



CAF B 94

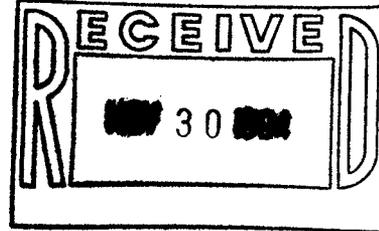
DEPARTMENT OF THE AIR FORCE

HEADQUARTERS 27th FIGHTER WING (ACC)  
CANNON AIR FORCE BASE, NEW MEXICO

XVII

17 NOV 1994

Christopher S. Long, Colonel, USAF  
Commander, 27th Support Group  
100 S DL Ingram Blvd Suite 200  
Cannon AFB NM 88103-5217



Ms. Barbara Hoditschek  
RCRA Permits Program Manager  
New Mexico Environment Department  
1190 St Francis Drive  
PO Box 26110  
Santa Fe NM 87502

Dear Ms. Hoditschek

We are providing the attached groundwater analytical results for Solid Waste Management Unit 113 Landfill 5, 9-10 Aug 94 for your review. This report provides the third quarter sampling for 1994. We previously provided the first quarter (21-25 Feb 94) results.

If you have any questions, please contact Mr. John Constantine at (505) 784-4348.

Sincerely

*Christopher S. Long*  
CHRISTOPHER S. LONG, Colonel, USAF  
Commander, 27th Support Group

Attachment:  
Groundwater Analytical Results Landfill 5

cc:  
U.S. EPA (B. Hurlbut)

*Analytical results  
in library*

**LIBRARY COPY**



**GROUND-WATER ANALYTICAL RESULTS**

**LANDFILL 5**

**AUGUST 9-10, 1994**

**CANNON AIR FORCE BASE, NEW MEXICO**

GROUND-WATER ANALYTICAL RESULTS  
LANDFILL 5  
August 9,10, 1994

CANNON AIR FORCE BASE, NEW MEXICO

## INTRODUCTION

The U. S. Geological Survey (USGS) and the U.S. Air Force Air Combat Command (ACC) have a memorandum of understanding to address the USGS assisting any ACC base in their hydrology or environmental programs. The USGS has agreed to assist Cannon Air Force Base (CAFB) , an ACC base, in their ground-water monitoring program. Cannon AFB is located in eastcentral New Mexico about 7 miles west of Clovis as shown on Figure 1. The ground-water monitoring is at Landfill 5 on the southeast corner of the base as shown on Figure 2. The monitoring is being performed as part of the 13 July 1990 Compliance Agreement between CAFB and the New Mexico Environment Department (NMED) and the work was performed in accordance with a Sampling and Analysis Plan submitted to NMED on January 28, 1991.

## PURPOSE AND SCOPE

The purpose of this report is to provide the data resulting from sampling 5 wells around landfill 5 on CAFB August 9-10, 1994. The monitoring wells sampled at the landfill are wells A, B, L, M, and I as shown on figure 3. All of the wells were sampled for Total Organic Carbon (TOC) and Total Organic Halogen as Cl (TOX).

A daily log of activities was taken during the sampling and is presented in Appendix A at the end of this report. The log of activites also presents the purging measurements of volume, pH, Temperature, Turbidity, and Conductivity. All samples were immediately cooled after sampling and shipped by overnight mail to Quanterra Environmental Services-Denver for analysis.

## Analytical Results

Table 1 presents a summary of the analytical results for the August 9-10, 1994 sampling on Landfill 5. The highest values of TOC and TOX obtained were from the equipment blank for well B. Slightly elevated values of TOC (1.3 mg/L) was found in Well I and slightly elevated values of TOX (32.3 mg/L) were found in well L.

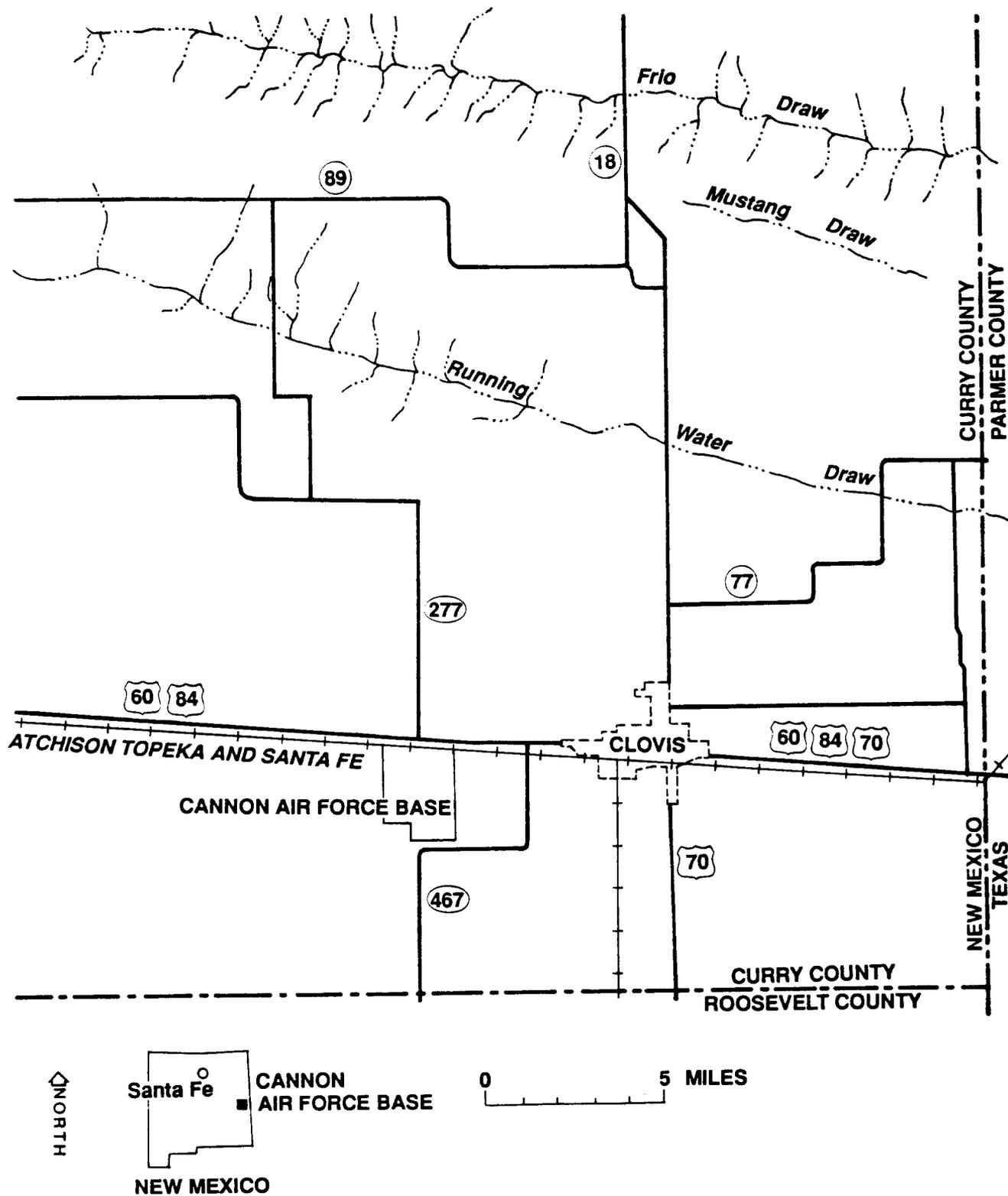


Figure 1.--Location of Cannon Air Force Base, New Mexico.

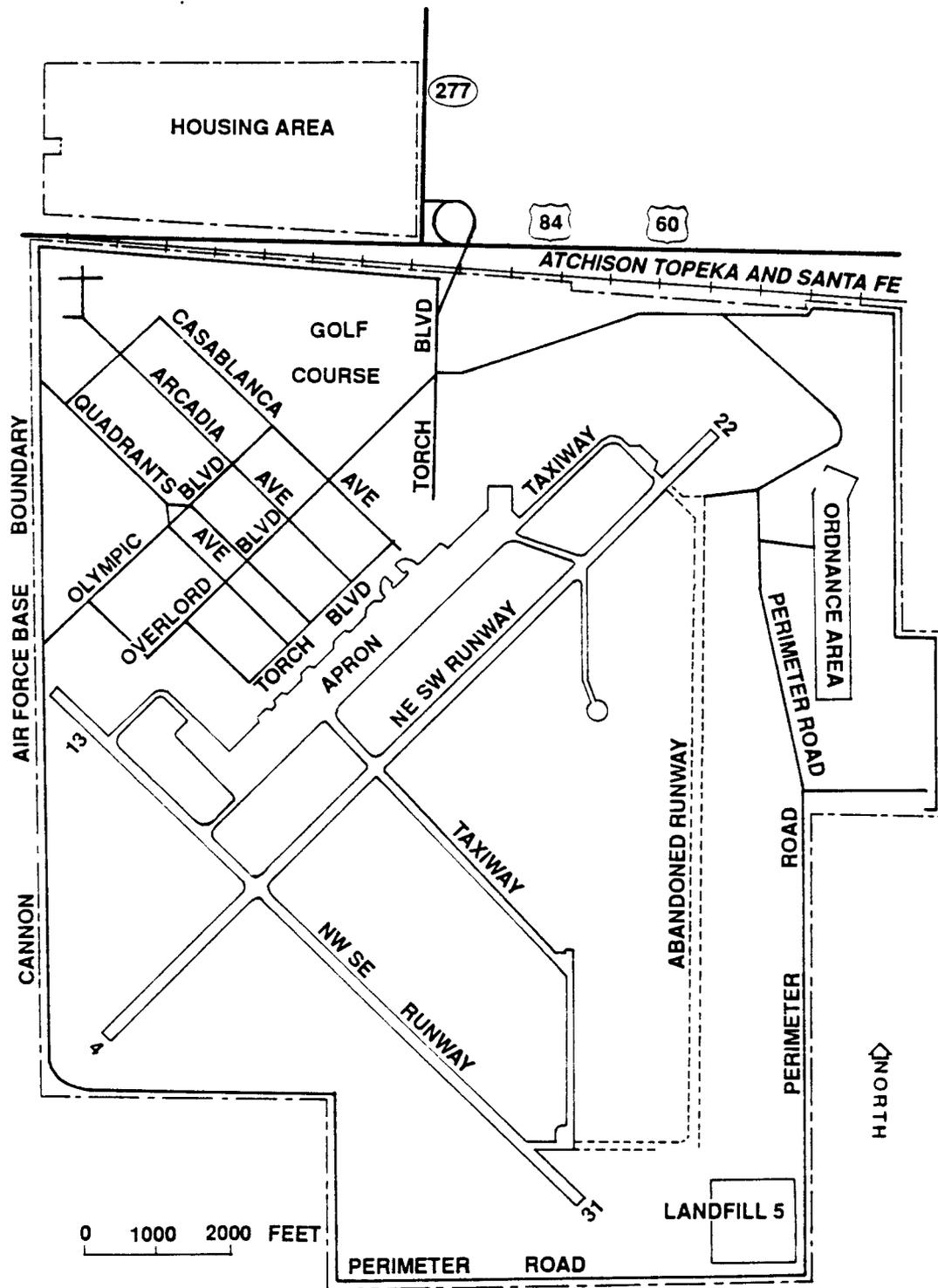


Figure 2.--Cannon Air Force Base and location of Landfill 5.

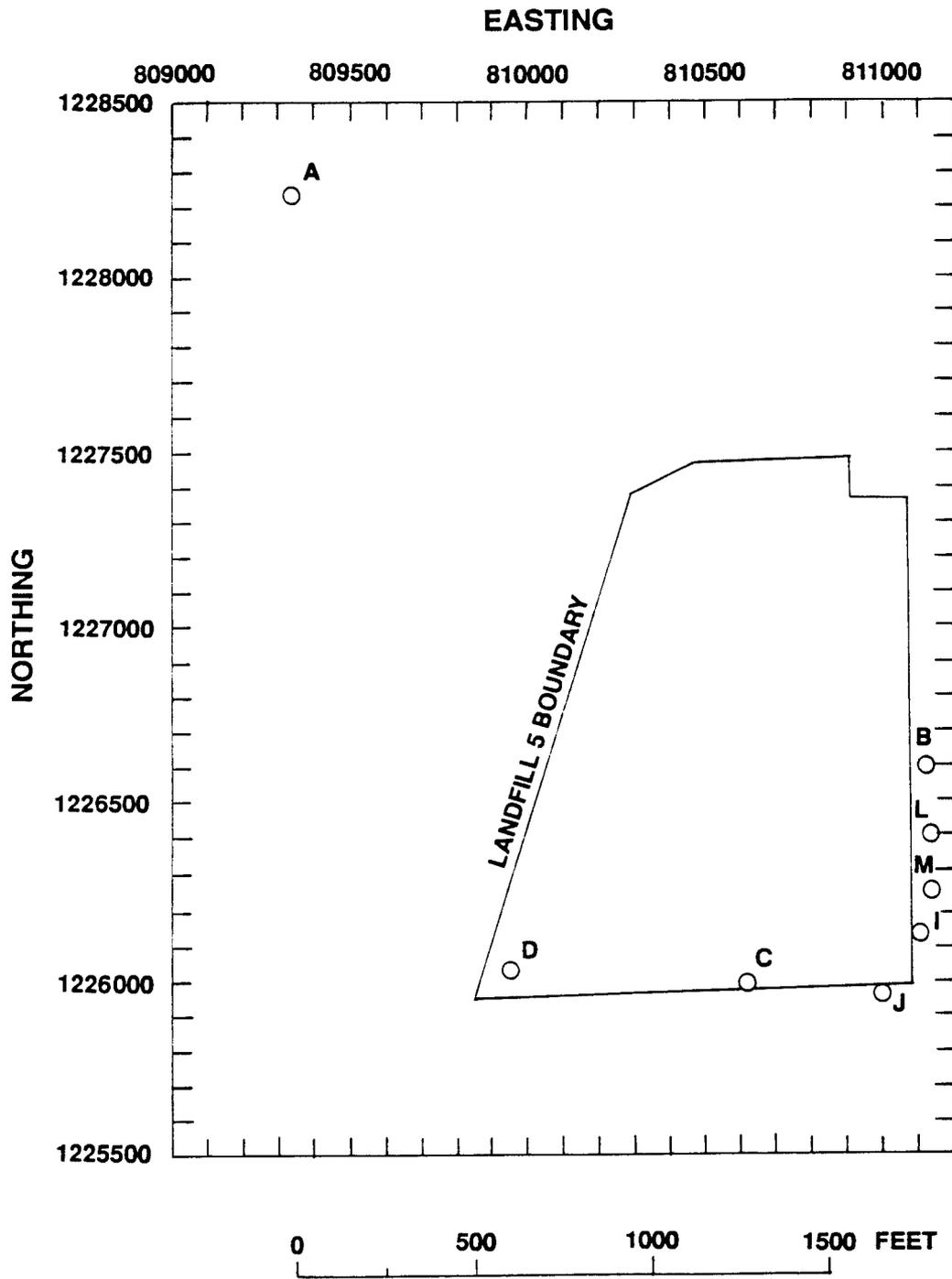


Figure 3.--Location of Monitoring wells around Landfill 5.

TABLE 1--Summary of August 9, 10, 1994 sampling at Landfill 5, Cannon Air Force Base

Well/sample ID: Date sampled: Depth (feet):	CAFB-A-0894-1 8-9-94		CAFB-B-0894-1 8-10-94 Equipment Blank		CAFB-B-0894-2 8-10-94		CAFB-I-0894-1 8-9-94		CAFB-I-0894-2 8-9-94 DUP		CAFB-L-0894-1 8-9-94	
Analytes	Result	QL	Result	QL	Result	QL	Result	QL	Result	QL	Result	QL
SW9060 (mg/L) Total Organic Carbon	1.0	1.0	1.6	1.0	1.1	1.0	1.3	1.0	1.0	1.0	1.0	1.0
SW9020 (mg/L) Total Organic Halogen as Cl	ND	30.0	35.5	30.0	ND	30.0	ND	30.0	ND	30.0	32.3	30.0

Well/sample ID: Date sampled: Depth (feet):	CAFB-M-0894-1 8-9-94	
Analytes	Result	QL
SW9060 (mg/L) Total Organic Carbon	1.1	1.0
SW9020 (mg/L) Total Organic Halogen as Cl	ND	30.0

APPENDIX A  
FIELD NOTES

08-09-94

Field crew: Fred Gebhardt & Ralph Wilcox

- 0730 Arrive @ Well A (Landfill 5)
- 0742 Tip reading 0.0 ppm in well.
- 0807 Unable to get reliable w.l. w/ steel tape.
- 0825 Calibrated meters: pH @ 7.00 and 10.00; conductivity @ 738  $\mu\text{S}/\text{cm}$ ; & checked turbidity standards.
- 0832 Measured w.l. w/ solinst @ 270.28 ft below top of PVC disk w/ Bennett pump fittings



0839 Began purging well w/ Bennett pump powered w/ compressed Nitrogen tank.

<u>time</u>	<u>vol.</u>	<u>pH</u>	<u>temp.</u>	<u>turb.</u>	<u>cond.</u>
0840	0.5 gal	7.37	18°C	1.14 NTU	681 $\mu\text{S}/\text{cm}$
0844	10	7.83	19°	1.27	669
0849	20	7.91	19	1.16	661
0855	30	8.01	19	0.83	680
0900	40	8.03	19	0.43	681
0904	50	7.92	19	0.33	680
0908	60	7.89	19	0.22	682
0914	70	7.94	19	0.30	680
0920	80	7.94	19	0.25	678
0924	90	7.91	19	0.23	679

0925 Collected ground water sample CAFB-A-0894-1.



08-09-94 continued

0950 Arrived @ well I\* (Landfill 5).

0959 Tip reading 0.0 ppm in well.

1008 Measured w.l. w/ Solinst @ 275.21 ft below PVC disk w/ Bennett pump fittings.

1010 Began purging well w/ Bennett pump powered w/ compressed nitrogen tank.

<u>time</u>	<u>vol</u>	<u>pH</u>	<u>temp.</u>	<u>turb.</u>	<u>cond.</u>
1011	0.5 gal	7.65	19°C	0.99 NTU	815 µS/cm
1016	10	7.79	19	1.34	784
1023	20	7.79	19	4.59	785
1029	30	7.80	19	7.00	795
1036	40	7.79	19	2.62	794
1044	50	?7.50?	19	1.86	803
1048	60	7.63	19	1.53	798
1057	70	7.72	19	1.08	821
1104	80	7.77	19	0.97	819
1110	90	7.78	19	1.19	797

← Rechecked pH cal. w/ 7.00 std. Read 7.03.

1111 Collected ground water sample CAFB-I-0894-1 and duplicate sample CAFB-I-0894-2.



08-09-94 continued

- 1130 Arrived @ well M (Landfill 5).  
 1132 Tip reading 0.4 ppm in well.  
 1139 Measured w.l. w/salinst @ 274.80 ft below top of PVC disk w/ Bennett pump fittings.  
 1145 Began purging well w/ Bennett pump powered w/ compressed nitrogen tank.

<u>time</u>	<u>vol.</u>	<u>pH</u>	<u>temp.</u>	<u>turb.</u>	<u>cond.</u>
1146	0.5gal	7.86	20°C	1.19 NTU	735 $\mu$ S/cm
1153	10	7.70	19	29.8	840
1200	20	7.43	19	12.4	850

- 1203 Dried well up after purging 25 gal.  
 1219 Started purging again.

1222 30 gal 7.42 20°C 34.1 NTU 792  $\mu$ S/cm

1223 Dried up well after purging an additional 5 gal (30 total).

1339 Started purging again.

1243 Purged an additional 4 gal (34 gal total), and collected ground-water sample CAFB-M-0894-1.



08-09-94 continued

- 1304 Arrived @ well L (Landfill 5).  
 1307 Tip reading 0.0 ppm in well.  
 1315 Measured w.l. w/ solinst @ 275.64 ft below top of PVC disk w/ Bennett pump fittings.  
 1316 Began purging well w/ Bennett pump powered w/ compressed nitrogen tank.

time	vol.	pH	temp.	turb.	cond.
1317	0.5 gal	7.42	19.5°C	2.02 NTU	777 $\mu$ S/cm
1323	10	7.36	19	3.09	865
1329	20	7.32	19	1.78	856
1337	30	7.44	19.5	7.80	827
1352	40	7.40	20	0.48	809
1406	50	7.26	20	0.43	805
1421	60	7.35	19.5	0.54	793
1435	70	7.37	19.5	0.34	798

Well drying up, pumping rate has dropped off.  
 Ran out of nitrogen, changed tanks.

1436 Collected ground water sample CAFB-L-0894-1, Environmental sample plus MS and MSD.

1450 Rechecked meter  
 cal. @ 738  $\mu$ S/cm STD.  
 read 735  $\mu$ S/cm;  
 pH 7.00 STD. read 6.96;  
 pH 10.00 STD read 9.98.

08-10-94

Field crew: Ralph Wilcox &amp; Fred Gebhardt

- 0738 Arrived @ well B (Landfill 5).  
 0740 Tip reading 0.0 ppm in well.  
 0808 Solinst malfunctioning. Could not get a reliable w.l. w/ steel tape.  
 0827 Collected equipment blank sample CAFB-B-0894-1. Poured blank water through teflon sampling bailer and over winch cable. Filled sample bottles through bailer bottom emptying device (bed)  
 0842 Calibrated meters: pH @ 7.00 and 10.00; conductivity @ 738  $\mu\text{S}/\text{cm}$ ; and checked turbidity standards.  
 0850 Began purging w/ 8 ft  $\times$  3 1/2 in PVC bailer.

<u>time</u>	<u>vol.</u>	<u>pH</u>	<u>temp.</u>	<u>turb.</u>	<u>cond.</u>
0856	2 gal	7.18	19°C	23.4	817 $\mu\text{S}/\text{cm}$
0919	11 gal	7.80	19	56.5	806
0943	22 gal	7.84	19	69.5	802
1007	33	7.82	19	67.9	804
1040	45	7.85	19	64.6	811
1103	55	7.85	19	59.2	804
1127	66	7.84	19	35.6	803
1155	77	7.90	19	32.0	803
1226	88	7.87	19	52.5	803
1254	99	7.86	19	45.3	805
1317	110	7.87	19	34.1	803
1339	121	7.88	19	33.1	803

08-10-94 continued

w/taflon bailer @  
bed

- 1345 Collected ground water sample CAFB-B-0894-2<sub>1</sub>.
- 1352 Rechecked meter calibration: pH 7.00 std. read 6.99.  
pH 10.00 std read 10.03; 738  $\mu$ S/cm std read  
731 mS/cm.

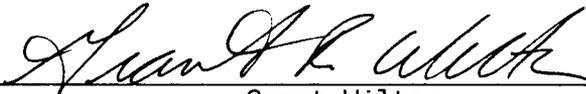


**APPENDIX B**  
**LABORATORY ANALYTICAL SHEETS**

ANALYTICAL RESULTS  
FOR  
U.S. GEOLOGICAL SURVEY  
QUANTERRA ENVIRONMENTAL SERVICES, DENVER  
PROJECT NUMBER 037466  
SEPTEMBER 6, 1994



Reviewed by:

  
\_\_\_\_\_  
Grant Wilton

  
\_\_\_\_\_  
Lindsay Breyer

## I. OVERVIEW

On August 12, 1994, Quanterra Environmental Services, Denver (formerly Enseco-Rocky Mountain Analytical Laboratory) received seven aqueous samples from the U.S. Geological Survey.

This report presents the analytical results as well as supporting information to aid in the evaluation and interpretation of the data and is arranged in the following order:

- I. Overview
- II. Sample Description Information/Analytical Test Requests
- III. Analytical
- IV. Quality Control Report

With the exceptions as mentioned above, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. All laboratory QC samples analyzed in conjunction with the samples in this project were within established control limits.

## II. SAMPLE DESCRIPTION INFORMATION/ANALYTICAL TEST REQUESTS

### Sample Description Information

The Sample Description Information lists all of the samples received in this project together with the internal laboratory identification number assigned for each sample. Each project received at Quanterra Environmental Services, Denver is assigned a unique six digit number. Samples within the project are numbered sequentially. The laboratory identification number is a combination of the six digit project code and the sample sequence number.

Also given in the Sample Description Information is the Sample Type (matrix), Date of Sampling (if known) and Date of Receipt at the laboratory.

### Analytical Test Requests

The Analytical Test Requests lists the analyses that were performed on each sample. The Custom Test column indicates where tests have been modified to conform to the specific requirements of this project.

SAMPLE DESCRIPTION INFORMATION  
 for  
 U.S. Geological Survey

Lab ID	Client ID	Matrix	Sampled		Received
			Date	Time	
037466-0001-SA	CAFB-A-0894-1	AQUEOUS	09 AUG 94	09:25	12 AUG 94
037466-0002-SA	CAFB-I-0894-1	AQUEOUS	09 AUG 94	11:11	12 AUG 94
037466-0003-SA	CAFB-I-0894-2	AQUEOUS	09 AUG 94	11:11	12 AUG 94
037466-0004-SA	CAFB-M-0894-1	AQUEOUS	09 AUG 94	12:43	12 AUG 94
037466-0005-SA	CAFB-L-0894-1	AQUEOUS	09 AUG 94	14:36	12 AUG 94
037466-0005-MS	CAFB-L-0894-1	AQUEOUS	09 AUG 94	14:36	12 AUG 94
037466-0005-SD	CAFB-L-0894-1	AQUEOUS	09 AUG 94	14:36	12 AUG 94
037466-0006-EB	CAFB-B-0894-1	AQUEOUS	10 AUG 94	08:27	12 AUG 94
037466-0007-SA	CAFB-B-0894-2	AQUEOUS	10 AUG 94	13:45	12 AUG 94

ANALYTICAL TEST REQUESTS  
for  
U.S. Geological Survey

Lab ID: 037466	Group Code	Analysis Description	Custom Test?
0001 - 0007	A	Total Organic Carbon (TOC) Total Organic Halogen (TOX)	N N

### III. ANALYTICAL RESULTS

The analytical results for this project are presented in the following data tables. Each data table includes sample identification information, and when available and appropriate, dates sampled, received, authorized, prepared and analyzed. The authorization data is the date when the project was defined by the client such that laboratory work could begin. The date prepared is typically the date an extraction or digestion was initiated. For volatile organic compounds in water, the date prepared is the date the screening of the sample was performed.

Data sheets contain a listing of the parameters measured in each test, the analytical results and the Quanterra Environmental Services, Denver laboratory's reporting limit. Reporting limits are adjusted to reflect dilution of the sample, when appropriate. Solid and waste samples are reported on an "as received" basis, i.e. no correction is made for moisture content.

In addition, surrogate recovery data is presented for all GC/MS analyses. The surrogate recovery is an indication of the affect of the sample matrix on the performance of the method. The results from the Standard Quanterra Environmental Services, Denver laboratory's QA/QC Program, which generates data which are independent of matrix effects, is given in Section IV.

The analytical data reported are subject to the following limitations of the analytical methodology:

### Volatile Organics

- a) Due to the chemical nature of ethanol, this component cannot be consistently recovered using EPA Method 624 or 8240. This component is reported with a NR (Not Recoverable) in place of a reporting limit.
- b) Methylene chloride and acetone are common laboratory contaminants in GC/MS analysis. We have programs in place to minimize contamination, occasionally these compounds will be found at low levels in samples.

### Semivolatile Organics

- a) Benzo(b) and benzo(k) fluoranthene cannot be differentiated based on their mass spectra; retention times are almost identical. The isomer which is the closest in retention time to the sample is reported.
- b) 1,2-diphenylhydrazine is measured as azobenzene.
- c) Diphenylamine cannot be distinguished from N-nitrosodiphenylamine.
- d) 3-Methyl phenol and 4-methyl phenol cannot be differentiated because their mass spectra and retention times are almost identical. Results are reported as 3/4-methyl phenol (or m&p-cresols).
- e) Several Appendix IX and Refinery List compounds are not consistently recovered using Method 8270, and reporting limits cannot be established. These compounds include: dimethoate, famphur, hexachlorophene, 4-nitroquinoline-1-oxide, 4-phenylenedianine, and benzenethiol.
- f) Two Refinery List compounds, pyridine and quinoline, are not recovered after alumina column cleanup.

- g) Bis-2-(ethyl)hexyl-phthalate is a common laboratory contaminant in GC/MS analysis. We have programs in place to minimize this contamination, occasionally these compounds will be found at low levels in samples.

### Tentatively Identified Compounds

This report presents results for the "identification" of unknown compounds that were detected in the GC/MS analysis. The results from this work are presented as "tentatively identified compounds" (TIC). The approach used for reporting TICs was based on the protocol established for this purpose in the EPA Superfund methods and on guidelines established by the American Chemical Society (ACS).

In summary, the mass spectrum of chromatographic peaks in concentrations in excess of 10% of the internal standard were obtained. Normally, the number of unknown compounds identified is limited to 10 compounds in the volatile fraction and 20 compounds in the semivolatile fraction. Each mass spectrum was then compared to a library of over 30,000 reference spectra in a computerized "library search." The three "best" matches obtained by the computer were hardcopied along with the mass spectrum of the unknown peak. This information was then reviewed by an analyst who "identified" the compound based on the available information.

All identifications were based on the "Guidelines for GC/MS Identification" developed by the American Chemical Society (Environmental Science and Technology, 1982, 16 143A). As recommended in these guidelines, identifications of unknown substances were reported with a level of confidence. The three levels of confidence cited in the ACS guidelines and used in this report are as follows:

#### Level 3: Confirmed Identification

The identification is based on the analysis of an authentic standard.

### Level 2: Confident Identification

Good agreement was observed between the unknown compound and a specific library spectrum.

### Level 1: Tentative Identification

The unknown compound is only indicative of a specific library spectrum.

### Class Identification

The unknown compound was not similar to a specific library spectrum, but it did contain ions characteristic of a class of compounds (saturated hydrocarbon, chlorinated hydrocarbon, etc.).

If there were no library spectra similar to the unknown, and it could not be assigned to a particular class of compounds, the compound is reported as "unknown."

Quantitation of TICs is based on the total ionization peak area relative to an internal standard, assuming a response factor of one. Accordingly, the reported concentration is an estimate.

In general, mass spectrometry cannot distinguish isomers (compounds with the same molecular formula). Therefore, an identified compound may be any one of several different isomers.

The tentatively identified compounds in this report include some compounds reported as "siloxanes". Siloxanes are common laboratory and field artifacts or contaminants. Potential sources include silicon-based grease in the field or laboratory plus the liquid phase coating on gas chromatography columns, as well as other equipment in the laboratory. However, siloxanes may be present in environmental samples from spills of silicone oils or lubricating oils with siloxane additives.

## Metals

All nominal reporting limits for metals have been established from instrument detection limit (IDL) evaluations and represent the level above which reliable data can be routinely obtained. Low level standards are analyzed seven times on three non-consecutive days on each instrument. The standard deviations of the three runs are summed to yield the IDL. Nominal reporting limits are generally 2-5 times the IDL (consistent with the American Chemical Society definition for the Limit of Quantification). The ability to achieve these quoted reporting limits is verified each quarter. Reporting limits above the nominal levels are often submitted due to matrix interferences or elevated analyte levels.

Reporting limits for metals analyzed by Inductively Coupled Plasma (ICP) are typically raised only for dilution due to an analyte exceeding the instrument linear range. Background and interelement interferences are corrected automatically and do not require dilution.

Metals analyzed by Graphite Furnace Atomic Absorption (GFAA) are subject to matrix interferences. Consequently, Quanterra Environmental Services, Denver laboratory's protocol is to analyze a spiked aliquot with every sample. The severity of the interference, based upon analyte level and spike recovery, is assessed against specific criteria and the need for an elevated reporting limit or dilution is determined.

The analysis of mercury by Cold Vapor Atomic Absorption (CVAA) is generally free from matrix interferences. As with ICP, reporting limits are raised only for dilution due to a sample concentration exceeding the linear range of the instrument.

## General Inorganics

Client Name: U.S. Geological Survey

Client ID: CAFB-A-0894-1

Lab ID: 037466-0001-SA

Matrix: AQUEOUS

Authorized: 12 AUG 94

Sampled: 09 AUG 94

Prepared: See Below

Received: 12 AUG 94

Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Total Organic Carbon	1.0	mg/L	1.0	9060	NA	16 AUG 94
Total Organic Halogen as Cl	ND	ug/L	30.0	9020	NA	31 AUG 94

ND = Not detected  
NA = Not applicable

Reported By: Judy Lange

Approved By: Roxanne Sullivan

General Inorganics

Client Name: U.S. Geological Survey  
 Client ID: CAFB-I-0894-1  
 Lab ID: 037466-0002-SA  
 Matrix: AQUEOUS  
 Authorized: 12 AUG 94

Sampled: 09 AUG 94  
 Prepared: See Below

Received: 12 AUG 94  
 Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Total Organic Carbon	1.3	mg/L	1.0	9060	NA	16 AUG 94
Total Organic Halogen as Cl	ND	ug/L	30.0	9020	NA	31 AUG 94

ND = Not detected  
 NA = Not applicable

Reported By: Judy Lange

Approved By: Roxanne Sullivan

## General Inorganics

Client Name: U.S. Geological Survey

Client ID: CAFB-I-0894-2

Lab ID: 037466-0003-SA

Matrix: AQUEOUS

Authorized: 12 AUG 94

Sampled: 09 AUG 94

Prepared: See Below

Received: 12 AUG 94

Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Total Organic Carbon	1.0	mg/L	1.0	9060	NA	16 AUG 94
Total Organic Halogen as Cl	ND	ug/L	30.0	9020	NA	31 AUG 94

ND = Not detected  
NA = Not applicable

Reported By: Judy Lange

Approved By: Roxanne Sullivan

General Inorganics

Client Name: U.S. Geological Survey  
 Client ID: CAFB-M-0894-1  
 Lab ID: 037466-0004-SA  
 Matrix: AQUEOUS  
 Authorized: 12 AUG 94

Sampled: 09 AUG 94  
 Prepared: See Below

Received: 12 AUG 94  
 Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Total Organic Carbon	1.1	mg/L	1.0	9060	NA	16 AUG 94
Total Organic Halogen as Cl	ND	ug/L	30.0	9020	NA	31 AUG 94

ND = Not detected  
 NA = Not applicable

Reported By: Judy Lange

Approved By: Roxanne Sullivan

## General Inorganics

Client Name: U.S. Geological Survey

Client ID: CAFB-L-0894-1

Lab ID: 037466-0005-SA

Matrix: AQUEOUS

Authorized: 12 AUG 94

Sampled: 09 AUG 94

Prepared: See Below

Received: 12 AUG 94

Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Total Organic Carbon	1.0	mg/L	1.0	9060	NA	16 AUG 94
Total Organic Halogen as Cl	32.3	ug/L	30.0	9020	NA	31 AUG 94

ND = Not detected  
NA = Not applicable

Reported By: Judy Lange

Approved By: Roxanne Sullivan

## General Inorganics

Client Name: U.S. Geological Survey

Client ID: CAFB-B-0894-1

Lab ID: 037466-0006-EB

Matrix: AQUEOUS

Authorized: 12 AUG 94

Sampled: 10 AUG 94

Prepared: See Below

Received: 12 AUG 94

Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Total Organic Carbon	1.6	mg/L	1.0	9060	NA	16 AUG 94
Total Organic Halogen as Cl	35.5	ug/L	30.0	9020	NA	31 AUG 94

ND = Not detected  
NA = Not applicable

Reported By: Judy Lange

Approved By: Roxanne Sullivan

General Inorganics

Client Name: U.S. Geological Survey  
 Client ID: CAFB-B-0894-2  
 Lab ID: 037466-0007-SA  
 Matrix: AQUEOUS  
 Authorized: 12 AUG 94

Sampled: 10 AUG 94  
 Prepared: See Below

Received: 12 AUG 94  
 Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Total Organic Carbon	1.1	mg/L	1.0	9060	NA	16 AUG 94
Total Organic Halogen as Cl	ND	ug/L	30.0	9020	NA	31 AUG 94

ND = Not detected  
 NA = Not applicable

Reported By: Judy Lange

Approved By: Roxanne Sullivan

#### IV. QUALITY CONTROL REPORT

Quanterra Environmental Services, Denver operates under a vigorous QA/QC program designed to ensure the generation of scientifically valid, legally defensible data by monitoring every aspect of laboratory operations. Routine QA/QC procedures include the use of approved methodologies, independent verification of analytical standards, use of duplicate Laboratory Control Samples to assess the precision and accuracy of the methodology on a routine basis, and a rigorous system of data review.

The standard laboratory QC package is designed to:

- 1) establish a strong, cost-effective QC program that ensures the generation of scientifically valid, legally defensible data
- 2) assess the laboratory's performance of the analytical method using control limits generated with a well-defined matrix
- 3) establish clear-cut guidelines for acceptability of analytical data so that QC decisions can be made immediately at the bench, and
- 4) provide a standard set of reportables which assures the client of the quality of his data.

Quanterra Environmental Services, Denver laboratory's QC program is based upon monitoring the precision and accuracy of an analytical method by analyzing a set of Duplicate Control Samples (DCS) at frequent, well-defined intervals. Each DCS is a well-characterized matrix which is spiked with target compounds at 5-100 times the reporting limit, depending upon the methodology being monitored. The purpose of the DCS is not to duplicate the sample matrix, but rather to provide an interference-free, homogeneous matrix from which to gather data to establish control limits. These limits are used to determine whether data generated by the laboratory on any given day is in control.

Control limits for accuracy (percent recovery) are based on the average, historical percent recovery +/- 3 standard deviation units. Control limits for precision (relative percent difference) range from 0 (identical duplicate DCS results) to the average, historical relative percent difference + 3 standard deviation units. These control limits are fairly narrow based on the consistency of the matrix being monitored and are updated on a quarterly basis. For each batch of samples analyzed, an additional control measure is taken in the form of a Single Control Sample (SCS). The SCS consists of a control matrix that is spiked with surrogate compounds appropriate to the method being used. In cases where no surrogate is available, (e.g., metals or conventional analyses) a single DCS serves as the control sample. An SCS is prepared for each sample lot for which the DCS pair are not analyzed. The recovery of the SCS is charted in exactly the same manner as described for the DCS, and provides a daily check on the performance of the method.

Accuracy for DCS and SCS is measured by Percent Recovery:

$$\% \text{ Recovery} = \frac{\text{Measured Concentration}}{\text{Actual Concentration}} \times 100$$

Precision for DCS is measured by Relative Percent Difference (RPD):

$$\text{RPD} = \frac{|\text{Measured Concentration DCS1} - \text{Measured Concentration DCS2}|}{(\text{Measured Concentration DCS1} + \text{Measured Concentration DCS2})/2} \times 100$$

All samples analyzed concurrently by the same test are assigned the same QC lot number. Projects which contain numerous samples, analyzed over several days, may have multiple QC lot numbers associated with each test. The QC information which follows includes a listing of the QC lot numbers associated with each of the samples reported, DCS and SCS (where applicable) recoveries from the QC lots associated with the samples, and control limits for these lots. The QC data is reported by test code, in the order that the tests are reported in the analytical results section of this report.

QC LOT ASSIGNMENT REPORT  
Wet Chemistry Analysis and Preparation

Laboratory Sample Number	QC Matrix	QC Category	QC Lot Number (DCS)	QC Run Number (SCS/BLANK)
037466-0001-SA	AQUEOUS	TOC-A	16 AUG 94-6A	-
037466-0001-SA	AQUEOUS	TOX-A	31 AUG 94-9L	-
037466-0002-SA	AQUEOUS	TOC-A	16 AUG 94-6A	-
037466-0002-SA	AQUEOUS	TOX-A	31 AUG 94-9L	-
037466-0003-SA	AQUEOUS	TOC-A	16 AUG 94-6A	-
037466-0003-SA	AQUEOUS	TOX-A	31 AUG 94-9L	-
037466-0004-SA	AQUEOUS	TOC-A	16 AUG 94-6A	-
037466-0004-SA	AQUEOUS	TOX-A	31 AUG 94-9L	-
037466-0005-SA	AQUEOUS	TOC-A	16 AUG 94-6A	-
037466-0005-SA	AQUEOUS	TOX-A	31 AUG 94-9L	-
037466-0005-MS	AQUEOUS	TOC-A	16 AUG 94-6A	-
037466-0005-MS	AQUEOUS	TOX-A	31 AUG 94-9L	-
037466-0005-SD	AQUEOUS	TOC-A	16 AUG 94-6A	-
037466-0005-SD	AQUEOUS	TOX-A	31 AUG 94-9L	-
037466-0006-EB	AQUEOUS	TOC-A	16 AUG 94-6A	-
037466-0006-EB	AQUEOUS	TOX-A	31 AUG 94-9L	-
037466-0007-SA	AQUEOUS	TOC-A	16 AUG 94-6A	-
037466-0007-SA	AQUEOUS	TOX-A	31 AUG 94-9L	-

DUPLICATE CONTROL SAMPLE REPORT  
Wet Chemistry Analysis and Preparation

Analyte	Concentration		Measured DCS2	AVG	Accuracy Average(%)		Precision (RPD)		
	Spiked	DCS1			DCS	Limits	DCS	Limit	
Category: TOC-A Matrix: AQUEOUS QC Lot: 16 AUG 94-6A Concentration Units: mg/L									
Total Organic Carbon	25.0	26.4	26.6	26.5	106	90-111	0.8	10	
Category: TOX-A Matrix: AQUEOUS QC Lot: 31 AUG 94-9L Concentration Units: ug Cl/L									
Total Organic Halogen as Cl	100	93.4	95.6	94.5	94	80-120	2.4	20	

Calculations are performed before rounding to avoid round-off errors in calculated results.

MATRIX SPECIFIC QC  
ASSIGNMENT REPORT  
Wet Chemistry Analysis and Preparation

QC SAMPLE TYPE	TEST	LABORATORY SAMPLE NUMBER	QC LOT
MATRIX SPIKE DUPLICATE	TOC-TOC-A	037466-0005-SD	16 AUG 94-6A
MATRIX SPIKE	TOC-TOC-A	037466-0005-MS	16 AUG 94-6A
MATRIX SPIKE DUPLICATE	TOX-TOX-A	037466-0005-SD	31 AUG 94-9L
MATRIX SPIKE	TOX-TOX-A	037466-0005-MS	31 AUG 94-9L

MATRIX SPIKE / MATRIX SPIKE DUPLICATE REPORT  
 Wet Chemistry Analysis and Preparation

Analyte	Sample	Concentration			Spiked		%Recovery		% RPD
		Matrix Spike	Matrix Spike Dup	MS	MSD	MS	MSD		
Test: TOC-TOC-A Matrix AQUEOUS Sample: 037466-0005 Units: mg/L									
Total Organic Carbon	1.0	14.8	14.9	10.0	10.0	138	139	1	
Test: TOX-TOX-A Matrix AQUEOUS Sample: 037466-0005 Units: ug/L									
Total Organic Halogen as Cl	32.3	117	118	100	100	85	86	1	

All calculations are performed before rounding to avoid round-off errors in calculated results.

**U.S. GEOLOGICAL SURVEY, WATER RESOURCES DIVISION, NEW MEXICO DISTRICT  
ANALYTICAL REQUEST/CHAIN OF CUSTODY**

Project Name & Number Cannon Air Force Base, Ground Water Sampling (463536004)					PACKING AND SHIPPING DETAILS	
Sampling Location Landfill 5					Packed and Sealed for Shipping by Ralph Wilcox	
Team Leader Ralph Wilcox					Delivered to Shipper by Ralph Wilcox	
					Seal Number 01	
					Airbill Number 2316903330	
					Sampling Status <input checked="" type="checkbox"/> Done <input type="checkbox"/> Continuing	
Sample Date	Sample Time	Field Sample Number	Sample Type	No. of Containers	Analytical Methods (Parameters)	Remarks
08-09-94	0925	CAFB-A-0894-1	ground water	2	SW9060 (TOC)& SW9020 (TOX)	Environmental Sample -1
08-09-94	1111	CAFB-I-0894-1	ground water	2	SW9060 (TOC)& SW9020 (TOX)	Environmental Sample -2
08-09-94	1111	CAFB-I-0894-2	ground water	2	SW9060 (TOC)& SW9020 (TOX)	Environmental Sample -3
08-09-94	1243	CAFB-M-0894-1	ground water	2	SW9060 (TOC)& SW9020 (TOX)	Environmental Sample -4
08-09-94	1436	CAFB-L-0894-1	ground water	6	SW9060 (TOC)& SW9020 (TOX)	Environmental Sample plus MS/MSD -5 MS/SD
08-10-94	0827	CAFB-B-0894-1	QC blank	2	SW9060 (TOC)& SW9020 (TOX)	Equipment Blank -6
08-10-94	1345	CAFB-B-0894-2	ground water	2	SW9060 (TOC)& SW9020 (TOX)	Environmental Sample -7

Additional Comments

CHAIN OF CUSTODY RECORD				LABORATORY LOG-IN OF SAMPLE SHIPPING CONTAINER		
Relinquished by (signed)	Received by (signed)	Date	Time	Analytical Laboratory		Seal Intact upon Receipt
<i>Ralph Wilcox</i>	<i>to Federal Express</i>	<i>8-11-94</i>	<i>1500</i>	Rocky Mountain Analytical Lab 4855 Yarrow Street Arvada, CO 80002		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
	<i>[Signature]</i>	<i>8/12/94</i>	<i>245</i>	ph: (303) 421-6611		Condition of Contents <i>(200)</i>
				Attention: Julie Kramer		Contents Temperature <i>10.5</i>
						Laboratory Project Number <i>37466</i>