Vegas, Nevada 89119-3705
Telephone 702-361-0220 800-582-7605 Facsimile 702-361-8146

LK5893
0045267

LOCKHEED MARTIN 

January 3, 1996

Ms. Joan Kessner
Bechtel Hanford, Inc.
1022 Lee Boulevard
P.O. Box 969
Richland, WA 99352



RE: Log-in No: L5893
Quotation No: Q400000-B
Document File No: 1121596
BHI Document Control No: 298
SAF No.: B96-032
SDG No.: LK5893



The attached data report contains the analytical results of samples that were submitted to Lockheed Analytical Services on 21 November 1995.

The temperature of the cooler upon receipt was 4°C. Sample containers received agree with the chain-of-custody documentation. Sample containers were received intact. Samples designated for nitrate/nitrite analysis were not received in time to meet the analytical holding time requirements. The vials for volatile analyses did not contain headspace.

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

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

If you have any questions concerning the analysis or the data please call Kathleen M. Hall at (509) 375-4741.

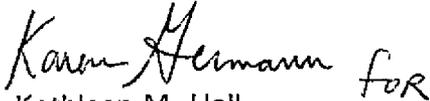
0002

Lockheed Analytical Services

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Quotation No.: Q400000-B
SAF: B96-032
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"I certify that this data package is in compliance with the SOW, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package has been authorized by the Laboratory Manager or a designee, as verified by the following signature."

Sincerely,


Kathleen M. Hall
Client Services Representative

kmh

cc: Client Services
Document Control

0003

**CASE NARRATIVE
INORGANIC NON METALS ANALYSES
WATER**

The routine calibration and quality control analyses performed for this batch include as applicable: initial and continuing calibration verification, initial and continuing calibration blanks, method blank(s), laboratory control sample(s), matrix spike sample(s), and duplicate sample(s).

Preparation and Analysis Requirements

- Two water samples were received for LK5893 and analyzed in batch 1121 bh for selected analytes as requested on the chain of custody. Quality control analysis was performed on the following sample:

Client ID	LAL #		Method
BOGSF4	L5893-5	MS, DUP	300.0 Chloride, Fluoride, Nitrate-Nitrogen, Nitrite-Nitrogen, Orthophosphate, Sulfate

Holding Time Requirements

- All samples were analyzed within the method-specific holding time with the exception of Method 300.0 Nitrate-Nitrogen, Nitrite-Nitrogen and Orthophosphate which were received outside of holding time. The associated samples are flagged with an "H".

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
Prepared By

December 15, 1995
Date

**CASE NARRATIVE
INORGANIC METALS ANALYSES
WATER**

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

- Two water samples were received in good condition on November 21, 1995 and logged in as L5893.
- The samples were prepared as LAS Batch 1121BHT and analyzed for selected analytes as requested on the chain of custody. Sample BOGSF4 (L5893-3) was used for matrix spike and duplicate, post-digestion spike and serial dilution. All data flags due to the performance of the above-mentioned QC are associated with every sample digested with this batch.

Holding Time Requirements

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

Method Blanks

- The level of analytes in the method blanks were less than the reporting detection limits.

Internal Quality Control

All internal quality control were within acceptance limits.

Sample Results

- For calcium, magnesium and sodium, the Percent Difference of the serial dilution is outside the 10% control limit. This may be due to physical interferences. All associated analytes are flagged with an "E".

Hongsheng LI

1/2/96

Prepared By

Date

0005

**CASE NARRATIVE
INORGANIC METALS ANALYSES
FILTERED WATER**

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

- Two water samples were received in good condition on November 21, 1995 and logged in as L5893.
- The samples were prepared as LAS Batch 1121BHD and analyzed for selected analytes as requested on the chain of custody. Sample BOGSF5 (L5093-31) was used for matrix spike and duplicate, post-digestion spike and serial dilution. All data flags due to the performance of the above-mentioned QC are associated with every sample digested with this batch.

Holding Time Requirements

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

Method Blanks

- The level of analytes in the method blanks were less than the reporting detection limits.

Internal Quality Control

All internal quality control were within acceptance limits.

Hongsheng LI

1/2/96

Prepared By

Date

0006

**CASE NARRATIVE
ORGANIC ANALYSES**

Analytical Method CLP 3/90 Volatiles

This data package contains the volatile organic constituent results for the samples collected on November 17, 1995 and received at Lockheed Analytical Services on November 21, 1995. The samples and corresponding laboratory numbers can be found on the Method Blank Summary Form IV.

Sample Delivery Group Number: L5893

Login Number: L5893

Analytical Batch 112795-8260 D1 (water)

Holding Times

The samples were analyzed within holding time on November 27, 1995.

Instrument Tunes, Initial and Continuing Calibrations

All instrument tunes, initial and continuing calibrations were within QC criteria.

Surrogate Recoveries

Surrogate recoveries were within QC limits for all samples.

Method Blank Results

Target compounds and tentatively identified compounds (TICs) were not detected in the method blank.

Matrix Spike (MS) and Matrix Spike Duplicate (MSD)

Note: Sample BOGSG6 (L5893-16) was the native sample used for the MS and MSD analyzed in this analytical batch.

Compound recoveries were within QC limits in L5893-16MS and L5893-16MSD. The relative percent differences (RPDs) between the MS and MSD recoveries were within QC limits.

Lockheed Analytical Services

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Internal Standard Results

All internal standard area counts and retention times were within QC limits for all samples.

Sample Results

Target compounds were not detected in the associated client samples except in sample BOGSF1 (L5893-13). TICs were not detected in the associated client samples.

Prepared By: Lydia M. Coleman

December 27, 1995

0008

CASE NARRATIVE RADIOCHEMICAL ANALYSES

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

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

Holding Time Requirements

All holding times were met.

Gas Proportional Counter

Analytical Method Gross Alpha Beta

The gross alpha beta analysis was performed using standard operating procedure (SOP), LAL-91-SOP-0060. The samples were analyzed in workgroup 30664. The instrument calibration verification met criteria. The method blank was within QC criteria. The laboratory control sample (LCS) recoveries were within QC criteria. The matrix spike (MS) recoveries were within QC criteria. The duplicate (DUP) recoveries were within QC criteria. The minimum detectable activity (MDA) exceeded the reporting detection limit (RDL) due to residue weight limitations forcing a volume reduction. The affected samples are flagged with a "C" qualifier. No re-analyses were performed.

Analytical Method Strontium-90

The strontium-90 analysis was performed using SOP, LAL-91-SOP-0065. The samples were analyzed in workgroup 31149. The instrument calibration verification met criteria. The method blank was within QC criteria. The LCS recovery was within QC criteria. The DUP recoveries were within QC criteria. No re-analyses were performed.

Liquid Scintillation Counter

Analytical Method Carbon-14

The carbon-14 analysis was performed using SOP, LAL-92-SOP-0209. The samples were analyzed in workgroup 30662. The instrument calibration verification met criteria. The 0009

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method blank was within QC criteria. The LCS recovery was within QC criteria. The MS recovery was within QC criteria. The DUP recoveries were within QC criteria. The quench value was within curve limitations. No re-analyses were performed.

Analytical Method Tritium

The tritium analysis was performed using SOP, LAL-91-SOP-0066. The samples were analyzed in workgroup 30673. The instrument calibration verification met criteria. The method blank was within QC criteria. The LCS recovery was within QC criteria. The MS recovery was within QC criteria. The DUP recoveries were within QC criteria. The quench value was within curve limitations. No re-analyses were performed.

Yvonne M. Jacoby
Prepared By

December 14, 1995
Date

LOCKHEED ANALYTICAL SERVICES
 LOGIN CHAIN OF CUSTODY REPORT (ln01)
 Nov 21 1995, 02:41 pm

Login Number: L5893
 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
L5893-1 TEMP 4 Location: 157 Water 1 S SCREENING	BOGSF4 "SAF # B96-032"	17-NOV-95	21-NOV-95	26-DEC-95
			Hold: 15-MAY-96	
L5893-2 TEMP 4 Location: 157 Water 1 S SCREENING	BOGSF1 "SAF # B96-032"	17-NOV-95	21-NOV-95	26-DEC-95
			Hold: 15-MAY-96	
L5893-3 TEMP 4 Location: 157 Water 1 S CLP FURNACE Water 1 S CLP ICP	BOGSF4 "SAF # B96-032"	17-NOV-95	21-NOV-95	26-DEC-95
			Hold: 15-MAY-96 Hold: 15-MAY-96	
L5893-4 TEMP 4 Location: 157 Water 1 S CLP FURNACE Water 1 S CLP ICP	BOGSF1 "SAF # B96-032"	17-NOV-95	21-NOV-95	26-DEC-95
			Hold: 15-MAY-96 Hold: 15-MAY-96	
L5893-5 TEMP 4 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	BOGSF4 "SAF # B96-032"	17-NOV-95	21-NOV-95	26-DEC-95
			Hold: 15-DEC-95 Hold: 15-DEC-95 Hold: 19-NOV-95 Hold: 19-NOV-95 Hold: 19-NOV-95 Hold: 15-DEC-95	
L5893-6 TEMP 4 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	BOGSF1 "SAF # B96-032"	17-NOV-95	21-NOV-95	26-DEC-95
			Hold: 15-DEC-95 Hold: 15-DEC-95 Hold: 19-NOV-95 Hold: 19-NOV-95 Hold: 19-NOV-95 Hold: 15-DEC-95	

LOCKHEED ANALYTICAL SERVICES
 LOGIN CHAIN OF CUSTODY REPORT (ln01)
 Nov 21 1995, 02:41 pm

Login Number: L5893
 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
L5893-7 TEMP 4 "SAF # B96-032" Location: 157 Water 1 S CLP 3/90 VOLATILES	BOGSF4	17-NOV-95	21-NOV-95	26-DEC-95
				Hold:01-DEC-95
L5893-8 TEMP 4 "SAF # B96-032" Location: 157	BOGSF4	17-NOV-95	21-NOV-95	26-DEC-95
L5893-9 TEMP 4 "SAF # B96-032" Location: 157	BOGSF4	17-NOV-95	21-NOV-95	26-DEC-95
L5893-10 TEMP 4 "SAF # B96-032" Location: 157 Water 1 S CLP 3/90 VOLATILES	BOGSG7	17-NOV-95	21-NOV-95	26-DEC-95
				Hold:01-DEC-95
L5893-11 TEMP 4 "SAF # B96-032" Location: 157	BOGSG7	17-NOV-95	21-NOV-95	26-DEC-95
L5893-12 TEMP 4 "SAF # B96-032" Location: 157	BOGSG7	17-NOV-95	21-NOV-95	26-DEC-95
L5893-13 TEMP 4 "SAF # B96-032" Location: 157 Water 1 S CLP 3/90 VOLATILES	BOGSF1	17-NOV-95	21-NOV-95	26-DEC-95
				Hold:01-DEC-95
L5893-14 TEMP 4 "SAF # B96-032" Location: 157	BOGSF1	17-NOV-95	21-NOV-95	26-DEC-95
L5893-15 TEMP 4 "SAF # B96-032" Location: 157	BOGSF1	17-NOV-95	21-NOV-95	26-DEC-95
L5893-16 TEMP 4 "SAF # B96-032" Location: 157 Water 1 S CLP 3/90 VOLATILES	BOGSG6	17-NOV-95	21-NOV-95	26-DEC-95
				Hold:01-DEC-95

LOCKHEED ANALYTICAL SERVICES
 LOGIN CHAIN OF CUSTODY REPORT (ln01)
 Nov 21 1995, 02:41 pm

Login Number: L5893
 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
L5893-17 TEMP 4 "SAF # B96-032" Location: 157	BOGSG6	17-NOV-95	21-NOV-95	26-DEC-95
L5893-18 TEMP 4 "SAF # B96-032" Location: 157	BOGSG6	17-NOV-95	21-NOV-95	26-DEC-95
L5893-19 TEMP 4 "SAF # B96-032" Location: 157 Water 1 S GR ALP/BETA LAL-0060 Hold:15-MAY-96 Water 1 S SR-90 LAL-0196 Hold:15-MAY-96	BOGSF4	17-NOV-95	21-NOV-95	26-DEC-95
L5893-20 TEMP 4 "SAF # B96-032" Location: 157	BOGSF4	17-NOV-95	21-NOV-95	26-DEC-95
L5893-21 TEMP 4 "SAF # B96-032" Location: 157	BOGSF4	17-NOV-95	21-NOV-95	26-DEC-95
L5893-22 TEMP 4 "SAF # B96-032" Location: 157	BOGSF4	17-NOV-95	21-NOV-95	26-DEC-95
L5893-23 TEMP 4 "SAF # B96-032" Location: 157	BOGSF4	17-NOV-95	21-NOV-95	26-DEC-95
L5893-24 TEMP 4 "SAF # B96-032" Location: 157 Water 1 S GR ALP/BETA LAL-0060 Hold:15-MAY-96 Water 1 S SR-90 LAL-0196 Hold:15-MAY-96	BOGSF1	17-NOV-95	21-NOV-95	26-DEC-95
L5893-25 TEMP 4 "SAF # B96-032" Location: 157	BOGSF1	17-NOV-95	21-NOV-95	26-DEC-95
L5893-26 TEMP 4 "SAF # B96-032" Location: 157	BOGSF1	17-NOV-95	21-NOV-95	26-DEC-95

LOCKHEED ANALYTICAL SERVICES
 LOGIN CHAIN OF CUSTODY REPORT (ln01)
 Nov 21 1995, 02:41 pm

Login Number: L5893
 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
L5893-27 TEMP 4 "SAF # B96-032" Location: 157	BOGSF1	17-NOV-95	21-NOV-95	26-DEC-95
L5893-28 TEMP 4 "SAF # B96-032" Location: 157	BOGSF1	17-NOV-95	21-NOV-95	26-DEC-95
L5893-29 TEMP 4 "SAF # B96-032" Location: 157 Water 1 S C-14 LAL-0209 Hold:15-MAY-96 Water 1 S TRITIUM(H3) LAL-0066 Hold:15-MAY-96	BOGSF4	17-NOV-95	21-NOV-95	26-DEC-95
L5893-30 TEMP 4 "SAF # B96-032" Location: 157 Water 1 S C-14 LAL-0209 Hold:15-MAY-96 Water 1 S TRITIUM(H3) LAL-0066 Hold:15-MAY-96	BOGSF1	17-NOV-95	21-NOV-95	26-DEC-95
L5893-31 TEMP 4 "SAF # B96-032" Location: 157 Filt H2O 15 S CLP FURNACE Hold:15-MAY-96 Filt H2O 15 S CLP ICP Hold:15-MAY-96	BOGSF5	17-NOV-95	21-NOV-95	26-DEC-95
L5893-32 TEMP 4 "SAF # B96-032" Location: 157 Filt H2O 15 S CLP FURNACE Hold:15-MAY-96 Filt H2O 15 S CLP ICP Hold:15-MAY-96	BOGSF2	17-NOV-95	21-NOV-95	26-DEC-95
L5893-33 Location: Water 1 S EDD - DISK DEL. Water 1 S GCMS2 Water 1 S INORG TYPE 2 RPT + Water 1 S RAD RPT TYPE 2	REPORT TYPE	21-NOV-95	21-NOV-95	26-DEC-95

Signature: *Paul J. Davis* 0018
 Date: 11-21-95

1121546

Bechtel Hanford, Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

L5893

Data Turnaround

- Priority
- Normal

Collector <i>A. Rice / B. Fehlberg</i>	Company Contact Bob Raidl	Telephone (509) 372-9641
Project Designation 100-FR-3 Groundwater - Round 8	Sampling Location 100 F	SAF No. B96-032
Ice Chest No. <i>STE. Helen</i>	Field Logbook No. <i>SEL-1054</i>	Method of Shipment Federal Express
Shipped To Lockheed	Offsite Property No. <i>NA KT 11/20/95 W/96-0-0640-09</i>	Bill of Lading/Air Bill No. <i>NA KT 11/20/95 290 4646 753</i>

Possible Sample Hazards/Remarks	Preservation	HNO ₃	Cool 4°C	HCl	HNO ₃	Cool 4°C	Cool 4°C	HNO ₃
	Type of Container	P/G	P/G	Gs	P/G	G	P/G	P/G
	No. of Container(s)	1	1	3	5	1	1	1
Special Handling and/or Storage Maintain samples between 2°C and 6°C.	Volume	1L	500mL	40mL	1L	1L	20mL	1L
SAMPLE ANALYSIS	ICP Metals-TAL, AA Metals-As, Pb. (Unfiltered)	Anions (IC) F, Cl, SO ₄ , PO ₄ , NO ₂ , NO ₃	VOA-TCL	Gross Alpha, Gross Beta, Sr-90	Tritium, C-14	Activity Scan	ICP Metals-TAL, AA Metals-As, Pb. (Filtered)	

Sample No.	Matrix*	Date Sampled	Time Sampled							
BOGSF4	W	11-17-95	1250	Y	X	X	X	X	Y	
BOGSF5	W	11-17-95	1250							X
BOGSF6	W	11-17-95	1250			X	KT 11/20/95			
BOGS67	W	11-17-95	0545			Y				

CHAIN OF POSSESSION	Sign/Print Names	SPECIAL INSTRUCTIONS	Matrix*
Relinquished By <i>B. Fehlberg / B. Fehlberg</i>	Date/Time 11/17/95 14:05	Received By <i>ERC</i>	Date/Time 11-17-95
Relinquished By <i>ERC</i>	Date/Time 11-20-95 0800	Received By <i>B. Fehlberg</i>	Date/Time 11-17-95
Relinquished By <i>K. Trapp / K. Trapp</i>	Date/Time 11-20-95 0950	Received By <i>K. Trapp / K. Trapp</i>	Date/Time 11-20-95
Relinquished By	Date/Time	Received By	Date/Time
		Sample analysis for PO ₄ , NO ₂ , and NO ₃ by EPA 300.0 is being requested for information only. The ERC Contractor acknowledges that the 48-hour holding time will not be met.	
		The Activity Scan is for all samples listed on this chain of custody.	

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

LABORATORY SECTION	Received By <i>M. ...</i>	Title Sample Custodian	Date/Time 11-21-95/08-15
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

6100
06/5/95

Bechtel Hanford, Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

Data Turnaround

- Priority
- Normal

Collector <i>A. Rizzo / B. Fritzen</i>	Company Contact Bob Raidl	Telephone (509) 372-9641
Project Designation 100-FR-3 Groundwater - Round 8	Sampling Location 100 F	SAF No. B96-032
Ice Chest No. <i>Ste. Helen</i>	Field Logbook No. <i>ERC-1054</i>	Method of Shipment Federal Express
Shipped To Lockheed	Offsite Property No. <i>NA KR 11/20/95 WAG-0-0640-09</i>	Bill of Lading/Air Bill No. <i>NA KR 11/20/95 290 4646 773</i>

Possible Sample Hazards/Remarks	Preservation	HNO ₃	Cool 4°C	HCl	HNO ₃	Cool 4°C	Cool 4°C	HNO ₃
	Type of Container	P/G	P/G	Gs	P/G	G	P/G	P/G
	No. of Container(s)	1	1	3	5	1	1	1
Special Handling and/or Storage Maintain samples between 2°C and 6°C.	Volume	1L	500mL	40mL	1L	1L	20mL	1L
SAMPLE ANALYSIS	ICP Metals-TAL, AA Metals-As, Pb. (Unfiltered)	ICP Metals-TAL, AA Metals-As, Pb. (Filtered)	Anions (Cl) -F, Cl, SO ₄ , PO ₄ , NO ₂ , NO ₃	VOA-TCL	Gross Alpha, Gross Beta, Sr-90	Tritium, C-14	Activity Scan	

Sample No.	Matrix*	Date Sampled	Time Sampled	F	X	X	X	N	T
BOGSF1	W	11-17-95	1105						
BOGSF2 <i>KR 11/20/95</i>	W	11-17-95	1105						X
BOGSF3 BOGSF6	W	11-17-95	1105			X			
BOGSF6		11-17-95	0545			X			<i>KR 11/20/95</i>

CHAIN OF POSSESSION	Sign/Print Names	SPECIAL INSTRUCTIONS Sample analysis for PO ₄ , NO ₂ , and NO ₃ by EPA 300.0 is being requested for information only. The ERC Contractor acknowledges that the 48-hour holding time will not be met. The Activity Scan is for all samples listed on this chain of custody.	Matrix* S = Soil SE = Sediment SO = Solid SL = Sludge W = Water O = Oil A = Air DS = Drum Solids DL = Drum Liquids T = Tissue WI = Wipe L = Liquid V = Vegetation X = Other
Relinquished By <i>B. Fritzen</i>	Date/Time 11/17/95 14:05	Received By <i>Eric</i>	Date/Time 1405
Relinquished By <i>B. Fritzen</i>	Date/Time 0800	Received By <i>B. Whitton</i>	Date/Time 11-17-95
Relinquished By <i>K. Trap</i>	Date/Time 11-20-95	Received By <i>K. Trap</i>	Date/Time 11/20/95
Relinquished By <i>K. Trap</i>	Date/Time 11/20/95	Received By	Date/Time

LABORATORY SECTION	Received By <i>Admalle</i>	Title <i>Sample Custodian</i>	Date/Time 11-21-95
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time 11/21/95

020 11/21/95

Environmental
Restoration
Contractor **ERC Team**
Interoffice Memorandum

J 2 2 0 0 0
Job No. 22192
Written Response Request: NO.
CCN: N/A
OU: 100-FR-3
TSD: N/A
ERA: N/A
Subject Code: 5830

TO: W. S. Thompson N1-28 DATE: October 31, 1995
J. E. Parsons X0-23

COPIES: K. F. Trapp N1-28 FROM: S. K. De Mers 
T. L. Lafreniere X0-23
Radiological Controls
T7-05/373-1913

SUBJECT: 1995 Round 8 sampling for 100-FR-3

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.

All except two of 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 9,900 pCi/l β (H³) and 50 pCi/l α .

The remaining wells are in locations that do not provide a credible path whereby they could become contaminated at the above listed levels.

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

0021

1121596

WELL LISTED IN THE 1995 100-FR-3 ROUND 8 SAMPLING

199-F1-2
199-F5-1
199-F5-4
199-F5-6
199-F5-42
199-F5-43A
199-F5-43B
199-F5-44
199-F5-45
199-F5-46
199-F5-47
199-F5-48
199-F6-1
199-F7-1
199-F7-2
199-F7-3
199-F8-1
199-F8-2
199-F8-3
199-F8-4
699-71-30
699-77-36
699-83-47
699-74-44
699-80-43S
699-81-38
699-80-39B

SAMPLE CHECK-IN LIST

Date/Time Received: 11-21-95/0845 SDG#: N/A

Work Order Number: N/A SAF #: B96-032

Shipping Container ID: STE. Helen Chain of Custody # N/A

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

7. Samples have:

<input type="checkbox"/> tape	<input type="checkbox"/> hazard labels
<input checked="" type="checkbox"/> custody seals	<input type="checkbox"/> appropriate sample labels

8. Samples are:

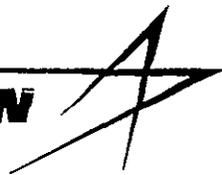
<input checked="" type="checkbox"/> in good condition	<input type="checkbox"/> leaking
<input type="checkbox"/> broken	<input type="checkbox"/> have air bubbles

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

Notes: nitrate/nitrite was received passed Holding Time

Sample Custodian/Laboratory: J. (C.) Lane / LAS Date: 11-21-95
Telephoned To: Kathleen Hall On 11-21-95 By Paul C. [unclear]
Faxed 1200 11-21-95

LOCKHEED MARTIN



Sample Login Login Review Checklist

Lot Number LS893

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

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

SAMPLE SUMMARY REPORT

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

LOGIN CHAIN OF CUSTODY

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

SAMPLE RECEIVING CHECKLIST

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

Paul Davis 11-21-95
primary review signature date

Annella
secondary review signature

11-21-95
date 0024

1121596

Lockheed Analytical Services
Sample Receiving Checklist

Client Name: *Bechtel - Hanford* Job No. *LS893* Cooler ID: *-1007*

COOLER CONDITION UPON RECEIPT

Temperature of cooler upon receipt: *4°C*
 temperature of temp. blank upon receipt: *-*

	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		<input checked="" type="checkbox"/>	
are samples bi-phasic (if so, indicate sample ID'S):			<i>not</i>

MISCELLANEOUS ITEMS

	Yes	No	* Comments/Discrepancies
samples with short holding times	<input checked="" type="checkbox"/>		<i>various/average 12000 passed Holding Times</i>
samples to subcontract		<input checked="" type="checkbox"/>	<i>not</i>

ADDITIONAL COMMENTS/DISCREPANCIES

Completed by / date: *Paula Jordan 11-21-85*
 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

025

1121596

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

Client	LAL	SDG	Matrix	Method
Sample Number	Sample Number	Number		
BOGSF1 -	L5893-2		Water	SCREENING -
	L5893-4		Water	- CLP FURNACE -
	L5893-4		Water	CLP ICP -
	L5893-6		Water	300.0 CHLORIDE -
	L5893-6		Water	300.0 FLUORIDE -
	L5893-6		Water	300.0 NITRATE -
	L5893-6		Water	300.0 NITRITE -
	L5893-6		Water	- 300.0 PHOSPHATE -
	L5893-6		Water	300.0 SULFATE -
	L5893-13		Water	- CLP 3/90 VOLATILE
	L5893-24		Water	GR ALP/BETA LAL-C
	L5893-24		Water	- SR-90 LAL-0196 -
	L5893-30		Water	- C-14 LAL-0209 -
L5893-30		Water	- TRITIUM(H3) LAL-C	
BOGSF2 -	L5893-32		Filt H2O	- CLP FURNACE -
	L5893-32		Filt H2O	- CLP ICP -
BOGSF4 -	L5893-1		Water	SCREENING -
	L5893-3		Water	CLP FURNACE -
	L5893-3		Water	CLP ICP -
	L5893-5		Water	300.0 CHLORIDE -
	L5893-5		Water	300.0 FLUORIDE -
	L5893-5		Water	300.0 NITRATE -
	L5893-5		Water	300.0 NITRITE -
	L5893-5		Water	300.0 PHOSPHATE -
	L5893-5		Water	300.0 SULFATE -
	L5893-7		Water	CLP 3/90 VOLATILE
	L5893-19		Water	GR ALP/BETA LAL-C
	L5893-19		Water	- SR-90 LAL-0196 -
L5893-29		Water	- C-14 LAL-0209 -	
L5893-29		Water	- TRITIUM(H3) LAL-C	
BOGSF5 -	L5893-31		Filt H2O	- CLP FURNACE -
	L5893-31		Filt H2O	- CLP ICP -
BOGS6 -	L5893-16		Water	- CLP 3/90 VOLATILE
BOGS7 -	L5893-10		Water	CLP 3/90 VOLATILE
REPORT TYPE -	L5893-33		Water	EDD - DISK DEL. -
	L5893-33		Water	GCMS2 -
	L5893-33		Water	INORG TYPE 2 RPT
	L5893-33		Water	RAD RPT TYPE 2 -

0026

1121596

LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: B0GSF4	Date Collected: 17-NOV-95
Matrix: Water	Date Received: 21-NOV-95
Percent Solids: N/A	

Constituent	Units	Method	Result	Project Reporting Limit	Data Qualifier(s)	Date Analyzed	LAS Batch ID	LAS Sample ID
Chloride	mg/L	300.0	2.1	0.020		28-NOV-95	30612	L5893-5
Fluoride	mg/L	300.0	0.073	0.10	B	08-DEC-95	30613	L5893-5
Nitrate-N	mg/L	300.0	3.3	0.020	H	28-NOV-95	30614	L5893-5
Nitrite-N	mg/L	300.0	< 0.002	0.010	HU	28-NOV-95	30615	L5893-5
Ortho Phosphate	mg/L	300.0	< 0.020	0.10	HU	08-DEC-95	30616	L5893-5
Sulfate	mg/L	300.0	31.	0.10		28-NOV-95	30617	L5893-5

LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: BOGSF1	Date Collected: 17-NOV-95
Matrix: Water	Date Received: 21-NOV-95
Percent Solids: N/A	

Constituent	Units	Method	Result	Project Reporting Limit	Data Qualifier(s)	Date Analyzed	LAS Batch ID	LAS Sample ID
Chloride	mg/L	300.0	15.	0.020		28-NOV-95	30612	L5893-6
Fluoride	mg/L	300.0	0.41	0.10		08-DEC-95	30613	L5893-6
Nitrate-N	mg/L	300.0	21.	0.020	H	28-NOV-95	30614	L5893-6
Nitrite-N	mg/L	300.0	< 0.002	0.010	HU	28-NOV-95	30615	L5893-6
Ortho Phosphate	mg/L	300.0	< 0.020	0.10	HU	08-DEC-95	30616	L5893-6
Sulfate	mg/L	300.0	72.	0.10		28-NOV-95	30617	L5893-6

1
INORGANIC ANALYSES DATA SHEET

CLIENT ID NO.

BOGSF1

Lab Name: L.A.S. _____ Contract: BECHTEL _____
 Lab Code: LOCK__ Case No.: 1121BH SAS No.: _____ SDG No.: L5893W
 Matrix (soil/water): WATER Lab Sample ID: L5893-4__
 Level (low/med): LOW__ Date Received: 11/21/95
 % Solids: _____0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	21.0	U		P
7440-36-0	Antimony	2.0	U		P
7440-38-2	Arsenic	12.5			P
7440-39-3	Barium	46.4	E		P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	5.0	U		P
7440-70-2	Calcium	63900		E	P
7440-47-3	Chromium	4.0	U		P
7440-48-4	Cobalt	6.0	U		P
7440-50-8	Copper	3.0	U		P
7439-89-6	Iron	20.4	B		P
7439-92-1	Lead	1.0	U		P
7439-95-4	Magnesium	20500		E	P
7439-96-5	Manganese	2.0	U		P
7440-02-0	Nickel	14.0	U		P
7440-09-7	Potassium	7420			P
7782-49-2	Selenium	4.8	E		P
7440-22-4	Silver	3.0	U		P
7440-23-5	Sodium	59900		E	P
7440-28-0	Thallium	3.0	U		P
7440-62-2	Vanadium	18.2	B		P
7440-66-6	Zinc	9.1	B		P

Color Before: COLORLESS Clarity Before: CLEAR_ Texture: _____
 Color After: COLORLESS Clarity After: CLEAR_ Artifacts: _____

Comments:

1
INORGANIC ANALYSES DATA SHEET

CLIENT ID NO.

BOGSF4

Lab Name: L.A.S. _____ Contract: BECHTEL _____
 Lab Code: LOCK__ Case No.: 1121BH SAS No.: _____ SDG No.: L5893W
 Matrix (soil/water): WATER Lab Sample ID: L5893-3__
 Level (low/med): LOW__ Date Received: 11/21/95
 % Solids: _____0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	23.7	B		P
7440-36-0	Antimony	2.0	U		P
7440-38-2	Arsenic	2.4	B		P
7440-39-3	Barium	31.9	B		P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	5.0	U		P
7440-70-2	Calcium	42300		E	P
7440-47-3	Chromium	4.0	U		P
7440-48-4	Cobalt	6.0	U		P
7440-50-8	Copper	3.0	U		P
7439-89-6	Iron	62.9	B		P
7439-92-1	Lead	1.0	U		P
7439-95-4	Magnesium	6920		E	P
7439-96-5	Manganese	2.0	U		P
7440-02-0	Nickel	14.0	U		P
7440-09-7	Potassium	2090	B		P
7782-49-2	Selenium	3.0	U		P
7440-22-4	Silver	3.0	U		P
7440-23-5	Sodium	3930	B	E	P
7440-28-0	Thallium	3.0	U		P
7440-62-2	Vanadium	4.0	U		P
7440-66-6	Zinc	12.2	B		P

Color Before: COLORLESS Clarity Before: CLEAR_ Texture: _____
 Color After: COLORLESS Clarity After: CLEAR_ Artifacts: _____

Comments:

1
INORGANIC ANALYSES DATA SHEET

CLIENT ID NO.

BOGSF2

Lab Name: L.A.S. _____ Contract: BECHTEL _____

Lab Code: LOCK__ Case No.: 1121BH SAS No.: _____ SDG No.: L5893F

Matrix (soil/water): WATER Lab Sample ID: L5893-32__

Level (low/med): LOW__ Date Received: 11/21/95

% Solids: _____0

Concentration Units (ug/L or mg/kg dry weight): UG/L__

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	26.3	B		P
7440-36-0	Antimony	2.0	U		P
7440-38-2	Arsenic	5.6	B		P
7440-39-3	Barium	48.4	B		P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	5.0	U		P
7440-70-2	Calcium	71700			P
7440-47-3	Chromium	4.0	U		P
7440-48-4	Cobalt	6.0	U		P
7440-50-8	Copper	3.0	U		P
7439-89-6	Iron	9.0	U		P
7439-92-1	Lead	1.0	U		P
7439-95-4	Magnesium	22100			P
7439-96-5	Manganese	2.0	U		P
7440-02-0	Nickel	14.0	U		P
7440-09-7	Potassium	8000			P
7782-49-2	Selenium	6.7			P
7440-22-4	Silver	3.0	U		P
7440-23-5	Sodium	61700			P
7440-28-0	Thallium	3.0	U		P
7440-62-2	Vanadium	21.4	B		P
7440-66-6	Zinc	3.0	U		P

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

1
INORGANIC ANALYSES DATA SHEET

CLIENT ID NO.

BOGSF5

Lab Name: L.A.S. _____ Contract: BECHTEL _____

Lab Code: LOCK _____ Case No.: 1121BH SAS No.: _____ SDG No.: L5893F

Matrix (soil/water): WATER Lab Sample ID: L5893-31 _____

Level (low/med): LOW _____ Date Received: 11/21/95

% Solids: _____ 0

Concentration Units (ug/L or mg/kg dry weight): UG/L _____

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	21.0	U		P
7440-36-0	Antimony	2.0	U		P
7440-38-2	Arsenic	2.0	U		P
7440-39-3	Barium	34.0	B		P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	5.0	U		P
7440-70-2	Calcium	48800			P
7440-47-3	Chromium	4.0	U		P
7440-48-4	Cobalt	6.0	U		P
7440-50-8	Copper	3.0	U		P
7439-89-6	Iron	9.0	U		P
7439-92-1	Lead	1.0	U		P
7439-95-4	Magnesium	7890			P
7439-96-5	Manganese	2.0	U		P
7440-02-0	Nickel	14.0	U		P
7440-09-7	Potassium	1380	B		P
7782-49-2	Selenium	3.0	U		P
7440-22-4	Silver	3.0	U		P
7440-23-5	Sodium	4280	B		P
7440-28-0	Thallium	3.0	U		P
7440-62-2	Vanadium	4.0	U		P
7440-66-6	Zinc	3.0	U		P

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

LOCKHEED ANALYTICAL LABORATORY
VOLATILE ORGANICS ANALYSIS DATA SHEET

CUSTOMER SAMPLE NO.

BOGSF4

Lab Job Name: BECHTEL-HANFORD

Contract: _

Lab Code: LAS

Case No.:

SAS No.:

SDG No.: L5893

Matrix: (soil/water) WATER

Lab Sample ID: L5893-7

Sample wt/vol: 5.00 (g/ml) ML

Lab File ID: D0475

Level: (low/med) LOW

Date Received: 11/21/95

% Moisture: not dec. 0

Date Analyzed: 11/27/95

GC Column: RTX502.2 ID: 0.53 (mm)

Dilution Factor: 1.00

Soil Extract Volume: 1.00 (ML)

Soil Aliquot Volume: 1.00 (uL)

CAS NO. COMPOUND CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L Q

74-87-3	Chloromethane	10.	U
74-83-9	Bromomethane	10.	U
75-01-4	Vinyl Chloride	10.	U
75-00-3	Chloroethane	10.	U
75-09-2	Methylene Chloride	10.	U
67-64-1	Acetone	10.	U
75-15-0	Carbon Disulfide	10.	U
75-35-4	1,1-Dichloroethene	10.	U
75-34-3	1,1-Dichloroethane	10.	U
540-59-0	1,2-Dichloroethene (total)	10.	U
67-66-3	Chloroform	10.	U
107-06-2	1,2-Dichloroethane	10.	U
78-93-3	2-Butanone	10.	U
71-55-6	1,1,1-Trichloroethane	10.	U
56-23-5	Carbon Tetrachloride	10.	U
75-27-4	Bromodichloromethane	10.	U
78-87-5	1,2-Dichloropropane	10.	U
10061-01-5	cis-1,3-Dichloropropene	10.	U
79-01-6	Trichloroethene	10.	U
124-48-1	Dibromochloromethane	10.	U
79-00-5	1,1,2-Trichloroethane	10.	U
71-43-2	Benzene	10.	U
10061-02-6	trans-1,3-Dichloropropene	10.	U
75-25-2	Bromoform	10.	U
108-10-1	4-Methyl-2-Pentanone	10.	U
591-78-6	2-Hexanone	10.	U
127-18-4	Tetrachloroethene	10.	U
79-34-5	1,1,2,2-Tetrachloroethane	10.	U
108-88-3	Toluene	10.	U
108-90-7	Chlorobenzene	10.	U
100-41-4	Ethylbenzene	10.	U
100-42-5	Styrene	10.	U
1330-20-7	Xylenes (total)	10.	U

LOCKHEED ANALYTICAL LABORATORY
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

CUSTOMER SAMPLE NO.

BOGSF4

Lab Job Name: BECHTEL-HANFORD

Contract: _____

Lab Code: LAS

Case No.: _____

SAS No.: _____

SDG No.: L5893

Matrix: (soil/water) WATER

Lab Sample ID: L5893-7

Sample wt/vol: 5.00 (g/ml) ML

Lab File ID: D0475

Level: (low/med) LOW

Date Received: 11/21/95

% Moisture: not dec. 0

Date Analyzed: 11/27/95

GC Column: RTX502.2 ID: 0.53 (mm)

Dilution Factor: 1.00

Soil Extract Volume: 1.00 (uL)

Soil Aliquot Volume: 1.00 (uL)

Number TICs Found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L_

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
=====	=====	=====	=====	=====
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
19.				
20.				
21.				
22.				
23.				
24.				
25.				
26.				
27.				
28.				
29.				
30.				

LOCKHEED ANALYTICAL LABORATORY
VOLATILE ORGANICS ANALYSIS DATA SHEET

CUSTOMER SAMPLE NO.

BOGSG7

Lab Job Name: BECHTEL-HANFORD

Contract: _

Lab Code: LAS

Case No.:

SAS No.:

SDG No.: L5893

Matrix: (soil/water) WATER

Lab Sample ID: L5893-10

Sample wt/vol: 5.00 (g/ml) ML

Lab File ID: D0476

Level: (low/med) LOW

Date Received: 11/21/95

% Moisture: not dec. 0

Date Analyzed: 11/27/95

GC Column: RTX502.2 ID: 0.53 (mm)

Dilution Factor: 1.00

Soil Extract Volume: 1.00 (ML)

Soil Aliquot Volume: 1.00 (uL)

CAS NO. COMPOUND CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L Q

74-87-3	Chloromethane	10.	U
74-83-9	Bromomethane	10.	U
75-01-4	Vinyl Chloride	10.	U
75-00-3	Chloroethane	10.	U
75-09-2	Methylene Chloride	10.	U
67-64-1	Acetone	10.	U
75-15-0	Carbon Disulfide	10.	U
75-35-4	1,1-Dichloroethene	10.	U
75-34-3	1,1-Dichloroethane	10.	U
540-59-0	1,2-Dichloroethene (total)	10.	U
67-66-3	Chloroform	10.	U
107-06-2	1,2-Dichloroethane	10.	U
78-93-3	2-Butanone	10.	U
71-55-6	1,1,1-Trichloroethane	10.	U
56-23-5	Carbon Tetrachloride	10.	U
75-27-4	Bromodichloromethane	10.	U
78-87-5	1,2-Dichloropropane	10.	U
10061-01-5	cis-1,3-Dichloropropene	10.	U
79-01-6	Trichloroethene	10.	U
124-48-1	Dibromochloromethane	10.	U
79-00-5	1,1,2-Trichloroethane	10.	U
71-43-2	Benzene	10.	U
10061-02-6	trans-1,3-Dichloropropene	10.	U
75-25-2	Bromoform	10.	U
108-10-1	4-Methyl-2-Pentanone	10.	U
591-78-6	2-Hexanone	10.	U
127-18-4	Tetrachloroethene	10.	U
79-34-5	1,1,2,2-Tetrachloroethane	10.	U
108-88-3	Toluene	10.	U
108-90-7	Chlorobenzene	10.	U
100-41-4	Ethylbenzene	10.	U
100-42-5	Styrene	10.	U
1330-20-7	Xylenes (total)	10.	U

LOCKHEED ANALYTICAL LABORATORY
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

CUSTOMER SAMPLE NO.

BOGSG7

Lab Job Name: BECHTEL-HANFORD

Contract: _

Lab Code: LAS

Case No.:

SAS No.:

SDG No.: L5893

Matrix: (soil/water) WATER

Lab Sample ID: L5893-10

Sample wt/vol: 5.00 (g/ml) ML

Lab File ID: D0476

Level: (low/med) LOW

Date Received: 11/21/95

% Moisture: not dec. 0

Date Analyzed: 11/27/95

GC Column: RTX502.2 ID: 0.53 (mm)

Dilution Factor: 1.00

Soil Extract Volume: 1.00 (uL)

Soil Aliquot Volume: 1.00 (uL)

Number TICs Found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L_

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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LOCKHEED ANALYTICAL LABORATORY
VOLATILE ORGANICS ANALYSIS DATA SHEET

CUSTOMER SAMPLE NO.

BOGSF1

Lab Job Name: BECHTEL-HANFORD

Contract: _

Lab Code: LAS

Case No.:

SAS No.:

SDG No.: L5893

Matrix: (soil/water) WATER

Lab Sample ID: L5893-13

Sample wt/vol: 5.00 (g/ml) ML

Lab File ID: D0477

Level: (low/med) LOW

Date Received: 11/21/95

% Moisture: not dec. 0

Date Analyzed: 11/27/95

GC Column: RTX502.2 ID: 0.53 (mm)

Dilution Factor: 1.00

Soil Extract Volume: 1.00 (ML)

Soil Aliquot Volume: 1.00 (uL)

CAS NO. COMPOUND CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L Q

74-87-3	-----Chloromethane	10.	U
74-83-9	-----Bromomethane	10.	U
75-01-4	-----Vinyl Chloride	10.	U
75-00-3	-----Chloroethane	10.	U
75-09-2	-----Methylene Chloride	10.	U
67-64-1	-----Acetone	10.	U
75-15-0	-----Carbon Disulfide	10.	U
75-35-4	-----1,1-Dichloroethene	10.	U
75-34-3	-----1,1-Dichloroethane	10.	U
540-59-0	-----1,2-Dichloroethene (total)	10.	U
67-66-3	-----Chloroform	10.	U
107-06-2	-----1,2-Dichloroethane	10.	U
78-93-3	-----2-Butanone	10.	U
71-55-6	-----1,1,1-Trichloroethane	10.	U
56-23-5	-----Carbon Tetrachloride	10.	U
75-27-4	-----Bromodichloromethane	10.	U
78-87-5	-----1,2-Dichloropropane	10.	U
10061-01-5	-----cis-1,3-Dichloropropene	10.	U
79-01-6	-----Trichloroethene	24.	
124-48-1	-----Dibromochloromethane	10.	U
79-00-5	-----1,1,2-Trichloroethane	10.	U
71-43-2	-----Benzene	10.	U
10061-02-6	-----trans-1,3-Dichloropropene	10.	U
75-25-2	-----Bromoform	10.	U
108-10-1	-----4-Methyl-2-Pentanone	10.	U
591-78-6	-----2-Hexanone	10.	U
127-18-4	-----Tetrachloroethene	10.	U
79-34-5	-----1,1,2,2-Tetrachloroethane	10.	U
108-88-3	-----Toluene	10.	U
108-90-7	-----Chlorobenzene	10.	U
100-41-4	-----Ethylbenzene	10.	U
100-42-5	-----Styrene	10.	U
1330-20-7	-----Xylenes (total)	10.	U

LOCKHEED ANALYTICAL LABORATORY
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

CUSTOMER SAMPLE NO.

BOGSF1

Lab Job Name: BECHTEL-HANFORD

Contract: _

Lab Code: LAS

Case No.:

SAS No.:

SDG No.: L5893

Matrix: (soil/water) WATER

Lab Sample ID: L5893-13

Sample wt/vol: 5.00 (g/ml) ML

Lab File ID: D0477

Level: (low/med) LOW

Date Received: 11/21/95

% Moisture: not dec. 0

Date Analyzed: 11/27/95

GC Column: RTX502.2 ID: 0.53 (mm)

Dilution Factor: 1.00

Soil Extract Volume: 1.00 (uL)

Soil Aliquot Volume: 1.00 (uL)

Number TICs Found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L_

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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LOCKHEED ANALYTICAL LABORATORY
VOLATILE ORGANICS ANALYSIS DATA SHEET

CUSTOMER SAMPLE NO.

BOGSG6

Lab Job Name: BECHTEL-HANFORD

Contract: _

Lab Code: LAS

Case No.:

SAS No.:

SDG No.: L5893

Matrix: (soil/water) WATER

Lab Sample ID: L5893-16

Sample wt/vol: 5.00 (g/ml) ML

Lab File ID: D0478

Level: (low/med) LOW

Date Received: 11/21/95

% Moisture: not dec. 0

Date Analyzed: 11/27/95

GC Column: RTX502.2 ID: 0.53 (mm)

Dilution Factor: 1.00

Soil Extract Volume: 1.00 (ML)

Soil Aliquot Volume: 1.00 (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
---------	----------	--	---

74-87-3-----	Chloromethane	10.	U
74-83-9-----	Bromomethane	10.	U
75-01-4-----	Vinyl Chloride	10.	U
75-00-3-----	Chloroethane	10.	U
75-09-2-----	Methylene Chloride	10.	U
67-64-1-----	Acetone	10.	U
75-15-0-----	Carbon Disulfide	10.	U
75-35-4-----	1,1-Dichloroethene	10.	U
75-34-3-----	1,1-Dichloroethane	10.	U
540-59-0-----	1,2-Dichloroethene (total)	10.	U
67-66-3-----	Chloroform	10.	U
107-06-2-----	1,2-Dichloroethane	10.	U
78-93-3-----	2-Butanone	10.	U
71-55-6-----	1,1,1-Trichloroethane	10.	U
56-23-5-----	Carbon Tetrachloride	10.	U
75-27-4-----	Bromodichloromethane	10.	U
78-87-5-----	1,2-Dichloropropane	10.	U
10061-01-5-----	cis-1,3-Dichloropropene	10.	U
79-01-6-----	Trichloroethene	10.	U
124-48-1-----	Dibromochloromethane	10.	U
79-00-5-----	1,1,2-Trichloroethane	10.	U
71-43-2-----	Benzene	10.	U
10061-02-6-----	trans-1,3-Dichloropropene	10.	U
75-25-2-----	Bromoform	10.	U
108-10-1-----	4-Methyl-2-Pentanone	10.	U
591-78-6-----	2-Hexanone	10.	U
127-18-4-----	Tetrachloroethene	10.	U
79-34-5-----	1,1,2,2-Tetrachloroethane	10.	U
108-88-3-----	Toluene	10.	U
108-90-7-----	Chlorobenzene	10.	U
100-41-4-----	Ethylbenzene	10.	U
100-42-5-----	Styrene	10.	U
1330-20-7-----	Xylenes (total)	10.	U

LOCKHEED ANALYTICAL LABORATORY
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

CUSTOMER SAMPLE NO.

BOGSG6

Lab Job Name: BECHTEL-HANFORD

Contract: _____

Lab Code: LAS

Case No.: _____

SAS No.: _____

SDG No.: L5893

Matrix: (soil/water) WATER

Lab Sample ID: L5893-16

Sample wt/vol: 5.00 (g/ml) ML

Lab File ID: D0478

Level: (low/med) LOW

Date Received: 11/21/95

% Moisture: not dec. 0

Date Analyzed: 11/27/95

GC Column: RTX502.2 ID: 0.53 (mm)

Dilution Factor: 1.00

Soil Extract Volume: 1.00 (uL)

Soil Aliquot Volume: 1.00 (uL)

Number TICs Found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L_

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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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: B0GSF4

LAL Sample ID: L5893-19

Date Collected: 17-NOV-95

Date Received: 21-NOV-95

Matrix: Water

Login Number: L5893

Constituent	Analyzed	Batch	Activity	Error	MDA	DataQual	Units
Gross Alpha	12-DEC-95	GR ALP/BETA LAL-0060_30664	0.9	1.1	1.9		pCi/L
Gross Beta	12-DEC-95	GR ALP/BETA LAL-0060_30664	53.0	4.2	2.1		pCi/L
STRONTIUM-89,90	08-DEC-95	SR-90 LAL-0065_31149	24.9	1.5	0.47		pCi/L

LOCKHEED ANALYTICAL SERVICES

RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. * Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: B0GSF1

LAL Sample ID: L5893-24

Date Collected: 17-NOV-95

Date Received: 21-NOV-95

Matrix: Water

Login Number: L5893

Constituent	Analyzed	Batch	Activity	Error	MDA	DataQual	Units
Gross Alpha	12-DEC-95	GR ALP/BETA LAL-0060_30664	5.7	3.3	4.3	C	pCi/L
Gross Beta	12-DEC-95	GR ALP/BETA LAL-0060_30664	12.9	2.8	3.6		pCi/L
STRONTIUM-89,90	08-DEC-95	SR-90 LAL-0065_31149	-0.01	0.28	0.49		pCi/L

LOCKHEED ANALYTICAL SERVICES

RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. * Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: B0GSF4

LAL Sample ID: L5893-29

Date Collected: 17-NOV-95

Date Received: 21-NOV-95

Matrix: Water

Login Number: L5893

Constituent	Analyzed	Batch	Activity	Error	MDA	DataQual	Units
C-14	06-DEC-95	C-14 LAL-0209_30662	41.	85.	100		pCi/L
H-3	12-DEC-95	TRITIUM(H3) LAL-0066_30673	320	200	220		pCi/L

LOCKHEED ANALYTICAL SERVICES

RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. * Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: B0GSF1

LAL Sample ID: L5893-30

Date Collected: 17-NOV-95

Date Received: 21-NOV-95

Matrix: Water

Login Number: L5893

Constituent	Analyzed	Batch	Activity	Error	MDA	DataQual	Units
C-14	06-DEC-95	C-14 LAL-0209_30662	12.	82.	100		pCi/L
H-3	12-DEC-95	TRITIUM(H3) LAL-0066_30673	400	200	220		pCi/L

SECONDARY/WORKING LEVEL STANDARD DILUTION RECORD

Dilution Source Information

Isotope: Am-241 and Sr-90

Parent Barcode Number: AA0030 AA0046
Am-241 IPL 388-100-1

Vendor or Certificate I.D. # of Parent Standard: Sr-90 NEST SRM 4319G
Am-241 91-0225-60-1

Diluted Source Logbook I.D. #: Sr-90 91-0225-30-2

Balance Verification?: Yes

Diluent Used: 0.1 N HNO₃

Dilution

* Diluent: 0.1 N HNO₃ + 42mg Sr(NO₃)₂/mL

* Density of diluent (g/ml): NA

a: Parent Specific Activity: Am-241 981 pCi/mL
Sr-90 600 pCi/mL m 8/1/90

b: Amount of Source Transferred: Am-241 0.5 mL
Sr-90 0.5 mL

c: Total amount of Dilution: 500 mL

d: Total Volume of Dilution: 500 mL

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

f: Activity of Dilution (a * b / d): Am-241 9.81 pCi/mL
Sr-90 12 pCi/mL m 8/1/90

Dilution Logbook I.D. #: 95-721-13-1

Prepared By: Joe Hutchinson Preparation Date: 8/23/95

Reviewed By: Greg Moad Review Date: 8/24/95

* 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

0147

Signed _____

Date _____

Signed _____

Date _____

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 Cl.

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 Cl/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. Moore
 QUALITY CONTROL

0148

AA0046 ✓



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 x 10 ⁵ Bq g ⁻¹
Reference time	1200 EST August 1, 1990
Overall uncertainty	1.05 percent ⁽³⁾
Photon-emitting impurities	None observed ⁽⁴⁾
Alpha-particle-emitting impurities	None observed ⁽⁵⁾
Half life	28.5 ± 0.2 years ⁽⁶⁾
Measuring instrument	4πβ liquid-scintillation counter

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

Gaithersburg, MD 20899
January, 1991

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

*Notes on back

0150

Std. Diluted to 10ml to make 91-0225-60-1 AA0030.

CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Radioisotope	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 Cl.

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

Radioisotope Concentration 0.1994 μ Cl/gram.

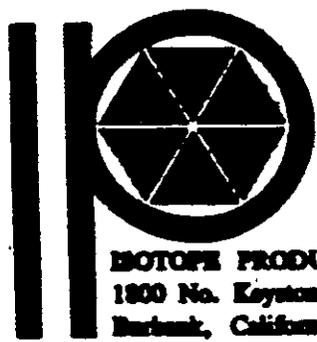
Method of Calibration
Weighed aliquots of the solution were assayed using a liquid scintillation counter.

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

Stan A. Milore
QUALITY CONTROL

0153

PROJECT Am-241 / 1.6" dia. filter & LCS

Continued From Page _____

ISOTOPE DILUTION RECORD

*Agnes Wong
4-9-93*

Isotope: Am-241

Secondary/Working Level Dilution

Date: 4-9-93 Preparer's Name: A. Wong

Pipet Check / Balance Wt. Check Done (✓)

Diluted Source ID (log#): 91-225-60-1

Diluent used: 0.5N HCl

A: Source activity: 21700 dpm/g (9774.8 pCi/g)

B: Amount of source transferred: 10.3235 g

C: Total amount of dilution: 100.1029 g

D: Activity of dilution (A*B/C): 2237.90 dpm/g

E: Density of Diluent: 1.0010 g/ml

* F: Activity by volume (D*E): 2240.14 dpm/ml

Dilution Log Book ID: ~~92-335~~^{RW} 92-353-81-1

Reviewed by: [Signature] Date: 4/9/93

1.6" diameter filter LCS in Gamma Spec. (14) Petri dish and sealed 955 5/18/93

Prepared by Nee Van Nuyen 5/10/93 - cut Whatman Glass Micro-fiber filter paper (originally 3" dia.) in 1.6" dia. - P. patted on filter.

¹³⁷Cs LAL-0199- 0.200 ml * 975.18 pCi/ml = 195.0 pCi (= 197.8 pCi 4-2-91)

⁶⁰Co LAL-0225-80-1 0.200 ml * ^(998.11 pCi/ml) 10.363 pCi/ml = 199.6 pCi (= 259.1 pCi 4-2-91)

(same pipette amounts as p.80R)

Read and Understood By

0155

Agnes Wong
Signed

4-9-93
Date

[Signature]
Signed

5-18-93
Date

Continued on Page N/A

RC 14 513197
ACSR
RIS

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

$+3.8\%$ or -3.8%

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

Decay Schemes

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

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

Chemical Composition of Solution

Carrier content per gram of solution:
30 micrograms strontium

Other components:
0.1 M HCl

Preservative:

Remarks

Date Certificate Prepared April 26, 1994

Approval Signature

Paul B. Fahn

0157

Sr-90

INITIAL STANDARD DILUTION RECORD

Standard Information:

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

Primary Dilution

Balance Verification?:	<u>yes</u>
Diluent Used:	<u>0.1M HCl</u>
a: Decay Corrected Standard Activity (pCi/g):	<u>5.4×10^3 pCi/g</u>
b: Weight of the Source Transferred (g):	<u>4.9670 g</u>
c: Total diluted weight (g):	<u>49.91 g</u>
d: Total Diluted Volume (mL)	<u>50 mL</u>
e: Activity of Dilution by Weight (pCi/g) [a * b / c]:	<u>537.4 pCi/g</u>
f: Calculated Density of Solution (g/mL) [c / d]:	<u>0.9982 g/mL</u>
g: Activity of Dilution by Volume (pCi/mL) [e * f]:	<u>536.44 pCi/mL</u>
h. Dilution Logbook I.D. #:	<u>93-474-81-1</u> ⁹³⁻¹⁷⁴⁻⁸²⁻¹ _{CP 4/7/95}
Prepared By: <u>Ignes 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: _____

0158

KLvd 5/5/77
ACSA
RIS

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

Calibration Certificate

Description

Principal radionuclide Half life

Nominal activity

Nominal volume ml in ampoule/bottle number

Measurement Activity of principal radionuclide

Activity per gram of this solution

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

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 half lives since it was obtained by EMSL-LV

We recommend that this solution should not be used after

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

C 57 Jan 2000

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

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

Random Errors

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

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

$+3.8\%$ or -3.8%

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

Decay Schemes

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

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

Chemical Composition of Solution

Carrier content per gram of solution:
30 micrograms strontium

Other components:
0.1 M HCl

Preservative:

Remarks

Date Certificate Prepared

April 26, 1994

Approval Signature

Paul B. Fahn

0166

Sr-90

INITIAL STANDARD DILUTION RECORD

Standard Information:	
Isotope:	Sr-90
Activity of Standard Received:	2.7×10^4 uCi
Weight of Standard Received (g):	50 g
Standard Activity (pCi/g):	5.4×10^3 pCi/g
Half-life in Years or Days:	28.6 yrs
Reference Date:	4-1-1994
Vendor:	EPA
Vendor I.D. #:	94003-1
LAL I.D. #:	AC5281
NIST Traceable ?	yes
Certificate #:	94003-1
Receiver's Name:	K. Free
Date Received:	5-3-94

Primary Dilution	
Balance Verification?:	yes
Diluent Used:	0.1 M HCl
a: Decay Corrected Standard Activity (pCi/g):	5.4×10^3 pCi/g
b: Weight of the Source Transferred (g):	4.9670 g
c: Total diluted weight (g):	49.91 g
d: Total Diluted Volume (mL)	50 mL
e: Activity of Dilution by Weight (pCi/g) [a * b / c]:	537.4 pCi/g
f: Calculated Density of Solution (g/mL) [c / d]:	0.9982 g/mL
g: Activity of Dilution by Volume (pCi/mL) [e * f]:	536.44 pCi/mL
h. Dilution Logbook I.D. #:	93-474-81-1 ⁹³⁻⁴⁷⁴⁻⁸²⁻¹ CP4/1/95
Prepared By: <u>Agnes 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

0162

SECONDARY/WORKING LEVEL STANDARD DILUTION RECORD

J.A. Mal
4/26/95

Dilution Source Information

Isotope: Sr-90

Parent Barcode Number: AA0046

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

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

Balance Verification?: Yes

Diluent Used: 1 M HCl

Dilution

*Diluent: 1 M HCl

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

a: Parent Specific Activity: 6000.69 pCi/g ^{pCi/ml}

b: Amount of Source Transferred: ~~300~~ 2.00 g

c: Total amount of Dilution: 303.63 g
+ 92.41021 g

d: Total Volume of Dilution: 300.0 ml

e: Activity of Dilution (a * b / c): 40.00 pCi/g ^{pCi/ml} @ 8/1/90

f: Activity of Dilution (a * b / d): 40.00 pCi/ml

Dilution Logbook I.D. #: LAL-94-0677-49

Prepared By: *J.A. Mal* Preparation Date: 4/7/95

Reviewed By: *Joe Hittman* Review Date: 6/1/95

*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.

Head and Understood By

Signed

Date

Signed

Date

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 Sr(NO₃)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 Sr(NO₃)₂ ± STD DEV. = 0.01231 g

Expected mg of Sr(NO₃)₂ = cert.value (=10mg of Sr/mL) * 0.5 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. ... 10/10/95

Signed	Date	Signed	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.

	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: AW 3-6-94

Continued on Page

Read and Understood By QA Review:

0170

AW3-15-94Gene MacLain8/11/94

LAL-0065-R01
Date: 5/93
Revision 1

Can
Plan
Ple
Net

5.3.5.a 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 Sr(NO₃)₂ in water and dilute to 1 L in a volumetric flask with water, then transfer to a stock bottle.

Calibrate a 10-mL pipet and then carefully pipet 3 - 10.0 mL portions of the strontium carrier solution into separate 50-mL centrifuge tubes. Add 1 mL of 6 N NaOH and heat in a water bath. Slowly, and with stirring, add 15 ml of 2 N Na₂CO₃ solution and continue digesting for 15 to 20 minutes. Centrifuge and carefully decant the solution. Wash the SrCO₃ precipitate with nanopure water pH adjusted to 8 with NH₄OH. Using a plastic disposable pipet, quantitatively transfer the SrCO₃ in to a tared 2" S.S. deep dish, dry under a heatlamp and reweigh.

	Calib # 1	Calib # 2	Calib # 3
Carrier plus planchet wt.	9.8395	9.7344	9.7538
Tare wt. of planchet	9.6228	9.5182	9.5490
Net wt. of carrier added (mg)	0.2167	0.2162	0.2048

AVERAGE SrCO₃ / 10 mL ± STD DEV. = 0.0213 ± 0.0067

$$\text{Expected mg of SrCO}_3 = \frac{\text{cert. value (=10mg of Sr/mL)} * 10 \text{ mL} * 147.62 \text{ g/mole SrCO}_3}{87.62 \text{ g/mole Sr}}$$

Within 5% of expected (168.5 mg/10 mL) value (yes/no) Yes

STANDARDIZED SrCO₃ / 2 mL = 0.0213g x 2 = 0.0426
20.0 mg of Sr(NO₃)₂ carrier is equivalent to 33.7 mg SrCO₃

Initial and Date: DAW 7/31/95

David Hagg
8/3/95

Continued on Page

Read and Understood By

DAW
Signed

8/3/95
Date

DA Review: CH
Signed

8/10/95 0171
Date

Rec'd 11/18/92

CERTIFICATE OF CALIBRATION BETA STANDARD SOLUTION

AA0114

Radionuclide	C-14	Customer:	LOCKHEED ENVIRONMENTAL
Half Life:	5730 ± 40 years	P.O.No.:	06LAB2959
Catalog No.:	7014	Reference Date:	November 15 1992 12:00 PST.
Source No.:	407-124-2	Contained Radioactivity:	1.093 μ Ci.
		Contained Radioactivity:	40.4 kBq

Description of Solution

a. Mass of solution:	5.0242	grams
b. Chemical form:	Benzoic Acid Carboxy-C-14 in 0.1N NaOH	
c. Carrier content:	None added	
d. Density:	1.002	g/ml @ 20°C.

Radioimpurities None detected

Radioactive Daughters None

Radionuclide Concentration 0.218 μ Ci/g

Method of Calibration

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

Uncertainty of Measurement

a. Systematic uncertainty in instrument calibration:	± 1.8%
b. Random uncertainty in assay:	± 0.5%
c. Random uncertainty in weighing(s):	± 1.0%
d. Total uncertainty at the 99% confidence level:	± 2.2%

NIST Traceability

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

Notes

1. Nuclear data were taken from "Table of Radioactive Isotopes", edited by Virginia S. Shirley, 1986.
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 North Keystone Street
 Burbank, California 91504
 (818) 843 - 7000

Anna U. Uman

QUALITY CONTROL

Nov. 17, 1992

Date Signed

0180

AA 0114

ISOTOPE WEIGHT DILUTION RECORD

Isotope: C-14 Vendor: IPL
 Total Received Activity: 1.093 μ ci Vendor ID: 407-124-2
 Wt. Received: 5.024 g NIST Traceable (Y/N) Cert. # Implicitly
 Activity in Units/g: .2175 μ ci/g Reference Date: 11-15-92
 Activity converted (dpm/g): 482,954 dpm/g Receive Date: 11/18/92
 Half-life (Yrs or days) $t_{1/2}$ = 5730 \pm 40 years Receiver's Name: Jimmy Morales

PRIMARY DILUTION:

Balance wt. check done

a: Source activity: 482,954 dpm/g * (if $t_{1/2}$ = < 100yr decay to prep. date)
 b: Wt. of Source transferred: 4.90951 g
 Diluent used: 0.1 N₂O₄
 c: Total diluted weight: 116.53 g
 d: Activity of dilution (a*b/c): 20,347 dpm/g \pm 2.2%
 e: Calculated density of solution: 1.002 g/mL (4M HNO₃ = 1.1294 \pm .0007 g/mL)
 f: Activity by volume = (d*e): 20,388 dpm/mL
 Dilution Log Book ID: LAL-93-474-23-1 ✓
 Preparation Date: 10/27/93 Preparer's Name: M

SECONDARY OR WORKING LEVEL DILUTION

Balance wt. check done

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: N/A g
 d: Activity of dilution (a*b/c): _____ dpm/g
 e: Calculated density of solution: _____ g/mL (4M HNO₃ = 1.1294 \pm .0007 g/mL)
 f: Activity by volume = (d*e): _____ dpm/mL
 Dilution Log Book ID: _____

0181

MS

10/27/93
Date

Revised Signed

Date

INITIAL STANDARD DILUTION RECORD

Standard Information:			
Isotope:	C-14	Vendor:	Isotope Product
Activity of Standard Received:	1.09 uCi	Vendor I.D. #	
Weight of Standard Received (g):	5.0242 g	LAL I.D. #:	AA0114
Standard Activity (pCi/g):	2.17E+05 pCi/g	NIST Traceable ?	Yes
Half-life in Years or Days:	5730 yrs	Certificate #:	407-124-2
Reference Date:	11/15/92	Preparer's Name:	Mark Young
		Date Received:	11/18/92

Primary Dilution	
Balance Verification?:	Yes
Diluent Used:	0.1 N NaOH
a: Decay Corrected Standard Activity (pCi/g):	2.17E+05 pCi/g
b: Weight of the Source Transferred (g):	4.90951 g
c: Total diluted weight (g):	116.53 g
d: Total Diluted Volume (mL)	116.3 mL
e: Activity of Dilution by Weight (pCi/g) [a * b / c]:	9.139E+03 pCi/g
f: Calculated Density of Solution (g/ml) [c / d]:	1.0020 g/mL
g: Activity of Dilution by Volume (pCi/mL) [e * f]:	9.157E+03 pCi/mL
h. Dilution Logbook I.D. #:	LAL-93-0474-23-1
Prepared By: _____	Preparation Date: <u>10/27/93</u>
Reviewed By: _____	Review Date: _____
Purity/Cross Check Performed By: _____	Check Date: _____ 0182

SECONDARY/WORKING LEVEL STANDARD DILUTION RECORD

Dilution Source Information	
Isotope:	<u>C-14</u>
Parent Barcode Number	<u>AA0114</u>
Vendor or Certificate I.D. # of Parent Standard:	<u>407-124-2</u>
Diluted Source Logbook I.D. #:	<u>LAL-93-0474-23-1</u>
Balance Verification?:	<u>Yes</u>
Diluent Used:	<u>0.1 N NaOH</u>

Dilution	
*Diluent:	<u>Nanopure w/ 1 mg/ml formaldehyde</u>
*Density of diluent (g/ml):	<u>1.0006</u> g/ml
a: Parent Specific Activity:	<u>9.14E+03</u> pCi/g
b: Amount of Source Transferred:	<u>0.70</u> g
c: Total amount of Dilution:	<u>250.14</u> g
d: Total Volume of Dilution:	<u>250</u> ml
e: Activity of Dilution [a * b / c]:	<u>2.57E+01</u> pCi/g
f: Activity of Dilution (a * b / d):	<u>2.58E+01</u> pCi/ml
Dilution Logbook I.D. #:	<u>LAL-94-0677-18-1</u>
Prepared By: <u>Agnes Wong</u>	Preparation Date: <u>11/19/94</u>
Preparer Signature: _____	
Reviewed By: _____	Review Date: _____
Reviewer Signature: _____	
<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>	

ACS294
RECEIVED
11/25/95
RIS

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



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

INITIAL STANDARD DILUTION RECORD

Standard Information:	
Isotope:	H-3
Activity of Standard Received:	.11 uCi
Weight of Standard Received (g):	5 g
Standard Activity (pCi/g):	21.9 nCi/g pCi/g
Half-life in Years or Days:	12.43 yrs
Reference Date:	0400, 6/3/92
Vendor:	EPA
Vendor I.D. #	347/95
LAL I.D. #:	AC 5299
NIST Traceable?	Yes
Certificate #:	2606-1
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 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. Pennewitz CAL-95-0721-1
Prepared By:	Joe Hutchinson / S. Morales / C. Pennewitz
Preparation Date:	2/7/95
Reviewed By:	Joe Hutchinson
Review Date:	2/7/95
Purity/Cross Check Performed By:	
Check Date:	

Signed

Date

CP5/8/95

Signed

Date

0195

SECONDARY/WORKING LEVEL STANDARD DILUTION RECORD

Dilution Source Information

Isotope: H-3 LCS

Parent Barcode Number: AC 5299

Vendor or Certificate I.D. # of Parent Standard: 2606-1

Diluted Source Logbook I.D. #: LAL - 95-721-1

Balance Verification?: Yes

Diluent Used: Deionized Water

Dilution

*Diluent: Deionized Water

*Density of diluent (g/ml): 0.99

a: Parent Specific Activity: 2190 pCi/ml

b: Amount of Source Transferred: 5.0 ml *8/24/95*

c: Total amount of Dilution: 4000 ml *8/24/95*

d: Total Volume of Dilution:

e: Activity of Dilution (a * b / c): 2.71 pCi/ml *8/3/92*

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

Dilution Logbook I.D. #: 95-721-14-1

J. C. M. J.
 8/24/95

Prepared By: J. C. M. J.

Preparation Date: 8/24/95

Reviewed By: Joe Hutchinson

Review Date: 8/24/95

*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

0196

SECONDARY/WORKING LEVEL STANDARD DILUTION RECORD

Dilution Source Information

Isotope:

H-3 LCS

Parent Barcode Number

AC 5299

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

2606-1

Diluted Source Logbook I.D. #:

LAL-95-721-1

Balance Verification?:

Yes

Diluent Used:

Deionized Water

Dilution

*Diluent:

Deep Well Water

*Density of diluent (g/ml):

0.9977 g/ml

a: Parent Specific Activity:

2.190 pCi/gmL

b: Amount of Source Transferred:

5.0 mL

c: Total amount of Dilution:

3995 mL
~~4000~~ 11/1/95

d: Total Volume of Dilution:

4000 ml

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

2.74 pCi/gmL on 6/3/92

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

2.74 pCi/ml on 6/3/92

Dilution Logbook I.D. #:

95-721-16-1

Prepared By:

Joe Hutchinson

Preparation Date:

11/1/95

Reviewed By:

Review Date:

*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.

Head and Understood by

Signed

Date

Signed

Date

0197

ACS244
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11/23/95
RKC

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

Calibration Certificate

Description

Principal radionuclide	<input type="text" value="Tritium (H-3)"/>	Half-life	<input type="text" value="12.43 years"/>
Nominal activity	<input type="text" value="110"/> <input type="text" value="nano"/> curies		
Nominal volume	<input type="text" value="5"/> ml in ampoule/bottle number	<input type="text" value="2606-1"/>	

Measurement Activity of principal radionuclide

Activity per gram of this solution

<input type="text" value="21.9"/>	<input type="text" value="nano"/> curies	of	<input type="text" value="Tritium"/>
		at 0400 hours PST on	<input type="text" value="June 3, 1992"/>

Activity of daughter radionuclide

The principal activity was accompanied at the quoted time by

<input type="text"/>	<input type="text" value="curies"/> Per gram
of the daughter nuclide	<input type="text"/>

Total mass of this solution

<input type="text" value="APPROX. 5.0"/> grams
--

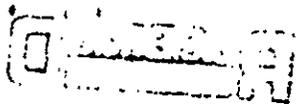
Method of measurement

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	<input type="text" value="0.0"/>	half lives since it was obtained by EMSL-LV
We recommend that this solution should not be used after	<input type="text" value="December 1999"/>	



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 H₂O

Other components:

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

Preservative:

Remarks

Date Certificate Prepared

June 17, 1992

0199

Approval Signature



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

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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:

$$0.08 \text{ } \gamma \text{ s}^{-1}\text{g}^{-1} \text{ for energies between 90 and 2700 keV.}$$

(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: <u>H-3</u>	Vendor: <u>EPA</u>
Activity of Standard Received: <u>.11</u> uCi	Vendor I.D. # <u>2/7/95</u>
Weight of Standard Received (g): <u>5</u> g	LAL I.D. #: <u>AC 5299</u>
Standard Activity (pCi/g): <u>21.9</u> ^{nCi/g} _{pCi/g}	NIST Traceable? <u>Yes</u>
Half-life in Years or Days: <u>12.43</u> yrs	Certificate #: <u>2646-1</u>
Reference Date: <u>0400, 6/3/92</u>	Receiver's Name: <u>Kevin Free</u>
	Date Received: <u>1/25/95</u>

Primary Dilution	
Balance Verification?: <u>Yes</u>	
Diluent Used: <u>EPA Distilled ASTM Type II Water (Dead Water)</u>	
a: Decay Corrected Standard Activity (pCi/g): <u>21.9</u> ^{nCi/g} _{pCi/g}	<u>on 6/3/92</u>
b: Weight of the Source Transferred (g): <u>4.939</u> g	
c: Total diluted weight (g): <u>49.377</u> g	
d: Total Diluted Volume (mL): <u>50</u> ^{2/7/95} <u>49.5</u> mL	
e: Activity of Dilution by Weight (pCi/g) [a * b / c]: <u>2190</u> pCi/g	
f: ^{Kevin} ₂₄ Calculated Density of Solution (g/mL) [c / d]: <u>0.99777</u> g/mL	
g: Activity of Dilution by Volume (pCi/mL) [e * f]: <u>2190</u> pCi/mL <u>on 6/3/92</u>	
h. Dilution Logbook I.D. #: <u>C. Ponienez</u>	<u>LAL-95-0721-1</u>
Prepared By: <u>Joe Hutchinson / J. Morales</u>	Preparation Date: <u>2/7/95</u>
Reviewed By: <u>Joe Hutchinson</u>	Review Date: <u>2/7/95</u>
Purity/Cross Check Performed By: _____	Check Date: _____

Signed

Date

02/18/95 signed

Date

0202

SECONDARY/WORKING LEVEL STANDARD DILUTION RECORD

Dilution Source Information	
Isotope:	H-3 LES ^{MS}
Parent Barcode Number	AC5299
Vendor or Certificate I.D. # of Parent Standard:	
Diluted Source Logbook I.D. #:	95-0721-1
Balance Verification?:	Yes
Diluent Used:	Deion Water

Dilution	
*Diluent:	Low Bkg Water
*Density of diluent (g/ml):	1 g/ml
a: Parent Specific Activity:	2190 pCi/g
b: Amount of Source Transferred:	10.0 g
c: Total amount of Dilution:	100 g
d: Total Volume of Dilution:	100 ml
e: Activity of Dilution (a * b / c):	pCi/g
f: Activity of Dilution (a * b / d):	219 pCi/ml on 6/23/95
Dilution Logbook I.D. #:	94-0677-70
Prepared By: <u>Joe H. H. H.</u>	Preparation Date: <u>6/23/95</u>
Reviewed By: <u>J. C. M. P.</u>	Review Date: <u>6/23/95</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>	

read and Understood by

^203

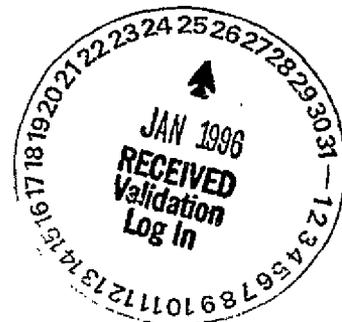
Signed _____

Date _____

Signed _____

Date _____

Date: January 26, 1996
To: Bechtel Hanford Inc. (technical representative)
From: A.T. Kearney, Inc.
Project: 100-FR-3 Round 8 Groundwater
Subject: Volatiles - Data Package No. LK5893-LAS (SDG No. LK5893)



INTRODUCTION

This memo presents the results of data validation on Summary Data Package No. LK5893-LAS prepared by Lockheed Analytical Services (LAS). A list of the samples validated along with the analyses reported and the method of analysis is provided in the following table.

Sample ID	Sample Date	Media	Validation Level	Analysis
BOGSF1	11/17/95	Water	C	CLP Volatiles
BOGSF4	11/17/95	Water	C	CLP Volatiles
BOGSG6	11/17/95	Water	C	CLP Volatiles
BOGSG7	11/17/95	Water	C	CLP Volatiles

Data validation was conducted in accordance with the WHC statement of work (WHC 1994) and validation procedures (WHC 1992a). Appendices 1 through 5 provide the following information as indicated below:

- Appendix 1. Glossary of Data Reporting Qualifiers
- Appendix 2. Summary of Data Qualification
- Appendix 3. Qualified Data Summary and Annotated Laboratory Reports
- Appendix 4. Laboratory Narrative and Chain-of-Custody Documentation
- Appendix 5. Data Validation Supporting Documentation

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DATA QUALITY OBJECTIVES

- **Holding Times**

Analytical holding times were assessed to ascertain whether the holding time requirements were met by the laboratory. Preserved water samples must be analyzed within 14 days of the date of sample collection.

If holding times are exceeded, but not by greater than two times the limit, all associated sample results are qualified as estimates and flagged "J" for detects and "UJ" for non-detects. If holding times are exceeded by greater than two times the limit, all associated detected sample results are qualified as estimates and flagged "J" and all non-detects are rejected and flagged "UR".

Holding times were met for all samples.

- **Instrument Calibration and Tuning**

Instrument calibration is performed to establish that the GC/MS instrument is capable of producing acceptable and reliable analytical data over a range of concentrations. The initial and continuing calibrations results must meet validation requirements set by Westinghouse-Hanford (WHC 1992a). An initial multipoint calibration is performed prior to sample analysis to establish the linear range of the GC/MS instrument. Continuing calibration checks are performed to verify that instrument performance is stable and reproducible on a day-to-day basis.

Instrument calibration and tuning are not evaluated under Level C validation.

- **Blanks**

Method blank analyses are conducted to determine the extent of laboratory contamination introduced through sampling, sample preparation and analysis. At least one acceptable method blank analysis must be conducted for every 20 samples. No contaminants should be present in the method blank. Analytical results for analytes present in any sample at less than five times the concentration of that analyte found in the associated blank are qualified as non-detects and flagged "U". Common laboratory contaminants present in samples at less than ten times the concentration of that analyte found in the associated blank are qualified as non-detects. If a sample result is less than the CRQL and is less than five times (or less than ten times for lab contaminants) the highest associated blank result, the sample result value is raised to the CRQL level, qualified as undetected and flagged "U". Tentatively identified compounds (TIC) present in the samples and blanks that are within plus or minus 0.06 relative

retention time units (RRT) of each other are qualified as undetected and flagged "U" if the sample concentration is less than five times (or less than ten times for common laboratory contaminants) the highest blank concentration.

All method blank target compound results were acceptable. TIC identifications were not reviewed since spectral match comparisons could not be made without the raw data, which is not provided in a summary data package.

Two trip blanks were submitted in this data package. The sample numbers, well locations and sampling dates for the blanks are as follows:

<u>Sample Number</u>	<u>Well Location</u>	<u>Sampling Date</u>
BOGSG6	199-F7-1	11/17/95
BOGSG7	199-F5-1	11/17/95

No target compounds were detected in the trip blanks.

- **Accuracy**

- Matrix Spike

- Matrix spike analyses are used to assess the analytical accuracy of the reported data and the effect of the matrix on the ability to accurately quantify sample concentrations. Matrix spike analyses are performed in duplicate using five compounds for which percent recoveries must be within established quality control limits. If spike recoveries are outside control limits, detected sample results less than five times the spike concentration are qualified as estimates and flagged "J". Undetected sample results with spike recoveries outside control limits are qualified as estimates and flagged "UJ". Sample results greater than five times the spike concentration require no qualification.

- All matrix spike recovery results were acceptable.

- Surrogate Recovery

- The analysis of surrogate compounds provides a measure of performance for individual samples. Matrix-specific surrogate compound recovery control windows have been established by the EPA CLP program. When a surrogate compound recovery is out of the control window, all positively identified target compounds associated with the unacceptable surrogate recoveries are qualified as estimates and flagged "J". Undetected compounds with surrogate recoveries less than the lower control limit are qualified as having an estimated detection limit and flagged "UJ". Samples with surrogate recoveries less than ten percent are qualified as estimates and flagged "J" for detects, and rejected and flagged

"UR" for nondetects. Undetected compounds with surrogate recoveries greater than the upper control limit require no qualification.

All surrogate recovery results were acceptable.

- **Precision**

Matrix Spike/Matrix Spike Duplicate Samples

Matrix spike/matrix spike duplicate results provide matrix-specific information on the precision of the method for specific target compound classes. Precision is expressed by the RPD between the recoveries of duplicate matrix spike analyses performed on a sample. For water samples analyzed using the CLP SOW, results must be within established RPD limits. If RPD values are out of specification and the sample concentration is less than five times the spike concentration, all associated sample results are qualified as estimates and flagged "J" for detects and "UJ" for non-detects. If RPD values are out of specification and the sample concentration is greater than five times the spike concentration, no qualification is required.

All matrix spike/matrix spike duplicate RPDs were acceptable.

Field Split Samples

Two sets of field split samples were submitted to LAS, and to Quanterra Environmental Services (QES), as shown below:

<u>LAS Samples</u>	<u>QES Samples</u>	<u>Well Location</u>
BOGSF1	BOGSB1	199-F7-1
BOGSF4	BOGS77	199-F5-1

The results for sample numbers BOGSB1 and BOGS77 are included in summary data package W0812-QES. The precision of the field split samples results was assessed by determining the RPD between the sample and the split sample and comparing the results to the QC criteria. For water samples, if the sample results are greater than five times the CRQL, the RPD limit is 20%. If the result for one or both samples is less than five times the CRQL but above the CRQL, the RPD limit is \pm the CRQL. All field duplicate RPDs were acceptable.

- **System Performance**

Internal Standards Performance

The evaluation of the internal standards criteria provide a means to assess the stability and sensitivity of the GC/MS system on every analysis. Internal standard area counts must be within the limits of -50% to +100% of the most recent standard. The retention time of the internal standard must not vary by more than +/-30 seconds of the most recent calibration. If area counts for a particular internal standards are outside the control limits or the relative retention time shift is greater than plus or minus 30 seconds, all associated sample results are qualified as estimates and flagged "J" for detects and "UJ" for non-detects. If area counts and retention times are both outside control limits, all non-detect sample results associated with that internal standard are rejected and flagged "UR".

Internal standard performance is not reviewed under Level C validation.

Compound Identification

The identifications of detected compounds are confirmed to investigate the possibility of false positives or false negatives. If a compound was incorrectly reported as undetected, the associated result is qualified as detected (no qualifier) or as an estimate and flagged "J". If retention time and mass spectral criteria are not met, all associated results are qualified as unusable and flagged "R". If it is determined that incorrect identifications were made as a result of cross-contamination or carryover between analyses, then the affected data are qualified as unusable and flagged "UR/R".

Compound identifications are not reviewed under Level C data validation.

- **Detection Levels**

Reported analytical detection levels are compared against CRQLs to ensure that laboratory detection levels meet the CRQL. All reported laboratory detection levels were at or below the analyte specific CRQL.

- **Completeness**

Data Package No. LK5893-LAS (SDG No. LK5893) was submitted for validation and verified for completeness. The completion percentage was 100%.

000005

MAJOR DEFICIENCIES

None found.

MINOR DEFICIENCIES

None found.

REFERENCES

- EPA, 1987, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, Third Edition, Environmental Protection Agency, Washington, D.C.
- EPA, 1988a, *EPA Contract Laboratory Program Statement of Work for Organics Analyses, Multi-Media, Multi-Concentration*, U.S. Environmental Protection Agency, Washington, D.C.
- EPA, 1988b, *Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses*, U.S. Environmental Protection Agency, Washington, D.C.
- EPA, 1988c, *EPA Contract Laboratory Program Statement of Work for Inorganics Analyses, Multi-Media, Multi-Concentration*, U.S. Environmental Protection Agency, Washington, D.C.
- EPA, 1988d, *Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses*, U.S. Environmental Protection Agency, Washington, D.C.
- EPA, 1990, *EPA Contract Laboratory Program Statement of Work for Inorganic Analyses, Multi-media, Multi-Concentration*, U.S. Environmental Protection Agency, Washington, D.C.
- EPA, 1991, *EPA Contract Laboratory Program Statement of Work for Organics Analyses, Multi-Media, Multi-Concentration*, Environmental Protection Agency, Washington, D.C.
- WHC, 1992a, *Data Validation Procedures for Chemical Analyses*, WHC-SD-EN-SPP-002, Rev. 2, Westinghouse Hanford Company, October 1993.
- WHC, 1992b, *Data Validation Procedure for Radiological Analyses*, WHC-SD-EN-SPP-001, Rev. 2, Westinghouse Hanford Company, 1993.

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EPA, 1994, *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, U.S. Environmental Protection Agency, Washington, D.C.

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Appendix 1
Glossary of Data Reporting Qualifiers

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Qualifiers which may be applied by data validator in compliance with WHC 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 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 the 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.
- 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 is unusable due to an identified QC deficiency.
- NJ - Indicates presumptive evidence of a compound at an estimated value. The data may not be valid for some specific applications (i.e., usable for decision-making purposes).
- N - Indicates presumptive evidence of a compound. The data may not be valid for some specific applications (i.e., usable for decision-making purposes).

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Appendix 2
Summary of Data Qualification

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DATA QUALIFICATION SUMMARY

SDG: LK5893	REVIEWER: PB	DATE: 01/26/96	PAGE <u>1</u> OF <u>1</u>
COMMENTS: No qualifiers assigned			
COMPOUND	QUALIFIER	SAMPLES AFFECTED	REASON

000011

Appendix 3

Qualified Data Summary and Annotated Laboratory Reports

000012

Project: BECHTEL-HANFORD																	
Laboratory: LOCKHEED																	
Case:		SDG: LK5893															
Sample Number	B0GSF1		B0GSF4		B0GSG6		B0GSG7										
Location	199-F7-1		199-F5-1		199-F7-1		199-F5-1										
Remarks	Split		Split		Trip blank		Trip blank										
Sample Date	11/17/95		11/17/95		11/17/95		11/17/95										
Analysis Date	11/27/95		11/27/95		11/27/95		11/27/95										
Volatile Organic Compound	CRQL	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Chloromethane	10	10	U	10	U	10	U	10	U								
Bromomethane	10	10	U	10	U	10	U	10	U								
Vinyl Chloride	10	10	U	10	U	10	U	10	U								
Chloroethane	10	10	U	10	U	10	U	10	U								
Methylene Chloride	10	10	U	10	U	10	U	10	U								
Acetone	10	10	U	10	U	10	U	10	U								
Carbon Disulfide	10	10	U	10	U	10	U	10	U								
1,1-Dichloroethene	10	10	U	10	U	10	U	10	U								
1,1-Dichloroethane	10	10	U	10	U	10	U	10	U								
1,2-Dichloroethene (total)	10	10	U	10	U	10	U	10	U								
Chloroform	10	10	U	10	U	10	U	10	U								
1,2-Dichloroethane	10	10	U	10	U	10	U	10	U								
2-Butanone	10	10	U	10	U	10	U	10	U								
1,1,1-Trichloroethane	10	10	U	10	U	10	U	10	U								
Carbon Tetrachloride	10	10	U	10	U	10	U	10	U								
Bromodichloromethane	10	10	U	10	U	10	U	10	U								
1,2-Dichloropropane	10	10	U	10	U	10	U	10	U								
cis-1,3-Dichloropropene	10	10	U	10	U	10	U	10	U								
Trichloroethene	10	24		10	U	10	U	10	U								
Dibromochloromethane	10	10	U	10	U	10	U	10	U								
1,1,2-Trichloroethane	10	10	U	10	U	10	U	10	U								
Benzene	10	10	U	10	U	10	U	10	U								
trans-1,3-Dichloropropene	10	10	U	10	U	10	U	10	U								
Bromoform	10	10	U	10	U	10	U	10	U								
4-Methyl-2-pentanone	10	10	U	10	U	10	U	10	U								
2-Hexanone	10	10	U	10	U	10	U	10	U								
Tetrachloroethene	10	10	U	10	U	10	U	10	U								
1,1,2,2-Tetrachloroethane	10	10	U	10	U	10	U	10	U								
Toluene	10	10	U	10	U	10	U	10	U								
Chlorobenzene	10	10	U	10	U	10	U	10	U								
Ethylbenzene	10	10	U	10	U	10	U	10	U								
Styrene	10	10	U	10	U	10	U	10	U								
Xylene (total)	10	10	U	10	U	10	U	10	U								

000033

JR/SC 1/26/96

LOCKHEED ANALYTICAL LABORATORY
VOLATILE ORGANICS ANALYSIS DATA SHEET

CUSTOMER SAMPLE NO.

BOGSF1

Lab Job Name: BECHTEL-HANFORD

Contract: _

Lab Code: LAS

Case No.:

SAS No.:

SDG No.: L5893

Matrix: (soil/water) WATER

Lab Sample ID: L5893-13

Sample wt/vol: 5.00 (g/ml) ML

Lab File ID: D0477

Level: (low/med) LOW

Date Received: 11/21/95

% Moisture: not dec. 0

Date Analyzed: 11/27/95

GC Column: RTX502.2 ID: 0.53 (mm)

Dilution Factor: 1.00

Soil Extract Volume: 1.00 (ML)

Soil Aliquot Volume: 1.00 (uL)

CAS NO. COMPOUND CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L Q

74-87-3	Chloromethane	10.	U
74-83-9	Bromomethane	10.	U
75-01-4	Vinyl Chloride	10.	U
75-00-3	Chloroethane	10.	U
75-09-2	Methylene Chloride	10.	U
67-64-1	Acetone	10.	U
75-15-0	Carbon Disulfide	10.	U
75-35-4	1,1-Dichloroethene	10.	U
75-34-3	1,1-Dichloroethane	10.	U
540-59-0	1,2-Dichloroethene (total)	10.	U
67-66-3	Chloroform	10.	U
107-06-2	1,2-Dichloroethane	10.	U
78-93-3	2-Butanone	10.	U
71-55-6	1,1,1-Trichloroethane	10.	U
56-23-5	Carbon Tetrachloride	10.	U
75-27-4	Bromodichloromethane	10.	U
78-87-5	1,2-Dichloropropane	10.	U
10061-01-5	cis-1,3-Dichloropropene	10.	U
79-01-6	Trichloroethene	24.	
124-48-1	Dibromochloromethane	10.	U
79-00-5	1,1,2-Trichloroethane	10.	U
71-43-2	Benzene	10.	U
10061-02-6	trans-1,3-Dichloropropene	10.	U
75-25-2	Bromoform	10.	U
108-10-1	4-Methyl-2-Pentanone	10.	U
591-78-6	2-Hexanone	10.	U
127-18-4	Tetrachloroethene	10.	U
79-34-5	1,1,2,2-Tetrachloroethane	10.	U
108-88-3	Toluene	10.	U
108-90-7	Chlorobenzene	10.	U
100-41-4	Ethylbenzene	10.	U
100-42-5	Styrene	10.	U
1330-20-7	Xylenes (total)	10.	U

FORM I - CLP VOA

3/90

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0075

FB
11/27

LOCKHEED ANALYTICAL LABORATORY
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

CUSTOMER SAMPLE NO.

Lab Job Name: BECHTEL-HANFORD

Contract: _____

BOGSF1

Lab Code: LAS

Case No.:

SAS No.:

SDG No.: L5893

Matrix: (soil/water) WATER

Lab Sample ID: L5893-13

Sample wt/vol: 5.00 (g/ml) ML

Lab File ID: D0477

Level: (low/med) LOW

Date Received: 11/21/95

% Moisture: not dec. 0

Date Analyzed: 11/27/95

GC Column: RTX502.2 ID: 0.53 (mm)

Dilution Factor: 1.00

Soil Extract Volume: 1.00 (uL)

Soil Aliquot Volume: 1.00 (uL)

Number TICs Found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L_

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
19.				
20.				
21.				
22.				
23.				
24.				
25.				
26.				
27.				
28.				
29.				
30.				

PB 11/9

LOCKHEED ANALYTICAL LABORATORY
VOLATILE ORGANICS ANALYSIS DATA SHEET

CUSTOMER SAMPLE NO.

BOGSF4

Lab Job Name: BECHTEL-HANFORD

Contract: _

Lab Code: LAS

Case No.:

SAS No.:

SDG No.: L5893

Matrix: (soil/water) WATER

Lab Sample ID: L5893-7

Sample wt/vol: 5.00 (g/ml) ML

Lab File ID: D0475

Level: (low/med) LOW

Date Received: 11/21/95

% Moisture: not dec. 0

Date Analyzed: 11/27/95

GC Column: RTX502.2 ID: 0.53 (mm)

Dilution Factor: 1.00

Soil Extract Volume: 1.00 (ML)

Soil Aliquot Volume: 1.00 (uL)

CAS NO. COMPOUND CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L Q

74-87-3	Chloromethane	10.	U
74-83-9	Bromomethane	10.	U
75-01-4	Vinyl Chloride	10.	U
75-00-3	Chloroethane	10.	U
75-09-2	Methylene Chloride	10.	U
67-64-1	Acetone	10.	U
75-15-0	Carbon Disulfide	10.	U
75-35-4	1,1-Dichloroethene	10.	U
75-34-3	1,1-Dichloroethane	10.	U
540-59-0	1,2-Dichloroethene (total)	10.	U
67-66-3	Chloroform	10.	U
107-06-2	1,2-Dichloroethane	10.	U
78-93-3	2-Butanone	10.	U
71-55-6	1,1,1-Trichloroethane	10.	U
56-23-5	Carbon Tetrachloride	10.	U
75-27-4	Bromodichloromethane	10.	U
78-87-5	1,2-Dichloropropane	10.	U
10061-01-5	cis-1,3-Dichloropropene	10.	U
79-01-6	Trichloroethene	10.	U
124-48-1	Dibromochloromethane	10.	U
79-00-5	1,1,2-Trichloroethane	10.	U
71-43-2	Benzene	10.	U
10061-02-6	trans-1,3-Dichloropropene	10.	U
75-25-2	Bromoform	10.	U
108-10-1	4-Methyl-2-Pentanone	10.	U
591-78-6	2-Hexanone	10.	U
127-18-4	Tetrachloroethene	10.	U
79-34-5	1,1,2,2-Tetrachloroethane	10.	U
108-88-3	Toluene	10.	U
108-90-7	Chlorobenzene	10.	U
100-41-4	Ethylbenzene	10.	U
100-42-5	Styrene	10.	U
1330-20-7	Xylenes (total)	10.	U

FORM I - CLP VOA

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LOCKHEED ANALYTICAL LABORATORY
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

CUSTOMER SAMPLE NO.

Lab Job Name: BECHTEL-HANFORD

Contract: _

BOGSF4

Lab Code: LAS

Case No.:

SAS No.:

SDG No.: L5893

Matrix: (soil/water) WATER

Lab Sample ID: L5893-7

Sample wt/vol: 5.00 (g/ml) ML

Lab File ID: D0475

Level: (low/med) LOW

Date Received: 11/21/95

% Moisture: not dec. 0

Date Analyzed: 11/27/95

GC Column: RTX502.2 ID: 0.53 (mm)

Dilution Factor: 1.00

Soil Extract Volume: 1.00 (uL)

Soil Aliquot Volume: 1.00 (uL)

Number TICs Found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L_

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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PB 11/29

LOCKHEED ANALYTICAL LABORATORY
VOLATILE ORGANICS ANALYSIS DATA SHEET

CUSTOMER SAMPLE NO.

BOGSG6

Lab Job Name: BECHTEL-HANFORD

Contract: _

Lab Code: LAS

Case No.:

SAS No.:

SDG No.: L5893

Matrix: (soil/water) WATER

Lab Sample ID: L5893-16

Sample wt/vol: 5.00 (g/ml) ML

Lab File ID: D0478

Level: (low/med) LOW

Date Received: 11/21/95

% Moisture: not dec. 0

Date Analyzed: 11/27/95

GC Column: RTX502.2 ID: 0.53 (mm)

Dilution Factor: 1.00

Soil Extract Volume: 1.00 (ML)

Soil Aliquot Volume: 1.00 (uL)

CAS NO. COMPOUND CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L Q

74-87-3	Chloromethane	10.	U
74-83-9	Bromomethane	10.	U
75-01-4	Vinyl Chloride	10.	U
75-00-3	Chloroethane	10.	U
75-09-2	Methylene Chloride	10.	U
67-64-1	Acetone	10.	U
75-15-0	Carbon Disulfide	10.	U
75-35-4	1,1-Dichloroethene	10.	U
75-34-3	1,1-Dichloroethane	10.	U
540-59-0	1,2-Dichloroethene (total)	10.	U
67-66-3	Chloroform	10.	U
107-06-2	1,2-Dichloroethane	10.	U
78-93-3	2-Butanone	10.	U
71-55-6	1,1,1-Trichloroethane	10.	U
56-23-5	Carbon Tetrachloride	10.	U
75-27-4	Bromodichloromethane	10.	U
78-87-5	1,2-Dichloropropane	10.	U
10061-01-5	cis-1,3-Dichloropropene	10.	U
79-01-6	Trichloroethene	10.	U
124-48-1	Dibromochloromethane	10.	U
79-00-5	1,1,2-Trichloroethane	10.	U
71-43-2	Benzene	10.	U
10061-02-6	trans-1,3-Dichloropropene	10.	U
75-25-2	Bromoform	10.	U
108-10-1	4-Methyl-2-Pentanone	10.	U
591-78-6	2-Hexanone	10.	U
127-18-4	Tetrachloroethene	10.	U
79-34-5	1,1,2,2-Tetrachloroethane	10.	U
108-88-3	Toluene	10.	U
108-90-7	Chlorobenzene	10.	U
100-41-4	Ethylbenzene	10.	U
100-42-5	Styrene	10.	U
1330-20-7	Xylenes (total)	10.	U

FORM I - CLP VOA

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LOCKHEED ANALYTICAL LABORATORY
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

CUSTOMER SAMPLE NO.

BOGSG6

Lab Job Name: BECHTEL-HANFORD

Contract: _

Lab Code: LAS

Case No.:

SAS No.:

SDG No.: L5893

Matrix: (soil/water) WATER

Lab Sample ID: L5893-16

Sample wt/vol: 5.00 (g/ml) ML

Lab File ID: D0478

Level: (low/med) LOW

Date Received: 11/21/95

% Moisture: not dec. 0

Date Analyzed: 11/27/95

GC Column: RTX502.2 ID: 0.53 (mm)

Dilution Factor: 1.00

Soil Extract Volume: 1.00 (uL)

Soil Aliquot Volume: 1.00 (uL)

Number TICs Found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L_

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.				
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PB 11/96

LOCKHEED ANALYTICAL LABORATORY
VOLATILE ORGANICS ANALYSIS DATA SHEET

CUSTOMER SAMPLE NO.

BOGSG7

Lab Job Name: BECHTEL-HANFORD

Contract: _

Lab Code: LAS

Case No.:

SAS No.:

SDG No.: L5893

Matrix: (soil/water) WATER

Lab Sample ID: L5893-10

Sample wt/vol: 5.00 (g/ml) ML

Lab File ID: D0476

Level: (low/med) LOW

Date Received: 11/21/95

% Moisture: not dec. 0

Date Analyzed: 11/27/95

GC Column: RTX502.2 ID: 0.53 (mm)

Dilution Factor: 1.00

Soil Extract Volume: 1.00 (ML)

Soil Aliquot Volume: 1.00 (uL)

CAS NO. COMPOUND CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L Q

74-87-3	Chloromethane	10.	U
74-83-9	Bromomethane	10.	U
75-01-4	Vinyl Chloride	10.	U
75-00-3	Chloroethane	10.	U
75-09-2	Methylene Chloride	10.	U
67-64-1	Acetone	10.	U
75-15-0	Carbon Disulfide	10.	U
75-35-4	1,1-Dichloroethene	10.	U
75-34-3	1,1-Dichloroethane	10.	U
540-59-0	1,2-Dichloroethene (total)	10.	U
67-66-3	Chloroform	10.	U
107-06-2	1,2-Dichloroethane	10.	U
78-93-3	2-Butanone	10.	U
71-55-6	1,1,1-Trichloroethane	10.	U
56-23-5	Carbon Tetrachloride	10.	U
75-27-4	Bromodichloromethane	10.	U
78-87-5	1,2-Dichloropropane	10.	U
10061-01-5	cis-1,3-Dichloropropene	10.	U
79-01-6	Trichloroethene	10.	U
124-48-1	Dibromochloromethane	10.	U
79-00-5	1,1,2-Trichloroethane	10.	U
71-43-2	Benzene	10.	U
10061-02-6	trans-1,3-Dichloropropene	10.	U
75-25-2	Bromoform	10.	U
108-10-1	4-Methyl-2-Pentanone	10.	U
591-78-6	2-Hexanone	10.	U
127-18-4	Tetrachloroethene	10.	U
79-34-5	1,1,2,2-Tetrachloroethane	10.	U
108-88-3	Toluene	10.	U
108-90-7	Chlorobenzene	10.	U
100-41-4	Ethylbenzene	10.	U
100-42-5	Styrene	10.	U
1330-20-7	Xylenes (total)	10.	U

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FORM I - CLP VOA

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LOCKHEED ANALYTICAL LABORATORY
 VOLATILE ORGANICS ANALYSIS DATA SHEET
 TENTATIVELY IDENTIFIED COMPOUNDS

CUSTOMER SAMPLE NO.

BOGSG7

Lab Job Name: BECHTEL-HANFORD

Contract: _

Lab Code: LAS

Case No.:

SAS No.:

SDG No.: L5893

Matrix: (soil/water) WATER

Lab Sample ID: L5893-10

Sample wt/vol: 5.00 (g/ml) ML

Lab File ID: D0476

Level: (low/med) LOW

Date Received: 11/21/95

% Moisture: not dec. 0

Date Analyzed: 11/27/95

GC Column: RTX502.2 ID: 0.53 (mm)

Dilution Factor: 1.00

Soil Extract Volume: 1.00 (uL)

Soil Aliquot Volume: 1.00 (uL)

Number TICs Found: 0

CONCENTRATION UNITS:
 (ug/L or ug/Kg) UG/L_

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.				
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Appendix 4

Laboratory Narrative and Chain-of-Custody Documentation

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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



January 3, 1996

Ms. Joan Kessner
Bechtel Hanford, Inc.
1022 Lee Boulevard
P.O. Box 969
Richland, WA 99352

RE: Log-in No: L5893
Quotation No: Q400000-B
Document File No: 1121596
BHI Document Control No: 298
SAF No.: B96-032
SDG No.: LK5893



The attached data report contains the analytical results of samples that were submitted to Lockheed Analytical Services on 21 November 1995.

The temperature of the cooler upon receipt was 4°C. Sample containers received agree with the chain-of-custody documentation. Sample containers were received intact. Samples designated for nitrate/nitrite analysis were not received in time to meet the analytical holding time requirements. The vials for volatile analyses did not contain headspace.

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

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

If you have any questions concerning the analysis or the data please call Kathleen M. Hall at (509) 375-4741.

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Lockheed Analytical Services

Log-in No.: L5893
Quotation No.: Q400000-B
SAF: B96-032
Document File No.: 1121596
WHC Document File No.: 298
SDG No.: LK5893
Page No.: 1

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

Sincerely,

Karen Hermann for
Kathleen M. Hall
Client Services Representative

kmh

cc: Client Services
Document Control

PB/11/9
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**CASE NARRATIVE
ORGANIC ANALYSES**

Analytical Method CLP 3/90 Volatiles

This data package contains the volatile organic constituent results for the samples collected on November 17, 1995 and received at Lockheed Analytical Services on November 21, 1995. The samples and corresponding laboratory numbers can be found on the Method Blank Summary Form IV.

Sample Delivery Group Number: L5893

Login Number: L5893

Analytical Batch 112795-8260 D1 (water)

Holding Times

The samples were analyzed within holding time on November 27, 1995.

Instrument Tunes, Initial and Continuing Calibrations

All instrument tunes, initial and continuing calibrations were within QC criteria.

Surrogate Recoveries

Surrogate recoveries were within QC limits for all samples.

Method Blank Results

Target compounds and tentatively identified compounds (TICs) were not detected in the method blank.

Matrix Spike (MS) and Matrix Spike Duplicate (MSD)

Note: Sample BOGSG6 (L5893-16) was the native sample used for the MS and MSD analyzed in this analytical batch.

Compound recoveries were within QC limits in L5893-16MS and L5893-16MSD. The relative percent differences (RPDs) between the MS and MSD recoveries were within QC limits.

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Lockheed Analytical Services

Log-in No.: L5893
Quotation No.: Q400000-B
SAF: B96-032
Document File No.: 1121596
WHC Document File No.: 298
SDG No.: LK5893
Page No.: 6

Internal Standard Results

All internal standard area counts and retention times were within QC limits for all samples.

Sample Results

Target compounds were not detected in the associated client samples except in sample BOGSF1 (L5893-13). TICs were not detected in the associated client samples.

Prepared By: Lydia M. Coleman

December 27, 1995

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LOCKHEED ANALYTICAL SERVICES
 LOGIN CHAIN OF CUSTODY REPORT (1n01)
 Nov 21 1995, 02:41 pm

Login Number: L5893
 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
L5893-1 TEMP 4 Location: 157 Water	BOGSF4 "SAF # B96-032" 1 S SCREENING	17-NOV-95	21-NOV-95	26-DEC-95
			Hold:15-MAY-96	
L5893-2 TEMP 4 Location: 157 Water	BOGSF1 "SAF # B96-032" 1 S SCREENING	17-NOV-95	21-NOV-95	26-DEC-95
			Hold:15-MAY-96	
L5893-3 TEMP 4 Location: 157 Water Water	BOGSF4 "SAF # B96-032" 1 S CLP FURNACE 1 S CLP ICP	17-NOV-95	21-NOV-95	26-DEC-95
			Hold:15-MAY-96 Hold:15-MAY-96	
L5893-4 TEMP 4 Location: 157 Water Water	BOGSF1 "SAF # B96-032" 1 S CLP FURNACE 1 S CLP ICP	17-NOV-95	21-NOV-95	26-DEC-95
			Hold:15-MAY-96 Hold:15-MAY-96	
L5893-5 TEMP 4 Location: 157 Water Water Water Water Water Water	BOGSF4 "SAF # B96-032" 1 S 300.0 CHLORIDE 1 S 300.0 FLUORIDE 1 S 300.0 NITRATE 1 S 300.0 NITRITE 1 S 300.0 PHOSPHATE 1 S 300.0 SULFATE	17-NOV-95	21-NOV-95	26-DEC-95
			Hold:15-DEC-95 Hold:15-DEC-95 Hold:19-NOV-95 Hold:19-NOV-95 Hold:19-NOV-95 Hold:15-DEC-95	
L5893-6 TEMP 4 Location: 157 Water Water Water Water Water Water	BOGSF1 "SAF # B96-032" 1 S 300.0 CHLORIDE 1 S 300.0 FLUORIDE 1 S 300.0 NITRATE 1 S 300.0 NITRITE 1 S 300.0 PHOSPHATE 1 S 300.0 SULFATE	17-NOV-95	21-NOV-95	26-DEC-95
			Hold:15-DEC-95 Hold:15-DEC-95 Hold:19-NOV-95 Hold:19-NOV-95 Hold:19-NOV-95 Hold:15-DEC-95	

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LOCKHEED ANALYTICAL SERVICES
 LOGIN CHAIN OF CUSTODY REPORT (ln01)
 Nov 21 1995, 02:41 pm

Login Number: L5893
 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
L5893-7 TEMP 4 "SAF # B96-032" Location: 157 Water 1 S CLP 3/90 VOLATILES	BOGSF4 "SAF # B96-032"	17-NOV-95	21-NOV-95	26-DEC-95
				Hold:01-DEC-95
L5893-8 TEMP 4 "SAF # B96-032" Location: 157	BOGSF4 "SAF # B96-032"	17-NOV-95	21-NOV-95	26-DEC-95
L5893-9 TEMP 4 "SAF # B96-032" Location: 157	BOGSF4 "SAF # B96-032"	17-NOV-95	21-NOV-95	26-DEC-95
L5893-10 TEMP 4 "SAF # B96-032" Location: 157 Water 1 S CLP 3/90 VOLATILES	BOGSG7 "SAF # B96-032"	17-NOV-95	21-NOV-95	26-DEC-95
				Hold:01-DEC-95
L5893-11 TEMP 4 "SAF # B96-032" Location: 157	BOGSG7 "SAF # B96-032"	17-NOV-95	21-NOV-95	26-DEC-95
L5893-12 TEMP 4 "SAF # B96-032" Location: 157	BOGSG7 "SAF # B96-032"	17-NOV-95	21-NOV-95	26-DEC-95
L5893-13 TEMP 4 "SAF # B96-032" Location: 157 Water 1 S CLP 3/90 VOLATILES	BOGSF1 "SAF # B96-032"	17-NOV-95	21-NOV-95	26-DEC-95
				Hold:01-DEC-95
L5893-14 TEMP 4 "SAF # B96-032" Location: 157	BOGSF1 "SAF # B96-032"	17-NOV-95	21-NOV-95	26-DEC-95
L5893-15 TEMP 4 "SAF # B96-032" Location: 157	BOGSF1 "SAF # B96-032"	17-NOV-95	21-NOV-95	26-DEC-95
L5893-16 TEMP 4 "SAF # B96-032" Location: 157 Water 1 S CLP 3/90 VOLATILES	BOGSG6 "SAF # B96-032"	17-NOV-95	21-NOV-95	26-DEC-95
				Hold:01-DEC-95

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LOCKHEED ANALYTICAL SERVICES
 LOGIN CHAIN OF CUSTODY REPORT (ln01)
 Nov 21 1995, 02:41 pm

Login Number: L5893
 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
L5893-17 TEMP 4 "SAF # B96-032" Location: 157	BOGSG6	17-NOV-95	21-NOV-95	26-DEC-95
L5893-18 TEMP 4 "SAF # B96-032" Location: 157	BOGSG6	17-NOV-95	21-NOV-95	26-DEC-95
L5893-19 TEMP 4 "SAF # B96-032" Location: 157 Water 1 S GR ALP/BETA LAL-0060 Hold:15-MAY-96 Water 1 S SR-90 LAL-0196 Hold:15-MAY-96	BOGSF4	17-NOV-95	21-NOV-95	26-DEC-95
L5893-20 TEMP 4 "SAF # B96-032" Location: 157	BOGSF4	17-NOV-95	21-NOV-95	26-DEC-95
L5893-21 TEMP 4 "SAF # B96-032" Location: 157	BOGSF4	17-NOV-95	21-NOV-95	26-DEC-95
L5893-22 TEMP 4 "SAF # B96-032" Location: 157	BOGSF4	17-NOV-95	21-NOV-95	26-DEC-95
L5893-23 TEMP 4 "SAF # B96-032" Location: 157	BOGSF4	17-NOV-95	21-NOV-95	26-DEC-95
L5893-24 TEMP 4 "SAF # B96-032" Location: 157 Water 1 S GR ALP/BETA LAL-0060 Hold:15-MAY-96 Water 1 S SR-90 LAL-0196 Hold:15-MAY-96	BOGSF1	17-NOV-95	21-NOV-95	26-DEC-95
L5893-25 TEMP 4 "SAF # B96-032" Location: 157	BOGSF1	17-NOV-95	21-NOV-95	26-DEC-95
L5893-26 TEMP 4 "SAF # B96-032" Location: 157	BOGSF1	17-NOV-95	21-NOV-95	26-DEC-95

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LOCKHEED ANALYTICAL SERVICES
 LOGIN CHAIN OF CUSTODY REPORT (ln01)
 Nov 21 1995, 02:41 pm

Login Number: L5893
 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
L5893-27 TEMP 4 Location: 157	BOGSF1 "SAF # B96-032"	17-NOV-95	21-NOV-95	26-DEC-95
L5893-28 TEMP 4 Location: 157	BOGSF1 "SAF # B96-032"	17-NOV-95	21-NOV-95	26-DEC-95
L5893-29 TEMP 4 Location: 157 Water 1 Water 1	BOGSF4 "SAF # B96-032" S C-14 LAL-0209 S TRITIUM(H3) LAL-0066	17-NOV-95	21-NOV-95	26-DEC-95
L5893-30 TEMP 4 Location: 157 Water 1 Water 1	BOGSF1 "SAF # B96-032" S C-14 LAL-0209 S TRITIUM(H3) LAL-0066	17-NOV-95	21-NOV-95	26-DEC-95
L5893-31 TEMP 4 Location: 157 Filt H2O 15 Filt H2O 15	BOGSF5 "SAF # B96-032" S CLP FURNACE S CLP ICP	17-NOV-95	21-NOV-95	26-DEC-95
L5893-32 TEMP 4 Location: 157 Filt H2O 15 Filt H2O 15	BOGSF2 "SAF # B96-032" S CLP FURNACE S CLP ICP	17-NOV-95	21-NOV-95	26-DEC-95
L5893-33 Location: Water Water Water Water	REPORT TYPE 1 S EDD - DISK DEL. 1 S GCMS2 1 S INORG TYPE 2 RPT + 1 S RAD RPT TYPE 2	21-NOV-95	21-NOV-95	26-DEC-95

Page 4

Signature: *Paul J. Davis*

Date: 11-21-95

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Bechtel Hanford, Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

L5893

Data Turnaround
 Priority
 Normal

Collector <i>A. Rizzo / B. Fallberg</i>	Company Contact Bob Reidl	Telephone (509) 372-9641
Project Designation 100-FR-3 Groundwater - Round 8	Sampling Location 100 F	SAF No. B96-032
Ice Chest No. <i>STE. Helen</i>	Field Logbook No. <i>EFL-1054</i>	Method of Shipment Federal Express
Shipped To Lockheed	Offsite Property No. <i>NA KT 11/20/95 W96-0-0640-09</i>	Bill of Lading/Air Bill No. <i>NA KT 11/20/95 290 4646 753</i>

Possible Sample Hazards/Remarks	Preservation		HNO ₃	Cool 4°C	HCl	HNO ₃	Cool 4°C	Cool 4°C		HNO ₃	
	Type of Container	P/G	P/G	Gs	P/G	G	P/G		P/G		
	No. of Container(s)	1	1	3	5	1	1		1		
Special Handling and/or Storage Maintain samples between 2°C and 6°C.	Volume	1L	500mL	40mL	1L	1L	20mL		1L		
SAMPLE ANALYSIS	ICP Metals-TAL AA Metals-As, Pb. (Unfiltered)	ICP Metals-TAL AA Metals-As, Pb. (Filtered)	Anions (IC) -F, Cl, SO ₄ , PO ₄ , NO ₃	VOA-TCL	Gross Alpha, Gross Beta, Sr-90	Tritium, C-14	Activity Scan				

Sample No.	Matrix*	Date Sampled	Time Sampled							
BOGSF4	W	11-17-95	1250	Y	X	X	X	X	Y	
BOGSF5	W	11-17-95	1250							X
BOGSF6	W	11-17-95	1250			X		KT 11/20/95		
BOGS67	W	11-17-95	0545			Y				

000031

CHAIN OF POSSESSION	Sign/Print Names	SPECIAL INSTRUCTIONS	Matrix*
Relinquished By <i>B. Fallberg</i>	Date/Time 11/17/95 14:05	Received By <i>ERC</i>	Date/Time 11/17/95
Relinquished By <i>B. Fallberg</i>	Date/Time 11-20-95 0800	Received By <i>B. Fallberg</i>	Date/Time 11-20-95
Relinquished By <i>K. Trapp</i>	Date/Time 11/20/95 0950	Received By <i>K. Trapp</i>	Date/Time 11/20/95
Relinquished By	Date/Time	Received By	Date/Time

The Activity Scan is for all samples listed on this chain of custody.

001928 11/20/95

LABORATORY SECTION	Received By <i>M. Valle</i>	Title Sample Custodian	Date/Time 11-21-95/08:15
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

Bechtel Hanford, Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

Data Turnaround

- Priority
- Normal

Collector <i>A. Rizzo / B. Fritzsche</i>	Company Contact Bob Raidl	Telephone (509) 372-9641
Project Designation 100-FR-3 Groundwater - Round 8	Sampling Location 100 F	SAF No. B96-032
Ice Chest No. <i>Ste. Helen</i>	Field Logbook No. <i>ETC-1054</i>	Method of Shipment Federal Express
Shipped To Lockheed	Offsite Property No. <i>NA KR 11/20/95 WAG-0-0640-09</i>	Bill of Lading/Air Bill No. <i>NA KR 11/20/95 290 4646 753</i>

Possible Sample Hazards/Remarks	Preservation	HNO ₃	Cool 4°C	HCl	HNO ₃	Cool 4°C	Cool 4°C	HNO ₃
	Type of Container	P/G	P/G	Gs	P/G	G	P/G	P/G
	No. of Container(s)	1	1	3	5	1	1	1
Special Handling and/or Storage Maintain samples between 2°C and 6°C.	Volume	1L	500mL	40mL	1L	1L	20mL	1L

SAMPLE ANALYSIS	ICP Metals-TAL AA Metals-As, Pb. (Unfiltered)	Among IICl F, Cl, SO ₄ , PO ₄ , NO ₃ , NO ₂	VOA-TCL	Gross Alpha, Gross Beta, Sr-90	Tritium, C-14	Activity Scan	ICP Metals-TAL AA Metals-As, Pb. (Filtered)

Sample No.	Matrix *	Date Sampled	Time Sampled							
BOGSF1	W	11-17-95	1105	<i>f</i>	<i>x</i>	<i>x</i>	<i>x</i>	<i>x</i>		
BOGSF2 <i>NA 11/20/95</i>	W	11-17-95	1105							<i>x</i>
BOGSF3 BOGSF6	W	11-17-95	1105		<i>x</i>					
BOGSF4		11-17-95	0545		<i>x</i>				<i>NA 11/20/95</i>	

000036

CHAIN OF POSSESSION		Sign/Print Names	
Relinquished By <i>B. Fritzsche</i>	Date/Time 11/17/95 14:05	Received By <i>Bob Raidl</i>	Date/Time 11-17-95
Relinquished By <i>B. Fritzsche</i>	Date/Time 0900	Received By <i>B. Whitton</i>	Date/Time 0900
Relinquished By <i>K. Troop</i>	Date/Time 11-20-95	Received By <i>K. Troop</i>	Date/Time 11/20/95
Relinquished By <i>K. Troop</i>	Date/Time 0940	Received By <i>K. Troop</i>	Date/Time 11/20/95

SPECIAL INSTRUCTIONS
Sample analysis for PO₄, NO₂, and NO₃ by EPA 300.0 is being requested for information only. The ERC Contractor acknowledges that the 48-hour holding time will not be met.

The Activity Scan is for all samples listed on this chain of custody.

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

LABORATORY SECTION	Received By <i>Admelle</i>	Title Sample Custodian	Date/Time 11-21-95
FINAL SAMPLE	Disposal Method	Disposed By	Date/Time 11/21/95

0111910

Appendix 5
Data Validation Supporting Documentation

GC/MS ORGANIC DATA VALIDATION CHECKLIST

VALIDATION LEVEL:	A	B	<u>C</u>	D	E
PROJECT: 100-FR3 - Groundwater Rnd			DATA PACKAGE:		
VALIDATOR: P. Brown		LAB: Lockheed		DATE: 1/11/96	
CASE:			SDG: W LK 5893		
ANALYSES PERFORMED					
<input checked="" type="checkbox"/> CLP Volatiles	<input type="checkbox"/> SW-846 8240 (cap column)	<input type="checkbox"/> SW-846 8260 (packed column)	<input type="checkbox"/> CLP Semivolatiles	<input type="checkbox"/> SW-846 8270 (cap column)	<input type="checkbox"/> SW-846 (packed column)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SAMPLES/MATRIX 4 water samples; BOGSE1, BOGSE4, BOGSG6 (TB), BOGSG7 (TB)					

1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE

Is technical verification documentation present? Yes No N/A

Is a case narrative present? Yes No N/A

Comments: _____

2. HOLDING TIMES

Are sample holding times acceptable? Yes No N/A

Comments: 14 days for preserved H₂O samples

FB
1/11/96

[Signature]

GC/MS ORGANIC DATA VALIDATION CHECKLIST

3. INSTRUMENT TUNING AND CALIBRATION

- Is the GC/MS tuning/performance check acceptable? Yes No N/A
- Are initial calibrations acceptable? Yes No N/A
- Are continuing calibrations acceptable? Yes No N/A

Comments: _____

4. BLANKS

- Were laboratory blanks analyzed? Yes No N/A
- Are laboratory blank results acceptable? Yes No N/A
- Were field/trip blanks analyzed? Yes No N/A
- Are field/trip blank results acceptable? Yes No N/A

Comments: No detects

5. ACCURACY

- Were surrogates/System Monitoring Compounds analyzed? Yes No N/A
- Are surrogate/System Monitoring Compound recoveries acceptable? Yes No N/A
- Were MS/MSD samples analyzed? Yes No N/A
- Are MS/MSD results acceptable? Yes No N/A

Comments: _____

Handwritten signature

FB 1/10/96

GC/MS ORGANIC DATA VALIDATION CHECKLIST

6. PRECISION

Are MS/MSD RPD values acceptable? Yes No N/A
Are field duplicate RPD values acceptable? Yes No N/A
Are field split RPD values acceptable? Yes No N/A

Comments: LAS DES
BOGSF4 BOGS77
BOGSF1 BOGSB1

7. SYSTEM PERFORMANCE

Were internal standards analyzed? Yes No N/A
Are internal standard areas acceptable? Yes No N/A
Are internal standard retention times acceptable? Yes No N/A

Comments: _____

8. COMPOUND IDENTIFICATION AND QUANTITATION

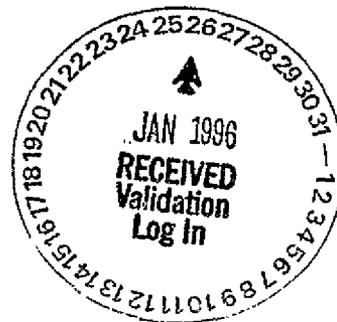
Is compound identification acceptable? Yes No N/A
Is compound quantitation acceptable? Yes No N/A

Comments: _____

9. REPORTED RESULTS AND QUANTITATION LIMITS

Are results reported for all requested analyses? Yes No N/A
Are all results supported in the raw data? Yes No N/A
Do results meet the CRQLs? Yes No N/A
Has the laboratory properly identified and coded all TIC? . . . Yes No N/A

Comments: _____



Date: January 26, 1996
To: Bechtel Hanford Inc. (technical representative)
From: A.T. Kearney, Inc.
Project: 100-FR-3 Round 8 Groundwater
Subject: Wet Chemistry - Data Package No. LK5893-LAS (SDG No. LK5893)

INTRODUCTION

This memo presents the results of data validation on Summary Data Package No. LK5893-LAS prepared by Lockheed Analytical Services (LAS). A list of the samples validated along with the analyses reported and the method of analysis is provided in the following table.

Sample ID	Sample Date	Media	Validation Level	Analysis
BOGSF1	11/17/95	Water	C	See Notes 1 and 2
BOGSF4	11/17/95	Water	C	See Notes 1 and 2

Note 1. Requested Method: EPA 300.0 for chloride, fluoride, nitrate, nitrite, sulfate and orthophosphate.

Note 2. Nitrate, nitrite and orthophosphate were analyzed 'for information only' per VSR-B96-011.

Data validation was conducted in accordance with the WHC statement of work (WHC 1994) and validation procedures (WHC 1992a). Appendices 1 through 5 provide the following information as indicated below:

- Appendix 1. Glossary of Data Reporting Qualifiers
- Appendix 2. Summary of Data Qualification
- Appendix 3. Qualified Data Summary and Annotated Laboratory Reports
- Appendix 4. Laboratory Narrative and Chain-of-Custody Documentation
- Appendix 5. Data Validation Supporting Documentation

DATA QUALITY OBJECTIVES

• Holding Times

Analytical holding times are assessed to ascertain whether the holding time requirements have been met by the laboratory. The holding time requirements are 28 days for chloride, fluoride and sulfate and two (2) days for nitrate, nitrite and orthophosphate.

000001

If holding times are exceeded, but not by greater than two times the limit, all associated sample results are qualified as estimates and flagged "J" for detects and "UJ" for non-detects. If holding times are exceeded by greater than two times the limit, all associated detectable sample results are qualified as estimates and flagged "J" and all non-detects are rejected and flagged "UR".

Due to the holding time being exceeded by greater than twice the limit, all nitrate results (all detects) were qualified as estimates and flagged "J".

Due to the holding time being exceeded by greater than twice the limit, all nitrite and orthophosphate results (all non-detects) were rejected and flagged "UR".

Holding times were met for all other analytes.

- **Instrument Calibration**

Instrument calibration is performed to establish that the instrument is capable of producing acceptable and reliable analytical data over a range of concentrations. The initial and continuing calibrations are performed according to the associated EPA Methods and all results must meet validation requirements set by Westinghouse Hanford Company (WHC 1992a). At least one blank and three standards are used to establish the instrument calibrations prior to sample analysis and the correlation must be greater than or equal to 0.995. Continuing calibration checks are performed to verify that instrument performance is stable and reproducible on a day-to-day basis.

Instrument calibration is not evaluated under Level C validation.

- **Blanks**

Method blank analyses are performed to determine the extent of laboratory contamination introduced through sampling, sample preparation and analysis. At least one acceptable method blank analysis must be conducted for every 20 samples. No contaminants should be present in the method blank. All blank results must fall below the CRQL to be acceptable.

All method blank results were acceptable.

000002

- **Accuracy**

Matrix Spike

Matrix spike analyses are used to assess the analytical accuracy of the reported data and the effect of the matrix on the ability to accurately quantify sample concentrations. Matrix spike recoveries must fall within the range of 75% to 125%. Samples with a spike recovery of less than 30% and a sample value below the IDL are rejected and flagged "UR". Samples with a spike recovery of 30% to 74% and a sample result less than the IDL are qualified "UJ". Samples with a spike recovery of greater than 125% or less than 75% and a sample result greater than the IDL are qualified "J". Finally, for samples with a spike recovery greater than 125% and a sample result less than the IDL, no qualification is required.

All matrix spike recovery results were acceptable.

Laboratory Control Sample

The LCS monitors the overall performance of the analysis, including the sample preparation. An LCS should be prepared (e.g., digested or distilled) and analyzed with every group of samples which have been prepared together.

The performance criteria for solid LCS samples are established through interlaboratory studies coordinated by a certifying agency (e.g., EPA or an independent commercial supplier). If the LCS recoveries are outside the control limit and the sample result is greater than the IDL, all sample results must be qualified as estimates and flagged "J". If the LCS recoveries are less than the control limit and the sample result is less than the IDL, all sample results must be flagged "UJ". If the LCS recoveries are greater than the control limits and the sample result is less than the IDL, then no qualification is necessary.

The performance criteria for aqueous LCS samples are percent recoveries between 80% and 120%. Samples with LCS recoveries of less than 50% are rejected and flagged "UR/R". Samples with LCS recoveries between 50% and 79% and a sample value below the IDL are qualified as estimates and flagged "UJ". If the LCS recovery is greater than 120% or between 50% and 79% and the sample value above the IDL, the result is qualified as an estimate and flagged "J". For LCS recoveries greater than 120% and a sample value below IDL, no qualification is necessary.

LCS results are not evaluated under Level C validation.

- **Precision**

Laboratory Duplicate Samples

Laboratory duplicate sample analyses are used to measure laboratory precision and sample homogeneity. For solid samples, results must be within RPD limits of plus or minus 35%. If RPD values are out of specification and the sample concentration is greater than five times the CRDL, all associated sample results are qualified as estimated "J" for detects, "UJ" for non-detects. If RPD values are plus or minus two times the CRDL and the sample concentration is less than five times the CRDL, all associated sample results are qualified as estimated and flagged "J" for detects and "UJ" for non-detects.

The performance criteria for aqueous laboratory duplicates are an RPD less than 20% for positive sample results greater than five times the CRDL and plus or minus the CRDL for positive sample results less than five times the CRDL. Sample results outside the criteria are qualified as estimates and flagged "J".

All laboratory duplicate results were acceptable.

Field Split Samples

Two split sample pairs were submitted to LAS as shown below:

<u>Sample Number</u>	<u>Split Sample Number</u>	<u>Well Location</u>
BOGSB1(QES)	BOGSF1(LAS)	199-F7-1
BOGS77(QES)	BOGSF4(LAS)	199-F5-1

Samples BOGSB1 and BOGS77 were analyzed by Quanterra Environmental Services (QES) and reported with SDG W0812-QES. The split sample results were compared using the validation guidelines for determining the RPD between a sample and its duplicate. The RPD for the fluoride results in split sample pair BOGSB1/BOGSF1 was outside QC limits. Under WHC guidelines, no qualification is required. All other results fell within control limits.

- **Detection Levels**

Reported analytical detection levels are compared against CRQLs to ensure that laboratory detection levels meet the required criteria. All reported laboratory detection levels were below the analyte specific CRQL.

- **Completeness**

Data Package No. LK5893-LAS (SDG No. LK5893) was submitted for validation and verified for completeness. The completion rate was 67%.

MAJOR DEFICIENCIES

Due to exceeded holding times, the nitrite and orthophosphate results for all samples were rejected and flagged "UR". Rejected data are unusable and should not be reported.

MINOR DEFICIENCIES

Due to exceeded holding times, the nitrate results in all samples were qualified as estimates and flagged "J". Data flagged "J" indicates that the associated concentration is an estimate, but under WHC guidelines, the data may be usable for decision-making purposes.

REFERENCES

- EPA, 1987, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, Third Edition, Environmental Protection Agency, Washington, D.C.
- EPA, 1988a, *EPA Contract Laboratory Program Statement of Work for Organics Analyses, Multi-Media, Multi-Concentration*, U.S. Environmental Protection Agency, Washington, D.C.
- EPA, 1988b, *Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses*, U.S. Environmental Protection Agency, Washington, D.C.
- EPA, 1988c, *EPA Contract Laboratory Program Statement of Work for Inorganics Analyses, Multi-Media, Multi-Concentration*, U.S. Environmental Protection Agency, Washington, D.C.
- EPA, 1988d, *Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses*, U.S. Environmental Protection Agency, Washington, D.C.
- EPA, 1990, *EPA Contract Laboratory Program Statement of Work for Inorganic Analyses, Multi-media, Multi-Concentration*, U.S. Environmental Protection Agency, Washington, D.C.

EPA, 1991, *EPA Contract Laboratory Program Statement of Work for Organics Analyses, Multi-Media, Multi-Concentration*, Environmental Protection Agency, Washington, D.C.

WHC, 1992a, *Data Validation Procedures for Chemical Analyses*, WHC-SD-EN-SPP-002, Rev. 2, Westinghouse Hanford Company, October 1993.

WHC, 1992b, *Data Validation Procedure for Radiological Analyses*, WHC-SD-EN-SPP-001, Rev. 2, Westinghouse Hanford Company, 1993.

EPA, 1994, *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, U.S. Environmental Protection Agency, Washington, D.C.

Appendix 1
Glossary of Data Reporting Qualifiers

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Qualifiers which may be applied by data validators in compliance with WHC procedures 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 the 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.
- 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 is unusable due to an identified QC deficiency.
- NJ - Indicates presumptive evidence of a compound at an estimated value. The data may not be valid for some specific applications (i.e., usable for decision-making purposes).
- N - Indicates presumptive evidence of a compound. The data may not be valid for some specific applications (i.e., usable for decision-making purposes).

Appendix 2
Summary of Data Qualification

DATA QUALIFICATION SUMMARY

SDG: LK5893	REVIEWER: RBC	DATE: 01/26/96	PAGE <u>1</u> OF <u>1</u>
COMMENTS:			
COMPOUND	QUALIFIER	SAMPLES AFFECTED	REASON
Nitrate	J	BOGSF1, BOGSF4	Exceeded holding time
Nitrite	UR	BOGSF1, BOGSF4	Exceeded holding time
Orthophosphate	UR	BOGSF1, BOGSF4	Exceeded holding time

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Appendix 3

Qualified Data Summary and Annotated Laboratory Reports

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LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: BOGSF1	Date Collected: 17-NOV-95
Matrix: Water	Date Received: 21-NOV-95
Percent Solids: N/A	

Constituent	Units	Method	Result	Project Reporting Limit	Data Qualifier(s)	Date Analyzed	LAS Batch ID	LAS Sample ID
Chloride	mg/L	300.0	15.	0.020		28-NOV-95	30612	L5893-6
Fluoride	mg/L	300.0	0.41	0.10	PK	08-DEC-95	30613	L5893-6
Nitrate-N	mg/L	300.0	21.	0.020	J	28-NOV-95	30614	L5893-6
Nitrite-N	mg/L	300.0	< 0.002	0.010	UR	28-NOV-95	30615	L5893-6
Ortho Phosphate	mg/L	300.0	< 0.020	0.10	UR	08-DEC-95	30616	L5893-6
Sulfate	mg/L	300.0	72.	0.10		28-NOV-95	30617	L5893-6

RBC
1/17/96

LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: BOGSF4	Date Collected: 17-NOV-95
Matrix: Water	Date Received: 21-NOV-95
Percent Solids: N/A	

Constituent	Units	Method	Result	Project Reporting Limit	Data Qualifier(s)	Date Analyzed	LAS Batch ID	LAS Sample ID
Chloride	mg/L	300.0	2.1	0.020		28-NOV-95	30612	L5893-5
Fluoride	mg/L	300.0	0.073	0.10		08-DEC-95	30613	L5893-5
Nitrate-N	mg/L	300.0	3.3	0.020	J	28-NOV-95	30614	L5893-5
Nitrite-N	mg/L	300.0	< 0.002	0.010	UR	28-NOV-95	30615	L5893-5
Ortho Phosphate	mg/L	300.0	< 0.020	0.10	UR	08-DEC-95	30616	L5893-5
Sulfate	mg/L	300.0	31.	0.10		28-NOV-95	30617	L5893-5

RKSC
1/17/96

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Appendix 4

Laboratory Narrative and Chain-of-Custody Documentation

000015

Lockheed Environmental Systems & Technologies Co.
Lockheed Analytical Services
975 Kelly Johnson Drive Las Vegas, Nevada 89119-3705
Telephone 702-361-0220 800-382-7605 Facsimile 702-361-8146

LOCKHEED MARTIN



January 3, 1996

Ms. Joan Kessner
Bechtel Hanford, Inc.
1022 Lee Boulevard
P.O. Box 969
Richland, WA 99352

RE: Log-in No: L5893
Quotation No: Q400000-B
Document File No: 1121596
BHI Document Control No: 298
SAF No.: B96-032
SDG No.: LK5893



The attached data report contains the analytical results of samples that were submitted to Lockheed Analytical Services on 21 November 1995.

The temperature of the cooler upon receipt was 4°C. Sample containers received agree with the chain-of-custody documentation. Sample containers were received intact. Samples designated for nitrate/nitrite analysis were not received in time to meet the analytical holding time requirements. The vials for volatile analyses did not contain headspace.

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

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

If you have any questions concerning the analysis or the data please call Kathleen M. Hall at (509) 375-4741.

Handwritten signature

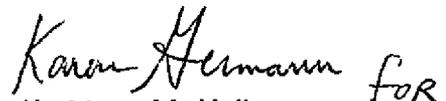
000016

Lockheed Analytical Services

Log-in No.: L5893
Quotation No.: Q400000-B
SAF: B96-032
Document File No.: 1121596
WHC Document File No.: 298
SDG No.: LK5893
Page No.: 1

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

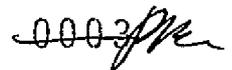
Sincerely,


Kathleen M. Hall
Client Services Representative

kmh

cc: Client Services
Document Control

000017



**CASE NARRATIVE
INORGANIC NON METALS ANALYSES
WATER**

The routine calibration and quality control analyses performed for this batch include as applicable: initial and continuing calibration verification, initial and continuing calibration blanks, method blank(s), laboratory control sample(s), matrix spike sample(s), and duplicate sample(s).

Preparation and Analysis Requirements

- Two water samples were received for LK5893 and analyzed in batch 1121 bh for selected analytes as requested on the chain of custody. Quality control analysis was performed on the following sample:

Client ID	LAL #		Method
BOGSF4	L5893-5	MS, DUP	300.0 Chloride, Fluoride, Nitrate-Nitrogen, Nitrite-Nitrogen, Orthophosphate, Sulfate

Holding Time Requirements

- All samples were analyzed within the method-specific holding time with the exception of Method 300.0 Nitrate-Nitrogen, Nitrite-Nitrogen and Orthophosphate which were received outside of holding time. The associated samples are flagged with an "H".

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
Prepared By

December 15, 1995
Date

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0004/2

Bechtel Hanford, Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

Data Turnaround

- Priority
- Normal

Collector <i>A. Pizzo / B. Fehlbauer</i>	Company Contact Bob Raidl	Telephone (509) 372-9641
Project Designation 100-FR-3 Groundwater - Round 8	Sampling Location 100 F	SAF No. B96-032
Ice Chest No. <i>Ste. Helen</i>	Field Logbook No. <i>ET-2-1054</i>	Method of Shipment Federal Express
Shipped To Lockheed	Offsite Property No. <i>NA KR 11/20/95 WAG-0-0640-09</i>	Bill of Lading/Air Bill No. <i>NA KR 11/20/95 290 4646 773</i>

Possible Sample Hazards/Remarks	Preservation	HNO ₃	Cool 4°C	HCl	HNO ₃	Cool 4°C	Cool 4°C	HNO ₃
	Type of Container	P/G	P/G	Gs	P/G	G	P/G	P/G
	No. of Container(s)	1	1	3	5	1	1	1
Special Handling and/or Storage Maintain samples between 2°C and 6°C.	Volume	1L	500mL	40mL	1L	1L	20mL	1L

SAMPLE ANALYSIS	ICP Metals-TAL, AA Metals-As, Pb. (Unfiltered)	Anions (Cl, F, Cl, SO ₄ , PO ₄ , NO ₂ , NO ₃)	VOA-TCL	Gross Alpha, Gross Beta, Sr-90	Tritium, C-14	Activity Scan	ICP Metals-TAL, AA Metals-As, Pb. (Filtered)

Sample No.	Matrix*	Date Sampled	Time Sampled							
BOGSF1	W	11-17-95	1105							
BOGSF2 <i>kr 11/20/95</i>	W	11-17-95	1105							X
BOGSF3 BOG5G6	W	11-17-95	1105							
BOG5G6		11-17-95	0545							

000019

03101101596

CHAIN OF POSSESSION	Sign/Print Names	SPECIAL INSTRUCTIONS Sample analysis for PO ₄ , NO ₂ , and NO ₃ by EPA 300.0 is being requested for information only. The ERC Contractor acknowledges that the 48-hour holding time will not be met. The Activity Scan is for all samples listed on this chain of custody.	Matrix* S = Soil SE = Sediment SO = Solid SL = Sludge W = Water O = Oil A = Air DS = Drum Solids DL = Drum Liquids T = Tissue WI = Wipe L = Liquid V = Vegetation X = Other
Relinquished By <i>B. F. Pizzo</i>	Date/Time 11/17/95 14:05	Received By <i>Bob Raidl</i>	Date/Time 11-17-95
Relinquished By <i>B. F. Pizzo</i>	Date/Time 0800	Received By <i>K. Tropp</i>	Date/Time 0900
Relinquished By <i>K. Tropp</i>	Date/Time 11-20-95	Received By <i>K. Tropp</i>	Date/Time 11/20/95
Relinquished By <i>K. Tropp</i>	Date/Time 11/20/95	Received By	Date/Time

LABORATORY SECTION	Received By <i>Armando</i>	Title Sample Custodian	Date/Time 11-21-95 1045
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

Bechtel Hanford, Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

L5893

Data Turnaround

- Priority
- Normal

Collector <i>A. Rizzo / B. Fehlberg</i>	Company Contact Bob Raidl	Telephone (509) 372-9641
Project Designation 100-FR-3 Groundwater - Round 8	Sampling Location 100 F	SAF No. B96-032
Ice Chest No. <i>STE. Helen</i>	Field Logbook No. <i>EFL-1054</i>	Method of Shipment Federal Express
Shipped To Lockheed	Offsite Property No. <i>NA KR 11/20/95 W96-0-0640-09</i>	Bill of Lading/Air Bill No. <i>NA KR 11/20/95 290 4646 753</i>

Possible Sample Hazards/Remarks	Preservation		HNO ₃	Cool 4°C	HCl	HNO ₃	Cool 4°C	Cool 4°C	HNO ₃
	Type of Container	P/G	P/G	Gs	P/G	G	P/G	P/G	
	No. of Container(s)	1	1	3	5	1	1	1	
Special Handling and/or Storage Maintain samples between 2°C and 6°C.	Volume	1L	500mL	40mL	1L	1L	20mL	1L	
SAMPLE ANALYSIS	ICP Metals-TAL. AA Metals-As, Pb. (Unfiltered)	Anions (IC) -F, Cl, SO ₄ , PO ₄ , NO ₃ , NO ₂	VOA-TCL	Gross Alpha, Gross Beta, Sr-90	Tritium, C-14	Activity Scan	ICP Metals-TAL. AA Metals-As, Pb. (Filtered)		

Sample No.	Matrix*	Date Sampled	Time Sampled							
BOGSF4	W	11-17-95	1250	Y	X	X	X	X	Y	
BOGSF5	W	11-17-95	1250							X
BOGSF6	W	11-17-95	1250			X	KT 11/20/95			
BOGS67	W	11-17-95	0545		Y					

000020

000020

CHAIN OF POSSESSION	Sign/Print Names	SPECIAL INSTRUCTIONS
Relinquished By <i>B. Fehlberg / B. Fehlberg</i>	Date/Time 11/17/95 14:05	Received By <i>ERC</i>
Relinquished By <i>ERC</i>	Date/Time 0800	Date/Time 11-17-95
Relinquished By <i>K. Trapp / K. Trapp</i>	Date/Time 11-20-95 0850	Received By <i>K. Trapp / K. Trapp</i>
Relinquished By <i>K. Trapp / K. Trapp</i>	Date/Time 11/20/95	Date/Time 11/20/95
Relinquished By	Date/Time	Date/Time
Sample analysis for PO ₄ , NO ₃ , and NO ₂ by EPA 300.0 is being requested for information only. The ERC Contractor acknowledges that the 48-hour holding time will not be met.		The Activity Scan is for all samples listed on this chain of custody.

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

LABORATORY SECTION	Received By <i>[Signature]</i>	Title Sample Custodian	Date/Time 11-21-95/0845
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

Appendix 5

Data Validation Supporting Documentation

GENERAL CHEMISTRY DATA VALIDATION CHECKLIST

VALIDATION LEVEL:	A	B	C	D	E
PROJECT:	100-FR-3		DATA PACKAGE: LK5893		
VALIDATOR:	RBC	LAB: Lockheed	DATE: 1/17/96		
CASE:			SDG: LK5893-LA-5		
ANALYSES PERFORMED					
<input checked="" type="checkbox"/> Anions/IC	<input type="checkbox"/> TOC	<input type="checkbox"/> TOX	<input type="checkbox"/> TPH-418.1	Oil and Grease	Alkalinity
<input type="checkbox"/> Ammonia	<input type="checkbox"/> BOD/COD	<input type="checkbox"/> Chloride	<input type="checkbox"/> Chromium-VI	<input type="checkbox"/> pH	<input type="checkbox"/> NO ₂ /NO ₃
<input type="checkbox"/> Sulfate	<input type="checkbox"/> TDS	<input type="checkbox"/> TKN	<input type="checkbox"/> Phosphate	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SAMPLES/MATRIX					
BOGSFY (split BOGS77)					
BOGSFI (split BOGSBI)					
Water					

1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE

Is technical verification documentation present? **Yes** No N/A
 Is a case narrative present? **Yes** No N/A

Comments: _____

2. HOLDING TIMES

Are sample holding times acceptable? Yes **No** N/A

Comments: nitrate, nitrite + phosphate over by 2X

 Nitrate - J
 nitrite + orthophosphate - UR

A-23/PC

GENERAL CHEMISTRY DATA VALIDATION CHECKLIST

3. INSTRUMENT CALIBRATION

- Was initial calibration performed for all applicable analyses? Yes No N/A
- Are initial calibration results acceptable? Yes No N/A
- Was a calibration check performed for all applicable analyses? Yes No N/A
- Are calibration check results acceptable? Yes No N/A

Comments: _____

4. BLANKS

- Were laboratory blanks analyzed? Yes No N/A
- Are laboratory blank results acceptable? Yes No N/A
- Were field/trip blanks analyzed? Yes No N/A
- Are field/trip blank results acceptable? Yes No N/A

Comments: _____

5. ACCURACY

- Were spike samples analyzed at the required frequency? Yes No N/A
- Are spike recoveries acceptable? Yes No N/A
- Were LCS analyses performed at the required frequency? Yes No N/A
- Are LCS recoveries acceptable? Yes No N/A

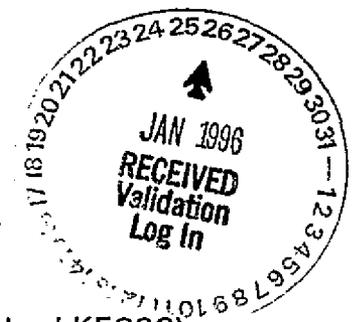
Comments: _____

6. PRECISION

- Were laboratory duplicate samples analyzed at the required frequency? Yes No N/A
- Are laboratory duplicate sample RPD values acceptable? Yes No N/A
- Are field duplicate RPD values acceptable? Yes No N/A
- Are field split RPD values acceptable? Yes No N/A

A-24/21

Date: January 26, 1996
To: Bechtel Hanford Company (technical representative)
From: A.T. Kearney, Inc.
Project: 100-FR-3 Round 8 Groundwater
Subject: Inorganics - Data Package No. LK5893-LAS (SDG No. LK5893)



INTRODUCTION

This memo presents the results of data validation on Summary Data Package No. LK5893-LAS prepared by Lockheed Analytical Services (LAS). A list of samples validated along with the analyses reported and the method of analysis is provided in the following table. Per SAF No. B96-032, arsenic and lead were to be analyzed by GFAA. All inorganic analytes in SDG No. LK5893 were instead analyzed by ICP-MS.

Sample ID	Sample Date	Media	Validation Level	Analysis
BOGSF1	11/17/95	Water	C	See Note 1
BOGSF2	11/17/95	Water	C	See Note 1
BOGSF4	11/17/95	Water	C	See Note 1
BOGSF5	11/17/95	Water	C	See Note 1

Note 1. Requested Method: CLP/ICP metals, CLP/GFAA arsenic and lead

Data validation was conducted in accordance with the WHC statement of work (WHC 1994) and validation procedures (WHC 1992a). Appendices 1 through 5 provide the following information as indicated below:

- Appendix 1. Glossary of Data Reporting Qualifiers
- Appendix 2. Summary of Data Qualification
- Appendix 3. Qualified Data Summary and Annotated Laboratory Reports
- Appendix 4. Laboratory Narrative and Chain-of-Custody Documentation
- Appendix 5. Data Validation Supporting Documentation

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DATA QUALITY OBJECTIVES

- **Holding Times**

Analytical holding times for ICP metals are assessed to ascertain whether the holding time requirements were met by the laboratory. The holding time requirements are as follows: Samples must be analyzed within six months for all ICP metals.

Holding time requirements for all analytes were met.

- **Blanks**

Calibration Blanks

A calibration blank must be analyzed immediately after every initial and continuing calibration verification. The blank must be analyzed at the beginning of the run and after the last analytical sample. In the case of positive blank results, samples with digestate concentrations (in ug/L) of less than five times the highest amount found in any of the associated blanks have had their associated values qualified as non-detected and flagged "U". Samples with concentrations of greater than five times the highest blank value do not require qualification.

In the case of negative calibration blank results, if the absolute value of any calibration blank exceeds the Instrument Detection Limit (IDL), all non-detects are qualified as estimates and flagged "UJ", and all positive results within two times the absolute value of the blank result are qualified as estimates and flagged "J". The qualification is applied only to results generated between the associated unacceptable calibration blank and the nearest acceptable blank.

Level C validation does not include the review of data based on calibration blanks.

Preparation Blanks

At least one preparation blank, consisting of deionized distilled water processed through each sample preparation and analysis procedure, must be prepared and analyzed with every sample delivery group. In the case of positive blank results, samples with digestate concentrations (in ug/L) less than five times the preparation blank value have had their associated values qualified as non-detected and flagged "U". Samples with concentrations of greater than five times the highest blank concentration do not require qualification.

In the case of negative blank results, if the absolute value exceeds the Contract

Required Detection Limit (CRDL), all non-detects are rejected and flagged "UR" and all detects that are less than ten times the absolute value of the associated preparation blank result are qualified as estimates and flagged "J". If the absolute value of the negative preparation blank is greater than the IDL and less than or equal to the CRDL, all non-detects are qualified as estimates and flagged "UJ" and all detects less than ten times the absolute value of the blank are qualified as estimates and flagged "J". If the sample results are greater than ten times the absolute value of the preparation blank, no qualification is necessary.

Due to the presence of a positive preparation blank result, the aluminum result for sample number BOGSF4 has been flagged "U".

Due to the presence of a positive preparation blank result, the iron results for sample numbers BOGSF1 and BOGSF4 have been flagged "U".

Due to the presence of a positive preparation blank result, the zinc results for sample numbers BOGSF1 and BOGSF4 have been flagged "U".

All other preparation blanks results were acceptable.

- **Accuracy**

- Matrix Spike

- Matrix spike analyses are used to assess the analytical accuracy of the reported data and the effect of the matrix on the ability to accurately quantify sample concentrations. Matrix spike recoveries must fall within the range of 75% to 125%. Samples with a spike recovery of less than 30% and a sample value below the IDL are rejected and flagged "UR". Samples with a spike recovery of 30% to 74% and a sample result less than the IDL are qualified "UJ". Samples with a spike recovery of greater than 125% or less than 75% and a sample result greater than the IDL are qualified "J". Finally, for samples with a spike recovery greater than 125% and a sample result less than the IDL, no qualification is required.

- All matrix spike recovery results were acceptable.

- Laboratory Control Sample Recovery

- The LCS monitors the overall performance of the analysis, including the sample preparation. An LCS should be digested or distilled and analyzed with every group of samples which have been prepared together. The performance criteria for solid LCS samples are established through interlaboratory studies coordinated by a certifying agency (e.g., EPA or an independent commercial supplier).

One liquid LCS is digested and analyzed for each sample batch that contains water samples. The results are compared against the control limit of 80-120% as required by the WHC data validation guidelines (WHC 1992a).

Level C validation does not require the qualification of data based on laboratory control sample results.

- **Precision**

Laboratory Duplicate Samples

The laboratory duplicate result measures the precision of the method by measuring a second aliquot of the sample that is treated the same way as the original. Samples whose precision fell outside the quality control requirements were qualified as estimates and flagged "J".

All laboratory duplicate recovery results were acceptable.

ICP Serial Dilution

The ICP serial dilution is used to determine whether significant physical or chemical interferences exist due to the sample matrix. If the sample concentration is greater than or equal to 50 times the IDL for an analyte and the %D is greater than 10%, the associated data is qualified as an estimate and flagged "J".

Level C validation does not require the qualification of data based on serial dilution results.

Field Split Samples

Four sets of field split samples were submitted to LAS and QES as shown below:

<u>Sample Number</u>	<u>Split Sample No.</u>	<u>Well Location</u>
BOGSB1(QES)	BOGSF1(LAS)	199-F7-1
BOGSB2(QES)	BOGSF2(LAS)	199-F7-1
BOGS77(QES)	BOGSF4(LAS)	199-F5-1
BOGS78(QES)	BOGSF5(LAS)	199-F5-1

Samples BOGSB1, BOGSB2, BOGS77 and BOGS78 were analyzed by Quanterra Environmental Services (QES) and reported with SDG W0812-QES. The split sample results were compared using the validation guidelines for determining the RPD between a sample and its duplicate. All results fell within the required

control limits. Per SAF No. B96-032, arsenic and lead were to be analyzed by GFAA. Arsenic and lead in SDG No. LK5893 were instead analyzed by ICP-MS while all arsenic and lead samples analyzed by QES were analyzed by GFAA.

- **Detection Levels**

Reported detection levels are compared against CRDLs to ensure that laboratory detection levels meet the required criteria. All reported laboratory detection levels were above the analyte specific CRDL.

- **Completeness**

Data Package No. LK5893-LAS (SDG No. LK5893) was submitted for validation and verified for completeness. The completion rate was 100%.

MAJOR DEFICIENCIES

None found.

MINOR DEFICIENCIES

Minor positive preparation blank contamination was reported for three analytes. All results were flagged accordingly. All other validated results are considered accurate within the standard error associated with the methods.

REFERENCES

EPA, 1987, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, Third Edition, Environmental Protection Agency, Washington, D.C.

EPA, 1988a, *EPA Contract Laboratory Program Statement of Work for Organics Analyses, Multi-Media, Multi-Concentration*, U.S. Environmental Protection Agency, Washington, D.C.

EPA, 1988b, *Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses*, U.S. Environmental Protection Agency, Washington, D.C.

EPA, 1988c, *EPA Contract Laboratory Program Statement of Work for Inorganics Analyses, Multi-Media, Multi-Concentration*, U.S. Environmental Protection Agency, Washington, D.C.

EPA, 1988d, *Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses*, U.S. Environmental Protection Agency, Washington, D.C.

EPA, 1990, *EPA Contract Laboratory Program Statement of Work for Inorganic Analyses, Multi-media, Multi-Concentration*, U.S. Environmental Protection Agency, Washington, D.C.

EPA, 1991, *EPA Contract Laboratory Program Statement of Work for Organics Analyses, Multi-Media, Multi-Concentration*, Environmental Protection Agency, Washington, D.C.

WHC, 1992a, *Data Validation Procedures for Chemical Analyses*, WHC-SD-EN-SPP-002, Rev. 2, Westinghouse Hanford Company, October 1993.

WHC, 1992b, *Data Validation Procedure for Radiological Analyses*, WHC-SD-EN-SPP-001, Rev. 2, Westinghouse Hanford Company, 1993.

EPA, 1994, *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, U.S. Environmental Protection Agency, Washington, D.C.

Appendix 1
Glossary of Data Reporting Qualifiers

000007

Qualifiers which may be applied by data validators in compliance with WHC guidelines 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 the data validation, the associated quantitation limit is an estimate.
- J - Indicates the compound or analyte was analyzed for and detected. Due to a QC deficiency identified during the data validation, 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 is unusable due to an identified QC deficiency.
- NJ - Indicates presumptive evidence of a compound at an estimated value. The data may not be valid for some specific applications (i.e., usable for decision-making purposes).
- N - Indicates presumptive evidence of a compound. The data may not be valid for some specific applications (i.e., usable for decision-making purposes).

000005

Appendix 2
Summary of Data Qualification

000005

DATA QUALIFICATION SUMMARY

SDG: LK5893	REVIEWER: RJS	DATE: 01/26/96	PAGE <u>1</u> OF <u>1</u>
COMMENTS:			
COMPOUND	QUALIFIER	SAMPLES AFFECTED	REASON
Aluminum	U	BOGSF4	Positive preparation blank result
Iron	U	BOGSF1, BOGSF4	Positive preparation blank result
Zinc	U	BOGSF1, BOGSF4	Positive preparation blank result

Appendix 3

Qualified Data Summary and Annotated Laboratory Reports

000011

Project: BECHTEL-HANFORD																					
Laboratory: Lockheed																					
Case		SDG: LK5893																			
Sample Number		B0GSF1		B0GSF2		B0GSF4		B0GSF5													
Location		199-F7-1		199-F7-1		199-F5-1		199-F5-1													
Remarks		Split		Split		Split		Split													
Sample Date		11/17/95		11/17/95		11/17/95		11/17/95													
Inorganic Analytes	CRDL	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Aluminum	200	21.0	U	26.3		23.7	U	21.0	U												
Antimony	60	2.0	U	2.0	U	2.0	U	2.0	U												
Arsenic	10	12.5		5.6		2.4		2.0	U												
Barium	200	46.4		48.4		31.9		34.0													
Beryllium	5	1.0	U	1.0	U	1.0	U	1.0	U												
Cadmium	5	5.0	U	5.0	U	5.0	U	5.0	U												
Calcium	5000	63900		71700		42300		48800													
Chromium	10	4.0	U	4.0	U	4.0	U	4.0	U												
Cobalt	50	6.0	U	6.0	U	6.0	U	6.0	U												
Copper	25	3.0	U	3.0	U	3.0	U	3.0	U												
Iron	100	20.4	U	9.0	U	62.9	U	9.0	U												
Lead	3	1.0	U	1.0	U	1.0	U	1.0	U												
Magnesium	5000	20500		22100		6920		7890													
Manganese	15	2.0	U	2.0	U	2.0	U	2.0	U												
Nickel	40	14.0	U	14.0	U	14.0	U	14.0	U												
Potassium	5000	7420		8000		2090		1380													
Selenium	5	4.8		6.7		3.0	U	3.0	U												
Silver	10	3.0	U	3.0	U	3.0	U	3.0	U												
Sodium	5000	59900		61700		3930		4280													
Thallium	10	3.0	U	3.0	U	3.0	U	3.0	U												
Vanadium	50	18.2		21.4		4.0	U	4.0	U												
Zinc	20	9.1	U	3.0	U	12.2	U	3.0	U												

RJS 1/15/96

000012

1
INORGANIC ANALYSES DATA SHEET

CLIENT ID NO.

BOGSF1

Lab Name: L.A.S. _____ Contract: BECHTEL _____

Lab Code: LOCK _____ Case No.: 1121BH SAS No.: _____ SDG No.: L5893W

Matrix (soil/water): WATER Lab Sample ID: L5893-4 _____

Level (low/med): LOW _____ Date Received: 11/21/95

% Solids: _____ 0

Concentration Units (ug/L or mg/kg dry weight): UG/L _____

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	21.0	U		P
7440-36-0	Antimony	2.0	U		P
7440-38-2	Arsenic	12.5			P
7440-39-3	Barium	46.4	B		P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	5.0	U		P
7440-70-2	Calcium	63900		E	P
7440-47-3	Chromium	4.0	U		P
7440-48-4	Cobalt	6.0	U		P
7440-50-8	Copper	3.0	U		P
7439-89-6	Iron	20.4	B		P
7439-92-1	Lead	1.0	U		P
7439-95-4	Magnesium	20500		E	P
7439-96-5	Manganese	2.0	U		P
7440-02-0	Nickel	14.0	U		P
7440-09-7	Potassium	7420			P
7782-49-2	Selenium	4.8	B		P
7440-22-4	Silver	3.0	U		P
7440-23-5	Sodium	59900		E	P
7440-28-0	Thallium	3.0	U		P
7440-62-2	Vanadium	18.2	B		P
7440-66-6	Zinc	9.1	B		P

u
u

Color Before: COLORLESS Clarity Before: CLEAR _____ Texture: _____

Color After: COLORLESS Clarity After: CLEAR _____ Artifacts: _____

Comments:

RAS 1/15/96

1
INORGANIC ANALYSES DATA SHEET

CLIENT ID NO.

BOGSF2

Lab Name: L.A.S. _____ Contract: BECHTEL _____

Lab Code: LOCK _____ Case No.: 1121BH SAS No.: _____ SDG No.: L5893F

Matrix (soil/water): WATER _____ Lab Sample ID: L5893-32 _____

Level (low/med): LOW _____ Date Received: 11/21/95

% Solids: _____ 0

Concentration Units (ug/L or mg/kg dry weight): UG/L _____

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	26.3	B		P
7440-36-0	Antimony	2.0	U		P
7440-38-2	Arsenic	5.6	B		P
7440-39-3	Barium	48.4	B		P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	5.0	U		P
7440-70-2	Calcium	71700			P
7440-47-3	Chromium	4.0	U		P
7440-48-4	Cobalt	6.0	U		P
7440-50-8	Copper	3.0	U		P
7439-89-6	Iron	9.0	U		P
7439-92-1	Lead	1.0	U		P
7439-95-4	Magnesium	22100			P
7439-96-5	Manganese	2.0	U		P
7440-02-0	Nickel	14.0	U		P
7440-09-7	Potassium	8000			P
7782-49-2	Selenium	6.7			P
7440-22-4	Silver	3.0	U		P
7440-23-5	Sodium	61700			P
7440-28-0	Thallium	3.0	U		P
7440-62-2	Vanadium	21.4	B		P
7440-66-6	Zinc	3.0	U		P

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

R75
1/15/96

005025

CLP

1

INORGANIC ANALYSES DATA SHEET

CLIENT ID NO.

BOGSF4

Lab Name: L.A.S.

Contract: BECHTEL

Lab Code: LOCK

Case No.: 1121BH

SAS No.:

SDG No.: L5893W

Matrix (soil/water): WATER

Lab Sample ID: L5893-3

Level (low/med): LOW

Date Received: 11/21/95

% Solids: 0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	23.7	X		P
7440-36-0	Antimony	2.0	U		P
7440-38-2	Arsenic	2.4	B		P
7440-39-3	Barium	31.9	B		P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	5.0	U		P
7440-70-2	Calcium	42300		E	P
7440-47-3	Chromium	4.0	U		P
7440-48-4	Cobalt	6.0	U		P
7440-50-8	Copper	3.0	U		P
7439-89-6	Iron	62.9	X		P
7439-92-1	Lead	1.0	U		P
7439-95-4	Magnesium	6920		E	P
7439-96-5	Manganese	2.0	U		P
7440-02-0	Nickel	14.0	U		P
7440-09-7	Potassium	2090	B		P
7782-49-2	Selenium	3.0	U		P
7440-22-4	Silver	3.0	U		P
7440-23-5	Sodium	3930	B	E	P
7440-28-0	Thallium	3.0	U		P
7440-62-2	Vanadium	4.0	U		P
7440-66-6	Zinc	12.2	X		P

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u

u

Color Before: COLORLESS

Clarity Before: CLEAR

Texture:

Color After: COLORLESS

Clarity After: CLEAR

Artifacts:

Comments:

RJS 1/15/96

FORM I - IN

000015

00432

CLP

1
INORGANIC ANALYSES DATA SHEET

CLIENT ID NO.

BOGSF5

Lab Name: L.A.S. _____ Contract: BECHTEL _____

Lab Code: LOCK _____ Case No.: 1121BH SAS No.: _____ SDG No.: L5893F

Matrix (soil/water): WATER _____ Lab Sample ID: L5893-31 _____

Level (low/med): LOW _____ Date Received: 11/21/95

% Solids: _____ 0

Concentration Units (ug/L or mg/kg dry weight): UG/L _____

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	21.0	U		P
7440-36-0	Antimony	2.0	U		P
7440-38-2	Arsenic	2.0	U		P
7440-39-3	Barium	34.0	B		P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	5.0	U		P
7440-70-2	Calcium	48800			P
7440-47-3	Chromium	4.0	U		P
7440-48-4	Cobalt	6.0	U		P
7440-50-8	Copper	3.0	U		P
7439-89-6	Iron	9.0	U		P
7439-92-1	Lead	1.0	U		P
7439-95-4	Magnesium	7890			P
7439-96-5	Manganese	2.0	U		P
7440-02-0	Nickel	14.0	U		P
7440-09-7	Potassium	1380	B		P
7782-49-2	Selenium	3.0	U		P
7440-22-4	Silver	3.0	U		P
7440-23-5	Sodium	4280	B		P
7440-28-0	Thallium	3.0	U		P
7440-62-2	Vanadium	4.0	U		P
7440-66-6	Zinc	3.0	U		P

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

_____ RJS 11/15/95

FORM I - IN

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Appendix 4

Laboratory Narrative and Chain-of-Custody Documentation

000017

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

LOCKHEED MARTIN 

January 3, 1996

Ms. Joan Kessner
Bechtel Hanford, Inc.
1022 Lee Boulevard
P.O. Box 969
Richland, WA 99352

RE: Log-in No: L5893
Quotation No: Q400000-B
Document File No: 1121596
BHI Document Control No: 298
SAF No.: B96-032
SDG No.: LK5893



The attached data report contains the analytical results of samples that were submitted to Lockheed Analytical Services on 21 November 1995.

The temperature of the cooler upon receipt was 4°C. Sample containers received agree with the chain-of-custody documentation. Sample containers were received intact. Samples designated for nitrate/nitrite analysis were not received in time to meet the analytical holding time requirements. The vials for volatile analyses did not contain headspace.

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

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

If you have any questions concerning the analysis or the data please call Kathleen M. Hall at (509) 375-4741.

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Lockheed Analytical Services

Log-in No.: L5893
Quotation No.: Q400000-B
SAF: B96-032
Document File No.: 1121596
WHC Document File No.: 298
SDG No.: LK5893
Page No.: 1

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

Sincerely,

Karen Hermann FOR
Kathleen M. Hall
Client Services Representative

kmh

cc: Client Services
Document Control

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**CASE NARRATIVE
INORGANIC METALS ANALYSES
WATER**

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

- Two water samples were received in good condition on November 21, 1995 and logged in as L5893.
- The samples were prepared as LAS Batch 1121BHT and analyzed for selected analytes as requested on the chain of custody. Sample BOGSF4 (L5893-3) was used for matrix spike and duplicate, post-digestion spike and serial dilution. All data flags due to the performance of the above-mentioned QC are associated with every sample digested with this batch.

Holding Time Requirements

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

Method Blanks

- The level of analytes in the method blanks were less than the reporting detection limits.

Internal Quality Control

All internal quality control were within acceptance limits.

Sample Results

- For calcium, magnesium and sodium, the Percent Difference of the serial dilution is outside the 10% control limit. This may be due to physical interferences. All associated analytes are flagged with an "E".

Hongsheng LI

1/2/96

Prepared By

Date

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**CASE NARRATIVE
INORGANIC METALS ANALYSES
FILTERED WATER**

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

- Two water samples were received in good condition on November 21, 1995 and logged in as L5893.
- The samples were prepared as LAS Batch 1121BHD and analyzed for selected analytes as requested on the chain of custody. Sample BOGSF5 (L5093-31) was used for matrix spike and duplicate, post-digestion spike and serial dilution. All data flags due to the performance of the above-mentioned QC are associated with every sample digested with this batch.

Holding Time Requirements

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

Method Blanks

- The level of analytes in the method blanks were less than the reporting detection limits.

Internal Quality Control

All internal quality control were within acceptance limits.

Hongsheng LI

1/2/96

Prepared By

Date

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Bechtel Hanford, Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

L5893

Data Turnaround

- Priority
- Normal

Collector <i>A. Rizzo / B. Feilberg</i>	Company Contact Bob Raidl	Telephone (509) 372-9641
Project Designation 100-FR-3 Groundwater - Round 8	Sampling Location 100 F	SAF No. B96-032
Ice Chest No. <i>STE, Helen</i>	Field Logbook No. <i>EFL-1054</i>	Method of Shipment Federal Express
Shipped To Lockheed	Offsite Property No. <i>NA KT 11/20/95 W96-0-0640-09</i>	Bill of Lading/Air Bill No. <i>NA KT 11/20/95 290 4646 753</i>

Possible Sample Hazards/Remarks	Preservation	HNO ₃	Cool 4°C	HCl	HNO ₃	Cool 4°C	Cool 4°C	HNO ₃
	Type of Container	PIG	PIG	Gs	PIG	G	PIG	PIG
	No. of Container(s)	1	1	3	5	1	1	1
Special Handling and/or Storage Maintain samples between 2°C and 6°C.	Volume	1L	500mL	40mL	1L	1L	20mL	1L

SAMPLE ANALYSIS	ICP Metals-TAL, AA Metals-As, Pb. (Unfiltered)	Anions (IC) F, Cl, SO ₄ , PO ₄ , NO ₃ , NO ₂	VOA-TCL	Gross Alpha, Gross Beta, Sr-90	Tritium, C-14	Activity Scan	ICP Metals-TAL, AA Metals-As, Pb. (Filtered)
-----------------	--	---	---------	--------------------------------------	------------------	---------------	--

Sample No.	Matrix*	Date Sampled	Time Sampled							
BOGSF4	W	11-17-95	1250	Y	X	X	X	X	X	
BOGSF5	W	11-17-95	1250							X
BOGSF6	W	11-17-95	1250			X				
BOGS67	W	11-17-95	0545			Y				

000022

CHAIN OF POSSESSION	Sign/Print Names	SPECIAL INSTRUCTIONS Sample analysis for PO ₄ , NO ₂ , and NO ₃ by EPA 300.0 is being requested for information only. The ERC Contractor acknowledges that the 48-hour holding time will not be met. The Activity Scan is for all samples listed on this chain of custody.	Matrix* S = Soil SE = Sediment SO = Solid SL = Sludge W = Water O = Oil A = Air OS = Drum Solids DL = Drum Liquids T = Tissue Wt = Wipe L = Liquid V = Vegetation X = Other
Relinquished By <i>B. Feilberg</i>	Date/Time 11/17/95 14:05	Received By <i>ERC</i>	Date/Time 11/17/95
Relinquished By <i>B. Feilberg</i>	Date/Time 11/20/95 0800	Received By <i>K. J. J. / K. Traap</i>	Date/Time 11/20/95
Relinquished By <i>K. J. J. / K. Traap</i>	Date/Time 11/20/95 0850	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time

001988 11-21-95

LABORATORY SECTION	Received By <i>M. J. J.</i>	Title Sample Custodian	Date/Time 11-21-95/08:15
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

Bechtel Hanford, Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

Data Turnaround
 Priority
 Normal

Collector <i>A. Rizzo / B. Frilberg</i>	Company Contact Bob Raidl	Telephone (509) 372-9641
Project Designation 100-FR-3 Groundwater - Round 8	Sampling Location 100 F	SAF No. B96-032
Ice Chest No. <i>Ste. Helen</i>	Field Logbook No. <i>ET-2-1054</i>	Method of Shipment Federal Express
Shipped To Lockheed	Offsite Property No. <i>NA KR 11/20/95 WAG-0-0640-09</i>	Bill of Lading/Air Bill No. <i>NA KR 11/20/95 290 4646 753</i>

Possible Sample Hazards/Remarks	Preservation	HNO ₃	Cool 4°C	HCl	HNO ₃	Cool 4°C	Cool 4°C	HNO ₃
	Type of Container	P/G	P/G	Gs	P/G	G	P/G	P/G
	No. of Container(s)	1	1	3	5	1	1	1
Special Handling and/or Storage Maintain samples between 2°C and 6°C.	Volume	1L	500mL	40mL	1L	1L	20mL	1L
SAMPLE ANALYSIS	ICP Metals-TAL, AA Metals-As, Pb. (Unfiltered)	Arsons (IC) -F, Cl, SO ₂ , PO ₄ , NO ₂ , NO ₃ .	VOA-TCL	Gross Alpha, Gross Beta, Sr-90	Tritium, C-14	Activity Scan	ICP Metals-TAL, AA Metals-As, Pb. (Filtered)	

Sample No.	Matrix*	Date Sampled	Time Sampled							
BOGSF1	W	11-17-95	1105	X	X	X	X	X	X	
BOGSF2 <i>KR 11/20/95</i>	W	11-17-95	1105							X
BOGSF3 BOGSF6	W	11-17-95	1105		X					
BOGSF6		11-17-95	0545		X				<i>KR 11/20/95</i>	

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02005 121594

CHAIN OF POSSESSION	Sign/Print Names	SPECIAL INSTRUCTIONS Sample analysis for PO ₄ , NO ₂ , and NO ₃ by EPA 300.0 is being requested for information only. The ERC Contractor acknowledges that the 48-hour holding time will not be met. The Activity Scan is for all samples listed on this chain of custody.	Matrix* S = Soil SE = Sediment SO = Solid SL = Sludge W = Water O = Oil A = Air DS = Drum Solids DL = Drum Liquids T = Tissue WI = Wipe L = Liquid V = Vegetation X = Other
Relinquished By <i>B.F. O'Leary / B. Frilberg</i>	Date/Time 11/17/95 14:05	Received By <i>Bob Raidl / B. Frilberg</i>	Date/Time 11-17-95
Relinquished By <i>B. Frilberg</i>	Date/Time 0800	Received By <i>K. J. Trappe / K. Trappe</i>	Date/Time 11-20-95
Relinquished By <i>K. J. Trappe / K. Trappe</i>	Date/Time 11-20-95	Received By	Date/Time

LABORATORY SECTION	Received By <i>Admiral</i>	Title Sample Custodian	Date/Time 11-21-95 1045
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

Appendix 5
Data Validation Supporting Documentation

INORGANIC ANALYSIS DATA VALIDATION CHECKLIST

VALIDATION LEVEL:	A	B	C	D	E
PROJECT:	BHI		DATA PACKAGE: LK5893-LAS		
VALIDATOR:	RJS	LAB: Lockheed	DATE: 1/15/96		
CASE:	100-FR-3 Round 8 GW		SDG: LK5893		
ANALYSES PERFORMED					
<input checked="" type="checkbox"/> CLP/ICP	<input type="checkbox"/> CLP/GFAA	<input type="checkbox"/> CLP/Hg	<input type="checkbox"/> CLP/Cyanide	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> SW-846/ICP	<input type="checkbox"/> SW-846/GFAA	<input type="checkbox"/> SW-846/Hg	<input type="checkbox"/> SW-846 Cyanide	<input type="checkbox"/>	<input type="checkbox"/>
SAMPLES/MATRIX					
BOGSF1, BOGSF2					
BOGSF4, BOGSF5					
(4 Water Samples)					

1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE

Is technical verification documentation present? **Yes** No N/A
 Is a case narrative present? **Yes** No N/A
 Comments: _____

2. HOLDING TIMES

Are sample holding times acceptable? **Yes** No N/A
 Comments: All ICP metals < 6 months ✓

INORGANIC ANALYSIS DATA VALIDATION CHECKLIST

3. INSTRUMENT PERFORMANCE AND CALIBRATIONS

Were initial calibrations performed on all instruments? Yes No N/A
 Are initial calibrations acceptable? Yes No N/A
 Are ICP interference checks acceptable? Yes No N/A
 Were ICV and CCV checks performed on all instruments? Yes No N/A
 Are ICV and CCV checks acceptable? Yes No N/A

Comments: _____

4. BLANKS

Were ICB and CCB checks performed for all applicable analyses? Yes No N/A
 Are ICB and CCB results acceptable? Yes No N/A
 Were preparation blanks analyzed? Yes No N/A
 Are preparation blank results acceptable? Yes No N/A
 Were field/trip blanks analyzed? Yes No N/A
 Are field/trip blank results acceptable? Yes No N/A

Comments: _____
Qualified Prep blank detects (Al, Fe, Zn) "U"

5. ACCURACY

Were spike samples analyzed? Yes No N/A
 Are spike sample recoveries acceptable? Yes No N/A
 Were laboratory control samples (LCS) analyzed? Yes No N/A
 Are LCS recoveries acceptable? Yes No N/A

Comments: _____

A-20K5

INORGANIC ANALYSIS DATA VALIDATION CHECKLIST

6. PRECISION

Were laboratory duplicates analyzed? Yes No N/A

Are laboratory duplicate samples RPD values acceptable? Yes No N/A

Were ICP serial dilution samples analyzed? Yes No N/A

Are ICP serial dilution %D values acceptable? Yes No N/A

Are field duplicate RPD values acceptable? Yes No N/A

Are field split RPD values acceptable? Yes No N/A

Comments: Field Splits (4 pairs)

① BOGSF1/BOGSB1 ✓ ③ BOGSF4/BOGS77 ✓

② BOGSF2/BOGSB2 ✓ ④ BOGSF5/BOGS78 ✓

7. FURNACE AA QUALITY CONTROL

Were duplicate injections performed as required? Yes No N/A

Are duplicate injection %RSD values acceptable? Yes No N/A

Were analytical spikes performed as required? Yes No N/A

Are analytical spike recoveries acceptable? Yes No N/A

Was MSA performed as required? Yes No N/A

Are MSA results acceptable? Yes No N/A

Comments: _____

8. REPORTED RESULTS AND DETECTION LIMITS

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

Comments: _____

Request analyses included GFAA analysis of arsenic and lead. All analytes in this SDG were analyzed by ICP-MS.

A-21es

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CLP
3
BLANKS

Lab Name: L.A.S. _____ Contract: BECHTEL _____
 Lab Code: LOCK _____ Case No.: 1121BH SAS No.: _____ SDG No.: L5893W
 Preparation Blank Matrix (soil/water): WATER
 Preparation Blank Concentration Units (ug/L or mg/kg): UG/L_

Prep 1

Analyte	Initial Calib. Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank		M
		C	1	C	2	C	3	C		C	
Aluminum	21.0	U	21.0	U	21.0	U	21.0	U	24.140	B	P
Antimony	2.0	U	2.0	U	2.0	U	2.0	U	2.000	U	P
Arsenic	2.0	U	2.0	U	2.0	U	2.0	U	2.000	U	P
Barium	14.0	U	14.0	U	14.0	U	14.0	U	14.000	U	P
Beryllium	1.0	U	1.0	U	1.0	U	1.0	U	1.000	U	P
Cadmium	5.0	U	5.0	U	5.0	U	5.0	U	5.000	U	P
Calcium	26.0	U	26.0	U	26.0	U	26.0	U	26.000	U	P
Chromium	4.2	B	4.0	U	4.0	U	4.0	U	4.000	U	P
Cobalt	6.0	U	6.0	U	6.0	U	6.0	U	6.000	U	P
Copper	3.0	U	3.0	U	3.0	U	3.0	U	3.000	U	P
Iron	9.0	U	9.0	U	9.0	U	9.0	U	26.410	B	P
Lead	1.0	U	1.0	U	1.0	U	1.0	U	1.000	U	P
Magnesium	38.0	U	38.0	U	38.0	U	38.0	U	38.000	U	P
Manganese	2.0	U	2.0	U	2.0	U	2.0	U	2.000	U	P
Nickel	14.0	U	14.0	U	14.0	U	14.0	U	14.000	U	P
Potassium	520.0	U	520.0	U	520.0	U	520.0	U	520.000	U	P
Selenium	3.0	U	3.0	U	3.0	U	3.0	U	3.000	U	P
Silver	3.0	U	3.0	U	3.0	U	3.0	U	3.000	U	P
Sodium	46.0	U	46.0	U	46.0	U	46.0	U	164.860	B	P
Thallium	3.0	U	3.0	U	3.0	U	3.0	U	3.000	U	P
Vanadium	4.0	U	4.0	U	4.0	U	4.0	U	4.000	U	P
Zinc	3.0	U	3.0	U	3.0	U	3.0	U	6.280	B	P

{ BOGSF1 }
{ BOGSF4 }

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CLP
3
BLANKS

Lab Name: L.A.S. _____ Contract: BECHTEL _____
 Lab Code: LOCK _____ Case No.: 1121BH SAS No.: _____ SDG No.: L5893F
 Preparation Blank Matrix (soil/water): WATER
 Preparation Blank Concentration Units (ug/L or mg/kg): UG/L_

Prep²

Analyte	Initial Calib. Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank		M
		C	1	C	2	C	3	C		C	
Aluminum	21.0	U	21.0	U	21.0	U	21.0	U	21.000	U	P
Antimony	2.0	U	2.0	U	2.0	U	2.0	U	2.000	U	P
Arsenic	2.0	U	2.0	U	2.0	U	2.0	U	2.000	U	P
Barium	14.0	U	14.0	U	14.0	U	14.0	U	14.000	U	P
Beryllium	1.0	U	1.0	U	1.0	U	1.0	U	1.000	U	P
Cadmium	5.0	U	5.0	U	5.0	U	5.0	U	5.000	U	P
Calcium	26.0	U	26.0	U	26.0	U	26.0	U	26.000	U	P
Chromium	-4.2	B	4.0	U	4.0	U	4.0	U	4.000	U	P
Cobalt	6.0	U	6.0	U	6.0	U	6.0	U	6.000	U	P
Copper	3.0	U	3.0	U	3.0	U	3.0	U	3.000	U	P
Iron	9.0	U	9.0	U	9.0	U	9.0	U	9.000	U	P
Lead	1.0	U	1.0	U	1.0	U	1.0	U	1.000	U	P
Magnesium	38.0	U	38.0	U	38.0	U	38.0	U	38.000	U	P
Manganese	2.0	U	2.0	U	2.0	U	2.0	U	2.000	U	P
Nickel	14.0	U	14.0	U	14.0	U	14.0	U	14.000	U	P
Potassium	520.0	U	520.0	U	520.0	U	520.0	U	520.000	U	P
Selenium	3.0	U	3.0	U	3.0	U	3.0	U	3.000	U	P
Silver	3.0	U	3.0	U	3.0	U	3.0	U	3.000	U	P
Sodium	46.0	U	46.0	U	46.0	U	46.0	U	46.000	U	P
Thallium	3.0	U	3.0	U	3.0	U	3.0	U	3.000	U	P
Vanadium	4.0	U	4.0	U	4.0	U	4.0	U	4.000	U	P
Zinc	3.0	U	3.0	U	3.0	U	3.0	U	3.000	U	P

{ 8065F2 }
{ 80655 }

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Date: January 26, 1996
To: Bechtel Hanford, Inc. (technical representative)
From: A.T. Kearney, Inc.
Project: 100-FR-3 Round 8 Groundwater
Subject: Radiochemistry - Data Package No. LK5893-LAS (SDG No. LK5893)

INTRODUCTION

This memo presents the results of data validation on Summary Data Package No. LK5893-LAS prepared by Lockheed Analytical Services (LAS). A list of samples validated along with the analyses reported and the method of analysis is provided in the following table.

Sample ID	Sample Date	Media	Validation Level	Analysis
BOGSF1	11/17/95	Water	C	See Note 1
BOGSF4	11/17/95	Water	C	See Note 1

Note 1. Requested Method: Gross alpha/beta, strontium-90, carbon-14 and tritium.

Data validation was conducted in accordance with the WHC statement of work (WHC 1994) and validation procedures (WHC 1992b). Appendices 1 through 5 provide the following information as indicated below:

- Appendix 1. Glossary of Data Reporting Qualifiers
- Appendix 2. Summary of Data Qualification
- Appendix 3. Qualified Data Summary and Annotated Laboratory Reports
- Appendix 4. Laboratory Narrative and Chain-of-Custody Documentation
- Appendix 5. Data Validation Supporting Documentation

DATA QUALITY OBJECTIVES

- **Holding Times**

Holding times are calculated from Chain-of-Custody forms to determine the validity of the results. The maximum holding time for radiochemical analyses is six months.

All holding times were acceptable.

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- **Instrument Calibration and Performance**

Instrument calibration is performed to establish that the counters used to determine radionuclide activities are capable of producing acceptable and reliable analytical data. Each counting system must be factory calibrated at installation and after any maintenance or repair. Calibration consists of an instrument efficiency determination for each applicable radionuclide. Continuing calibration checks are performed to verify that instrument performance is stable and reproducible.

Initial and continuing calibrations are not reviewed under Level C validation.

- **Blanks**

Laboratory Blanks

Blank samples are analyzed to determine if positive results are due to laboratory reagent, sample container, or detector contamination. If blank analysis results indicate the presence of an analyte above the MDA, the following qualifiers are applied: All positive sample results less than five times the highest blank concentration are qualified as estimates and flagged "J"; sample results below the MDA are elevated to the MDA and qualified as undetected and flagged "U"; sample results above the MDA and greater than five times the highest blank concentration are not qualified.

All blank results were acceptable.

- **Accuracy**

Accuracy is evaluated by analyzing distilled water and field samples spiked with known amounts of radionuclides. The sample activity as determined by analysis is compared to the known activity to assess accuracy. The acceptable laboratory control sample recovery range is 70% to 130%, while that for a matrix spike is 60% to 140%. In addition, samples may be spiked with a radiochemical tracer to assist in isolating the radioisotope of interest with the yield of the tracer being used in calculating sample activity. The acceptable range for tracer recovery is 20% to 105%. Spike sample results outside the above ranges result in associated sample results being qualified as estimates, rejected, or not qualified, depending on the activity of the individual sample.

All accuracy results were acceptable.

- **Precision**

Analytical precision is expressed by the RPD between the recoveries of duplicate matrix spike analyses performed on a sample. Precision may also be assessed using unspiked duplicate sample analyses. If both sample and replicate activities are greater than five times the CRDL and the RPD is less than 35 percent for soil samples and 20 percent for water samples, the results are acceptable. If either activities are less than five times the CRDL, a control limit of less than or equal to two times the CRDL is used for soil samples and less than or equal to the CRDL for water samples. If either the original or replicate value is below the CRDL, the applicable control limits are less than or equal to the CRDL for water samples and less than or equal to two times the CRDL for soil samples. If the RPD is outside the applicable control limit, associated results are qualified as estimated detects or estimated non-detects.

All precision results were acceptable.

Split Samples

Two sets of field split samples were submitted for analysis as shown below:

<u>Sample Number</u>	<u>Split Sample No.</u>	<u>Well Location</u>
BOGSB1(QES)	BOGSF1(LAS)	199-F7-1
BOGS77(QES)	BOGSF4(LAS)	199-F5-1

Samples BOGSB1 and BOGS77 were submitted to Quanterra Environmental Services (QES) and analyzed with SDG No. W0812-QES. The split sample results were compared using the validation guidelines for determining the RPD between a sample and its duplicate. All results fell within the required control limits.

- **Detection Levels**

Reported laboratory detection levels are reviewed to ensure that they are at or below the CRDL. The MDA was above the CRDL for gross alpha and gross beta in sample BOGSF1. Under WHC guidelines, no qualification is required. All other reported MDAs were at or below the analyte specific CRDL.

- **Completeness**

Data Package No. LK5893-LAS (SDG No. LK5893) was submitted for validation and verified for completeness. The completion rate was 100%. The MDA was above the CRDL for gross alpha and gross beta in sample BOGSF1. Under WHC guidelines, no qualification is required.

000005

MAJOR DEFICIENCIES

None found.

MINOR DEFICIENCIES

None found.

REFERENCES

EPA, 1987, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, Third Edition, Environmental Protection Agency, Washington, D.C.

EPA, 1988a, *EPA Contract Laboratory Program Statement of Work for Organics Analyses, Multi-Media, Multi-Concentration*, U.S. Environmental Protection Agency, Washington, D.C.

EPA, 1988b, *Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses*, U.S. Environmental Protection Agency, Washington, D.C.

EPA, 1988c, *EPA Contract Laboratory Program Statement of Work for Inorganics Analyses, Multi-Media, Multi-Concentration*, U.S. Environmental Protection Agency, Washington, D.C.

EPA, 1988d, *Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses*, U.S. Environmental Protection Agency, Washington, D.C.

EPA, 1990, *EPA Contract Laboratory Program Statement of Work for Inorganic Analyses, Multi-media, Multi-Concentration*, U.S. Environmental Protection Agency, Washington, D.C.

EPA, 1991, *EPA Contract Laboratory Program Statement of Work for Organics Analyses, Multi-Media, Multi-Concentration*, Environmental Protection Agency, Washington, D.C.

WHC, 1992a, *Data Validation Procedures for Chemical Analyses*, WHC-SD-EN-SPP-002, Rev. 2, Westinghouse Hanford Company, October 1993.

WHC, 1992b, *Data Validation Procedure for Radiological Analyses*, WHC-SD-EN-SPP-001, Rev. 2, Westinghouse Hanford Company, 1993.

EPA, 1994, *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, U.S. Environmental Protection Agency, Washington, D.C.

000004

Appendix 1
Glossary of Data Reporting Qualifiers

000003

Qualifiers which may be applied by data validators in compliance with WHC procedures are as follows:

- U - Indicates the compound or analyte was analyzed for and not detected above the minimum detectable activity (MDA) in the sample. The value reported is the sample result corrected for sample dilution and moisture content by the laboratory. The data is usable for decision making purposes.
- UJ - Indicates the compound or analyte was analyzed for and not detected at concentrations above the minimum detectable activity (MDA) in the sample. Due to a QC deficiency identified during the data validation, the associated quantitation limit is an estimate, but is usable for decision making purposes.
- J - Indicates the compound or analyte was analyzed for and detected. Due to a QC deficiency identified during the data validation, the associated concentration is an estimate, but the data are usable for decision-making purposes.
- 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 is unusable due to an identified QC deficiency.

Appendix 2
Summary of Data Qualification

000007

DATA QUALIFICATION SUMMARY

SDG: LK5893	REVIEWER: RBC	DATE: 01/26/96	PAGE 1 OF 1
COMMENTS: No qualifiers assigned.			
COMPOUND	QUALIFIER	SAMPLES AFFECTED	REASON

Appendix 3

Qualified Data Summary and Annotated Laboratory Reports

000009

LOCKHEED ANALYTICAL SERVICES

RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. * Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: B0GSF1

LAL Sample ID: L5893-24

Date Collected: 17-NOV-95

Date Received: 21-NOV-95

Matrix: Water

Login Number: L5893

Constituent	Analyzed	Batch	Activity	Error	MBA	DataQual	Units
Gross Alpha	12-DEC-95	GR ALP/BETA LAL-0060_30664	5.7	3.3	4.3	C	pCi/L
Gross Beta	12-DEC-95	GR ALP/BETA LAL-0060_30664	12.9	2.8	3.6		pCi/L
STRONTIUM-89,90	08-DEC-95	SR-90 LAL-0065_31149	-0.01 U	0.28	0.49		pCi/L

RBC
1/10/96

LOCKHEED ANALYTICAL SERVICES

RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. * Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: B0GSF1

LAL Sample ID: L5893-30

Date Collected: 17-NOV-95

Date Received: 21-NOV-95

Matrix: Water

Login Number: L5893

Constituent	Analyzed	Batch	Activity	Error	NDA	DataQual	Units
C-14	06-DEC-95	C-14 LAL-0209_30662	12.0	82.	100		pCi/L
H-3	12-DEC-95	TRITIUM(H3) LAL-0066_30673	400	200	220		pCi/L

pkc
4/10/96

LOCKHEED ANALYTICAL SERVICES

RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. * Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: B0GSF4

LAL Sample ID: L5893-19

Date Collected: 17-NOV-95

Date Received: 21-NOV-95

Matrix: Water

Login Number: L5893

Constituent	Analyzed	Batch	Activity	Error	MDA	DataQual	Units
Gross Alpha	12-DEC-95	GR ALP/BETA LAL-0060_30664	0.9	1.1	1.9		pCi/L
Gross Beta	12-DEC-95	GR ALP/BETA LAL-0060_30664	53.0	4.2	2.1		pCi/L
STRONTIUM-89,90	08-DEC-95	SR-90 LAL-0065_31149	24.9	1.5	0.47		pCi/L

RK
1/10/96

LOCKHEED ANALYTICAL SERVICES

RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. * Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: B0GSF4

LAL Sample ID: L5893-29

Date Collected: 17-NOV-95

Date Received: 21-NOV-95

Matrix: Water

Login Number: L5893

Constituent	Analyzed	Batch	Activity	Error	MBA	DataQual	Units
C-14	06-DEC-95	C-14 LAL-0209_30662	41.0	85.	100		pCi/L
H-3	12-DEC-95	TRITIUM(H3) LAL-0066_30673	320	200	220		pCi/L

RLC
1/10/96

Appendix 4

Laboratory Narrative and Chain-of-Custody Documentation

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

LOCKHEED MARTIN



January 3, 1996

Ms. Joan Kessner
Bechtel Hanford, Inc.
1022 Lee Boulevard
P.O. Box 969
Richland, WA 99352

RE: Log-in No: L5893
Quotation No: Q400000-B
Document File No: 1121596
BHI Document Control No: 298
SAF No.: B96-032
SDG No.: LK5893



The attached data report contains the analytical results of samples that were submitted to Lockheed Analytical Services on 21 November 1995.

The temperature of the cooler upon receipt was 4°C. Sample containers received agree with the chain-of-custody documentation. Sample containers were received intact. Samples designated for nitrate/nitrite analysis were not received in time to meet the analytical holding time requirements. The vials for volatile analyses did not contain headspace.

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

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

If you have any questions concerning the analysis or the data please call Kathleen M. Hall at (509) 375-4741.

Handwritten signature/initials

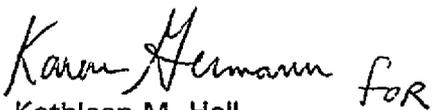
000003

Lockheed Analytical Services

Log-in No.: L5893
Quotation No.: Q400000-B
SAF: B96-032
Document File No.: 1121596
WHC Document File No.: 298
SDG No.: LK5893
Page No.: 1

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

Sincerely,


Kathleen M. Hall
Client Services Representative

kmh

cc: Client Services
Document Control

~~0003~~ per

000017

CASE NARRATIVE RADIOCHEMICAL ANALYSES

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

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

Holding Time Requirements

All holding times were met.

Gas Proportional Counter

Analytical Method Gross Alpha Beta

The gross alpha beta analysis was performed using standard operating procedure (SOP), LAL-91-SOP-0060. The samples were analyzed in workgroup 30664. The instrument calibration verification met criteria. The method blank was within QC criteria. The laboratory control sample (LCS) recoveries were within QC criteria. The matrix spike (MS) recoveries were within QC criteria. The duplicate (DUP) recoveries were within QC criteria. The minimum detectable activity (MDA) exceeded the reporting detection limit (RDL) due to residue weight limitations forcing a volume reduction. The affected samples are flagged with a "C" qualifier. No re-analyses were performed.

Analytical Method Strontium-90

The strontium-90 analysis was performed using SOP, LAL-91-SOP-0065. The samples were analyzed in workgroup 31149. The instrument calibration verification met criteria. The method blank was within QC criteria. The LCS recovery was within QC criteria. The DUP recoveries were within QC criteria. No re-analyses were performed.

Liquid Scintillation Counter

Analytical Method Carbon-14

The carbon-14 analysis was performed using SOP, LAL-92-SOP-0209. The samples were analyzed in workgroup 30662. The instrument calibration verification met criteria. The ~~000~~ *2*

Lockheed Analytical Services

Log-in No.: L5893
Quotation No.: Q400000-B
SAF: B96-032
Document File No.: 1121596
WHC Document File No.: 298
SDG No.: LK5893
Page No.: 8

method blank was within QC criteria. The LCS recovery was within QC criteria. The MS recovery was within QC criteria. The DUP recoveries were within QC criteria. The quench value was within curve limitations. No re-analyses were performed.

Analytical Method Tritium

The tritium analysis was performed using SOP, LAL-91-SOP-0066. The samples were analyzed in workgroup 30673. The instrument calibration verification met criteria. The method blank was within QC criteria. The LCS recovery was within QC criteria. The MS recovery was within QC criteria. The DUP recoveries were within QC criteria. The quench value was within curve limitations. No re-analyses were performed.

Yvonne M. Jacoby
Prepared By

December 14, 1995
Date

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Bechtel Hanford, Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

Data Turnaround
 Priority
 Normal

Collector <i>A. Rizzo / B. Fehler</i>	Company Contact Bob Raidl	Telephone (509) 372-9641
Project Designation 100-FR-3 Groundwater - Round 8	Sampling Location 100 F	SAF No. B96-032
Ice Chest No. <i>Ste. Helen</i>	Field Logbook No. <i>ERC-1054</i>	Method of Shipment Federal Express
Shipped To Lockheed	Offsite Property No. <i>NA-KT 11/20/95 WAG-0-0640-09</i>	Bill of Lading/Air Bill No. <i>NA-KT 11/20/95 290 4646 753</i>

Possible Sample Hazards/Remarks	Preservation	HNO ₃	Cool 4°C	HCl	HNO ₃	Cool 4°C	Cool 4°C	HNO ₃
	Type of Container	P/G	P/G	Gs	P/G	G	P/G	P/G
	No. of Container(s)	1	1	3	5	1	1	1
Special Handling and/or Storage Maintain samples between 2°C and 6°C.	Volume	1L	500mL	40mL	1L	1L	20mL	1L
SAMPLE ANALYSIS	ICP Metals-TAL AA Metals-As, Pb. (Unfiltered)	Anions (IC) -F, Cl, SO ₄ , PO ₄ , NO ₂ , NO ₃ .	VOA-TCL	Gross Alpha, Gross Beta, Sr-90	Tritium, C-14	Activity Scan	ICP Metals-TAL AA Metals-As, Pb. (Filtered)	

Sample No.	Matrix*	Date Sampled	Time Sampled						
BOGSF1	W	11-17-95	1105	f	x	x	x	x	
BOGSF2 <i>KT 11/20/95</i>	W	11-17-95	1105						X
BOGSF3 BOGSF6	W	11-17-95	1105		X				
BOGSF6		11-17-95	0545		X				<i>KT 11/20/95</i>

000020

CHAIN OF POSSESSION	Sign/Print Names	SPECIAL INSTRUCTIONS	Matrix*
Relinquished By <i>B. Fehler</i>	Date/Time 11/17/95 14:05	Sample analysis for PO ₄ , NO ₂ , and NO ₃ by EPA 300.0 is being requested for information only. The ERC Contractor acknowledges that the 48-hour holding time will not be met. The Activity Scan is for all samples listed on this chain of custody.	<ul style="list-style-type: none"> S = Soil SE = Sediment SO = Solid SL = Sludge W = Water O = Oil A = Air DS = Drum Solids DL = Drum Liquids T = Tissue WI = Wipe L = Liquid V = Vegetation X = Other
Received By <i>ERC</i>	Date/Time 11-17-95		
Relinquished By <i>B. Fehler</i>	Date/Time 0800		
Received By <i>K. Trap</i>	Date/Time 11/20/95		
Relinquished By <i>K. Trap</i>	Date/Time 0930		
Received By <i>K. Trap</i>	Date/Time 11/20/95		

000020

LABORATORY SECTION	Received By <i>A. M. [Signature]</i>	Title Sample Custodian	Date/Time 11-21-95 1045
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

Bechtel Hanford, Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

L5893

Data Turnaround
 Priority
 Normal

Collector <i>A. Rizzo / B. Fabian</i>	Company Contact Bob Raidl	Telephone (509) 372-9641
Project Designation 100-FR-3 Groundwater - Round 8	Sampling Location 100 F	SAF No. B96-032
Ice Chest No. <i>STE. Helen</i>	Field Logbook No. <i>ERL-1054</i>	Method of Shipment Federal Express
Shipped To Lockheed	Offsite Property No. <i>NA KT 11/20/95 W96-0-0640-09</i>	Bill of Lading/Air Bill No. <i>NA KT 11/20/95 290 4646 753</i>

Possible Sample Hazards/Remarks	Preservation	HNO ₃	Cool 4°C	HCl	HNO ₃	Cool 4°C	Cool 4°C	HNO ₃
	Type of Container	P/G	P/G	Gs	P/G	G	P/G	P/G
	No. of Container(s)	1	1	3	5	1	1	1
Special Handling and/or Storage Maintain samples between 2°C and 6°C.	Volume	1L	500mL	40mL	1L	1L	20mL	1L

SAMPLE ANALYSIS	ICP Metals-TAL, AA Metals-As, Pb. (Unfiltered)	Anions (Cl, SO ₄ , PO ₄ , NO ₂ , NO ₃)	VOA-TCL	Gross Alpha, Gross Beta, Sr-90	Tritium, C-14	Activity Scan	ICP Metals-TAL, AA Metals-As, Pb. (Filtered)

Sample No.	Matrix *	Date Sampled	Time Sampled							
BOGSF4	W	11-17-95	1250	Y	X	X	X	X	Y	
BOGSF5	W	11-17-95	1250							X
BOGSF6	W	11-17-95	1250			X		KT 11/20/95		
BOGS67	W	11-17-95	0545			Y				

CHAIN OF POSSESSION	Sign/Print Names	SPECIAL INSTRUCTIONS	Matrix *
Relinquished By <i>B. Fabian / B. Fabian</i>	Date/Time 11-17-95 14:05	Received By <i>ERC</i>	Date/Time 11-17-95
Relinquished By <i>ERC</i>	Date/Time 11-20-95 0800	Received By <i>K. Trapp / K. Trapp</i>	Date/Time 11-20-95 0900
Relinquished By <i>K. Trapp / K. Trapp</i>	Date/Time 11-20-95 0850	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time

The Activity Scan is for all samples listed on this chain of custody.

LABORATORY SECTION	Received By <i>[Signature]</i>	Title Sample Custodian	Date/Time 11-21-95/0845
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

0000220

00194

11-21-95

Appendix 5
Data Validation Supporting Documentation

000022

RADIOCHEMICAL DATA VALIDATION CHECKLIST

VALIDATION LEVEL:	A	B	<u>C</u>	D	E
PROJECT:	100-FR-3		DATA PACKAGE: LK5893		
VALIDATOR:	LAB: LAS		DATE: 1/10/96		
CASE:	SDG: LK5893-LAS				
ANALYSES PERFORMED					
<input checked="" type="checkbox"/> Gross Alpha/Beta	<input checked="" type="checkbox"/> Strontium-90	<input type="checkbox"/> Technetium-99	<input type="checkbox"/> Alpha Spectroscopy	<input type="checkbox"/> Gamma Spectroscopy	
<input type="checkbox"/> Total Uranium	<input type="checkbox"/> Radium-22	<input checked="" type="checkbox"/> Tritium	<input checked="" type="checkbox"/> C-14		
SAMPLES/MATRIX					
BOGSF4, BOGSF1 (split SB1)					
(split 577) (split 577) K					
water					

1. Completeness N/A
 Technical verification forms present? Yes No N/A
 Comments: _____

2. Initial Calibration N/A
 Instruments/detectors calibrated within one year of sample analysis? Yes No N/A
 Initial calibration acceptable? Yes No N/A
 Standards NIST traceable? Yes No N/A
 Standards Expired? Yes No N/A
 Comments: _____

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3. Continuing Calibration N/A

Calibration checked within one week of sample analysis? . . . Yes No N/A

Calibration check acceptable? Yes No N/A

Calibration check standards NIST traceable? Yes No N/A

Calibration check standards expired? Yes No N/A

Comments: _____

4. Blanks N/A

Method blank analyzed? Yes No N/A

Method blank results acceptable? Yes No N/A

Analytes detected in method blank? Yes No N/A

Field blank(s) analyzed? Yes No N/A

Field blank results acceptable? Yes No N/A

Analytes detected in field blank(s)? Yes No N/A

Transcription/Calculation Errors? Yes No N/A

Comments: _____

5. Matrix Spikes N/A

Matrix spike analyzed? Yes No N/A

Spike recoveries acceptable? Yes No N/A

Spike source traceable? Yes No N/A

Spike source expired? Yes No N/A

Transcription/Calculation Errors? Yes No N/A

Comments: _____

A/le

3. Continuing Calibration N/A

Calibration checked within one week of sample analysis? . . . Yes No N/A

Calibration check acceptable? Yes No N/A

Calibration check standards NIST traceable? Yes No N/A

Calibration check standards expired? Yes No N/A

Comments: _____

4. Blanks N/A

Method blank analyzed? Yes No N/A

Method blank results acceptable? Yes No N/A

Analytes detected in method blank? Yes No N/A

Field blank(s) analyzed? Yes No N/A

Field blank results acceptable? Yes No N/A

Analytes detected in field blank(s)? Yes No N/A

Transcription/Calculation Errors? Yes No N/A

Comments: _____

5. Matrix Spikes N/A

Matrix spike analyzed? Yes No N/A

Spike recoveries acceptable? Yes No N/A

Spike source traceable? Yes No N/A

Spike source expired? Yes No N/A

Transcription/Calculation Errors? Yes No N/A

Comments: _____

A-2

6. Laboratory Control Samples N/A

LCS analyzed? Yes No N/A

LCS recoveries acceptable? Yes No N/A

LCS traceable? Yes No N/A

Transcription/Calculation Errors? Yes No N/A

Comments: _____

7. Chemical Recovery N/A

Chemical carrier added? Yes No N/A

Chemical recovery acceptable? Yes No N/A

Chemical carrier traceable? Yes No N/A

Chemical carrier expired? Yes No N/A

Transcription/Calculation errors? Yes No N/A

Comments: SR90

C-14 No yield 3H No yield per BHI use LCS

8. Duplicates N/A

Duplicates Analyzed? Yes No N/A

RPD Values Acceptable? Yes No N/A

Transcription/Calculation Errors? Yes No N/A

Comments: _____

9. Field QC Samples N/A

Field duplicate sample(s) analyzed? Yes No N/A

Field duplicate RPD values acceptable? Yes No N/A

Field split sample(s) analyzed? Yes No N/A

Field split RPD values acceptable? Yes No N/A

Performance audit sample(s) analyzed? Yes No N/A

Performance audit sample results acceptable? Yes No N/A

Comments: _____

10. Holding Times

Are sample holding times acceptable? Yes No N/A

Comments: _____

11. Results and Detection Limits (Levels D & E) N/A

Results reported for all required sample analyses? Yes No N/A

Results supported in raw data? Yes No N/A

Results Acceptable? Yes No N/A

Transcription/Calculation errors? Yes No N/A

MDA's meet required detection limits? Yes No N/A

Transcription/calculation errors? Yes No N/A

Comments: gross alpha + Beta in sample BOGSF1

> CRDL

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