9613476.2564

START

LK5893

0045267

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

SEP 1996 RECEIVED EDMC

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

JAN 1996 RECEIVED Data Log In

| | | |
|---|---|---|
| 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.

***Lockheed Analytical Services***

Log-in No.: L5893
Quotation No.: Q400000-B
SAF: B96-032
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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 Heimann for

Kathleen M. Hall
Client Services Representative

kmh

cc: Client Services
Document Control

*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.: 2

# 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**

*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.: 3

# 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**

*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.: 4

# 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**

# 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*

Log-in No.: L5893
Quotation No.: Q400000-B
SAF: B96-032
Document File No.: 1121596
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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

# 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

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

9613476.2573

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 | PR | Due Date |
|---|---|---|---|---|---|
| L5893-1 | B0GSF4 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| Water 1 S SCREENING | | Hold:15-MAY-96 | | | |
| L5893-2 | B0GSF1 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| Water 1 S SCREENING | | Hold:15-MAY-96 | | | |
| L5893-3 | B0GSF4 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| Water 1 S CLP FURNACE | | Hold:15-MAY-96 | | | |
| Water 1 S CLP ICP | | Hold:15-MAY-96 | | | |
| L5893-4 | B0GSF1 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| Water 1 S CLP FURNACE | | Hold:15-MAY-96 | | | |
| Water 1 S CLP ICP | | Hold:15-MAY-96 | | | |
| L5893-5 | B0GSF4 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| Water 1 S 300.0 CHLORIDE | | Hold:15-DEC-95 | | | |
| Water 1 S 300.0 FLUORIDE | | Hold:15-DEC-95 | | | |
| Water 1 S 300.0 NITRATE | | Hold:19-NOV-95 | | | |
| Water 1 S 300.0 NITRITE | | Hold:19-NOV-95 | | | |
| Water 1 S 300.0 PHOSPHATE | | Hold:19-NOV-95 | | | |
| Water 1 S 300.0 SULFATE | | Hold:15-DEC-95 | | | |
| L5893-6 | B0GSF1 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| Water 1 S 300.0 CHLORIDE | | Hold:15-DEC-95 | | | |
| Water 1 S 300.0 FLUORIDE | | Hold:15-DEC-95 | | | |
| Water 1 S 300.0 NITRATE | | Hold:19-NOV-95 | | | |
| Water 1 S 300.0 NITRITE | | Hold:19-NOV-95 | | | |
| Water 1 S 300.0 PHOSPHATE | | Hold:19-NOV-95 | | | |
| Water 1 S 300.0 SULFATE | | Hold:15-DEC-95 | | | |



0015

112596

9613476.2574

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 | PR | Due Date |
|---|---|---|---|---|---|
| L5893-7 | B0GSF4 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| Water 1 S CLP 3/90 VOLATILES | | Hold:01-DEC-95 | | | |
| L5893-8 | B0GSF4 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| L5893-9 | B0GSF4 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| L5893-10 | B0GSG7 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| Water 1 S CLP 3/90 VOLATILES | | Hold:01-DEC-95 | | | |
| L5893-11 | B0GSG7 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| L5893-12 | B0GSG7 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| L5893-13 | B0GSF1 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| Water 1 S CLP 3/90 VOLATILES | | Hold:01-DEC-95 | | | |
| L5893-14 | B0GSF1 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| L5893-15 | B0GSF1 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| L5893-16 | B0GSG6 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| Water 1 S CLP 3/90 VOLATILES | | Hold:01-DEC-95 | | | |



0016

1121596

9613476.2575

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 | PR | Due Date |
|---|---|---|---|---|---|
| L5893-17 | B0GSG6 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| L5893-18 | B0GSG6 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| L5893-19 | B0GSF4 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| 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 | | | | | |
| L5893-20 | B0GSF4 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| L5893-21 | B0GSF4 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| L5893-22 | B0GSF4 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| L5893-23 | B0GSF4 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| L5893-24 | B0GSF1 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| 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 | | | | | |
| L5893-25 | B0GSF1 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| L5893-26 | B0GSF1 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |



112596

9613476.2576

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 | PR | Due Date |
|---|---|---|---|---|---|
| L5893-27 | B0GSF1 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| L5893-28 | B0GSF1 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| L5893-29 | B0GSF4 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| 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 | | | |
| L5893-30 | B0GSF1 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| 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 | | | |
| L5893-31 | B0GSF5 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| Filt H20 15 S | CLP FURNACE | Hold:15-MAY-96 | | | |
| Filt H20 15 S | CLP ICP | Hold:15-MAY-96 | | | |
| L5893-32 | B0GSF2 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| Filt H20 15 S | CLP FURNACE | Hold:15-MAY-96 | | | |
| Filt H20 15 S | CLP ICP | Hold:15-MAY-96 | | | |
| L5893-33 | REPORT TYPE | 21-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| 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 | | | | |



0018

Signature: Paula Dennis

Date: 11-21-95

112596

Bechtel Hanford, Inc.

# CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST L5893

Page 1 of 1

Data Turnaround: ☐ Priority ■ Normal

| | | |
|---|---|---|
| Collector: A. Kizzie / B. Fahlberg | 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.: Ste. Helen | Field Logbook No.: EFL-1054 | Method of Shipment: Federal Express |
| Shipped To: Lockheed | Offsite Property No.: ~~NA~~ KT 11/20/95 W96-0-0640-09 | Bill of Lading/Air Bill No.: ~~NA~~ KT 11/20/95 290 4646 753 |

Possible Sample Hazards/Remarks

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

| SAMPLE ANALYSIS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 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 | | |
| | | | Volume | 1L | 500mL | 40mL | 1L | 1L | 20mL | | 1L | | |
| | | | | 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 | | | | | | | | | | |
| B0GSF4 | W | 11-17-95 | 1250 | X | X | X | X | X | X | | | | |
| B0GSF5 | W | 11-17-95 | 1250 | | | | | | | | X | | |
| ~~B0GSF6~~ | ~~W~~ | ~~11-17-95~~ | ~~1250~~ | | | ~~X~~ | KT 11/20/95 | | | | | | |
| B0GSG7 | W | 11-17-95 | 0545 | | | X | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

| CHAIN OF POSSESSION | Sign/Print Names | | |
|---|---|---|---|
| Relinquished By: B. Fahlberg / B. Fahlberg | Date/Time: 14:05 11/17/95 | Received By: ERC B. Ashton | Date/Time: 1905 11-17-95 |
| Relinquished By: ERC B. Ashton | Date/Time: 0800 11-20-95 | Received By: K. Trapp / K. Trapp | Date/Time: 0900 11/20/95 |
| Relinquished By: K. Trapp / K. Trapp | Date/Time: 0850 11/20/95 | Received By: | Date/Time: |
| Relinquished By: | Date/Time: | Received By: | Date/Time: |

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

| LABORATORY SECTION | Received By | Title | Date/Time |
|---|---|---|---|
| | [illegible] | Sample Custodian | 11-21-95 / 08:15 |

| FINAL SAMPLE DISPOSITION | Disposal Method | Disposed By | Date/Time |
|---|---|---|---|
| | | | |

0019

Bechtel Hanford, Inc.

# CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

Page 1 of 1

Data Turnaround
☐ Priority
■ Normal

| | | |
|---|---|---|
| Collector: A. Rizzo / B. Fahlberg | 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.: Ste. Helen | Field Logbook No.: ERC-1054 | Method of Shipment: Federal Express |
| Shipped To: Lockheed | Offsite Property No.: ~~NA~~ KT 11/20/95 W96-0-0640-09 | Bill of Lading/Air Bill No.: ~~NA~~ KT 11/20/95 290 4646 753 |

| 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 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B0GSF1 | W | 11 17 95 | 1105 | X | X | X | X | X | X | | | | |
| B0GSF2 KT 11/20/95 | W | 11-17-95 | 1105 | | | | | | | | X | | |
| ~~B0GSF3~~ B0GSG6 | W | 11 17 95 | 1105 | | ~~X~~ 11 17 95 | X | | | | | | | |
| ~~B0GSG6~~ | ~~W~~ | ~~11 17 95~~ | ~~0545~~ | | | ~~X~~ | KT 11/20/95 | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

| CHAIN OF POSSESSION | Sign/Print Names | | |
|---|---|---|---|
| Relinquished By: B. Fahlberg / B. Fahlberg | Date/Time: 11/17/95 14:05 | Received By: ERC / B. Whitten | Date/Time: 1405 / 11-17-95 |
| Relinquished By: ERC / B. Whitten | Date/Time: 0800 / 11-20-95 | Received By: K. Trapp / K. Trapp | Date/Time: 0800 / 11/20/95 |
| Relinquished By: K. Trapp / K. Trapp | Date/Time: 0930 / 11/20/95 | Received By: | Date/Time: |
| Relinquished By: | Date/Time: | Received By: | Date/Time: |

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

| LABORATORY SECTION | Received By: | Title: | Date/Time: |
|---|---|---|---|
| | [illegible] | Sample Custodian | 11-21-95 / 0845 |

| FINAL SAMPLE DISPOSITION | Disposal Method | Disposed By | Date/Time |
|---|---|---|---|
| | | | |

030

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Environmental Restoration Contractor **ERC Team**

# Interoffice Memorandum

Job No. 22192
Written Response Required: NO
CCN: N/A
OU: 100-FR-3
TSD: N/A
ERA: N/A
Subject Code: 5820

| | | | | |
|---|---|---|---|---|
| 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 $\beta$ activity in excess of 100,000 pCi/l (<.1 uCi/sample based on a 1 liter sample size) nor any $\alpha$ 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 $\beta(H^3)$ and 50 pCi/l $\alpha$.

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

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

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

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

Yes[x] No [ ]

Notes: Nitrate/nitrite was received passed Holding Time.

Sample Custodian/Laboratory: [illegible]/LAS Date: 11-21-95

~~Telephoned~~ Faxed To: Kathleen Hall On 11-21-95 By [illegible]
PCO 11-21-95

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**LOCKHEED MARTIN**

## Sample Login
## Login Review Checklist

**Lot Number** L5893

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

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

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

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

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

Paula Davis 11-21-95
primary review signature date

[illegible] 11-21-95
secondary review signature date

0024

121596

# Lockheed Analytical Services
## Sample Receiving Checklist



Client Name: Bechtel - Hanford  Job No. L5893  Cooler ID: -2nd

**COOLER CONDITION UPON RECEIPT**

Temperature of cooler upon receipt: 4°C

temperature of temp. blank upon receipt: —

| | Yes | No | * Comments/Discrepancies |
|---|---|---|---|
| custody seals intact | X | | |
| chain of custody present | X | | |
| blue ice (or equiv.) present/frozen | X | | |
| rad survey completed | X | | |

**SAMPLE CONDITION UPON RECEIPT**

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

**MISCELLANEOUS ITEMS**

| | Yes | No | * Comments/Discrepancies |
|---|---|---|---|
| samples with short holding times | X | | Nitrate/nitrite received passed Holding Times |
| samples to subcontract | | n/a | |

**ADDITIONAL COMMENTS/DISCREPANCIES**

Completed by / date: Paula Dana 11-21-95

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

*Notes: * = contact the appropriate CSR of any discrepancies immediately upon receipt*

*** = please review this information and return via facsimile to the appropriate CSR (702) 361-8146*

version 2.0 (11/11/94)

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

| Client Sample Number | LAL Sample Number | SDG Number | Matrix | Method |
|---|---|---|---|---|
| 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-( |
| | L5893-24 | | Water | SR-90 LAL-0196 |
| | L5893-30 | | Water | C-14 LAL-0209 |
| | L5893-30 | | Water | TRITIUM(H3) LAL-( |
| BOGSF2 | L5893-32 | | Filt H20 | CLP FURNACE |
| | L5893-32 | | Filt H20 | 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-( |
| | L5893-19 | | Water | SR-90 LAL-0196 |
| | L5893-29 | | Water | C-14 LAL-0209 |
| | L5893-29 | | Water | TRITIUM(H3) LAL-( |
| BOGSF5 | L5893-31 | | Filt H20 | CLP FURNACE |
| | L5893-31 | | Filt H20 | CLP ICP |
| BOGSG6 | L5893-16 | | Water | CLP 3/90 VOLATILI |
| BOGSG7 | L5893-10 | | Water | CLP 3/90 VOLATILI |
| 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 |



112596

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# 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 |

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# LOCKHEED ANALYTICAL SERVICES

## Sample Results

| | |
|---|---|
| Client Sample ID: B0GSF1 | 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 |

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CLP

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 |
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Comments:

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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 | 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 |
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Comments:

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CLP

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 |
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Comments:

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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 |
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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 |

9613476.2592

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. | | | | | |
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9613476.2593

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 |

9613476.2594

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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9613476.2595

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 |

9613476.2596

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 |
|---|---|---|---|---|---|
| 1. | | | | | |
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9613476.2597

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 |

9613476.2598

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. | | | | | |
| 2. | | | | | |
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| 4. | | | | | |
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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 |

PROJECT Gross Alpha/Beta LCS

Notebook No. 0721



Continued From Page _____

# SECONDARY/WORKING LEVEL STANDARD DILUTION RECORD

## Dilution Source Information

| | |
|---|---|
| Isotope: | Am-241 and Sr-90 |
| Parent Barcode Number | AA0030 AA0046 |
| Vendor or Certificate I.D. # of Parent Standard: | Am-241 IPL 388-100-1<br>Sr-90 NIST SRM 4919G |
| Diluted Source Logbook I.D. #: | Am-241 91-0225-60-1<br>Sr-90 91-0225-30-2 |
| Balance Verification?: | Yes |
| Diluent Used: | 0.1 N $HNO_3$ |

## Dilution

| | |
|---|---|
| *Diluent: | 0.1 N $HNO_3$ + 42 mg $Sr(NO_3)_2$/mL |
| *Density of diluent (g/ml): | NA |
| a: Parent Specific Activity: | Am-241 9810 pCi/mL<br>Sr-90 6000 pCi/mL on 8/1/90 |
| b: Amount of Source Transferred: | Am-241 0.5 mL<br>Sr-90 0.5 ~~g~~ mL |
| c: Total amount of Dilution: | 500 ~~g~~ 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<br>Sr-90 12 pCi/mL on 8/1/90 |
| Dilution Logbook I.D. #: | 95-721-13-1 |

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

Reviewed By: [illegible]  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

| Signed | Date | Signed | Date |
|---|---|---|---|
| | | | |

9613426.2604

S7d. Diluted to 1 ml to make 91-0225-60-1 AA0030 ✓

# 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 µCi. |

**Description of Solution**

| | | |
|---|---|---|
| a. Mass of solution: | 5.0007 | grams. |
| b. Chemical form: | AmCl3 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 µCi/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)

Gary F. Gilmore
QUALITY CONTROL

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

9613476.2605

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 $\mu$g each of non-radioactive strontium and yttrium per gram of 1-molar hydrochloric acid (2) |
| Mass | Approximately 5.0 grams |
| Radioactivity concentration | $4.514 \times 10^3$ Bq $g^{-1}$ |
| Reference time | 1200 EST August 1, 1990 |
| Overall uncertainty | 1.05 percent (3) |
| Photon-emitting impurities | None observed (4) |
| Alpha-particle-emitting impurities | None observed (5) |
| Half life | 28.5 ± 0.2 years (6) |
| Measuring instrument | $4\pi\beta$ liquid-scintillation counter |

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

Gaithersburg, MD 20899
[illegible]uary, 1991

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

*Notes on back

0150

9613476.2606

S/d. Diluted to 1 ml to make 91-0225-60-1 AA0030.

# 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 µCi. |

**Description of Solution**

a. Mass of solution: 5.0007 grams.

b. Chemical form: AmCl3 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 µCi/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)

Gary F. Silvoe
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0153

Job or Task 9613476.2607

Notebook No. 553



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: 0.5 N 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: EJ Date: 4/9/93

1.6" diameter filter LCS for Gamma Spec. (in petri dish and sealed) JSS 5/18/93

Prepared by Nee Van Nuyen 5/10/93 — Cut Whatman Glass Microfiber Filter paper (originally 3" dia) to 1.6" dia — Pipetted on filter:

| | | | | |
|---|---|---|---|---|
| $^{137}$Cs | LRL-0199- | 0.200 ml | * 975.18 pCi/ml = 195.0 pCi | (≡ 197.8 pCi 4-2-91) |
| $^{60}$Co | LRL-0225-80-1 | 0.200 ml | * 40.3 Bq/ml (998.11 pCi/ml) = 199.6 pCi | (≡ 259.1 pCi 4-2-91) |

(same pipette amounts as p.80R)

Continued on Page N/A

Read and Understood By

| Signed | Date | Signed | Date |
|---|---|---|---|
| Agnes Wong | 4-9-93 | Jack S. Schuett | 5-18-93 |

0155

9613476.2608

Rcvd 5/3/94
ACS 251
RKS

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

## Calibration Certificate

**Description**

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

Nominal activity: 27 nano curies

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

**Measurement** Activity of principal radionuclide

Activity per gram of this solution

5.40 nano curies of Strontium-90

at 0400 hours PST on April 1, 1994

Activity of daughter radionuclide

The principal activity was accompanied at the quoted time by

5.40 nano curies Per gram

of the daughter nuclide Yttrium-90

Total mass of this solution

Approximately 5.0 grams

Method of measurement

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

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

**Useful Life**

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

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

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

9613476.2609

**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 ± 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**

0157

Date Certificate Prepared April 26, 1994

Approval Signature Paul B. Hahn

9613476.2610

82

PROJECT Sr-90

Notebook No. 0474

Continued From Page

# INITIAL STANDARD DILUTION RECORD

**Standard Information:**

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

**Primary Dilution**

| | |
|---|---|
| Balance Verification?: | yes |
| Diluent Used: | 0.1M HCl |
| a: Decay Corrected Standard Activity (pCi/g): | $5.4 \times 10^3$ 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 CR 4/7/95 |

Prepared By: Agnes Wong Preparation Date: 6-15-94

Reviewed By: Joe Hutchison Review Date: 6/30/94

Purity/Cross Check Performed By: Check Date:

0158

Signed Signed Date

9613476.2611

Rcvd 5/5/77
ACS 251
RKS

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

## Calibration Certificate

**Description**

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

Nominal activity: 27 nano curies

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

**Measurement** Activity of principal radionuclide

Activity per gram of this solution

5.40 nano curies of Strontium-90

at 0400 hours PST on April 1, 1994

Activity of daughter radionuclide

The principal activity was accompanied at the quoted time by

5.40 nano curies Per gram

of the daughter nuclide Yttrium-90

Total mass of this solution

Approximately 5.0 grams

Method of measurement

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

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

**Useful Life**

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

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

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

**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 ± 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: | Other components: |
|---|---|
| 30 micrograms strontium | 0.1 M HCl |

Preservative:

**Remarks**

0166

Date Certificate Prepared April 26, 1994

Approval Signature Paul B. Hahn

9613476.2613

82

PROJECT Sr-90

Notebook No. 0474

Continued From Page

# INITIAL STANDARD DILUTION RECORD

**Standard Information:**

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

**Primary Dilution**

| | |
|---|---|
| Balance Verification?: | yes |
| Diluent Used: | 0.1M HCl |
| a: Decay Corrected Standard Activity (pCi/g): | $5.4 \times 10^3$ 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 CP 4/7/95 |

Prepared By: Agnes Wong Preparation Date: 6-15-94

Reviewed By: Joe Hutchison Review Date: 6/30/94

Purity/Cross Check Performed By: Check Date:

0167

Signed Date Signed Date

# SECONDARY/WORKING LEVEL STANDARD DILUTION RECORD

J. C. 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~~ ml |
| b: Amount of Source Transferred: | ~~3.00~~ 2.00 | g |
| c: Total amount of Dilution: | ~~102.21~~ ~~101.21~~ 303.63 | g |
| d: Total Volume of Dilution: | 300.0 | ml |
| e: Activity of Dilution [a * b / c]: | ~~59.37~~ ~~40.00~~ 40.49 | pCi/g @ 8/1/90 |
| f: Activity of Dilution (a * b / d): | ~~59.37~~ ~~40.00~~ 40.00 | pCi/ml |
| Dilution Logbook I.D. #: | LAL-94-0677-49 | |

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

Reviewed By: Joe Hutchinson 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.

Read and Understood By

| Signed | Date | Signed | Date |
|---|---|---|---|
| | | [illegible] | 5/8/95 |

4
PROJECT Sr - Carrier Calibration

Notebook No. 658
Continued From Page

## 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 $Sr(NO_3)_2$ in water and dilute to 1 L in a volumetric flask with water.

Perform calibration check on a 0.5 mL pipet and then carefully pipet 3 - 0.5 mL portions of the strontium carrier solution into separate cleaned dried and tared planchets. Dry the planchet under a drying lamp. Cool the planchets in a desiccator and weigh. Sr Carrier #91-208-100-1 was recalibrated to give a new calibrated value. Prepped m 1-5-95

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

**AVERAGE $Sr(NO_3)_2$ ± STD DEV. =** 0.01231 g

*Expected mg of* $Sr(NO_3)_2$ = *cert.value(≈10mgofSr/mL)* * 0.5 *mL* * 2.41

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

Initial and Date: 1-10-95

Read and Understood By

| Signed | Date | Signed | Date |
|---|---|---|---|
| | | | 1-10-95 |

100
PROJECT Sr Carrier Standardization

Notebook No. 0208
Continued From Page

Signed [illegible] 3-15-94

## 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 $Sr(NO_3)_2$ 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 $Sr(NO_3)_2$ ± STD DEV. = 0.01192 g ± 0.000277

*Expected mg of* $Sr(NO_3)_2$ = *cert.value*(≈10*mgofSr/mL*) * 0.5 *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:

[illegible] 3-15-94 [illegible] 8/14/94

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

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 $Sr(NO_3)_2$ 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 $Na_2CO_3$ solution and continue digesting for 15 to 20 minutes. Centrifuge and carefully decant the solution. Wash the $SrCO_3$ precipitate with nanopure water pH adjusted to 8 with $NH_4OH$. Using a plastic disposable pipet, quantitatively transfer the $SrCO_3$ 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 $SrCO_3$ / 10 mL ± STD DEV. = 0.0213 ± 0.0067

$$\text{Expected mg of } SrCO_3 = \frac{\text{cert.value } (\approx 10\text{mg of Sr/mL}) * 10 \text{ mL} * 147.62 \text{ g/mole } SrCO_3}{87.62 \text{ g/mole Sr}}$$

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

STANDARDIZED $SrCO_3$ / 2 mL = 0.0213g x 2 = 0.0426
20.0 mg of $Sr(NO_3)_2$ carrier is equivalent to 33.7 mg $SrCO_3$

Initial and Date: DAH 7/31/95

David Hoff 8/3/95

Continued on Page

Read and Understood By

DAH 8/3/95 — Signed, Date
DA Reeves CP 8/10/95 — Signed, Date

9613476.2618

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 | µCi. |
| | | 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 µCi/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).

Anna U. Uma

QUALITY CONTROL

Nov. 17, 1992

Date Signed

ISOTOPE PRODUCTS LABORATORIES
1800 North Keystone Street
Burbank, California 91504
(818) 843 - 7000

9613476.2619

Notebook No. 474 23

AA ϕ 114

# ISOTOPE WEIGHT DILUTION RECORD

Isotope: C-14 Vendor: IPL

Total Received Activity: 1.093 µci Vendor ID: 407-124-2

Wt. Received: 5.024 g NIST Traceable (Y)/N Cert. # Implicitly

Activity in Units/g: .2175 µci/g Reference Date: 11-15-92

Activity converted (dpm/g): 482,954 dpm/g Receive Date: 11/18/92

Halflife (Yrs or days) t½ = 5730 ± 40 years Receiver's Name: Jimmy Morales

**PRIMARY DILUTION:** Balance wt. check done (✓)

a: Source activity: 482,954 dpm/g * (if t½ = <100yr decay to prep. date)

b: Wt. of Source transfered: 4.90951 g

Diluent used: 0.1 NaOH

c: Total diluted weight: 116.53 g

d: Activity of dilution (a*b/c): 20,347 dpm/g ± 2.2%

e: Calculated density of solution: 1.052 g/mL (4M $HNO_3$ = 1.1294 ± .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 t½ = <100yr decay to prep. date)

b: Wt. of Source transfered: g

Diluent used:

c: Total diluted weight: g

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

e: Calculated density of solution: g/mL (4M $HNO_3$ = 1.1294 ± .0007 g/mL)

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

Dilution Log Book ID:

N/A

0181

RGS 10/27/93 Date Reviewed Signed Date

9613476.2620

# 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 |
| Halflife 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: 10/27/93

Reviewed By: _____ Review Date: _____

Purity/Cross Check Performed By: _____ Check Date: _____

0182

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# SECONDARY/WORKING LEVEL STANDARD DILUTION RECORD

## Dilution Source Information

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

## Dilution

| | | |
|---|---|---|
| *Diluent: | Nanopure w/ 1 mg/ml formaldehyde | |
| *Density of diluent (g/ml): | 1.0006 | g/ml |
| a: Parent Specific Activity: | 9.14E+03 | pCi/g |
| b: Amount of Source Transferred: | 0.70 | g |
| c: Total amount of Dilution: | 250.14 | g |
| d: Total Volume of Dilution: | 250 | ml |
| e: Activity of Dilution [a * b / c]: | 2.57E+01 | pCi/g |
| f: Activity of Dilution (a * b / d): | 2.58E+01 | pCi/ml |
| Dilution Logbook I.D. #: | LAL-94-0677-18-1 | |

Prepared By: Agnes Wong  Preparation Date: 11/19/94

Preparer Signature: _____

Reviewed By: _____  Review Date: _____

Reviewer Signature: _____

*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.

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AA0114

# SECONDARY/WORKING LEVEL STANDARD DILUTION RECORD

| Dilution Source Information | |
|---|---|
| Isotope: | C-14 |
| Parent Barcode Number | AA0114 |
| Vendor or Certificate I.D. # of Parent Standard: | |
| Diluted Source Logbook I.D. #: | 93-474-23-1 |
| Balance Verification?: | yes |
| Diluent Used: | DDI water in 1mg/ml formaldehyde |

| Dilution | | |
|---|---|---|
| *Diluent: | Nanopure water with 1mg/ml formaldehyde | |
| *Density of diluent (g/ml): | N/A | g/ml |
| a: Parent Specific Activity: 9267.27 | ~~20,388~~ | ~~pCi/g~~ 11-19-94 pCi/ml |
| b: Amount of Source Transferred: | 0.7046 | g |
| c: Total amount of Dilution: | 250.14 | g |
| d: Total Volume of Dilution: | N/A | ml |
| e: Activity of Dilution [a * b / c]: | N/A | pCi/g |
| f: Activity of Dilution (a * b / d): | 26.10 | pCi/ml |
| Dilution Logbook I.D. #: | 94-677-18-1 ✓ | |

Prepared By: Agnes Wong  Preparation Date: 11-19-94

Reviewed By: Joe Hutchinson  Review Date: 12/12/94

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

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ACS294

RECEIVED 11/25/95 RKS

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

## Calibration Certificate

**Description**

Principal radionuclide: Tritium (H-3) Half-life: 12.43 years

Nominal activity: 110 nano curies

Nominal volume: 5 ml in ampoule/bottle number: 2606-1

**Measurement** Activity of principal radionuclide

Activity per gram of this solution

21.9 nano curies of Tritium

at 0400 hours PST on June 3, 1992

Activity of daughter radionuclide

The principal activity was accompanied at the quoted time by

curies Per gram

of the daughter nuclide

Total mass of this solution

APPROX. 5.0 grams

Method of measurement

The activity of the primary solution 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 0.0 half lives since it was obtained by EMSL-LV

We recommend that this solution should not be used after December 1999

9613476.2624

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 |

| | NIST DATA | EMSL DATA |
|---|---|---|
| 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 | $4\pi\beta$ liquid-scintillation counters calibrated with SRM 4926D | Liquid-scintillation counting |
| Half life | 12.43 ± 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

9613476.2625

PROJECT H-3

Notebook No. 0721

Continued From Page NA



# INITIAL STANDARD DILUTION RECORD

## Standard Information:

| | | | |
|---|---|---|---|
| Isotope: | H-3 | Vendor: | EPA |
| Activity of Standard Received: | .11 uCi | ~~Vendor I.D. #~~ 5/4/95 | — |
| Weight of Standard Received (g): | 5 g | LAL I.D. #: | AC5299 |
| Standard Activity (pCi/g): | 21.9 ~~pCi/g~~ nCi/g 2/7/95 | NIST Traceable ? | Yes |
| Halflife in Years or Days: | 12.43 yrs | Certificate #: | 2660-1 |
| Reference Date: | 0400, 6/3/92 | Receiver's Name: | Kevin Free |
| | | Date Received: | 1/25/95 |

## Primary Dilution

| | |
|---|---|
| Balance Verification?: | Yes |
| Diluent Used: | EPA Distilled ASTM Type II Water (Deed Water) |
| a: Decay Corrected Standard Activity (pCi/g): | ~~4.939~~ 21.9 nCi/g 2/7/95 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 2/7/95 mL |
| e: Activity of Dilution by Weight (pCi/g) [a * b / c]: | 2190 pCi/g |
| f: ~~Calculated~~ Known 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. Poniewozy LAL-95-0721-1 |

Prepared By: Joe Hutchinson / J. Morales / C. Poniewozy Preparation Date: 2/7/95

Reviewed By: Joe Hutchinson Review Date: 2/7/95

Purity/Cross Check Performed By: _____ Check Date: _____

0195

Signed _____ Date CP 5/8/95 Signed _____ Date _____

PROJECT H-3 LCS

Notebook No. 0721

Continued From Page N/A

# 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: | Deadwater |

## Dilution

| | |
|---|---|
| *Diluent: | Dead Water |
| *Density of diluent (g/ml): | 0.99 |
| a: Parent Specific Activity: | 2190 pCi/ml |
| b: Amount of Source Transferred: | 5.0 ml ~~8~~ 8/24/95 |
| c: Total amount of Dilution: | 4000 ml ~~8~~ 8/24/95 |
| d: Total Volume of Dilution: | — |
| e: Activity of Dilution [a * b / c]: | 2.71 pCi/ml @ 6/3/92 |
| f: Activity of Dilution (a * b / d): | — |
| Dilution Logbook I.D. #: | 95-721-14-1 |

Prepared By: [signature] Preparation Date: 8/24/95

Reviewed By: [signature] 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

Signed

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PROJECT H-3 LCS

Notebook No. 0721

Continued From Page

# 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 |

## Dilution

| | |
|---|---|
| *Diluent: | Deep Well Water |
| *Density of diluent (g/ml): | 0.9977 g/ml |
| a: Parent Specific Activity: | 2190 pCi/~~g~~ mL |
| b: Amount of Source Transferred: | 5.0 ~~g~~ mL |
| c: Total amount of Dilution: | ~~4000 g~~ 3995 ~~g~~ mL 11/1/95 |
| d: Total Volume of Dilution: | 4000 ml |
| e: Activity of Dilution [a * b / c]: | 2.74 pCi/~~g~~ mL 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 Hutchison  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.

Read and Understood By

| Signed | Date | Signed | Date |
|---|---|---|---|
| | | | |

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ACS244

RECEIVED 11/25/95 RKS

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

## Calibration Certificate

**Description**

Principal radionuclide: Tritium (H-3) Half-life: 12.43 years

Nominal activity: 110 nano curies

Nominal volume: 5 ml in ampoule/bottle number: 2606-1

**Measurement** Activity of principal radionuclide

Activity per gram of this solution

21.9 nano curies of Tritium

at 0400 hours PST on June 3, 1992

Activity of daughter radionuclide

The principal activity was accompanied at the quoted time by

curies Per gram

of the daughter nuclide

Total mass of this solution

APPROX. 5.0 grams

Method of measurement

The activity of the primary solution 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 0.0 half lives since it was obtained by EMSL-LV

We recommend that this solution should not be used after December 1999

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**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 ± 0.4 %

(The 99.7% confidence limits are given by t(sm) where t is obtained from the student t factor for the degree of freedom (n-1)).

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

+ 2.9 % or - 2.9 %

the overall uncertainty (often called accuracy) is an estimate of the possible divergence of the quoted result from the true value. It is a combination of random error [t(sm)] at the 99.7% confidence limits and the worst case estimate of the systematic errors ( $+\delta, -\delta'$ )
The overall uncertainty is therefore calculated on the basis of + [t(sm) $+\delta$], - [t(sm) $+\delta'$]
and is + 4.3 %, - 4.3 % of the quoted radioactive concentration.

**Decay Schemes**

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

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

**Chemical Composition of Solution**

Carrier content per gram of solution:

100 percent $H_2O$

Other components:

Barium less than 0.004 percer
Lead less than $3 \times 10^{-5}$ percent

Preservative:

**Remarks**

Date Certificate Prepared June 17, 1992

Approval Signature [signature]

0199

9613476.2630

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 |

| | NIST DATA | EMSL DATA |
|---|---|---|
| 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 | $4\pi\beta$ liquid-scintillation counters calibrated with SRM 4926D | Liquid-scintillation counting |
| Half life | 12.43 ± 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

0200

## 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:

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

(5) Unterweger, 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.

9613476.2632

PROJECT H-3

Notebook No. 0721

Continued From Page NA



# INITIAL STANDARD DILUTION RECORD

**Standard Information:**

| | | | |
|---|---|---|---|
| Isotope: | H-3 | Vendor: | EPA |
| Activity of Standard Received: | .11 uCi | ~~Vendor I.D. #~~ 2/7/95 | — |
| Weight of Standard Received (g): | 5 g | LAL I.D. #: | AC 5299 |
| Standard Activity (pCi/g): | 21.9 ~~pCi/g~~ nCi/g 2/7/95 | NIST Traceable ? | Yes |
| Halflife in Years or Days: | 12.43 yrs | Certificate #: | 2606-1 |
| Reference Date: | 0400, 6/3/92 | Receiver's Name: | Kevin Free |
| | | Date Received: | 1/25/95 |

**Primary Dilution**

| | | |
|---|---|---|
| Balance Verification?: | Yes | |
| Diluent Used: | EPA Distilled ASTM Type II Water (Deed Water) | |
| a: Decay Corrected Standard Activity (pCi/g): | ~~4.939~~ 21.9 nCi/g 2/7/95 | 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 2/7/95 | mL |
| e: Activity of Dilution by Weight (pCi/g) [a * b / c]: | 2190 | pCi/g |
| f: ~~Calculated~~ Known 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. #: | LAL-95-0721-1 | |

Carrie Pinnewy

Prepared By: Joel Hutchinson / J. Morales / C. Ponienezg Preparation Date: 2/7/95

Reviewed By: Joe Hutchinson Review Date: 2/7/95

Purity/Cross Check Performed By: _____ Check Date: _____

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Signed _____ Date _____ C D Clark Signed _____ Date _____

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PROJECT _____

Notebook No. _____

Continued From Page _____

# SECONDARY/WORKING LEVEL STANDARD DILUTION RECORD

## Dilution Source Information

| | |
|---|---|
| Isotope: | H-3 ~~LCS~~ 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: | Deal 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 6/23/92 |
| Dilution Logbook I.D. #: | 94-0677-70 | |

Prepared By: Joe Hutchison  Preparation Date: 6/23/95

Reviewed By: [illegible]  Review Date: 6/23/95

*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

| Signed | Date | Signed | Date |
|---|---|---|---|
| | | | |

9613476.2634

JAN 1996
RECEIVED
Validation
Log In

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 |
|---|---|---|---|---|
| B0GSF1 | 11/17/95 | Water | C | CLP Volatiles |
| B0GSF4 | 11/17/95 | Water | C | CLP Volatiles |
| B0GSG6 | 11/17/95 | Water | C | CLP Volatiles |
| B0GSG7 | 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

## 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:

| Sample Number | Well Location | Sampling Date |
|---|---|---|
| B0GSG6 | 199-F7-1 | 11/17/95 |
| B0GSG7 | 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:

| LAS Samples | QES Samples | Well Location |
|---|---|---|
| B0GSF1 | B0GSB1 | 199-F7-1 |
| B0GSF4 | B0GS77 | 199-F5-1 |

The results for sample numbers B0GSB1 and B0GS77 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%.

## 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

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

# DATA QUALIFICATION SUMMARY

| SDG: LK5893 | REVIEWER: PB | DATE: 01/26/96 | PAGE 1 OF 1 |
|---|---|---|---|
| COMMENTS: No qualifiers assigned | | | |
| COMPOUND | QUALIFIER | SAMPLES AFFECTED | REASON |
| | | | |
| | | | |
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# Appendix 3

## Qualified Data Summary and Annotated Laboratory Reports

VOLATILE ORGANIC ANALYSIS, WATER MATRIX, (μg/L)



| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 | 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 | | | | | | | | | | | | |

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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 |

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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.

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 |

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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 |
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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 |

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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 |
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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 |

PB 11/11/96

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. | | | | | |
| 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. | | | | | |

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FORM I - CLP VOA-TIC 3/90

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# Appendix 4

## Laboratory Narrative and Chain-of-Custody Documentation

9613476.2656

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

JAN 1996 RECEIVED Data Log In

| | | |
|---|---|---|
| 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.

PB 1/11/96

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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 1/11/9
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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.

**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

PB 1/11

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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 | PR | Due Date |
|---|---|---|---|---|---|
| L5893-1 | B0GSF4 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| Water 1 S SCREENING | | Hold:15-MAY-96 | | | |
| L5893-2 | B0GSF1 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| Water 1 S SCREENING | | Hold:15-MAY-96 | | | |
| L5893-3 | B0GSF4 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| Water 1 S CLP FURNACE | | Hold:15-MAY-96 | | | |
| Water 1 S CLP ICP | | Hold:15-MAY-96 | | | |
| L5893-4 | B0GSF1 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| Water 1 S CLP FURNACE | | Hold:15-MAY-96 | | | |
| Water 1 S CLP ICP | | Hold:15-MAY-96 | | | |
| L5893-5 | B0GSF4 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-9 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| Water 1 S 300.0 CHLORIDE | | Hold:15-DEC-95 | | | |
| Water 1 S 300.0 FLUORIDE | | Hold:15-DEC-95 | | | |
| Water 1 S 300.0 NITRATE | | Hold:19-NOV-95 | | | |
| Water 1 S 300.0 NITRITE | | Hold:19-NOV-95 | | | |
| Water 1 S 300.0 PHOSPHATE | | Hold:19-NOV-95 | | | |
| Water 1 S 300.0 SULFATE | | Hold:15-DEC-95 | | | |
| L5893-6 | B0GSF1 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-9 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| Water 1 S 300.0 CHLORIDE | | Hold:15-DEC-95 | | | |
| Water 1 S 300.0 FLUORIDE | | Hold:15-DEC-95 | | | |
| Water 1 S 300.0 NITRATE | | Hold:19-NOV-95 | | | |
| Water 1 S 300.0 NITRITE | | Hold:19-NOV-95 | | | |
| Water 1 S 300.0 PHOSPHATE | | Hold:19-NOV-95 | | | |
| Water 1 S 300.0 SULFATE | | 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 | PR | Due Date |
|---|---|---|---|---|---|
| L5893-7 | B0GSF4 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| Water 1 S CLP 3/90 VOLATILES | | Hold:01-DEC-95 | | | |
| L5893-8 | B0GSF4 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| L5893-9 | B0GSF4 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| L5893-10 | B0GSG7 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| Water 1 S CLP 3/90 VOLATILES | | Hold:01-DEC-95 | | | |
| L5893-11 | B0GSG7 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| L5893-12 | B0GSG7 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-9 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| L5893-13 | B0GSF1 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-9 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| Water 1 S CLP 3/90 VOLATILES | | Hold:01-DEC-95 | | | |
| L5893-14 | B0GSF1 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-9 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| L5893-15 | B0GSF1 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-9 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| L5893-16 | B0GSG6 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-9 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| Water 1 S CLP 3/90 VOLATILES | | 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 | PR | Due Date |
|---|---|---|---|---|---|
| L5893-17 | B0GSG6 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| L5893-18 | B0GSG6 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| L5893-19 | B0GSF4 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| 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 | | | | | |
| L5893-20 | B0GSF4 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| L5893-21 | B0GSF4 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| L5893-22 | B0GSF4 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| L5893-23 | B0GSF4 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| L5893-24 | B0GSF1 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-9 |
| 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 | | | | | |
| L5893-25 | B0GSF1 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-9 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |
| L5893-26 | B0GSF1 | 17-NOV-95 | 21-NOV-95 | | 26-DEC-9 |
| TEMP 4 "SAF # B96-032" | | | | | |
| Location: 157 | | | | | |



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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 | B0GSF1 | 17-NOV-95 | 21-NOV-95 | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | |
| Location: 157 | | | | |
| L5893-28 | B0GSF1 | 17-NOV-95 | 21-NOV-95 | 26-DEC-95 |
| TEMP 4 "SAF # B96-032" | | | | |
| Location: 157 | | | | |
| L5893-29 | B0GSF4 | 17-NOV-95 | 21-NOV-95 | 26-DEC-9 |
| 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 | | | |
| L5893-30 | B0GSF1 | 17-NOV-95 | 21-NOV-95 | 26-DEC-9 |
| 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 | | | |
| L5893-31 | B0GSF5 | 17-NOV-95 | 21-NOV-95 | 26-DEC-9 |
| TEMP 4 "SAF # B96-032" | | | | |
| Location: 157 | | | | |
| Filt H20 15 S CLP FURNACE | Hold:15-MAY-96 | | | |
| Filt H20 15 S CLP ICP | Hold:15-MAY-96 | | | |
| L5893-32 | B0GSF2 | 17-NOV-95 | 21-NOV-95 | 26-DEC-9 |
| TEMP 4 "SAF # B96-032" | | | | |
| Location: 157 | | | | |
| Filt H20 15 S CLP FURNACE | Hold:15-MAY-96 | | | |
| Filt H20 15 S CLP ICP | Hold:15-MAY-96 | | | |
| L5893-33 | REPORT TYPE | 21-NOV-95 | 21-NOV-95 | 26-DEC- |
| 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 | | | | |



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Signature: Paula Dennis

Date: 11-21-95



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Bechtel Hanford, Inc.

# CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST L5893

Page 1 of 1

Data Turnaround: ☐ Priority ■ Normal

| | | |
|---|---|---|
| Collector: A. Rizzo / B. Fahlberg | 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.: Ste. Helen | Field Logbook No.: EFL-1054 | Method of Shipment: Federal Express |
| Shipped To: Lockheed | Offsite Property No.: ~~NA~~ KT 11/20/95 W96-0-0640-09 | Bill of Lading/Air Bill No.: ~~NA~~ KT 11/20/95 290 4646 753 |

Possible Sample Hazards/Remarks

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

| SAMPLE ANALYSIS | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 | | |
| Volume | 1L | 500mL | 40mL | 1L | 1L | 20mL | | 1L | | |
| | 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 | | | | | | | | | | |
| B0GSF4 / W / 11-17-95 / 1250 | X | X | X | X | X | X | | | | |
| B0GSF5 / W / 11-17-95 / 1250 | | | | | | | | X | | |
| ~~B0GSF6 / W / 11-17-95 / 1250~~ | | | ~~X~~ | KT 11/20/95 | | | | | | |
| B06SG7 / W / 11-17-95 / 0545 | | | X | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| CHAIN OF POSSESSION | Sign/Print Names | | |
|---|---|---|---|
| Relinquished By: B. Fahlberg / B. Fahlberg | Date/Time: 11/17/95 14:05 | Received By: ERC / Bob Hen | Date/Time: 11-17-95 1905 |
| Relinquished By: ERC / B. Bohlen | Date/Time: 11-20-95 0800 | Received By: K. Trapp / K. Trapp | Date/Time: 11/20/95 0800 |
| Relinquished By: K. Trapp / K. Trapp | Date/Time: 11/20/95 0850 | Received By: | Date/Time: |
| Relinquished By: | Date/Time: | Received By: | Date/Time: |

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

| LABORATORY SECTION | Received By | Title | Date/Time |
|---|---|---|---|
| | [illegible] | Sample Custodian | 11-21-95 / 08:45 |

| FINAL SAMPLE DISPOSITION | Disposal Method | Disposed By | Date/Time |
|---|---|---|---|
| | | | |

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B0GSF8 11/20/95

Bechtel Hanford, Inc.

# CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

Page 1 of 1

Data Turnaround
☐ Priority
■ Normal

| | | |
|---|---|---|
| Collector: A. Rizzo / B. Fahlberg | 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.: Ste. Helen | Field Logbook No.: ERC 1054 | Method of Shipment: Federal Express |
| Shipped To: Lockheed | Offsite Property No.: ~~NA~~ KT 11/20/95 W96-0-0640-09 | Bill of Lading/Air Bill No.: ~~NA~~ KT 11/20/95 290 4646 753 |

Possible Sample Hazards/Remarks

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

| SAMPLE ANALYSIS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 | |
| Volume | | | | 1L | 500mL | 40mL | 1L | 1L | 20mL | | 1L | |
| | | | | 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 | | | | | | | | | |
| B0GSF1 | W | 11/17/95 | 1105 | X | X | X | X | X | X | | | |
| B0GSF2 KT 11/20/95 | W | 11/17/95 | 1105 | | | | | | | | X | |
| ~~B0GSF3~~ B0GSG6 | W | 11/17/95 | 1105 | | ~~X~~ 11/17/95 | X | | | | | | |
| ~~B0GSG6~~ | ~~W~~ | ~~11/17/95~~ | ~~0545~~ | | | ~~X~~ | KT 11/20/95 | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |

| CHAIN OF POSSESSION | Sign/Print Names | | |
|---|---|---|---|
| Relinquished By | Date/Time | Received By | Date/Time |
| B. Fahlberg / B. Fahlberg | 11/17/95 1405 | ERC / B. Walton | 1405 / 11-17-95 |
| Relinquished By | Date/Time | Received By | Date/Time |
| ERC / B. Walton | 11-20-95 0800 | K. Trapp / K. Trapp | 0800 / 11/20/95 |
| Relinquished By | Date/Time | Received By | Date/Time |
| K. Trapp / K. Trapp | 11/20/95 0950 | | |
| Relinquished By | Date/Time | Received By | Date/Time |
| | | | |

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

| LABORATORY SECTION | Received By | Title | Date/Time |
|---|---|---|---|
| | [illegible] | Sample Custodian | 11-21-95 0845 |
| FINAL SAMPLE | Disposal Method | Disposed By | Date/Time |

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EFF 11/8/95 PR 11/1/96

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# Appendix 5

## Data Validation Supporting Documentation

# GC/MS ORGANIC DATA VALIDATION CHECKLIST

| VALIDATION LEVEL: | A | B | C | D | E |
|---|---|---|---|---|---|
| PROJECT: 100-FR3 - GroundWater Rd8 | | | DATA PACKAGE: | | |
| VALIDATOR: P. Brown | | LAB: Lockheed | | DATE: 1/11/96 | |
| CASE: | | | SDG: W LK 5893 | | |

ANALYSES PERFORMED

| ☒ CLP Volatiles | ☐ SW-846 8240 (cap column) | ☐ SW-846 8260 (packed column) | ☐ CLP Semivolatiles | ☐ SW-846 8270 (cap column) | ☐ SW-846 (packed column) |
|---|---|---|---|---|---|
| ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

SAMPLES/MATRIX 4 water samples; BOGSF1, BOGSF4, 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 $H_2O$ samples

PB 1/11/96

## 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: _____

PB 1/11/96

## 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 QES
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:

PB 1/11/96

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JAN 1996
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Validation
Log In

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 |
|---|---|---|---|---|
| B0GSF1 | 11/17/95 | Water | C | See Notes 1 and 2 |
| B0GSF4 | 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.

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 qualfied 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.

- **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 that 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:

| Sample Number | Split Sample Number | Well Location |
|---|---|---|
| B0GSB1(QES) | B0GSF1(LAS) | 199-F7-1 |
| B0GS77(QES) | B0GSF4(LAS) | 199-F5-1 |

Samples B0GSB1 and B0GS77 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 B0GSB1/B0GSF1 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.

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# Appendix 1

## Glossary of Data Reporting Qualifiers

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).

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# Appendix 2

## Summary of Data Qualification

# DATA QUALIFICATION SUMMARY

| SDG: LK5893 | REVIEWER: RBC | DATE: 01/26/96 | PAGE 1 OF 1 |
|---|---|---|---|
| COMMENTS: | | | |
| COMPOUND | QUALIFIER | SAMPLES AFFECTED | REASON |
| Nitrate | J | B0GSF1, B0GSF4 | Exceeded holding time |
| Nitrite | UR | B0GSF1, B0GSF4 | Exceeded holding time |
| Orthophosphate | UR | B0GSF1, B0GSF4 | Exceeded holding time |

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# Appendix 3

## Qualified Data Summary and Annotated Laboratory Reports

GENERAL CHEMISTRY ANALYSIS, WATER MATRIX, (mg/l)



| | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Project: BECHTEL-HANFORD | | | | | | | | | | | | | | | | | | | | | | | |
| Laboratory: Lockheed | | | | | | | | | | | | | | | | | | | | | | | |
| Case | SDG: LK5893 | | | | | | | | | | | | | | | | | | | | | | |
| Sample Number | | B0GSF1 | | B0GSF4 | | | | | | | | | | | | | | | | | | | |
| Location | | 199-F7-1 | | 199-F5-1 | | | | | | | | | | | | | | | | | | | |
| Remarks | | Split | | Split | | | | | | | | | | | | | | | | | | | |
| Sample Date | | 11/17/95 | | 11/17/95 | | | | | | | | | | | | | | | | | | | |
| General Chemistry | CRDL | Result | Q | Result | Q | Result | Q | Result | Q | Result | Q | Result | Q | Result | Q | Result | Q | Result | Q | Result | Q | | |
| Chloride | 0.1 | 15. | | 2.1 | | | | | | | | | | | | | | | | | | | |
| Fluoride | 0.1 | 0.41 | | 0.073 | | | | | | | | | | | | | | | | | | | |
| Nitrate-N | 0.1 | 21. | J | 3.3 | J | | | | | | | | | | | | | | | | | | |
| Nitrite-N | 0.1 | <0.002 | UR | <0.002 | UR | | | | | | | | | | | | | | | | | | |
| Orthophosphate | 0.1 | <0.020 | UR | <0.020 | UR | | | | | | | | | | | | | | | | | | |
| Sulfate | 0.1 | 72. | | 31. | | | | | | | | | | | | | | | | | | | |

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# LOCKHEED ANALYTICAL SERVICES

## Sample Results

| | |
|---|---|
| Client Sample ID: B0GSF1 | 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 | RBC | 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 |

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1/17/96

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# 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 | | 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 | UQ | 28-NOV-95 | 30615 | L5893-5 |
| Ortho Phosphate | mg/L | 300.0 | < 0.020 | 0.10 | UQ | 08-DEC-95 | 30616 | L5893-5 |
| Sulfate | mg/L | 300.0 | 31. | 0.10 | | 28-NOV-95 | 30617 | L5893-5 |

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1/17/96

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# Appendix 4

## Laboratory Narrative and Chain-of-Custody Documentation

9613476.2685

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

JAN 1996
RECEIVED
Data
Log In

| | | |
|---|---|---|
| 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

0003

*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.: 2

# 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**

Bechtel Hanford, Inc.

# CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

Page 1 of 1

Data Turnaround
☐ Priority
■ Normal

| | | |
|---|---|---|
| Collector: A. Rizzo / B Fahlberg | 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.: Ste. Helen | Field Logbook No.: EFL-1054 | Method of Shipment: Federal Express |
| Shipped To: Lockheed | Offsite Property No.: ~~NA~~ KT 11/20/95 W96-0-0640-09 | Bill of Lading/Air Bill No.: ~~NA~~ KT 11/20/95 290 4646 753 |

Possible Sample Hazards/Remarks

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

| SAMPLE ANALYSIS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 | |
| Volume | | | | 1L | 500mL | 40mL | 1L | 1L | 20mL | | 1L | |
| | | | | 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 | | | | | | | | | |
| B0GSF1 | W | 11/17/95 | 1105 | X | X | X | X | X | X | | | |
| B0GSF2 KT 11/20/95 | W | 11/17/95 | 1105 | | | | | | | | X | |
| ~~B0GSF3~~ B0GSG6 | W | 11/17/95 | 1105 | | ~~X~~ 11/17/95 | X | | | | | | |
| ~~B0GSG6~~ | ~~W~~ | ~~11/17/95~~ | ~~0545~~ | | | ~~X~~ | KT 11/20/95 | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |

| CHAIN OF POSSESSION | Sign/Print Names | | |
|---|---|---|---|
| Relinquished By | Date/Time | Received By | Date/Time |
| B. Fahlberg / B Fahlberg | 11/17/95 1405 | GRC / B. Whitten | 1405 / 11-17-95 |
| Relinquished By | Date/Time | Received By | Date/Time |
| B. Whitten / B. Whitten | 11-20-95 0800 | K. Trapp / K. Trapp | 0800 / 11/20/95 |
| Relinquished By | Date/Time | Received By | Date/Time |
| K. Trapp / K. Trapp | 11/20/95 0990 | | |
| Relinquished By | Date/Time | Received By | Date/Time |
| | | | |

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

| | | | |
|---|---|---|---|
| LABORATORY SECTION | Received By: A. Mattle | Title: Sample Custodian | Date/Time: 11-21-95 0845 |
| FINAL SAMPLE DISPOSITION | Disposal Method | Disposed By | Date/Time |

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96-MAD-0608

Bechtel Hanford, Inc.

# CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

L5893

Page 1 of 1

Data Turnaround
☐ Priority
■ Normal

| | | |
|---|---|---|
| Collector: A. Rizzo / B. Fehlberg | 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.: Ste. Helen | Field Logbook No.: EFL-1054 | Method of Shipment: Federal Express |
| Shipped To: Lockheed | Offsite Property No.: ~~NA~~ KT 11/20/95 W96-0-0640-09 | Bill of Lading/Air Bill No.: ~~NA~~ KT 11/20/95 290 4646 753 |

| 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 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B0GSF4 | W | 11-17-95 | 1250 | X | X | X | X | X | X | | | | |
| B0GSF5 | W | 11-17-95 | 1250 | | | | | | | | X | | |
| ~~B0GSF6~~ | ~~W~~ | ~~11-17-95~~ | ~~1250~~ | | | ~~X~~ | KT 11/20/95 | | | | | | |
| B0GSG7 | W | 11-17-95 | 0545 | | | X | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

| CHAIN OF POSSESSION | Sign/Print Names | | |
|---|---|---|---|
| Relinquished By: B. Fehlberg / B. Fehlberg | Date/Time: 11/17/95 14:05 | Received By: ERC / Bulletin | Date/Time: 1905 11-17-95 |
| Relinquished By: ERC / Bulletin | Date/Time: 11-20-95 0800 | Received By: K. Thomas / K. Tran | Date/Time: 11/20/95 0900 |
| Relinquished By: K. Thomas / K. Tran | Date/Time: 11/20/95 0850 | Received By: | Date/Time: |
| Relinquished By: | Date/Time: | Received By: | Date/Time: |

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

| LABORATORY SECTION | Received By | Title | Date/Time |
|---|---|---|---|
| | [illegible] | Sample Custodian | 11-21-95 / 0845 |

| FINAL SAMPLE DISPOSITION | Disposal Method | Disposed By | Date/Time |
|---|---|---|---|
| | | | |

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# 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-LAS |

ANALYSES PERFORMED

| | | | | | |
|---|---|---|---|---|---|
| ☒ Anions/IC | ☐ TOC | ☐ TOX | ☐ TPH-418.1 | Oil and Grease | Alkalinity |
| ☐ Ammonia | ☐ BOD/COD | ☐ Chloride | ☐ Chromium-VI | ☐ pH | ☐ $NO_3/NO_2$ |
| ☐ Sulfate | ☐ TDS | ☐ TKN | ☐ Phosphate | ☐ | ☐ |
| ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

SAMPLES/MATRIX

BOG5F4 (split BOG577)
BOG5F1 (split BOG5B1)

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

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

GENERAL CHEMISTRY DATA VALIDATION CHECKLIST

Comments: BOGSF1/B1 Fluorid. F1 <5XCRDL but >0.1 diff

7. ANALYTE QUANTITATION

Was analyte quantitation performed properly? . . . . . Yes No N/A

Comments:

8. REPORTED RESULTS AND DETECTION LIMITS

Are results reported for all requested analyses? . . . . . Yes No N/A

Are 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:

A-25

HOLDING TIME SUMMARY

| SDG: LK5893 | VALIDATOR: RBC | DATE: 1/17/96 | PAGE 1 OF 1 |
|---|---|---|---|
| COMMENTS: | | | |

| FIELD SAMPLE ID | ANALYSIS TYPE | DATE SAMPLED | DATE PREPARED | DATE ANALYZED | PREP. HOLDING TIME, DAYS | ANALYSIS HOLDING TIME, DAYS | QUALIFIER |
|---|---|---|---|---|---|---|---|
| BOGSF4 | nitrate | 11/17/95 | | 11/28/95 | | 2 | J |
| ↓ | nitrite | ↓ | | ↓ | | ↓ | UR |
| ↓ | orthophosphate | ↓ | | ↓ | | ↓ | UR |
| BOGSF1 | nitrate | 11/17/95 | | 11/28/95 | | 2 | J |
| | nitrite | ↓ | | ↓ | | ↓ | UR |
| | orthophosphate | ↓ | | ↓ | | ↓ | UR |
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Validation
Log In

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 |
|---|---|---|---|---|
| B0GSF1 | 11/17/95 | Water | C | See Note 1 |
| B0GSF2 | 11/17/95 | Water | C | See Note 1 |
| B0GSF4 | 11/17/95 | Water | C | See Note 1 |
| B0GSF5 | 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

## 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 B0GSF4 has been flagged "U".

Due to the presence of a positive preparation blank result, the iron results for sample numbers B0GSF1 and B0GSF4 have been flagged "U".

Due to the presence of a positive preparation blank result, the zinc results for sample numbers B0GSF1 and B0GSF4 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:

| Sample Number | Split Sample No. | Well Location |
|---|---|---|
| B0GSB1(QES) | B0GSF1(LAS) | 199-F7-1 |
| B0GSB2(QES) | B0GSF2(LAS) | 199-F7-1 |
| B0GS77(QES) | B0GSF4(LAS) | 199-F5-1 |
| B0GS78(QES) | B0GSF5(LAS) | 199-F5-1 |

Samples B0GSB1, B0GSB2, B0GS77 and B0GS78 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.

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# Appendix 1

## Glossary of Data Reporting Qualifiers

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).

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# Appendix 2

## Summary of Data Qualification

# DATA QUALIFICATION SUMMARY

| SDG: LK5893 | REVIEWER: RJS | DATE: 01/26/96 | PAGE 1 OF 1 |
|---|---|---|---|
| COMMENTS: | | | |
| COMPOUND | QUALIFIER | SAMPLES AFFECTED | REASON |
| Aluminum | U | B0GSF4 | Positive preparation blank result |
| Iron | U | B0GSF1, B0GSF4 | Positive preparation blank result |
| Zinc | U | B0GSF1, B0GSF4 | Positive preparation blank result |
| | | | |
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# Appendix 3

## Qualified Data Summary and Annotated Laboratory Reports

INORGANIC ANALYSIS, WATER MATRIX, (ug/L)



| 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 | | | | | | | | | | | | |
| Potasssium | 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 | | | | | | | | | | | | |

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CLP

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 | U |
| 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 |
| | | | | | | |
| | | | | | | |
| | | | | | | |

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

RJS 1/15/96

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# 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:

RJS 1/15/96

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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 | ~~B~~ | | P | u |
| 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 | u |
| 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 | u |

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

RJS 1/15/96

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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 1/15/96

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# Appendix 4

## Laboratory Narrative and Chain-of-Custody Documentation

9613476.2712

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

JAN 1996 RECEIVED Data Log In

| | | |
|---|---|---|
| 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.

*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

*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.: 3

# 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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*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.: 4

# 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**

0006as

Bechtel Hanford, Inc.

# CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST L5893

Page 1 of 1

Data Turnaround
☐ Priority
■ Normal

| | | |
|---|---|---|
| Collector: A. Rizzo / B. Fehlberg | 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.: Ste. Helen | Field Logbook No.: EFL-1054 | Method of Shipment: Federal Express |
| Shipped To: Lockheed | Offsite Property No.: ~~NA~~ KT 11/20/95 W96-0-0640-09 | Bill of Lading/Air Bill No.: ~~NA~~ KT 11/20/95 290 4646 753 |

Possible Sample Hazards/Remarks

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

| SAMPLE ANALYSIS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 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 | | |
| | | | Volume | 1L | 500mL | 40mL | 1L | 1L | 20mL | | 1L | | |
| | | | | 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 | | | | | | | | | | |
| B0GSF4 | W | 11-17-95 | 1250 | X | X | X | X | X | X | | | | |
| B0GSF5 | W | 11-17-95 | 1250 | | | | | | | | X | | |
| ~~B0GSF6~~ | ~~W~~ | ~~11-17-95~~ | ~~1250~~ | | | ~~X~~ | KT 11/20/95 | | | | | | |
| B0GSG7 | W | 11-17-95 | 0545 | | | X | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

| CHAIN OF POSSESSION | Sign/Print Names | | |
|---|---|---|---|
| Relinquished By | Date/Time | Received By | Date/Time |
| B. Fehlberg / B. Fehlberg | 11/17/95 14:05 | ERC / Bob Hitt | 1905 11-17-95 |
| ERC / Bob Hitt | 11-20-95 0800 | K. Trapp / K. Trapp | 11/20/95 0900 |
| K. Trapp / K. Trapp | 11/20/95 0850 | | |
| Relinquished By | Date/Time | Received By | Date/Time |

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

| LABORATORY SECTION | Received By | Title | Date/Time |
|---|---|---|---|
| | [illegible] | Sample Custodian | 11-21-95 / 08:15 |

| FINAL SAMPLE DISPOSITION | Disposal Method | Disposed By | Date/Time |
|---|---|---|---|
| | | | |

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Bechtel Hanford, Inc.

# CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

Page 1 of 1

Data Turnaround
☐ Priority
■ Normal

| | | |
|---|---|---|
| Collector: A. Rizzo / B. Fahlberg | 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.: Ste. Helen | Field Logbook No.: EKL-1054 | Method of Shipment: Federal Express |
| Shipped To: Lockheed | Offsite Property No.: ~~NA~~ KT 11/20/95 W96-0-0640-09 | Bill of Lading/Air Bill No.: ~~NA~~ KT 11/20/95 290 4646 753 |

Possible Sample Hazards/Remarks

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

| 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 | | |
| 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 | X | X | X | X | X | X | | | | |
| BOGSF2 KT 11/20/95 | W | 11-17-95 | 1105 | | | | | | | | X | | |
| ~~BOGSF3~~ BOGSG6 | W | 11-17-95 | 1105 | | ~~11-17-95 X~~ | X | | | | | | | |
| ~~BOGSG6~~ | ~~W~~ | ~~11-17-95~~ | ~~0545~~ | | | ~~X~~ | KT 11/20/95 | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

| CHAIN OF POSSESSION | Sign/Print Names | | |
|---|---|---|---|
| Relinquished By | Date/Time | Received By | Date/Time |
| B. Fahlberg / B Fahlberg | 11/17/95 14:05 | ERC / B. Whitten | 1405 / 11-17-95 |
| Relinquished By | Date/Time | Received By | Date/Time |
| ERC / B. Whitten | 0800 / 11-20-95 | K. Trapp / K. Trapp | 0800 / 11/20/95 |
| Relinquished By | Date/Time | Received By | Date/Time |
| K. Trapp / K. Trapp | 0990 / 11/20/95 | | |
| Relinquished By | Date/Time | Received By | Date/Time |
| | | | |

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

| LABORATORY SECTION | Received By | Title | Date/Time |
|---|---|---|---|
| | Arlene Miller | Sample Custodian | 11-21-95 / 0745 |

| FINAL SAMPLE DISPOSITION | Disposal Method | Disposed By | Date/Time |
|---|---|---|---|
| | | | |

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# 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 | | | | | |
| ☒ CLP/ICP | ☐ CLP/GFAA | ☐ CLP/Hg | ☐ CLP/Cyanide | ☐ | ☐ |
| ☐ SW-846/ICP | ☐ SW-846/GFAA | ☐ SW-846/Hg | ☐ SW-846 Cyanide | ☐ | ☐ |

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-20

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)

(3) B06SF4/B06S77 ✓

(1) B06SF1/B06SB1 ✓

(2) B06SF2/B06SB2 ✓ (4) B06SF5/B06S78 ✓

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.

BLANK AND SAMPLE DATA SUMMARY

| SDG: LK5893 | VALIDATOR: RJS | DATE: 1/15/96 | PAGE 1 OF 1 |
|---|---|---|---|

COMMENTS:

| SAMPLE ID | COMPOUND | RESULT | Q | RT | UNITS | 5X RESULT | 10X RESULT | SAMPLES AFFECTED | QUALIFIER |
|---|---|---|---|---|---|---|---|---|---|
| Prep 1 | Aluminum | 24.14 | | | ug/L | 120.7 | — | B06SF4 | U |
| Prep 1 | Iron | 20.41 | | | | 102.05 | — | B06SF1, F4 | U |
| Prep 1 | Zinc | 6.28 | | | | 31.4 | — | B06SF1, F4 | U |

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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) | C | Continuing Calibration Blank (ug/L) 1 | C | 2 | C | 3 | C | Prepa-ration Blank | C | M |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 | 20.410 | 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

FORM III - IN

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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

Prep 2

| Analyte | Initial Calib. Blank (ug/L) | C | Continuing Calibration Blank (ug/L) 1 | C | 2 | C | 3 | C | Prepa-ration Blank | C | M |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

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B0G55}

FORM III - IN

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JAN 1996
RECEIVED
Validation
Log In

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 |
|---|---|---|---|---|
| B0GSF1 | 11/17/95 | Water | C | See Note 1 |
| B0GSF4 | 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.

- **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 then 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 analysisas shown below:

| Sample Number | Split Sample No. | Well Location |
|---|---|---|
| B0GSB1(QES) | B0GSF1(LAS) | 199-F7-1 |
| B0GS77(QES) | B0GSF4(LAS) | 199-F5-1 |

Samples B0GSB1 and B0GS77 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 B0GSF1. 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 B0GSF1. Under WHC guidelines, no qualification is required.

## 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.

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# Appendix 1

## Glossary of Data Reporting Qualifiers

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.

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# Appendix 2

## Summary of Data Qualification

# DATA QUALIFICATION SUMMARY

| SDG: LK5893 | REVIEWER: RBC | DATE: 01/26/96 | PAGE 1 OF 1 |
|---|---|---|---|
| COMMENTS: No qualifiers assigned. | | | |
| COMPOUND | QUALIFIER | SAMPLES AFFECTED | REASON |
| | | | |
| | | | |
| | | | |
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# Appendix 3

## Qualified Data Summary and Annotated Laboratory Reports

RADIOCHEMISTRY ANALYSIS, WATER MATRIX, (pCi/l)



| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Project: BECHTEL-HANFORD | | | | | | | | | | | | | | | | | | | | | |
| Laboratory: Lockheed | | | | | | | | | | | | | | | | | | | | | |
| Case | SDG: LK5893 | | | | | | | | | | | | | | | | | | | | |
| Sample Number | | B0GSF1 | | B0GSF4 | | | | | | | | | | | | | | | | | |
| Location | | 199-F7-1 | | 199-F5-1 | | | | | | | | | | | | | | | | | |
| Remarks | | Split | | Split | | | | | | | | | | | | | | | | | |
| Sample Date | | 11/17/95 | | 11/17/95 | | | | | | | | | | | | | | | | | |
| Radiochemistry | CRDL | Result | Q | Result | Q | Result | Q | Result | Q | Result | Q | Result | Q | Result | Q | Result | Q | Result | Q | Result | Q |
| Gross Alpha | 3 | 5.7 | | 0.9 | U | | | | | | | | | | | | | | | | |
| Gross Beta | 4 | 12.9 | | 53.0 | | | | | | | | | | | | | | | | | |
| Strontium-90 | 2 | -0.01 | U | 24.9 | | | | | | | | | | | | | | | | | |
| Carbon-14 | 200 | 12 | U | 41. | U | | | | | | | | | | | | | | | | |
| Tritium | 400 | 400 | | 320 | | | | | | | | | | | | | | | | | |

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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: 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 U | 0.28 | 0.49 | | pCi/L |

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1/10/96

LOCKHEED ANALYTICAL SERVICES

RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. * Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: BOGSF1

Date Collected: 17-NOV-95

Matrix: Water

LAL Sample ID: L5893-30

Date Received: 21-NOV-95

Login Number: L5893

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

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LOCKHEED ANALYTICAL SERVICES

RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. * Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: BOGSF4

Date Collected: 17-NOV-95

Matrix: Water

LAL Sample ID: L5893-19

Date Received: 21-NOV-95

Login Number: L5893

| Constituent | Analyzed | Batch | Activity | Error | MDA | DataQual | Units |
|---|---|---|---|---|---|---|---|
| Gross Alpha | 12-DEC-95 | GR ALP/BETA LAL-0060_30664 | 0.9 U | 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 |

RKC 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 | MDA | DataQual | Units |
|---|---|---|---|---|---|---|---|
| C-14 | 06-DEC-95 | C-14 LAL-0209_30662 | 41. U | 85. | 100 | | pCi/L |
| H-3 | 12-DEC-95 | TRITIUM(H3) LAL-0066_30673 | 320 | 200 | 220 | | pCi/L |

RWC
1/10/96

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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

LOCKHEED MARTIN

January 3, 1996

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

JAN 1996 RECEIVED Data Log In

| | | |
|---|---|---|
| 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*

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

# 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

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

Bechtel Hanford, Inc.

# CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

Page 1 of 1

Data Turnaround
☐ Priority
■ Normal

| | | |
|---|---|---|
| Collector: A. Rizzo / B Fahlberg | 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.: Ste. Helen | Field Logbook No.: EFL-1054 | Method of Shipment: Federal Express |
| Shipped To: Lockheed | Offsite Property No.: ~~NA~~ KT 11/20/95 W96-0-0640-09 | Bill of Lading/Air Bill No.: ~~NA~~ KT 11/20/95 290 4646 753 |

Possible Sample Hazards/Remarks

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

| SAMPLE ANALYSIS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 | | |
| Volume | | | 1L | 500mL | 40mL | 1L | 1L | 20mL | | 1L | | |
| | | | 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 | | | | | | | | | |
| B0GSF1 | W | 11/17/95 | 1105 | X | X | X | X | X | X | | | |
| B0GSF2 KT 11/20/95 | W | 11/17/95 | 1105 | | | | | | | X | | |
| ~~B0GSF3~~ B0GSG6 | W | 11/17/95 | 1105 | | ~~X~~ 11/17/95 | X | | | | | | |
| ~~B0GSG6~~ | ~~W~~ | ~~11/17/95~~ | ~~0545~~ | | | ~~X~~ KT 11/20/95 | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |

| CHAIN OF POSSESSION | Sign/Print Names | | |
|---|---|---|---|
| Relinquished By | Date/Time | Received By | Date/Time |
| B. Fahlberg / B Fahlberg | 11/17/95 1405 | ERC / B. Whitten | 11/17/95 1405 |
| ERC / B. Whitten | 11/20/95 0800 | K. Trapp / K. Trapp | 11/20/95 0800 |
| K. Trapp / K. Trapp | 11/20/95 0950 | | |
| | | | |

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

| LABORATORY SECTION | Received By | Title | Date/Time |
|---|---|---|---|
| | [illegible] | Sample Custodian | 11-21-95 0945 |

| FINAL SAMPLE DISPOSITION | Disposal Method | Disposed By | Date/Time |
|---|---|---|---|
| | | | |

000020

Abstract

Bechtel Hanford, Inc.

# CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST L5893

Page 1 of 1

Data Turnaround: ☐ Priority ■ Normal

| | | |
|---|---|---|
| Collector: A. Rizzo / B. Fehlberg | 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.: Ste. Helen | Field Logbook No.: EFL-1654 | Method of Shipment: Federal Express |
| Shipped To: Lockheed | Offsite Property No.: ~~NA~~ KT 11/20/95 W96-0-0640-09 | Bill of Lading/Air Bill No.: ~~NA~~ KT 11/20/95 290 4646 753 |

| 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 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B0GSF4 | W | 11-17-95 | 1250 | X | X | X | X | X | X | | | | |
| B0GSF5 | W | 11-17-95 | 1250 | | | | | | | | X | | |
| ~~B0GSF6~~ | ~~W~~ | ~~11-17-95~~ | ~~1250~~ | | | ~~X~~ | KT 11/20/95 | | | | | | |
| B06SG7 | " | 11-17-95 | 0545 | | | X | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

| CHAIN OF POSSESSION | Sign/Print Names | | |
|---|---|---|---|
| Relinquished By: B. Fehlberg / B. Fehlberg | Date/Time: 14:05 11/17/95 | Received By: ERC / Bob Hitt | Date/Time: 1905 11-17-95 |
| Relinquished By: ERC / Bob Hitt | Date/Time: 0800 11-20-95 | Received By: K. Trapp / K. Trapp | Date/Time: 0900 11/20/95 |
| Relinquished By: K. Trapp / K. Trapp | Date/Time: 0850 11/20/95 | Received By: | Date/Time: |
| Relinquished By: | Date/Time: | Received By: | Date/Time: |

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

| LABORATORY SECTION | Received By | Title | Date/Time |
|---|---|---|---|
| | [illegible] | Sample Custodian | 11-21-95 / 08:15 |

| FINAL SAMPLE DISPOSITION | Disposal Method | Disposed By | Date/Time |
|---|---|---|---|
| | | | |

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# Appendix 5

## Data Validation Supporting Documentation

# RADIOCHEMICAL DATA VALIDATION CHECKLIST

| VALIDATION LEVEL: | A | B | C | D | E |
|---|---|---|---|---|---|
| PROJECT: 100-FR-3 | | | DATA PACKAGE: LK5893 | | |
| VALIDATOR: | | LAB: LAS | | DATE: 1/10/96 | |
| CASE: | | | SDG: LK5893-LAS | | |

ANALYSES PERFORMED

| | | | | | |
|---|---|---|---|---|---|
| ☒ Gross Alpha/Beta | ☒ Strontium-90 | ☐ Technetium-99 | ☐ Alpha Spectroscopy | ☐ Gamma Spectroscopy | |
| ☐ Total Uranium | ☐ Radium-22 | ☒ Tritium | ☒ C-C14 | | |

SAMPLES/MATRIX

BOGSF4, BOGSF1 (split SB1)
(split S77) ~~(split S77)~~ pk

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:

~~A-1/Rev~~

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:_____

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:_____

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 — per BHI use LCS
3H No yield

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 B0G5F1 >CRDL

~~A-4~~ A/pc