0072032

VALIDATION SERVICES REQUEST

VSR No.: VSR06-012
Rev.: 0

Validator: EQM	**Date Initiated:** 7/10/2006
Project Coordinator(s): TRENT, SJ	**QAPP Number:**
Client(s): ROHAY, VJ	**SAP Number:**
Project(s): CPP 200 Area	**Level of Validation (A, B, C, D, E):** C
SAF Number(s): F03-018	**Data Package(s):** 222S20030368, 222S20030383, H2459

Validation Task Title: 216-Z-9 Trench Characterization Borehole - Soil

Validation Procedure/Revision Number to be utilized in validation:

Chem:

Rad:

Comments:

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JAN 22 2007
EDMC

Requested Validation Start Date: 7/10/2006

Requested Validation Completion Date: 7/31/2006

A-6003-620 (03/03)

Project Hanford Management System
COMMENT RESOLUTION SHEET

Sheet 1 of 21 JRJ 8/13/06

Document Number: SDG ~~[illegible]~~ 2225200303 69 and **Revision Number** N/A **Date:** Aug 3, 2006

Document Title: 2225200303 83 JRJ 8/13/06

Data Validation for Strontium-90 Analysis 2225200303 69 & 2225200300383

Reviewer:
Bill Thackaberry

Reviewers, if other than original:

Project/Organization:
FH/GRP/QA

Responsible Manager:
Dana Farwick

COMMENT(S)

Initials (If other than listed reviewer)	Section/ Step	Comments/Discrepancies	Basis	Recommendation	Resolution
JRJ 8/13/06	pg 1-8 33	Package lacks the data summary that has been provided in the past showing analyte, detection limit, result and qualifiers.	Provided in all packages reviewed in the last 4 years	Provide the table	Accepted, although table is not required by the data validation procedure. JRJ 8/13/06
	pgs ~~34~~ Sec 11	This section should not be N/A	it applies to level C	complete the individual lines (no and N/A answers)	Accepted. JRJ 8/13/06

Date: June 15, 2006
To: Fluor Hanford, Inc
From: Environmental Quality Management, Inc.
Project: 216-Z-9 Waste Site Vertical Borehole (Borehole C3426)
Subject: Data Validation for Strontium-90 Analysis

INTRODUCTION

This memo presents the results of data validation on Data Packages 222S20030369 and 222S20030383, prepared by the 222-S laboratory. 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
B17N46	10/20/03	Soil	C	Strontium-90
B17TM6	10/29/03	Soil	C	Strontium-90

Data validation was conducted in accordance with HNF-20434, Rev. 0, *Data Validation Procedure for Radiochemical Analyses*, DOE/RL-2001-01, Rev. 0, Appendix B, *Plutonium/Organic-Rich Process Condensate/Process Waste Group Operable Unit Representative Sites Sampling and Analysis Plan*, and DOE/RL-2001-01, Rev. 0, Appendix E, *Sampling and Analysis Plan for Investigation of Dense, Nonaqueous-Phase Liquid Carbon Tetrachloride at the 216-Z-9 Trench*. Appendices 1 through 6 of this Data Validation Report provide additional information as indicated below:

Appendix 1. Glossary of Data Reporting Qualifiers
Appendix 2. Summary of Data Qualification
Appendix 3. Annotated Laboratory Reports
Appendix 4. Laboratory Narrative and Chain-of-Custody Documentation
Appendix 5. Data Validation Supporting Documentation
Appendix 6. Additional Data Requested by Client

DATA QUALITY PARAMETERS

Holding Times

Holding times may be calculated from Chain-of-Custody forms to determine the validity of the results. Maximum holding time for strontium-90 analyses is specified as 6 months in DOE/RL-2001-01, App. B.

All holding times were met.

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 minimum detectable activity (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 qualified as undetected and flagged "U"; samples results above the MDA and greater than five times the highest blank concentration are not qualified.

  All blank criteria were met. Strontium-90 was not detected in the blank. The detection limit for the blank was less than the MDA and less than the required detection limit.

- Field Blank

  No field blanks were submitted for analysis.

Accuracy

Accuracy is evaluated from laboratory control sample (LCS) or blank spike sample (BSS) batch samples and spiked samples in the analytical batch. Measured activities are compared to the known added amounts. The acceptable LCS or BSS and matrix spike (MS) recovery range is 65-135%. In addition, a nonradiochemical carrier is used to determine the yield of the chemical separation procedure. The acceptable range for carrier recovery is 20% to 105%. Results outside the above ranges result in associated sample results being qualified as estimates. Results are rejected for LCS/BSS recoveries less than 30% or carrier or MS recoveries less than 10%.

LCS and MS recoveries satisfied the above criteria. A carrier was used for every sample, LCS, and blank (except for gamma spectroscopy) and acceptable results were obtained.

Precision

- Laboratory Duplicates

  Analytical precision is expressed by the relative percent differences (RPD) between results for one of the samples in the batch and a duplicate determination of that sample. If both results are nondetects, no RPD calculation is required. If both the activities measured for the sample and the duplicate are both greater than five times the required detection limit (RDL) and the RPD is less than 35%, no qualification is required. If either activity is less than five times the RDL, the control limit is two times the RDL. If the RPD is outside the applicable control limit, associated results are qualified as estimated detects or estimated non-detects.

A duplicate was analyzed for each sample, and the requirements were met.

- Field Duplicate

  No field duplicates were submitted for analysis.

Detection Levels

Reported analytical detection levels are compared against the RDLs in DOE/RL-2001-01, Appendix B, to ensure that laboratory detection levels meet the required criteria.

All sample results were reported with MDAs equal to or less than the analyte-specific RDL.

Completeness

Data Packages 222S20030369 and 222S20030383 were submitted for validation and verified for completeness. Completeness is based on the percentage of data requested by the client that were reported and determined to be valid (i.e., not rejected). The completion percentage was 100%.

MAJOR DEFICIENCIES

None

MINOR DEFICIENCIES

None

REFERENCES

HNF-20434, Rev. 0, *Data Validation Procedure for Radiochemical Analyses,* Fluor Hanford, Inc., Richland, Washington (2004).

DOE/RL-2001-01, Rev. 0, Appendix B, *Plutonium/Organic-Rich Process Condensate/Process Waste Group Operable Unit Representative Sites Sampling and Analysis Plan*, U.S. Department of Energy, Richland, Washington (2004).

DOE/RL-2001-01, Rev. 0, Appendix E, *Sampling and Analysis Plan for Investigation of Dense, Nonaqueous-Phase Liquid Carbon Tetrachloride at the 216-Z-9 Trench*, U.S. Department of Energy, Richland, Washington (2004).

Appendix 1

Glossary of Data Reporting Qualifiers

Qualifiers which may be applied by data validators in compliance with the data validation procedure 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 minor 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 minor QC deficiency identified during the data validation, the associated concentration is an estimated, but the data are usable for decision-making purposes.

R - Indicates the compound or analyte was analyzed for, detected, and due to an identified major QC deficiency, the date 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 major QC deficiency.

Appendix 2

Summary of Data Qualification

DATA QUALIFICATION SUMMARY

SDG: 222S20030369 and 222S20030383	REVIEWER: JRJ	DATE: 6/15/06	PAGE 1OF 1
COMMENTS: No data was qualified.			
COMPOUND	QUALIFIER	SAMPLES AFFECTED	REASON

Appendix 3

Annotated Laboratory Reports

STRONTIUM-90 ANALYSIS, SOIL (PCI/G)

Project: FLUOR HANFORD							
Laboratory: 222-S							
Case:	**SDG: 222S20030369 and 222S20030383**						
Sample Number		**B17N46**			**B17TM6**		
Remarks							
Sample Date		**10/20/03**			**10/29/03**		
Analysis Date		**01/12/04**			**01/12/04**		
Radionuclides	**RTQL**	**Result**	**Q**	**MDA**	**Result**	**Q**	**MDA**
Strontium-90	1	7.86	U	14	13.4		15

RTQL = required target quantitation limit
Q = validation qualifier; laboratory-applied non-detect qualifiers "U" have been included for clarity.
MDA = minimum detectable activity
GEA = gamma energy analysis
AEA = alpha energy analysis

29 TRENCH1
Data Summary Report

CORE NUMBER: 222520030369
SEGMENT #: B17N46

SEGMENT PORTION: Acid Digest

Sample#	R	A#	Analyte	Unit	Standard %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Count Err%
S03N000527		A	Silver -ICP-Acid Digest	ug/g	99.9	<5.48e-03	<1.11	<1.06	n/a	n/a	79.8	1.1	n/a
S03N000527		A	Arsenic -ICP-Acid Digest	ug/g	117	<0.0514	11.0	<9.94	n/a	n/a	92.0	10	n/a
S03N000527		A	Barium -ICP-Acid Digest	ug/g	96.3	<0.0210	93.2	38.6	65.9	82.7	71.8	4.2	n/a
S03N000527		A	Beryllium -ICP-Acid Digest	ug/g	102	<1.33e-03	<0.270	<0.258	n/a	n/a	80.5	0.27	n/a
S03N000527		A	Bismuth -ICP-Acid Digest	ug/g	93.0	<0.0516	<10.4	<9.97	n/a	n/a	78.3	10	n/a
S03N000527		A	Cadmium -ICP-Acid Digest	ug/g	94.4	<2.12e-03	3.50	1.60	2.55	74.3	74.8	0.43	n/a
S03N000527		A	Chromium -ICP-Acid Digest	ug/g	97.2	<5.19e-03	16.0	13.7	14.8	15.7	76.9	1.0	n/a
S03N000527		A	Copper -ICP-Acid Digest	ug/g	97.4	<0.0122	16.6	15.0	15.8	10.4	77.3	2.5	n/a
S03N000527		A	Lithium -ICP-Acid Digest	ug/g	99.1	<1.79e-03	8.26	8.63	8.44	4.37	79.5	0.36	n/a
S03N000527		A	Manganese -ICP-Acid Digest	ug/g	94.2	<1.07e-03	157	164	160	4.57	79.4	0.22	n/a
S03N000527		A	Nickel -ICP-Acid Digest	ug/g	95.6	<0.0110	9.11	7.92	8.51	13.9	75.3	2.2	n/a
S03N000527		A	Phosphorus -ICP-Acid Digest	ug/g	96.6	<0.0196	464	594	529	24.6	82.1	4.0	n/a
S03N000527		A	Lead -ICP-Acid Digest	ug/g	94.2	<0.0235	8.21	5.75	6.98	35.2	76.2	4.7	n/a
S03N000527		A	Antimony -ICP-Acid Digest	ug/g	94.8	<0.0212	<4.29	<4.10	n/a	n/a	67.5	4.3	n/a
S03N000527		A	Selenium -ICP-Acid Digest	ug/g	97.1	<0.0518	<10.5	<10.0	n/a	n/a	78.6	10	n/a
S03N000527		A	Strontium -ICP-Acid Digest	ug/g	98.0	<1.07e-03	11.7	12.7	12.2	7.75	78.1	0.22	n/a
S03N000527		A	Zinc -ICP-Acid Digest	ug/g	93.1	<2.14e-03	48.8	35.2	42.0	32.3	73.3	0.43	n/a

SEGMENT PORTION: Environmental Acid

Sample#	R	A#	Analyte	Unit	Standard %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Count Err%
S03N000528		E	Uranium by Phosphorescence	ug/g	104	<4.14e-04	0.897	0.945	0.921	5.21	n/a	0.041	n/a
S03N000528		E	Strontium-89/90 High Level	uCi/g	98.8	<1.05e-05	<7.86e-06	<9.44e-06	n/a	n/a	n/a	1.4e-05	8.4e+02
S03N000528		E	Pu-239/240 by TRU-SPEC Resin	uCi/g	93.3	<4.74e-03	0.0446	0.0392	0.0419	12.9	n/a	6.4e-03	3.1
S03N000528		E	Pu-238 by TRU-SPEC Resin IonEx	uCi/g	n/a	<8.96e-03	<0.0106	<0.0103	n/a	n/a	n/a	0.011	13
S03N000528		E	Np237 by TIA Extraction	uCi/g	82.5	<2.93e-04	<5.04e-04	<3.96e-04	n/a	n/a	n/a	6.2e-04	1.8e+02
S03N000528		E	Thorium-232 by ICP/MS	ug/g	105	0.0241	2.94	3.41	3.18	14.6	99.0	3.7e-04	n/a
S03N000528		E	Uranium-233 by ICP/MS Acid Dig	ug/g	n/a	<1.80e-03	9.58e-05	1.10e-04	1.03e-04	13.8	n/a	2.8e-05	n/a
S03N000528		E	Uranium-234 by ICP/MS Acid Dig	ug/g	n/a	<6.00e-04	1.89e-04	1.56e-04	1.73e-04	19.5	n/a	9.3e-06	n/a
S03N000528		E	Uranium-235 by ICP/MS Acid Dig	ug/g	104	<2.20e-03	0.0104	8.91e-03	9.67e-03	15.6	112	3.4e-05	n/a
S03N000528		E	Uranium-238 by ICP/MS Acid Dig	ug/g	106	<0.110	0.742	0.647	0.695	13.6	101	1.7e-03	n/a
S03N000528		E	Cobalt-60 by GEA	uCi/g	104	<2.64e-04	<2.68e-04	<2.69e-04	n/a	n/a	n/a	2.6e-04	n/a
S03N000528		E	Antimony-125 by GEA	uCi/g	n/a	<5.02e-04	<5.91e-04	<6.19e-04	n/a	n/a	n/a	5.9e-04	n/a
S03N000528		E	Cesium-134 by GEA	uCi/g	n/a	<1.90e-04	<2.23e-04	<1.97e-04	n/a	n/a	n/a	2.2e-04	n/a
S03N000528		E	Cesium-137 by GEA	uCi/g	111	<3.84e-04	<3.94e-04	<3.03e-04	n/a	n/a	n/a	3.9e-04	n/a
S03N000528		E	Europium-152 by GEA	uCi/g	n/a	<3.24e-04	<3.27e-04	<3.20e-04	n/a	n/a	n/a	3.3e-04	n/a
S03N000528		E	Europium-154 by GEA	uCi/g	n/a	<7.08e-04	<7.84e-04	<7.67e-04	n/a	n/a	n/a	7.8e-04	n/a
S03N000528		E	Europium-155 by GEA	uCi/g	n/a	<2.84e-04	<2.80e-04	<2.68e-04	n/a	n/a	n/a	2.8e-04	n/a
S03N000528		E	Am-241 by TRU-SPEC Resin IonEx	uCi/g	105	<7.29e-03	0.114	0.0979	0.106	15.2	n/a	0.013	2.4
S03N000528		E	Alpha of Digested Solid	uCi/g	95.4	<5.03e-04	0.148	0.125	0.136	16.8	95.0	1.2e-03	5.0
S03N000528		E	Beta of Solid Sample	uCi/g	105	<2.33e-03	0.0272	0.0191	0.0232	35.0	104	3.5e-03	19

OK JRB 8/4/06

29 TRENCH3
Data Summary Report

CORE NUMBER: 22282003038 3
SEGMENT #: B17M6

SEGMENT PORTION: Acid Digest

Sample#	R	A#	Analyte	Unit	Standard %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Count Err%
S03M000559		A	Silver -ICP-Acid Digest	ug/g	101	<5.48e-03	1.15	<1.10	n/a	n/a	98.5	1.1	n/a
S03M000559		A	Arsenic -ICP-Acid Digest	ug/g	115	<0.0514	<10.3	<10.3	n/a	n/a	113	10	n/a
S03M000559		A	Barium -ICP-Acid Digest	ug/g	95.6	<0.0210	53.4	53.2	53.3	0.377	94.5	4.2	n/a
S03M000559		A	Beryllium -ICP-Acid Digest	ug/g	103	<1.33e-03	0.293	<0.268	n/a	n/a	101	0.27	n/a
S03M000559		A	Bismuth -ICP-Acid Digest	ug/g	95.1	<0.0516	<10.4	10.8	n/a	n/a	93.2	10	n/a
S03M000559		A	Cadmium -ICP-Acid Digest	ug/g	93.8	<2.12e-03	1.79	1.45	1.62	20.6	90.8	0.42	n/a
S03M000559		A	Chromium -ICP-Acid Digest	ug/g	96.9	<3.19e-03	22.5	22.1	22.3	1.68	94.1	1.0	n/a
S03M000559		A	Copper -ICP-Acid Digest	ug/g	97.3	<0.0122	9.95	10.9	10.4	9.32	96.6	2.5	n/a
S03M000559		A	Lithium -ICP-Acid Digest	ug/g	98.8	<1.29e-03	10.6	9.80	10.2	7.94	97.2	0.36	n/a
S03M000559		A	Manganese -ICP-Acid Digest	ug/g	94.5	<1.07e-03	190	181	185	5.27	108	0.22	n/a
S03M000559		A	Nickel -ICP-Acid Digest	ug/g	95.2	<0.0110	20.2	18.2	19.2	10.5	92.8	2.2	n/a
S03M000559		A	Phosphorus -ICP-Acid Digest	ug/g	95.3	<0.0196	595	699	647	16.1	91.3	4.0	n/a
S03M000559		A	Lead -ICP-Acid Digest	ug/g	94.4	0.0257	6.58	<4.71	n/a	n/a	90.8	4.7	n/a
S03M000559		A	Antimony -ICP-Acid Digest	ug/g	94.7	0.0262	4.63	<4.27	n/a	n/a	82.3	4.3	n/a
S03M000559		A	Selenium -ICP-Acid Digest	ug/g	97.7	<0.0518	<10.4	<10.4	n/a	n/a	95.1	10	n/a
S03M000559		A	Strontium -ICP-Acid Digest	ug/g	97.5	<1.07e-03	13.7	23.3	18.5	52.0	96.4	0.22	n/a
S03M000559		A	Zinc -ICP-Acid Digest	ug/g	93.5	3.87e-03	37.8	33.2	35.5	12.9	91.2	0.43	n/a

SEGMENT PORTION: Environmental Acid

Sample#	R	A#	Analyte	Unit	Standard %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Count Err%
S03M000540		E	Uranium by Phosphorescence	ug/g	104	<4.14e-04	2.04	1.65	1.84	21.1	99.9	0.041	n/a
S03M000540		E	Strontium-89/90 High Level	uCi/g	100	<7.19e-06	1.34e-05	<1.25e-05	n/a	n/a	n/a	1.5e-05	88
S03M000540		E	Pu-239/240 by TRU-SPEC Resin	uCi/g	94.1	<7.26e-05	0.115	0.0897	0.102	24.7	n/a	0.014	2.7
S03M000540		E	Pu-238 by TRU-SPEC Resin IonEx	uCi/g	n/a	<0.0121	<0.0192	<0.0129	n/a	n/a	n/a	0.019	1.0e+02
S03M000540		E	Np237 by TTA Extraction	uCi/g	75.5	<4.86e-04	<3.37e-04	<3.28e-04	n/a	n/a	n/a	7.1e-04	1.0e+02
S03M000540		E	Thorium-232 by ICP/MS	ug/g	105	0.0497	3.00	2.06	2.53	37.2	99.7	4.3e-04	n/a
S03M000540		E	Uranium-233 by ICP/MS Acid Dig	ug/g	n/a	<1.80e-03	9.13e-05	6.58e-05	7.86e-05	32.4	n/a	3.2e-05	n/a
S03M000540		E	Uranium-234 by ICP/MS Acid Dig	ug/g	n/a	<6.00e-04	3.34e-04	2.83e-04	3.08e-04	16.5	n/a	1.1e-05	n/a
S03M000540		E	Uranium-235 by ICP/MS Acid Dig	ug/g	104	<2.20e-03	0.0220	0.0190	0.0205	14.8	110	3.9e-05	n/a
S03M000540		E	Uranium-238 by ICP/MS Acid Dig	ug/g	106	<0.110	1.85	1.55	1.70	17.3	102	2.0e-03	n/a
S03M000540		E	Cobalt-60 by GEA	uCi/g	101	<2.99e-04	<3.03e-04	<3.45e-04	n/a	n/a	n/a	3.8e-04	n/a
S03M000540		E	Antimony-125 by GEA	uCi/g	n/a	<9.08e-04	<7.92e-04	<8.75e-04	n/a	n/a	n/a	7.9e-04	n/a
S03M000540		E	Cesium-134 by GEA	uCi/g	n/a	<2.92e-04	<2.98e-04	<2.89e-04	n/a	n/a	n/a	3.0e-04	n/a
S03M000540		E	Cesium-137 by GEA	uCi/g	103	<7.53e-04	<7.66e-04	<7.44e-04	n/a	n/a	n/a	7.7e-04	n/a
S03M000540		E	Europium-152 by GEA	uCi/g	n/a	<6.28e-04	<7.01e-04	<6.63e-04	n/a	n/a	n/a	7.0e-04	n/a
S03M000540		E	Europium-154 by GEA	uCi/g	n/a	<9.81e-04	<1.02e-03	<1.15e-03	n/a	n/a	n/a	1.0e-03	n/a
S03M000540		E	Europium-155 by GEA	uCi/g	n/a	<7.77e-04	<7.88e-04	<7.91e-04	n/a	n/a	n/a	7.9e-04	n/a
S03M000540		E	Am-241 by TRU-SPEC Resin IonEx	uCi/g	101	<9.60e-03	0.0532	0.0451	0.0492	16.5	n/a	0.013	3.4
S03M000540		E	Alpha of Digested Solid	uCi/g	87.0	<6.74e-04	0.145	0.127	0.136	13.2	85.5	1.6e-03	5.6
S03M000540		E	Beta of Solid Sample	uCi/g	104	<2.38e-03	0.0108	6.87e-03	8.84e-03	44.5	103	4.9e-03	33

8/7/06
OK 8/7/06

DEVIATION
DOSTEMS

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Appendix 4

Laboratory Narrative and Chain-of-Custody Documentation

FINAL REPORT FOR THE SOIL SAMPLES FROM 216-Z-9 TRENCH – SAMPLE DELIVERY GROUPS 222S20030369 AND 222S20030383

1.0 INTRODUCTION

Two soil samples from the 216-Z-9 characterization borehole were received at the 222-S Laboratory; sample B17N46 on October 27, 2003 (sample delivery group [SDG] 222S20030369), and sample B17TM6 on October 31, 2003 (SDG 222S20030383). The samples were analyzed in accordance with the *216-Z-9 Trench Characterization Borehole Sampling and Analysis Concurrence for Analytical Requirements* (analytical instructions), the *222-S Laboratory Quality Assurance Plan* (reference 2), *Semi-Volatile Organic Compound Analysis* (reference 3), and *Volatile Organic Compound Analysis* (reference 4), referenced in the cover letter.

A Data Summary Report is included as Attachment 2. The correlation between the customer sample identification number and laboratory identification numbers is presented in the sample breakdown diagrams included as Attachment 3. Copies of the chain of custody, Request for Analysis, and Generator Knowledge Information forms are included as Attachment 4.

For sample B17N46, all detected compounds for the volatile organic analysis (VOA) were within the calibration range for the analysis of the low level sample (S03M000522), so the sample for high level VOA (S03M000523) did not require analysis.

For sample B17TM6, a very high concentration of carbon tetrachloride was detected during the analysis of the low level sample (S03M000533), and the results obtained for that analysis were unusable. The reported results were obtained from two different dilutions of the high level sample (S03M000534).

2.0 SAMPLE APPEARANCE AND HANDLING

Both samples (B17N46 and B17TM6) were described as moist soil. The samples were not homogenous, consisting of a mixture of course sand, "pea" gravel and pebbles.

The samples were stirred with a spatula prior to removing aliquots for analysis. However, with this type of sample, this method was not sufficient to achieve homogenization. The Laboratory does not have appropriate equipment to grind this type of sample to achieve better homogenization. This non-homogeneity is noted by the elevated results for the relative percent difference (RPD) between sample and duplicate results for some analytes.

For sample B17TM6, the aliquots for both the low level and high level VOA were each provided in a single amber glass bottle with no preservative. Because the bottles had to be opened in a

hood to obtain aliquots for analysis, the sample integrity was compromised and the results may be biased low.

For sample B17N46, pre-weighed vials containing preservative, water and a stir bar were provided to the project for collection of the aliquots for low level VOA. At the point of sample analysis, the chemical technologist noted that custody tape and additional labels had been added to the vials, which made it difficult to determine the weight of the samples. An attempt to determine the weight of the samples was made by weighing the vials as received, and then again after they were emptied and dried. The weight of the preservative added to the vials was already known. The stir bar weight was estimated based on the average weight of 5 stir bars. The weight of the water was estimated to be 5 g based on 5 mL of water. This allowed an estimate of the extra tape and labels to be made, which then allows the sample weight to be estimated.

3.0 HOLDING TIMES

The analytical instructions (reference 1) requested that the laboratory make every effort to meet the SW-846 holding times for VOA. The holding times were not met for either sample. For sample B17N46, the holding time was not met because of a combination of the 7-day delay between sampling and delivery of the samples to the laboratory and instrument operation problems. For sample B17TM6, the holding time was not met because of instrument operation problems.

4.0 ANALYTICAL RESULTS

The Data Summary Report, included as Attachment 2, presents the analytical results for the requested analytes. In this table, solid samples that were prepared by water digest are indicated with a "W" in the A# column. An "A" indicates an acid digest of a solid, and an "E" indicates that the stronger acid soil leach procedure was used to prepare the sample prior to analysis. Typically, if there is no letter identifier in this column, this indicates that the analysis was performed on a direct subsample with no separate preparation, or with sample preparation that was included as part of the analytical procedure steps.

Note that for the ion chromatography (IC) and inductively coupled plasma (ICP) spectroscopy analyses, the results reported for the blank are actually µg/mL, rather than µg/g as indicated in the Data Summary Report.

5.0 QUALITY CONTROL RESULTS (QC)

5.1 LABORATORY CONTROL STANDARDS

Most laboratory control standard (LCS) recoveries were acceptable in accordance with the 222-S Laboratory Quality Assurance Plan (QAPP-016) (Clark 2003), referenced in the cover letter. For the semi-volatile organic analysis (SVOA) of sample B17N46 (S03M000525), one of the 11 compounds (n-Nitroso-di-n-propylamine) in the LCS had a recovery that was slightly below the requested range of 70% - 130% recovery. However, the reported recovery of 65% is typical of what is normally achieved for this compound so no reanalysis was requested based on the low recovery.

For the SVOA of sample B17TM6 (S03M000537), 5 of the 11 compounds in the LCS (the acid compounds) had recoveries above the requested range of 70% - 130% recovery. Following the analysis, the chemist noted that the standard might have been concentrated because of evaporation. Subsequent analysis of a new standard gave acceptable recoveries. The high recoveries could indicate a high bias in the reported results. However, because these compounds were not identified in the sample, no reanalysis was requested based on these high recoveries.

5.2 METHOD AND PREPARATION BLANKS

For most analyses, no analytes were detected in the method or preparation blank. However, for the IC analysis of sample B17N46 (S03M000553), chloride was detected in the water digest preparation blank. The sample was re-prepared two additional times and these results were determined to be the best, based on the results reported for nitrite. The level of nitrite detected in the other two blanks was greater than that detected in the sample. The concentration of chloride in the blank is about 22% of that reported for the sample. Comparison of results from the other two digests indicates that the reported sample results are biased high by about 22% - 29% because of this contamination.

Nitrite was reported in the blank prepared and analyzed with sample B17TM6 (S03M000561). The blank result was greater than that reported for the sample. This sample was also re-prepared two additional times. At the time of this analysis, the source of the contamination could not be determined. Because no nitrite was detected in the sample, no additional preparations were performed. The contamination issue is still under investigation.

For the ICP analysis of sample B17TM6 (S03M000559), lead (Pb), antimony (Sb), and zinc (Zn) contamination were detected in the acid digestion preparation blank. The concentration of Zn in the blank is less than 5% of that detected in the sample and was considered insignificant in accordance with QAPP-016 (Clark 2003). However, the concentration of Pb in the blank is 78% of that measured in the sample and the level of Sb in the blank is 113% of that detected in the sample. These results are reported from the third preparation of the sample. No further digestions were prepared because the duplicate results for Pb and Sb were both less than the reported detection limit, and previous results indicated that neither Pb nor Sb are present in the sample. Therefore, the results reported for Pb and Sb for the sample portion should be considered biased high due to contamination.

5.3 DUPLICATE ANALYSES

The requested precision for analysis was a relative percent difference (RPD) ± 20% for radionuclides and ± 30% for all other methods. Most analyte results met these criteria, except as noted below.

A duplicate sample was analyzed for both samples for most methods. However, after most analyses were completed, the project point of contact requested that the laboratory batch the two samples together for remaining analyses. Therefore, for the IC analysis, a duplicate was analyzed with sample B17N46 only.

For sample B17N46, an RPD greater than 20% was reported for total beta analysis for sample S03M000528. RPDs greater than 30% were reported for barium (Ba), cadmium (Cd), Pb, and Zn for sample S03M000527, and acetone for sample S03M000522. The RPD criterion was not

applicable for Cd and Pb, in accordance with QAPP-016 (reference 2), because the sample results were less than 10 times the method detection limit. The other high RPDs were attributed to sample inhomogeneity and no repreparation and reanalysis was requested because the laboratory does not have equipment available to provide adequate homogenization of this type of sample matrix.

For sample B17TM6, RPDs greater than 20% were reported for plutonium-239/240 ($^{239/240}Pu$), thorium-232 (^{232}Th), uranium-233 (^{233}U), and total beta analysis for sample S03M000540. However, the counting error for the beta analysis is greater than 15% and the ^{233}U result is less than 10 times the method detection limit, so the RPD criterion is not applicable for those two analytes. An RPD greater than 30% was reported for strontium (Sr) for sample S03M000559, but the criterion was not applicable because the sample results were less than 10 times the method detection limit. The other high RPDs were attributed to sample inhomogeneity and no repreparation and reanalysis was requested because the laboratory does not have equipment available to provide adequate homogenization of this type of sample matrix.

Duplicate analyses for the SVOA and polychlorinated biphenyl (PCB) analysis was performed by comparing a matrix spike (MS) with a matrix spike duplicate (MSD). The results of this comparison are discussed in the next section. For sample B17N46 VOA, both a duplicate and MSD were analyzed because some compounds were expected to be present in the sample.

For sample B17TM6 VOA, only an MS and MSD were analyzed. However, since chloroform, tetrachloroethene and carbon tetrachloride were detected in the sample, but were not compounds present in the spike solution, the results from the sample MS and MSD analyses can be compared as triplicates to provide precision information for the analysis. The results are presented in Table 1 and a percent relative standard deviation (%RSD) was calculated to give an indication of the precision. The %RSDs were less than 30%, which indicates that the analysis met the precision requirement.

Table 1. Triplicate Analysis Results for Sample B17TM6 (S03M000534).

Compound	Result (µg/Kg)	MS (µg/Kg)	MSD (µg/Kg)	%RSD
Chloroform	4.88e+3	5.46e+3	4.73e+3	7.7
Tetrachloroethane	1.70e+4	1.76e+4	1.66e+4	2.9
Carbon tetrachloride	3.76e+5	2.87e+5	3.13e+5	14.0

5.4 MATRIX SPIKE AND MATRIX SPIKE DUPLICATE

An MS sample was analyzed for both samples for most methods. However, after most analyses were completed, the project point of contact requested that the laboratory batch the two samples together for remaining analyses. Therefore, for the total uranium and IC analyses, an MS was analyzed with sample B17N46 only.

MS samples were analyzed with all methods except for pH, $^{239/240}Pu$, ^{238}Pu, ^{90}Sr, neptunium-237 (^{237}Np), americium-241 (^{241}Am) and the isotopes reported by gamma energy analysis (GEA). For VOA and SVOA, the analytical instructions (reference 1) requested that the laboratory report

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spike recoveries only for the representative set of compounds indicated in the letters from H. L. Anastos (references 3 and 4). However, for VOA, some ketones were part of the standard mix used. Although the ketones were not required to be reported, for sample B17N46, acetone and 2-butanone recoveries and RPDs were discussed because those compounds were detected in the sample. For sample B17TM6, the ketones weren't reported because they were not requested by customer and no ketones were detected in the samples.

For PCB analysis, only aroclor-1254 is included in the matrix spike because it is the aroclor most commonly detected in samples on the Hanford site.

Most MS and/or MSD recoveries met the requirements in the analytical instructions (reference 1), except as noted below.

For sample B17N46 (S03M000525), most of the SVOA spike compounds (except pyrene) failed to meet the requirements. The low recoveries were attributed to a possible matrix effect because the recoveries for those compounds in the LCS were all acceptable (except for n-nitroso-di-n-propylamine, as noted previously). No reanalysis was requested because the sample matrix would still affect reanalysis results.

For sample B17TM6 (S03M000537) SVOA, most of the compounds failed to meet the requirements for MS and MSD recoveries because of the 50-fold dilution that was required to reduce the concentration of tri-n-butylphosphate so that it was within the calibration range. No reanalysis was requested because the same dilution would be required on the reanalysis and it is impractical to add sufficient spike solution for this sample where a substantial dilution is required.

For sample B17N46 (S03M000522) VOA, acetone and n-butanone have high recoveries. Because the LCS recoveries of these compounds were within the requested control limits, the high MS recoveries were attributed to a possible matrix effect that causes increased purging efficiencies for ketones. Again, no reanalysis was requested because of these MS recovery failures because a reanalysis was not expected to improve the results. The results reported for these two compounds should be considered biased high.

The RPDs between the MS and MSD for the PCB analyses met the requirements in the analytical instructions (reference 1). Some of the RPDs for the MS/MSDs analyzed with the VOA and SVOA failed to meet the requirements. The failures were attributed to the previously discussed matrix effects, so no reanalysis was requested.

The Data Summary Report included as Attachment 2 does not report the recoveries for the MSD analysis or the RPD for the MS/MSD analysis. This information is provided in Table 2 and Table 3 for VOA, Table 4 and Table 5 for SVOA and Table 6 and Table 7 for PCB analysis.

Table 2. MS/MSD Recoveries and RPDs for VOA for B17N46.

Compound	MS (%)	MSD (%)	RPD (%)
Benzene	98	101	3
Chlorobenzene	104	100	4
1,1-Dichloroethene	100	103	3
Toluene	95	92	3

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Table 2. MS/MSD Recoveries and RPDs for VOA for B17N46.

Compound	MS (%)	MSD (%)	RPD (%)
Trichloroethene	115	119	3
Acetone	158 †	172 †	8
2-Butanone	140 †	190 †	30 †

† - spike recovery or RPD failed to meet customer requirements

Table 3. MS/MSD Recoveries and RPDs for VOA for B17TM6.

Compound	MS (%)	MSD (%)	RPD (%)
Benzene	110	115	4
Chlorobenzene	114	116	2
1,1-Dichloroethene	98	111	12
Toluene	110	113	3
Trichloroethene	102	103	1

Table 4. MS/MSD Recoveries and RPDs for SVOA for B17N46.

Compound	MS (%)	MSD (%)	RPD (%)
Phenol	67 †	65 †	3
2-Chlorophenol	61 †	61 †	0
1,4-Dichlorobenzene	8 †	13 †	48 †
N-Nitroso-di-n-propylamine	35 †	42 †	18
1,2,4-Trichlorobenzene	33 †	36 †	9
4-Chloro-3-methylphenol	55 †	62 †	12
Acenaphthene	64 †	66 †	3
4-Nitrophenol	53 †	65 †	20
2,4-Dinitrotoluene	54 †	63 †	15
Pentachlorophenol	51 †	63 †	21
Pyrene	88	92	4

† - spike recovery or RPD failed to meet customer requirements

Table 5. MS/MSD Recoveries and RPDs for SVOA for B17TM6.

Compound	MS (%)	MSD (%)	RPD (%)
Phenol	70	89	24
2-Chlorophenol	77	90	16
1,4-Dichlorobenzene	48 †	55 †	14
N-Nitroso-di-n-propylamine	23 †	47 †	68 †
1,2,4-Trichlorobenzene	47 †	67 †	35 †
4-Chloro-3-methylphenol	64 †	55 †	15 †
Acenaphthene	56 †	65 †	15 †
4-Nitrophenol	0 †	0 †	N/A

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Table 5. MS/MSD Recoveries and RPDs for SVOA for B17TM6.

Compound	MS (%)	MSD (%)	RPD (%)
2,4-Dinitrotoluene	0 †	0 †	N/A
Pentachlorophenol	0 †	0 †	N/A
Pyrene	50 †	59 †	16

† - spike recovery or RPD failed to meet customer requirements

N/A – calculation not applicable

Table 6. MS/MSD Recoveries and RPDs for PCB for B17N46.

Compound	MS (%)	MSD (%)	RPD (%)
Aroclor 1254	76	72	5

Table 7. MS/MSD Recoveries and RPDs for PCB for B17TM6.

Compound	MS (%)	MSD (%)	RPD (%)
Aroclor 1254	120	106	12

5.5 SURROGATE RECOVERIES

Surrogate standards are added to all field and QC samples for VOA, SVOA and PCB analyses. The surrogate is added to monitor total method recovery through preparation, sample matrix cleanup and analysis.

Surrogates standard recoveries for VOA for sample B17N46 (S03M000522) met the requirements in QAPP-016 (reference 2). For the VOA for sample B17TM6 (S03M000534), dibromofluoromethane (DBFM) failed high by 4% on the sample aliquot. This failure was attributed to interference from the adjacent carbon tetrachloride peak, which exceeded the calibration curve and saturated the detector. This surrogate passed on the MS and MSD and on subsequent reanalysis of the diluted extract. Therefore, the reported sample results were considered acceptable.

Surrogates standard recoveries for PCB for sample B17N46 (S03M000522) met the requirements in QAPP-016 (reference 2). For the PCB analysis of sample B17TM6 (S03M000538), the recovery for decachlorobiphenyl in the LCS was slightly high. However, the reported results for the analysis were considered acceptable because the LCS, MS and MSD recoveries for the analysis all met the requirements.

For the SVOA for sample B17N46 (S03M000525), the recovery for nitrobenzene-d5 (one of 6 surrogates) failed to meet the requirements in QAPP-016 (reference 2). Administrative limits are set at 50% - 100% recovery. Recoveries for nitrobenzene-d5 ranged from 0% – 10% in the method blank, LCS, sample, MS, and MSD. The other 5 surrogates all had acceptable recoveries. The cause for the low recovery is unknown, however, the other base-neutral compounds that were spiked appear to be unaffected. Of the compounds of interest, only

n-tributylphosphate is in the base/neutral class. It is not chemically similar to nitrobenzene-d5, and is not likely to be affected by the poor recovery.

For the SVOA for sample B17TM6 (S03M000537), low surrogate recoveries were obtained because of the required 50-fold dilution. As discussed with the MS and MSD recovery failures, no reanalysis was requested based on these low recoveries. The sample results are considered usable.

5.6 OPPORTUNISTIC ANALYTES

The analytical instructions (reference 1) requested that the laboratory report opportunistic analyte results from the SVOA. These results are considered opportunistic because they are compounds that are calibrated for in the method, but are not requested.

For sample B17N46 (S03M000525), two opportunistic compounds were detected in the sample. Dimethylphthalate (chemical abstract system (CAS) number 131-11-3) was detected with a concentration of 1.38e+3 µg/Kg. Diethylphthalate (CAS number 84-66-2) was detected with a concentration of 4.31e+3 µg/Kg. Both of these results should be considered estimates because they were not greater than 10 times the detection limit of 960 µg/Kg.

For sample B17TM6 (S03M000537), no opportunistic compounds were detected.

5.7 TENTATIVELY IDENTIFIED COMPOUNDS

The analytical instructions (reference 1) list five compounds for VOA that the laboratory does not routinely report, as indicated in the letter from H. L. Anastos (reference 4). The laboratory was requested to perform a tentatively identified compound (TIC) search for these compounds. These compounds were not detected in either of the two samples. However, several other TICs were identified, as discussed below. TICs are identified by the instrument library search based only on masses in the spectra and are not based on retention times or verified with independent check standards. These compounds could be misidentified because of matrix effects. The concentrations are estimated based only on the nearest internal standard and a presumed response factor of 1.

For sample B17N46 (S03M000525) SVOA, an unknown phthalate was reported as a TIC. However, this unknown phthalate was also detected in the LCS and the preparation blank and, therefore, was considered to be contamination from an unknown source of plastic and not related to the sample matrix. In addition, 2,2'-methylenebis[6-tert-butyl-4-ethylphenol] (CAS# 88-24-4) was detected with estimated concentrations of 3.0e+3 µg/Kg in the MS and 5.5e+3 µg/Kg in the MSD.

For sample B17TM6 (S03M000534) VOA, two compounds were detected as TICs in the sample portion as well as the MS and MSD. Bromobenzene (CAS# 108-86-1) was detected with an estimated concentration of 4.0e+3 µg/Kg in the sample, 4.2e+3 µg/Kg in the MS and 4.1e+3 µg/Kg in the MSD. Estimated concentrations of hexachloroethane (CAS# 67-72-1) were 8.5e+4 µg/Kg in the sample, 9.0e+4 µg/Kg in the MS, and 8.7e+4 µg/Kg in the MSD. In addition, nonanal (CAS# 124-19-6) was detected in the MS with an estimated concentration of 3.9e+3 µg/Kg and in the MSD with an estimated concentration of 2.2e+3 µg/Kg. Tridecane (CAS# 629-50-5) was only detected in the MS with an estimated concentration of 1.0e+3 µg/Kg.

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No other compounds were reported as TICs from either the VOA or SVOA for the two samples.

5.8 TARGET QUANTITATION LIMITS

The laboratory was unable to meet all of the requested target quantitation limits due to necessary dilutions of the samples. These dilutions ensured analyte concentrations did not exceed calibration ranges and avoided contamination and carry-over problems. The laboratory used the largest feasible sample sizes.

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6.0 ANALYTICAL PROCEDURES

Table 8 presents the 222-S Laboratory analytical procedures used to generate the reported results.

Table 8. Analytical Procedures.

Analysis	Preparation Procedure	Analysis Procedure
Inorganic Analyses		
pH	Direct	LA-212-105 Rev. D-0
Hg	Direct	LA-325-106 Rev. C-0
CN	Direct	LA-695-102 Rev. I-2
NH_4	Water Digest	LA-533-101 Rev. K-0
IC	Water Digest	LA-533-107 Rev. C-2
Sulfide	Direct	LA-361-101 Rev. A-0
Total U	Acid Digest	LA-925-009 Rev. D-5
ICP	Acid Digest	LA-505-161 Rev. D-1
ICP-MS	Acid Digest	LA-506-101 Rev. C-0
Radionuclide Analyses		
AT/TB	Environmental Digest	LA-508-101 Rev. I-1
GEA	Environmental Digest	LA-548-121 Rev. F-5
^{90}Sr	Environmental Digest	LA-220-101 Rev. F-0
^{237}Np	Environmental Digest	LA-933-141 Rev. H-7
^{238}Pu, $^{239/240}Pu$	Environmental Digest	LA-953-104 Rev. D-0
^{241}Am	Environmental Digest	LA-953-104 Rev. D-0
Organic Analyses		
VOA	Direct	LA-523-118 Rev. A-2
SVOA	Organic Extraction	LA-523-135 Rev. A-1
PCB	Organic Extraction	LA-523-140 Rev. B-0

Abbreviations:
Hg – mercury
CN – cyanide
NH_4 – ammonium
IC – ion chromatography
Total U – total uranium
ICP – inductively coupled plasma
ICP/MS – ICP/mass spectrometry
AT/TB – total alpha/total beta
GEA – gamma energy analysis
^{90}Sr – strontium-90
^{237}Np – neptunium-237
^{238}Pu – plutonium-238
$^{239/240}Pu$ – plutonium-239/240
^{241}Am – americium-241
VOA – volatile organic analysis
SVOA – semi-volatile organic analysis
PCB – polychlorinated biphenyls

Notes:
Acid digest procedure: LA-505-163 Rev. D-1
Water digest procedure: LA-504-101 Rev. I-0
Environmental acid digest procedure: LA-544-101 Rev. C-5
Organic extraction procedure: LA-523-138 Rev. C-2

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FH-Central Plateau Project	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST		F03-018-53	Page 1 of 1
Collector Pope/Pfister/Hughes	Company Contact Steve Trent	Telephone No. 373-5869	Project Coordinator TRENT, SJ	Price Code 8N Air Quality ☐
Project Designation 216-Z-9 Trench Characterization Borehole - Soil	Sampling Location 216-Z-9WC3426 - Interval 23'-25'	43.5' - 44'	SAF No. F03-018	Data Turnaround 60 Days
Ice Chest No. VIKING 4H2V	Field Logbook No. HNF-N-3361	COA 119152E820	Method of Shipment Government Vehicle	
Shipped To 222-S Lab Operations	Offsite Property No. N/A	PMG 31OCT03	Bill of Lading/Air Bill No. N/A	

POSSIBLE SAMPLE HAZARDS/REMARKS

RADIOACTIVE TIE TO: B17N46

Hazard: Corrosive (Acidic)

Special Handling and/or Storage

SAMPLERS TO PUT 5 g soil into each vial with the encore sampler. Bottles are pre-labeled. Write the Hels number from the chain on each vial.

Preservation	Cool 4C	NONE	COOL 4C								
Type of Container	aGs*	P	aGs*								
No. of Container(s)	5	1	1								
Volume	40mL	500 mL	40 mL								
SAMPLE ANALYSIS	See item (1) in special instructions	SEE ITEM (2) IN SPECIAL INSTRUCTIONS	SEE ITEM (1)								
Sample No.	Matrix *	Sample Date	Sample Time								
B17N46	SOIL	10.20.03	1029	X	X	X					

CHAIN OF POSSESSION

Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time
[illegible]	10/20/03 1430	AAA / [illegible]	10/20/03 1430
Change trailer	10/22/03 1300	Site Fridge	10/22/03 1300
Site Fridge	10/27/03 1300	Greg Thomas / Greg Thomas	10/27/03 1300
Greg Thomas / Greg Thomas	10/27/03 1330	[illegible]	10/27/03 1335

Sign/Print Names

SPECIAL INSTRUCTIONS

** 222-S Laboratory will provide 40 mL VOA vials that have been pre-preserved with sodium bisulfate.

(1) VOA - 8260A - Complete; VOA - 8260A (Add-On) (Acetonitrile, Hexane, n-Butylbenzene)

Contact: Mark Duchsherer 373-7716

Matrix *: S=Soil; SE=Sediment; SD=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
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

BHI-EE-011 (03/01/2002)

FH-Central Plateau Project	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST		F03-018-54	Page 1 of 1
Collector Pope/Pfister/Hughes	Company Contact Steve Trent	Telephone No. 373-3869	Project Coordinator TRENT, SJ	Price Code 8N Air Quality ☐	Data Turnaround 60 Days
Project Designation 216-Z-9 Trench Characterization Borehole - Soil	Sampling Location 216-Z-9/C3426 - Interval ~~25-25~~ 43.5' - 46'		SAF No. F03-018	
Ice Chest No. VIKING 4H2V	Field Logbook No. HNF-N-336	COA 119152E310	Method of Shipment Government Vehicle	
Shipped To 222-S Lab Operations	Offsite Property No. N/A		Bill of Lading/Air Bill No. N/A	

POSSIBLE SAMPLE HAZARDS/REMARKS

RADIOACTIVE TIE TO: B17NM8

Special Handling and/or Storage 2X bulk

SAMPLERS: Collect 25 g with the encore sampler. If the TAP <0.5 mrem/hr this sample can be taken to WSCF. Sample analysis must occur in 48 hours or preserve with methanol.

Preservation	Cool 4C										
Type of Container	G										
No. of Container(s)	1										
Volume	25g										
SAMPLE ANALYSIS	See item (1) in special instructions.										

Sample No.	Matrix *	Sample Date	Sample Time									
~~B17N61~~ B17N46 PMG 10/27/03	SOIL	10-20-3	1029	X								

CHAIN OF POSSESSION		Sign/Print Names	
Relinquished By/Removed From JS Pfister/Hughes	Date/Time 10/20/03 1430	Received By/Stored In Cooler PMM/Chase Trailer	Date/Time 10/20/03 1430
Relinquished By/Removed From PMM/Chase trailer	Date/Time 10/20/03 1300	Received By/Stored In Site Bridge	Date/Time 10/20/03 1300
Relinquished By/Removed From Site Bridge	Date/Time 1300 10/27/03	Received By/Stored In Floor Greg Thomas/Greg Thomas	Date/Time 1300
Relinquished By/Removed From Greg Thomas/Greg Thomas	Date/Time 1330 10/27/03	Received By/Stored In Jackie Dicy #4	Date/Time 1335 10/27/03
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time

SPECIAL INSTRUCTIONS

(1) VOA - 8260A - Complete; VOA - 8260A (Add-On) (Acetonitrile, Hexane, n-Butylbenzene)

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

LABORATORY SECTION	Received By	Title	Date/Time
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

BHI-EE-011 (03/01/2002)

020426

REQUEST FOR SAMPLE ANALYSIS (RSA)

Group ID No. (For lab use only)

1. Sample Origin	2. Date Sampled	4. Requestor's Name	6. CACN/COA	7. Cost Center
216-Z-9 Borehole		S J. TRENT		

Customer/Project Code	3. Submitted By	5. Requestor's Phone/MSIN/FAX
		528-1172 /A0-21/ 375-5869

8. Customer ID No.	9. Laboratory Sample No.	10. Volume of Sample	11. Matrix of Sample	12. Requested Analyses	13. Expected Rang
B17N46		~150mL	Soil	See COC	~100uCi Pu

14. Sample Disposition	Sample(s) Dose Rate at Contact
☒ Return to Customer ☐ Samples found to contain PCBs will be returned to the customer ☐ Dispose of per facility procedures with applied charges for analyses and disposal	HPT Signature _____

15. QC Required ☒ Per 222-S Laboratory Quality Assurance Plan (HNF-SD-CP-QAPP-016)
☒ Other (list reference document or attach) See Analytical Instructions 216-Z-9 characterization

16. Special Instructions (Special Storage Requirements, Reporting format, holding times, etc.)	17. Requested Turnaround Time
Bottles: 5 x 40 mL (preserved; 5mL soil each) 1x25mL 1 x 40 mL encore 1 x 500 mL (contains ~60mL soil)	☐ 2 Weeks ☐ 4 Weeks ☒ Other 60 days

18. Sample Received By:	19. Chain of Custody
_____ Date _____ Time _____	☐ No ☐ Yes 000022 Number: _____

A-6002-365 (03/02

10/27/03 11:49 FAX 002

FLUOR Hanford Inc.	CENTRAL PLATEAU CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST	F03-018-069	Page 1 of 1
Collector: Pope/Pfister/Hughes	Company Contact: Steve Trent — Telephone No.: 373-5869	Project Coordinator: TRENT, SJ	Price Code: 8N — Data Turnaround: 45 Days
Project Designation: 216-Z-9 Trench Characterization Borehole - Soil	Sampling Location: 216-Z-9/C3426 - Interval	SAF No.: F03-018	Air Quality ☐
Ice Chest No.: YIHNG-4HZV	Field Logbook No.: HNF-N-3361 — COA: 119152ES10	Method of Shipment: Government Vehicle	
Shipped To: MAB 10/31/03 ~~Waste Sampling & Characterization~~ 222-S	Offsite Property No.: -N/A- RSR 106973	Bill of Lading/Air Bill No.: N/A	

POSSIBLE SAMPLE HAZARDS/REMARKS
RADIOACTIVE TIE TO: B17JN4

Special Handling and/or Storage
SAMPLERS: Fill VOA vials with Zero head space.

Preservation	Cool 4C	Cool 4C	Cool 4C	~~Cool 4C~~ MAB 10-31-03	None	~~None~~					
Type of Container	aGs*	aG	aG	~~GP~~ aG	aG	P					
No. of Container(s)	3	1 MAB 10-31-03	1 MAB 10-31-03	1 MAB 10-31-03	1 MAB 10-31-03	1					
Volume	40mL	~~120mL~~ 60mL	~~120mL~~ 60mL	~~250mL~~ 120mL	220mL 60mL	500mL					
SAMPLE ANALYSIS	See item (1) in Special Instructions.	See item (2) in Special Instructions.	PCBs - 8082	See item (3) in Special Instructions MAB 10/31/03	See item (4) in Special Instructions	~~See item (5) in Special Instructions~~ MAB 10/31/03					

Sample No.	Matrix *	Sample Date	Sample Time										
B17TM6	SOIL	10/29/03	0856	X	X	X	X	X	X				
							MAB 10/31/03		MAB 10/31/03				

CHAIN OF POSSESSION	Sign/Print Names		
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time
JS Pope/JS Pfister	10/29/03 1400	Sample Fridge	10/29/03 1400
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time
Sample Fridge	10/31/03 0940	M.H. Buchner M.H. Buchner	10/31/03 0940
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time
M.H. Buchner M.H. Buchner	10/31/03 1000	Jessica Dang	10/31/03 10:00
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time

SPECIAL INSTRUCTIONS
The lab is to achieve a detection limit of 5 pCi/g & 10 pCi/g for gross alpha and beta, respectively.

(1) VOA - 8260A (TCL); VOA - 8260A (Add-On) (1-Butanol, Acetonitrile, cis-1,2-Dichloroethylene, Hexane, n-Butylbenzene, trans-1,2-Dichloroethylene)
(2) Semi-VOA - 8270A (TCL); Semi-VOA - 8270A (Add-On) (1,2,4-Trimethylbenzene, Cyclohexanone, Tributyl phosphate); TPH-Diesel Range - WTPH-D (Total petroleum hydrocarbons - diesel range, Total petroleum hydrocarbons - kerosene range)
(3) ICP Metals - 6010A (TAL); ICP Metals - 6010A (Add-on) (Arsenic, Beryllium, Bismuth, Lead, Lithium, Phosphorus, Selenium, Strontium); ICP/MS - 200.8 (Add-on) (Mercury, Uranium)
(4) IC Anions - 300.0 (Chloride, Fluoride, Nitrogen in Nitrate, Nitrogen in Nitrite, Phosphate, Sulfate); Cations (IC) - 300.7 (Nitrogen in ammonium); Total Cyanide - 9010; pH (Soil) - 9045
(5) Gross Alpha; Gross Beta; Gamma Spectroscopy (Cesium-137, Cobalt-60, Europium-152, Europium-154, Europium-155); Gamma Spec - Add-on (Antimony-125, Cesium-134); Americium-241; Isotopic Plutonium; Isotopic Uranium; Neptunium-237

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
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

A-6003-618(03/93)

REQUEST FOR SAMPLE ANALYSIS (RSA)

Group ID No. (For lab use only)

1. Sample Origin	2. Date Sampled	4. Requestor's Name	6. CACN/COA	7. Cost Center
216-Z-9 Char. Borehole	10/29/2003	SJ Trent		

Customer/Project Code	3. Submitted By	5. Requestor's Phone/MSIN/FAX
		373-5869 A0-21

8. Customer ID No.	9. Laboratory Sample No.	10. Volume of Sample	11. Matrix of Sample	12. Requested Analyses	13. Expected Range
B17TM6		500 gm	soil	See Chain of Custody	200 uCi Pu

14. Sample Disposition
- [x] Return to Customer
- [ ] Samples found to contain PCBs will be returned to the customer
- [ ] Dispose of per facility procedures with applied charges for analyses and disposal

Sample(s) Dose Rate at Contact

HPT Signature

15. QC Required [x] Per 222-S Laboratory Quality Assurance Plan (HNF-SD-CP-QAPP-018)
[x] Other (list reference document or attach) 216-Z-9 Analytical Instructions

16. Special Instructions (Special Storage Requirements, Reporting format, holding times, etc.)
See 216-Z-9 Analytical Intstructions.

17. Requested Turnaround Time
- [ ] 2 Weeks
- [ ] 4 Weeks
- [x] Other 60 days

18. Sample Received By:

Date Time

19. Chain of Custody 001029
- [ ] No
- [x] Yes

Number:

A-6002-365 (03/02)

GENERATOR KNOWLEDGE INFORMATION

1. Chain of Custody Number _____ CACN/COA 118478ES20 Customer Identification Number _____

2. List generator knowledge or description of process that produced sample. Or list description of sample source:

216-Z-9 Trench DNAPL Investigation

MSDS Available? ◉ No ○ Yes Hanford MSDS No. _____

3. List all waste codes and constituents associated with the waste or media that was sampled, regardless of CERCLA status.

a) Does the sample contain any of the following listed waste codes?

By checking "unknown" the customer understands that no knowledge is available following a careful search.

	List Federal Waste Code(s):	List Constituent(s):			
P Codes:			○ Yes	◉ No	○ Unknown
U Codes:			○ Yes	◉ No	○ Unknown
K Codes:			○ Yes	◉ No	○ Unknown
F Codes:	F001	Carbon tetrachloride	◉ Yes	○ No	○ Unknown

b) List applicable characteristic waste codes, flash point, pH, constituents, and concentrations as appropriate.

D001:	☐ FP <100°F	☐ FP ≥100 <140°F	☐ DOT Oxidizer	○ Yes	◉ No	○ Unknown
D002:	☐ pH ≤2	☐ pH ≥12.5	☐ Solid Corrosive (WSC2)	○ Yes	◉ No	○ Unknown
D003:	☐ Cyanide	☐ Sulfide	☐ Water Reactive ☐ Other _____ (i.e., peroxide former, explosive, air reactive)	○ Yes	◉ No	○ Unknown
D004-D043 (identify applicable waste codes and concentrations):				○ Yes	◉ No	○ Unknown

c) If characteristic, list any known underlying hazardous constituents (UHCs) reasonably expected to be present, and their concentrations that may be present above the LDR treatment standard (40 CFR 268.48):

N/A

d) List any known Land Disposal Restrictions (LDR) subcategories, if applicable (40 CFR 268.40):

N/A

e) List any applicable Washington State dangerous waste codes: (not required if federally regulated)

WT01:	○ Yes	◉ No	○ Unknown
WT02:	○ Yes	◉ No	○ Unknown
W001:	○ Yes	◉ No	○ Unknown

List constituents and concentrations:

(*State mixture rule for ignitability)

WP01:	○ Yes	◉ No	○ Unknown
WP02:	○ Yes	◉ No	○ Unknown
WP03:	○ Yes	◉ No	○ Unknown
F003:*	○ Yes	◉ No	○ Unknown

4. Is this material TSCA regulated for PCBs? ○ Yes ◉ No ○ Unknown ○ Analysis Requested

List concentration if applicable: _____

If yes, what is the source of the PCBs? (see TSCA PCB Hanford Site User Guide, DOE/RL-2001-50)

☐ PCB Liquid Waste ☐ PCB Bulk Product Waste ☐ PCB Transformer ≥500 ppm ☐ Unknown
☐ PCB Remediation Waste ☐ PCB R&D Waste ☐ PCB contaminated electrical equipment (capacitor/ballast) <500 ppm
☐ PCB Spill Material ☐ PCB Item ☐ Other PCB Waste (list) _____

5. Is this material TRU? ○ Yes ○ No ◉ Unknown

000030

6. ACCURACY OF INFORMATION

Based on my inquiry of those individuals immediately responsible for obtaining this information, that to the best of my knowledge, the information entered in this document is true, accurate, and complete.

Print & Sign _____ Date 10/6/03

A-5002-690 (08/03)

Appendix 5

Data Validation Supporting Documentation

APPENDIX A

RADIOCHEMICAL DATA VALIDATION CHECKLIST

VALIDATION LEVEL:	A	B	C	D	E
PROJECT: 216-Z-9 Vertical Borehole			DATA PACKAGE: 222S20030383 and -0369		
VALIDATOR: JR Jewett		LAB: 222-S		DATE: 6/15/06	
			SDG:		
ANALYSES PERFORMED					
Gross Alpha/Beta	Strontium-90	Technetium-99	Alpha Spectrometry	Gamma Spectrometry	
Total Uranium	Radium-22	Tritium		Strontium-90	
SAMPLES/MATRIX					
B17N46 Soil					
B17TM6 Soil					

1. Completeness ..... ☐ N/A

Technical verification forms present? ..... Yes No N/A

Comments: Carrier recovery info was not in report, but was provided in e-mail from lab. See App. G of DVR.

2. Initial Calibration (Levels D, E) ..... ☑ N/A

Instruments/detectors calibrated? ..... Yes No N/A

Initial calibration acceptable? ..... Yes No N/A

Standards NIST traceable? ..... Yes No N/A

Standards Expired? ..... Yes No N/A

Calculation check acceptable? ..... Yes No N/A

Comments:

3. Continuing Calibration (Levels D, E) ..... ☑ N/A

Calibration checked within required frequency? ..... Yes No N/A

Calibration check acceptable? ..... Yes No N/A

Calibration check standards traceable? ..... Yes No N/A

Calibration check standards expired? ..... Yes No N/A

Calculation check acceptable? ..... Yes No N/A

Comments: _____

4. Background Counts (Levels D, E) ..... ☑ N/A

Background Counts checked within required frequency? ..... Yes No N/A

Background Counts acceptable? ..... Yes No N/A

Calculation check acceptable? ..... Yes No N/A

Comments: _____

5. Blanks (Levels B, C, D, E) ..... ☐ N/A

Method blank analyzed within required frequency? ..... 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? (Levels D, E) ..... Yes No N/A
Comments: _____

6. Laboratory Control Samples or Blank Spike Samples (Levels C, D, E) ..... ☐ N/A

LCS /BSS analyzed within required frequency? ..... Yes No N/A
LCS/BSS recoveries acceptable? ..... Yes No N/A
LCS/BSS traceable? (Levels D,E) ..... Yes No N/A
LCS/BSS expired? (Levels D,E) ..... Yes No N/A
LCS/BSS levels correct? (Levels D,E) ..... Yes No N/A
Transcription/Calculation Errors? (Levels D, E) ..... Yes No N/A
Comments: _____

7. Chemical Carrier Recovery (Levels C, D, E) ..... ☐ N/A

Chemical carrier added? ..... Yes No N/A
Chemical recovery acceptable? ..... Yes No N/A
Chemical carrier traceable? (Levels D, E) ..... Yes No N/A

Chemical carrier expired? (Levels D, E) ..... Yes No N/A

Transcription/Calculation errors? (Levels D, E) ..... Yes No N/A

Comments: _____

8. Tracer Recovery (Levels C, D, E) ..... ☒ N/A

Tracer added? ..... Yes No N/A

Tracer recovery acceptable? ..... Yes No N/A

Tracer traceable? (Levels D, E) ..... Yes No N/A

Tracer expired? (Levels D, E) ..... Yes No N/A

Transcription/Calculation errors? (Levels D, E) ..... Yes No N/A

Comments: ST Not used in Sr-90 method
JJ 6/1/06

9. Matrix Spikes (Levels C, D, E) ..... ☐ N/A

Matrix spike analyzed? ..... Yes No N/A

Spike recoveries acceptable? ..... Yes No N/A

Spike source traceable? (Levels D, E) ..... Yes No N/A

Spike source expired? Levels D, E) ..... Yes No N/A

Transcription/Calculation Errors? (Levels D, E) ..... Yes No N/A

Comments: _____

10. Duplicates (Levels C, D, E) ☐ N/A

Duplicates Analyzed at required frequency? Yes No N/A

RPD Values Acceptable? Yes No N/A

Transcription/Calculation Errors? (Levels D, E) Yes No N/A

Comments:

~~RPD for B77M6 was 52%.~~
~~Results > 5X RDL Flagged "J"~~

11. Field QC Samples (Levels C, D E) ☐ 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:

12. Holding Times (All levels)

Are sample holding times acceptable? Yes No N/A

Comments:

13. Results and Detection Limits (All Levels) ☐ N/A

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

Results supported in raw data?(Levels D, E) Yes No N/A

Results Acceptable? (Levels D, E) Yes No N/A

Transcription/Calculation errors? (Levels D, E) Yes No N/A

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

Transcription/calculation errors? (Levels D, E) Yes No N/A

Comments:

Comments:

Appendix 6

Additional Documentation Requested
(e-mail from lab re carrier recoveries)

From: Bushaw, Ruth A
Sent: Monday, June 19, 2006 6:50 AM
To: Trent, Stephen J
Subject: RE: Tracer Recoveries.
Importance: High

Steve,

The Sr-90 analysis uses a carrier, not a tracer. The carrier recoveries for the Sr-90 analysis for these samples are listed below.

SDG 222S20030369
B17N46
S03M000528
Sr-90 tracer recovery = 81.6%

SDG 222S20030383
B17TM6
S03M000540
Sr-90 tracer recovery = 84.2%

Please let me know if there is any other information that you need.
Thanks,

Ruth A. Bushaw
Project Coordinator
222-S Laboratory
373-4314

From: Trent, Stephen J
Sent: Thursday, June 15, 2006 2:31 PM
To: Bushaw, Ruth A
Subject: Tracer Recoveries.

Ruth,

Need tracer recoveries for Sr-90 in SDG 222S20030369... samples B17TM6 and B17N46....
Email response is fine.

Steve Trent
Sample Management Project Coordinator
Fluor Hanford - Groundwater Remediation Project
Ph: (509) 373-5869
Cell: (509) 947-9354
EFax: (866) 252-5816
Site Pager: 85-7344

Project Hanford Management System
COMMENT RESOLUTION SHEET

Sheet 1 of 1 8/7/06

Document Number: ~~SDG H2458~~ 222S20030369 and | **Revision Number** N/A | **Date:** Aug 3, 2006

Document Title: 8/7/06 222S20030383
Data Validation for Strontium-90 Analysis 222S20030369 & 222S200300383

Reviewer:
Bill Thackaberry

Reviewers, if other than original:

Project/Organization:
FH/GRP/QA

Responsible Manager:
Dana Farwick

COMMENT(S)

Initials (if other than listed reviewer)	Section/ Step	Comments/Discrepancies	Basis	Recommendation	Resolution
	pg 1-8	Package lacks the data summary that has been provided in the past showing analyte, detection limit, result and qualifiers.	Provided in all packages reviewed in the last 4 years	Provide the table	Rejected. Requested table is not required by data validation procedure.* 8/7/06
	pgs 24 Sec 11	This section should not be N/A	it applies to level C	complete the individual lines (no and N/A answers)	Accepted. 8/7/06
			*All info in requested table is already in appendices 2 and 3 of the data validation report as written 8/7/06		

AUG 2006 RECEIVED

A-6002-913 (10/01)

Date: June 15, 2006
To: Fluor Hanford, Inc
From: Environmental Quality Management, Inc.
Project: 216-Z-9 Waste Site Vertical Borehole (Borehole C3426)
Subject: Data Validation for Strontium-90 Analysis

INTRODUCTION

This memo presents the results of data validation on Data Packages 222S20030369 and 222S20030383, prepared by the 222-S laboratory. 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
B17N46	10/20/03	Soil	C	Strontium-90
B17TM6	10/29/03	Soil	C	Strontium-90

Data validation was conducted in accordance with HNF-20434, Rev. 0, *Data Validation Procedure for Radiochemical Analyses*, DOE/RL-2001-01, Rev. 0, Appendix B, *Plutonium/Organic-Rich Process Condensate/Process Waste Group Operable Unit Representative Sites Sampling and Analysis Plan*, and DOE/RL-2001-01, Rev. 0, Appendix E, *Sampling and Analysis Plan for Investigation of Dense, Nonaqueous-Phase Liquid Carbon Tetrachloride at the 216-Z-9 Trench*. Appendices 1 through 6 of this Data Validation Report provide additional information as indicated below:

Appendix 1. Glossary of Data Reporting Qualifiers
Appendix 2. Summary of Data Qualification
Appendix 3. Annotated Laboratory Reports
Appendix 4. Laboratory Narrative and Chain-of-Custody Documentation
Appendix 5. Data Validation Supporting Documentation
Appendix 6. Additional Data Requested by Client

DATA QUALITY PARAMETERS

Holding Times

Holding times may be calculated from Chain-of-Custody forms to determine the validity of the results. Maximum holding time for strontium-90 analyses is specified as 6 months in DOE/RL-2001-01, App. B.

All holding times were met.

Blanks

AUG 2006
RECEIVED

- 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 minimum detectable activity (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 qualified as undetected and flagged "U"; samples results above the MDA and greater than five times the highest blank concentration are not qualified.

  All blank criteria were met. Strontium-90 was not detected in the blank. The detection limit for the blank was less than the MDA and less than the required detection limit.

- Field Blank

  No field blanks were submitted for analysis.

Accuracy

Accuracy is evaluated from laboratory control sample (LCS) or blank spike sample (BSS) batch samples and spiked samples in the analytical batch. Measured activities are compared to the known added amounts. The acceptable LCS or BSS and matrix spike (MS) recovery range is 65-135%. In addition, a nonradiochemical carrier is used to determine the yield of the chemical separation procedure. The acceptable range for carrier recovery is 20% to 105%. Results outside the above ranges result in associated sample results being qualified as estimates. Results are rejected for LCS/BSS recoveries less than 30% or carrier or MS recoveries less than 10%.

LCS and MS recoveries satisfied the above criteria. A carrier was used for every sample, LCS, and blank (except for gamma spectroscopy) and acceptable results were obtained.

Precision

- Laboratory Duplicates

  Analytical precision is expressed by the relative percent differences (RPD) between results for one of the samples in the batch and a duplicate determination of that sample. If both results are nondetects, no RPD calculation is required. If both the activities measured for the sample and the duplicate are both greater than five times the required detection limit (RDL) and the RPD is less than 35%, no qualification is required. If either activity is less than five times the RDL, the control limit is two times the RDL. If the RPD is outside the applicable control limit, associated results are qualified as estimated detects or estimated non-detects.

A duplicate was analyzed for each sample, and the requirements were met.

- Field Duplicate

  No field duplicates were submitted for analysis.

Detection Levels

Reported analytical detection levels are compared against the RDLs in DOE/RL-2001-01, Appendix B, to ensure that laboratory detection levels meet the required criteria.

All sample results were reported with MDAs equal to or less than the analyte-specific RDL.

Completeness

Data Packages 222S20030369 and 222S20030383 were submitted for validation and verified for completeness. Completeness is based on the percentage of data requested by the client that were reported and determined to be valid (i.e., not rejected). The completion percentage was 100%.

MAJOR DEFICIENCIES

None

MINOR DEFICIENCIES

None

REFERENCES

HNF-20434, Rev. 0, *Data Validation Procedure for Radiochemical Analyses,* Fluor Hanford, Inc., Richland, Washington (2004).

DOE/RL-2001-01, Rev. 0, Appendix B, *Plutonium/Organic-Rich Process Condensate/Process Waste Group Operable Unit Representative Sites Sampling and Analysis Plan*, U.S. Department of Energy, Richland, Washington (2004).

DOE/RL-2001-01, Rev. 0, Appendix E, *Sampling and Analysis Plan for Investigation of Dense, Nonaqueous-Phase Liquid Carbon Tetrachloride at the 216-Z-9 Trench*, U.S. Department of Energy, Richland, Washington (2004).

Appendix 1

Glossary of Data Reporting Qualifiers

Qualifiers which may be applied by data validators in compliance with the data validation procedure 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 minor 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 minor QC deficiency identified during the data validation, the associated concentration is an estimated, but the data are usable for decision-making purposes.

R - Indicates the compound or analyte was analyzed for, detected, and due to an identified major QC deficiency, the date 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 major QC deficiency.

Appendix 2

Summary of Data Qualification

DATA QUALIFICATION SUMMARY

SDG: 222S20030369 and 222S20030383	REVIEWER: JRJ	DATE: 6/15/06	PAGE 1OF 1
COMMENTS: No data was qualified.			
COMPOUND	QUALIFIER	SAMPLES AFFECTED	REASON

Appendix 3

Annotated Laboratory Reports

Z9 TRENCH1
Data Summary Report

CORE NUMBER: 222620030369
SEGMENT #: B17W46

SEGMENT PORTION: Acid Digest

Sample#	R	A#	Analyte	Unit	Standard %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Count Err%
S03W000527		A	Silver -ICP-Acid Digest	ug/g	99.9	<5.48e-03	<1.11	<1.06	n/a	n/a	79.8	1.1	n/a
S03W000527		A	Aluminum -ICP-Acid Digest	ug/g	117	<0.0514	11.0	<9.94	n/a	n/a	92.0	10	n/a
S03W000527		A	Barium -ICP-Acid Digest	ug/g	96.3	<0.0210	93.2	38.6	65.9	82.7	71.8	4.2	n/a
S03W000527		A	Beryllium -ICP-Acid Digest	ug/g	102	<1.33e-03	<0.270	<0.258	n/a	n/a	80.5	0.27	n/a
S03W000527		A	Bismuth -ICP-Acid Digest	ug/g	93.8	<0.0516	<10.4	<9.97	n/a	n/a	76.3	10	n/a
S03W000527		A	Cadmium -ICP-Acid Digest	ug/g	94.4	<2.12e-03	3.50	1.60	2.55	74.3	74.8	0.43	n/a
S03W000527		A	Chromium -ICP-Acid Digest	ug/g	97.2	<5.19e-03	16.0	13.7	14.8	15.7	76.9	1.0	n/a
S03W000527		A	Copper -ICP-Acid Digest	ug/g	97.4	<0.0122	16.6	15.0	15.8	10.4	77.3	2.5	n/a
S03W000527		A	Lithium -ICP-Acid Digest	ug/g	99.1	<1.79e-03	8.26	8.63	8.44	4.37	79.5	0.36	n/a
S03W000527		A	Manganese -ICP-Acid Digest	ug/g	94.2	<1.07e-03	157	164	160	4.57	79.4	0.22	n/a
S03W000527		A	Nickel -ICP-Acid Digest	ug/g	95.6	<0.0110	9.11	7.92	8.51	13.9	75.3	2.2	n/a
S03W000527		A	Phosphorus -ICP-Acid Digest	ug/g	94.6	<0.0196	464	594	529	24.6	82.1	4.0	n/a
S03W000527		A	Lead -ICP-Acid Digest	ug/g	94.2	<0.0235	8.21	5.75	6.98	35.2	76.2	4.7	n/a
S03W000527		A	Antimony -ICP-Acid Digest	ug/g	94.8	<0.0212	<4.29	<4.10	n/a	n/a	67.5	4.3	n/a
S03W000527		A	Selenium -ICP-Acid Digest	ug/g	97.1	<0.0518	<10.5	<10.0	n/a	n/a	78.6	10	n/a
S03W000527		A	Strontium -ICP-Acid Digest	ug/g	98.0	<1.07e-03	11.7	12.7	12.2	7.75	78.1	0.22	n/a
S03W000527		A	Zinc -ICP-Acid Digest	ug/g	93.1	<2.14e-03	48.8	35.2	42.0	32.5	73.3	0.43	n/a

SEGMENT PORTION: Environmental Acid

Sample#	R	A#	Analyte	Unit	Standard %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Count Err%
S03W000528		E	Uranium by Phosphorescence	ug/g	104	<4.14e-04	0.897	0.945	0.921	5.21	n/a	0.041	n/a
S03W000528		E	Strontium-89/90 High Level	uCi/g	98.8	<1.05e-05	<7.86e-06	<9.44e-06	n/a	n/a	n/a	1.4e-05	8.4e+02
S03W000528		E	Pu-239/240 by TRU-SPEC Resin	uCi/g	93.9	<4.74e-03	0.0446	0.0392	0.0419	12.9	n/a	6.4e-03	3.1
S03W000528		E	Pu-238 by TRU-SPEC Resin IonEx	uCi/g	n/a	<8.96e-03	<0.0106	<0.0103	n/a	n/a	n/a	0.011	13
S03W000528		E	Np237 by TTA Extraction	uCi/g	82.5	<2.93e-04	<5.04e-04	<3.96e-04	n/a	n/a	n/a	6.2e-06	1.8e+02
S03W000528		E	Thorium-232 by ICP/MS	ug/g	105	0.0241	2.94	3.41	3.18	14.6	99.0	5.7e-04	n/a
S03W000528		E	Uranium-233 by ICP/MS Acid Dig	ug/g	n/a	<1.60e-03	9.58e-05	1.10e-04	1.03e-04	13.8	n/a	2.8e-05	n/a
S03W000528		E	Uranium-234 by ICP/MS Acid Dig	ug/g	n/a	<6.00e-04	1.89e-04	1.56e-04	1.73e-04	19.5	n/a	9.3e-06	n/a
S03W000528		E	Uranium-235 by ICP/MS Acid Dig	ug/g	104	<2.20e-03	0.0104	8.91e-03	9.67e-03	15.6	112	3.4e-05	n/a
S03W000528		E	Uranium-238 by ICP/MS Acid Dig	ug/g	106	<0.110	0.742	0.647	0.695	13.6	101	1.7e-03	n/a
S03W000528		E	Cobalt-60 by GEA	uCi/g	106	<2.64e-04	<2.60e-04	<2.69e-04	n/a	n/a	n/a	2.6e-04	n/a
S03W000528		E	Antimony-125 by GEA	uCi/g	n/a	<5.80e-04	<5.91e-04	<6.19e-04	n/a	n/a	n/a	5.9e-04	n/a
S03W000528		E	Cesium-134 by GEA	uCi/g	n/a	<1.90e-04	<2.23e-04	<1.97e-04	n/a	n/a	n/a	2.2e-04	n/a
S03W000528		E	Cesium-137 by GEA	uCi/g	111	<3.84e-04	<3.94e-04	<4.03e-04	n/a	n/a	n/a	3.9e-04	n/a
S03W000528		E	Europium-152 by GEA	uCi/g	n/a	<3.24e-04	<3.27e-04	<3.28e-04	n/a	n/a	n/a	3.3e-04	n/a
S03W000528		E	Europium-154 by GEA	uCi/g	n/a	<7.08e-04	<7.84e-04	<7.67e-04	n/a	n/a	n/a	7.8e-04	n/a
S03W000528		E	Europium-155 by GEA	uCi/g	n/a	<2.84e-04	<2.80e-04	<2.68e-04	n/a	n/a	n/a	2.8e-04	n/a
S03W000528		E	Am-241 by TRU-SPEC Resin IonEx	uCi/g	105	<7.29e-03	0.114	0.0979	0.106	15.2	n/a	0.013	2.4
S03W000528		E	Alpha of Digested Solid	uCi/g	95.4	<5.03e-04	0.148	0.125	0.136	16.8	95.0	1.2e-03	5.0
665W000528		E	Beta of Solid Sample	uCi/g	105	<2.33e-03	0.0272	0.0191	0.0232	35.0	104	3.5e-03	15

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Z9 TRENCH3
Data Summary Report

CORE NUMBER: 222S20030383
SEGMENT #: B17TM6

SEGMENT PORTION: Acid Digest

Sample#	R	A#	Analyte	Unit	Standard %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Count Err%
S03N000559		A	Silver -ICP-Acid Digest	ug/g	101	<5.48e-03	1.15	<1.10	n/a	n/a	98.5	1.1	n/a
S03N000559		A	Arsenic -ICP-Acid Digest	ug/g	115	<0.0514	<10.3	<10.3	n/a	n/a	113	10	n/a
S03N000559		A	Barium -ICP-Acid Digest	ug/g	95.6	<0.0210	53.4	53.2	53.3	0.377	94.5	4.2	n/a
S03N000559		A	Beryllium -ICP-Acid Digest	ug/g	103	<1.33e-03	0.293	<0.268	n/a	n/a	101	0.27	n/a
S03N000559		A	Bismuth -ICP-Acid Digest	ug/g	95.1	<0.0516	<10.4	10.8	n/a	n/a	93.2	10	n/a
S03N000559		A	Cadmium -ICP-Acid Digest	ug/g	93.8	<2.12e-03	1.79	1.45	1.62	20.6	90.8	0.42	n/a
S03N000559		A	Chromium -ICP-Acid Digest	ug/g	96.9	<5.19e-03	22.5	22.1	22.3	1.68	94.1	1.0	n/a
S03N000559		A	Copper -ICP-Acid Digest	ug/g	97.3	<0.0122	9.95	10.9	10.4	9.32	96.6	2.5	n/a
S03N000559		A	Lithium -ICP-Acid Digest	ug/g	98.8	<1.29e-03	10.6	9.80	10.2	7.94	97.2	0.36	n/a
S03N000559		A	Manganese -ICP-Acid Digest	ug/g	94.3	<1.07e-03	190	181	185	5.27	108	0.22	n/a
S03N000559		A	Nickel -ICP-Acid Digest	ug/g	95.2	<0.0110	20.2	18.2	19.2	10.5	92.8	2.2	n/a
S03N000559		A	Phosphorus -ICP-Acid Digest	ug/g	95.3	<0.0196	595	699	647	16.1	91.3	4.0	n/a
S03N000559		A	Lead -ICP-Acid Digest	ug/g	94.4	0.0257	6.58	<4.71	n/a	n/a	90.8	4.7	n/a
S03N000559		A	Antimony -ICP-Acid Digest	ug/g	94.7	0.0262	4.63	<4.27	n/a	n/a	82.3	4.3	n/a
S03N000559		A	Selenium -ICP-Acid Digest	ug/g	97.7	<0.0518	<10.4	<10.4	n/a	n/a	95.1	10	n/a
S03N000559		A	Strontium -ICP-Acid Digest	ug/g	97.5	<1.07e-03	13.7	23.3	18.5	52.0	96.4	0.22	n/a
S03N000559		A	Zinc -ICP-Acid Digest	ug/g	93.5	3.87e-03	37.8	33.2	35.5	12.9	91.2	0.43	n/a

SEGMENT PORTION: Environmental Acid

Sample#	R	A#	Analyte	Unit	Standard %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Count Err%
S03N000540		E	Uranium by Phosphorcacence	ug/g	104	<4.14e-04	2.04	1.65	1.84	21.1	99.9	0.041	n/a
S03N000540		E	Strontium-89/90 High Level	uCi/g	100	<7.19e-06	1.34e-05	<1.25e-05	n/a	n/a	n/a	1.5e-05	88
S03N000540		E	Pu-239/240 by TRU-SPEC Resin	uCi/g	94.1	<7.26e-03	0.115	0.0897	0.102	24.7	n/a	0.044	2.7
S03N000540		E	Pu-238 by TRU-SPEC Resin IonEx	uCi/g	n/a	<0.0121	<0.0192	<0.0129	n/a	n/a	n/a	0.019	1.0e+02
S03N000540		E	Np237 by TTA Extraction	uCi/g	75.5	<4.86e-04	<3.37e-04	<3.28e-04	n/a	n/a	n/a	7.1e-04	1.0e+02
S03N000540		E	Thorium-232 by ICP/MS	ug/g	105	0.0497	3.00	2.06	2.53	37.2	99.2	4.3e-04	n/a
S03N000540		E	Uranium-233 by ICP/MS Acid Dig	ug/g	n/a	<1.80e-03	9.13e-05	6.58e-05	7.86e-05	32.6	n/a	3.2e-05	n/a
S03N000540		E	Uranium-234 by ICP/MS Acid Dig	ug/g	n/a	<6.00e-04	3.34e-04	2.83e-04	3.08e-04	16.5	n/a	1.1e-05	n/a
S03N000540		E	Uranium-235 by ICP/MS Acid Dig	ug/g	104	<2.20e-03	0.0220	0.0190	0.0205	14.8	110	3.9e-05	n/a
S03N000540		E	Uranium-238 by ICP/MS Acid Dig	ug/g	106	<0.110	1.85	1.55	1.70	17.3	102	2.0e-03	n/a
S03N000540		E	Cobalt-60 by GEA	uCi/g	101	<2.99e-04	<3.85e-04	<3.45e-04	n/a	n/a	n/a	3.8e-04	n/a
S03N000540		E	Antimony-125 by GEA	uCi/g	n/a	<9.08e-04	<7.92e-04	<8.75e-04	n/a	n/a	n/a	7.9e-04	n/a
S03N000540		E	Cesium-134 by GEA	uCi/g	n/a	<2.92e-04	<2.90e-04	<2.89e-04	n/a	n/a	n/a	3.0e-04	n/a
S03N000540		E	Cesium-137 by GEA	uCi/g	103	<7.53e-04	<7.66e-04	<7.44e-04	n/a	n/a	n/a	7.7e-04	n/a
S03N000540		E	Europium-152 by GEA	uCi/g	n/a	<6.28e-04	<7.01e-04	<6.43e-04	n/a	n/a	n/a	7.0e-04	n/a
S03N000540		E	Europium-154 by GEA	uCi/g	n/a	<9.81e-04	<1.02e-03	<1.15e-03	n/a	n/a	n/a	1.0e-03	n/a
S03N000540		E	Europium-155 by GEA	uCi/g	n/a	<7.77e-04	<7.88e-04	<7.91e-04	n/a	n/a	n/a	7.9e-04	n/a
S03N000540		E	Am-241 by TRU-SPEC Resin IonEx	uCi/g	101	<9.60e-03	0.0532	0.0451	0.0492	16.5	n/a	0.013	3.4
S03N000540		E	Alpha of Digested Solid	uCi/g	87.0	<6.74e-04	0.145	0.127	0.136	13.2	85.5	1.6e-03	5.6
S03N000540		E	Beta of Solid Sample	uCi/g	104	<2.38e-03	0.0108	6.87e-03	8.84e-03	44.5	103	4.9e-03	33

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Appendix 4

Laboratory Narrative and Chain-of-Custody Documentation

FINAL REPORT FOR THE SOIL SAMPLES FROM 216-Z-9 TRENCH – SAMPLE DELIVERY GROUPS 222S20030369 AND 222S20030383

1.0 INTRODUCTION

Two soil samples from the 216-Z-9 characterization borehole were received at the 222-S Laboratory; sample B17N46 on October 27, 2003 (sample delivery group [SDG] 222S20030369), and sample B17TM6 on October 31, 2003 (SDG 222S20030383). The samples were analyzed in accordance with the *216-Z-9 Trench Characterization Borehole Sampling and Analysis Concurrence for Analytical Requirements* (analytical instructions), the *222-S Laboratory Quality Assurance Plan* (reference 2), *Semi-Volatile Organic Compound Analysis* (reference 3), and *Volatile Organic Compound Analysis* (reference 4), referenced in the cover letter.

A Data Summary Report is included as Attachment 2. The correlation between the customer sample identification number and laboratory identification numbers is presented in the sample breakdown diagrams included as Attachment 3. Copies of the chain of custody, Request for Analysis, and Generator Knowledge Information forms are included as Attachment 4.

For sample B17N46, all detected compounds for the volatile organic analysis (VOA) were within the calibration range for the analysis of the low level sample (S03M000522), so the sample for high level VOA (S03M000523) did not require analysis.

For sample B17TM6, a very high concentration of carbon tetrachloride was detected during the analysis of the low level sample (S03M000533), and the results obtained for that analysis were unusable. The reported results were obtained from two different dilutions of the high level sample (S03M000534).

2.0 SAMPLE APPEARANCE AND HANDLING

Both samples (B17N46 and B17TM6) were described as moist soil. The samples were not homogenous, consisting of a mixture of course sand, "pea" gravel and pebbles.

The samples were stirred with a spatula prior to removing aliquots for analysis. However, with this type of sample, this method was not sufficient to achieve homogenization. The Laboratory does not have appropriate equipment to grind this type of sample to achieve better homogenization. This non-homogeneity is noted by the elevated results for the relative percent difference (RPD) between sample and duplicate results for some analytes.

For sample B17TM6, the aliquots for both the low level and high level VOA were each provided in a single amber glass bottle with no preservative. Because the bottles had to be opened in a

hood to obtain aliquots for analysis, the sample integrity was compromised and the results may be biased low.

For sample B17N46, pre-weighed vials containing preservative, water and a stir bar were provided to the project for collection of the aliquots for low level VOA. At the point of sample analysis, the chemical technologist noted that custody tape and additional labels had been added to the vials, which made it difficult to determine the weight of the samples. An attempt to determine the weight of the samples was made by weighing the vials as received, and then again after they were emptied and dried. The weight of the preservative added to the vials was already known. The stir bar weight was estimated based on the average weight of 5 stir bars. The weight of the water was estimated to be 5 g based on 5 mL of water. This allowed an estimate of the extra tape and labels to be made, which then allows the sample weight to be estimated.

3.0 HOLDING TIMES

The analytical instructions (reference 1) requested that the laboratory make every effort to meet the SW-846 holding times for VOA. The holding times were not met for either sample. For sample B17N46, the holding time was not met because of a combination of the 7-day delay between sampling and delivery of the samples to the laboratory and instrument operation problems. For sample B17TM6, the holding time was not met because of instrument operation problems.

4.0 ANALYTICAL RESULTS

The Data Summary Report, included as Attachment 2, presents the analytical results for the requested analytes. In this table, solid samples that were prepared by water digest are indicated with a "W" in the A# column. An "A" indicates an acid digest of a solid, and an "E" indicates that the stronger acid soil leach procedure was used to prepare the sample prior to analysis. Typically, if there is no letter identifier in this column, this indicates that the analysis was performed on a direct subsample with no separate preparation, or with sample preparation that was included as part of the analytical procedure steps.

Note that for the ion chromatography (IC) and inductively coupled plasma (ICP) spectroscopy analyses, the results reported for the blank are actually μg/mL, rather than μg/g as indicated in the Data Summary Report.

5.0 QUALITY CONTROL RESULTS (QC)

5.1 LABORATORY CONTROL STANDARDS

Most laboratory control standard (LCS) recoveries were acceptable in accordance with the 222-S Laboratory Quality Assurance Plan (QAPP-016) (Clark 2003), referenced in the cover letter. For the semi-volatile organic analysis (SVOA) of sample B17N46 (S03M000525), one of the 11 compounds (n-Nitroso-di-n-propylamine) in the LCS had a recovery that was slightly below the requested range of 70% - 130% recovery. However, the reported recovery of 65% is typical of what is normally achieved for this compound so no reanalysis was requested based on the low recovery.

For the SVOA of sample B17TM6 (S03M000537), 5 of the 11 compounds in the LCS (the acid compounds) had recoveries above the requested range of 70% - 130% recovery. Following the analysis, the chemist noted that the standard might have been concentrated because of evaporation. Subsequent analysis of a new standard gave acceptable recoveries. The high recoveries could indicate a high bias in the reported results. However, because these compounds were not identified in the sample, no reanalysis was requested based on these high recoveries.

5.2 METHOD AND PREPARATION BLANKS

For most analyses, no analytes were detected in the method or preparation blank. However, for the IC analysis of sample B17N46 (S03M000553), chloride was detected in the water digest preparation blank. The sample was re-prepared two additional times and these results were determined to be the best, based on the results reported for nitrite. The level of nitrite detected in the other two blanks was greater than that detected in the sample. The concentration of chloride in the blank is about 22% of that reported for the sample. Comparison of results from the other two digests indicates that the reported sample results are biased high by about 22% - 29% because of this contamination.

Nitrite was reported in the blank prepared and analyzed with sample B17TM6 (S03M000561). The blank result was greater than that reported for the sample. This sample was also re-prepared two additional times. At the time of this analysis, the source of the contamination could not be determined. Because no nitrite was detected in the sample, no additional preparations were performed. The contamination issue is still under investigation.

For the ICP analysis of sample B17TM6 (S03M000559), lead (Pb), antimony (Sb), and zinc (Zn) contamination were detected in the acid digestion preparation blank. The concentration of Zn in the blank is less than 5% of that detected in the sample and was considered insignificant in accordance with QAPP-016 (Clark 2003). However, the concentration of Pb in the blank is 78% of that measured in the sample and the level of Sb in the blank is 113% of that detected in the sample. These results are reported from the third preparation of the sample. No further digestions were prepared because the duplicate results for Pb and Sb were both less than the reported detection limit, and previous results indicated that neither Pb nor Sb are present in the sample. Therefore, the results reported for Pb and Sb for the sample portion should be considered biased high due to contamination.

5.3 DUPLICATE ANALYSES

The requested precision for analysis was a relative percent difference (RPD) ± 20% for radionuclides and ± 30% for all other methods. Most analyte results met these criteria, except as noted below.

A duplicate sample was analyzed for both samples for most methods. However, after most analyses were completed, the project point of contact requested that the laboratory batch the two samples together for remaining analyses. Therefore, for the IC analysis, a duplicate was analyzed with sample B17N46 only.

For sample B17N46, an RPD greater than 20% was reported for total beta analysis for sample S03M000528. RPDs greater than 30% were reported for barium (Ba), cadmium (Cd), Pb, and Zn for sample S03M000527, and acetone for sample S03M000522. The RPD criterion was not

applicable for Cd and Pb, in accordance with QAPP-016 (reference 2), because the sample results were less than 10 times the method detection limit. The other high RPDs were attributed to sample inhomogeneity and no repreparation and reanalysis was requested because the laboratory does not have equipment available to provide adequate homogenization of this type of sample matrix.

For sample B17TM6, RPDs greater than 20% were reported for plutonium-239/240 ($^{239/240}Pu$), thorium-232 (^{232}Th), uranium-233 (^{233}U), and total beta analysis for sample S03M000540. However, the counting error for the beta analysis is greater than 15% and the ^{233}U result is less than 10 times the method detection limit, so the RPD criterion is not applicable for those two analytes. An RPD greater than 30% was reported for strontium (Sr) for sample S03M000559, but the criterion was not applicable because the sample results were less than 10 times the method detection limit. The other high RPDs were attributed to sample inhomogeneity and no repreparation and reanalysis was requested because the laboratory does not have equipment available to provide adequate homogenization of this type of sample matrix.

Duplicate analyses for the SVOA and polychlorinated biphenyl (PCB) analysis was performed by comparing a matrix spike (MS) with a matrix spike duplicate (MSD). The results of this comparison are discussed in the next section. For sample B17N46 VOA, both a duplicate and MSD were analyzed because some compounds were expected to be present in the sample.

For sample B17TM6 VOA, only an MS and MSD were analyzed. However, since chloroform, tetrachloroethene and carbon tetrachloride were detected in the sample, but were not compounds present in the spike solution, the results from the sample MS and MSD analyses can be compared as triplicates to provide precision information for the analysis. The results are presented in Table 1 and a percent relative standard deviation (%RSD) was calculated to give an indication of the precision. The %RSDs were less than 30%, which indicates that the analysis met the precision requirement.

Table 1. Triplicate Analysis Results for Sample B17TM6 (S03M000534).

Compound	Result (µg/Kg)	MS (µg/Kg)	MSD (µg/Kg)	%RSD
Chloroform	4.88e+3	5.46e+3	4.73e+3	7.7
Tetrachloroethane	1.70e+4	1.76e+4	1.66e+4	2.9
Carbon tetrachloride	3.76e+5	2.87e+5	3.13e+5	14.0

5.4 MATRIX SPIKE AND MATRIX SPIKE DUPLICATE

An MS sample was analyzed for both samples for most methods. However, after most analyses were completed, the project point of contact requested that the laboratory batch the two samples together for remaining analyses. Therefore, for the total uranium and IC analyses, an MS was analyzed with sample B17N46 only.

MS samples were analyzed with all methods except for pH, $^{239/240}Pu$, ^{238}Pu, ^{90}Sr, neptunium-237 (^{237}Np), americium-241 (^{241}Am) and the isotopes reported by gamma energy analysis (GEA). For VOA and SVOA, the analytical instructions (reference 1) requested that the laboratory report

spike recoveries only for the representative set of compounds indicated in the letters from H. L. Anastos (references 3 and 4). However, for VOA, some ketones were part of the standard mix used. Although the ketones were not required to be reported, for sample B17N46, acetone and 2-butanone recoveries and RPDs were discussed because those compounds were detected in the sample. For sample B17TM6, the ketones weren't reported because they were not requested by customer and no ketones were detected in the samples.

For PCB analysis, only aroclor-1254 is included in the matrix spike because it is the aroclor most commonly detected in samples on the Hanford site.

Most MS and/or MSD recoveries met the requirements in the analytical instructions (reference 1), except as noted below.

For sample B17N46 (S03M000525), most of the SVOA spike compounds (except pyrene) failed to meet the requirements. The low recoveries were attributed to a possible matrix effect because the recoveries for those compounds in the LCS were all acceptable (except for n-nitroso-di-n-propylamine, as noted previously). No reanalysis was requested because the sample matrix would still affect reanalysis results.

For sample B17TM6 (S03M000537) SVOA, most of the compounds failed to meet the requirements for MS and MSD recoveries because of the 50-fold dilution that was required to reduce the concentration of tri-n-butylphosphate so that it was within the calibration range. No reanalysis was requested because the same dilution would be required on the reanalysis and it is impractical to add sufficient spike solution for this sample where a substantial dilution is required.

For sample B17N46 (S03M000522) VOA, acetone and n-butanone have high recoveries. Because the LCS recoveries of these compounds were within the requested control limits, the high MS recoveries were attributed to a possible matrix effect that causes increased purging efficiencies for ketones. Again, no reanalysis was requested because of these MS recovery failures because a reanalysis was not expected to improve the results. The results reported for these two compounds should be considered biased high.

The RPDs between the MS and MSD for the PCB analyses met the requirements in the analytical instructions (reference 1). Some of the RPDs for the MS/MSDs analyzed with the VOA and SVOA failed to meet the requirements. The failures were attributed to the previously discussed matrix effects, so no reanalysis was requested.

The Data Summary Report included as Attachment 2 does not report the recoveries for the MSD analysis or the RPD for the MS/MSD analysis. This information is provided in Table 2 and Table 3 for VOA, Table 4 and Table 5 for SVOA and Table 6 and Table 7 for PCB analysis.

Table 2. MS/MSD Recoveries and RPDs for VOA for B17N46.

Compound	MS (%)	MSD (%)	RPD (%)
Benzene	98	101	3
Chlorobenzene	104	100	4
1,1-Dichloroethene	100	103	3
Toluene	95	92	3

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Table 2. MS/MSD Recoveries and RPDs for VOA for B17N46.

Compound	MS (%)	MSD (%)	RPD (%)
Trichloroethene	115	119	3
Acetone	158 †	172 †	8
2-Butanone	140 †	190 †	30 †

† - spike recovery or RPD failed to meet customer requirements

Table 3. MS/MSD Recoveries and RPDs for VOA for B17TM6.

Compound	MS (%)	MSD (%)	RPD (%)
Benzene	110	115	4
Chlorobenzene	114	116	2
1,1-Dichloroethene	98	111	12
Toluene	110	113	3
Trichloroethene	102	103	1

Table 4. MS/MSD Recoveries and RPDs for SVOA for B17N46.

Compound	MS (%)	MSD (%)	RPD (%)
Phenol	67 †	65 †	3
2-Chlorophenol	61 †	61 †	0
1,4-Dichlorobenzene	8 †	13 †	48 †
N-Nitroso-di-n-propylamine	35 †	42 †	18
1,2,4-Trichlorobenzene	33 †	36 †	9
4-Chloro-3-methylphenol	55 †	62 †	12
Acenaphthene	64 †	66 †	3
4-Nitrophenol	53 †	65 †	20
2,4-Dinitrotoluene	54 †	63 †	15
Pentachlorophenol	51 †	63 †	21
Pyrene	88	92	4

† - spike recovery or RPD failed to meet customer requirements

Table 5. MS/MSD Recoveries and RPDs for SVOA for B17TM6.

Compound	MS (%)	MSD (%)	RPD (%)
Phenol	70	89	24
2-Chlorophenol	77	90	16
1,4-Dichlorobenzene	48 †	55 †	14
N-Nitroso-di-n-propylamine	23 †	47 †	68 †
1,2,4-Trichlorobenzene	47 †	67 †	35 †
4-Chloro-3-methylphenol	64 †	55 †	15 †
Acenaphthene	56 †	65 †	15 †
4-Nitrophenol	0 †	0 †	N/A

Table 5. MS/MSD Recoveries and RPDs for SVOA for B17TM6.

Compound	MS (%)	MSD (%)	RPD (%)
2,4-Dinitrotoluene	0 †	0 †	N/A
Pentachlorophenol	0 †	0 †	N/A
Pyrene	50 †	59 †	16

† - spike recovery or RPD failed to meet customer requirements

N/A – calculation not applicable

Table 6. MS/MSD Recoveries and RPDs for PCB for B17N46.

Compound	MS (%)	MSD (%)	RPD (%)
Aroclor 1254	76	72	5

Table 7. MS/MSD Recoveries and RPDs for PCB for B17TM6.

Compound	MS (%)	MSD (%)	RPD (%)
Aroclor 1254	120	106	12

5.5 SURROGATE RECOVERIES

Surrogate standards are added to all field and QC samples for VOA, SVOA and PCB analyses. The surrogate is added to monitor total method recovery through preparation, sample matrix cleanup and analysis.

Surrogates standard recoveries for VOA for sample B17N46 (S03M000522) met the requirements in QAPP-016 (reference 2). For the VOA for sample B17TM6 (S03M000534), dibromofluoromethane (DBFM) failed high by 4% on the sample aliquot. This failure was attributed to interference from the adjacent carbon tetrachloride peak, which exceeded the calibration curve and saturated the detector. This surrogate passed on the MS and MSD and on subsequent reanalysis of the diluted extract. Therefore, the reported sample results were considered acceptable.

Surrogates standard recoveries for PCB for sample B17N46 (S03M000522) met the requirements in QAPP-016 (reference 2). For the PCB analysis of sample B17TM6 (S03M000538), the recovery for decachlorobiphenyl in the LCS was slightly high. However, the reported results for the analysis were considered acceptable because the LCS, MS and MSD recoveries for the analysis all met the requirements.

For the SVOA for sample B17N46 (S03M000525), the recovery for nitrobenzene-d5 (one of 6 surrogates) failed to meet the requirements in QAPP-016 (reference 2). Administrative limits are set at 50% - 100% recovery. Recoveries for nitrobenzene-d5 ranged from 0% – 10% in the method blank, LCS, sample, MS, and MSD. The other 5 surrogates all had acceptable recoveries. The cause for the low recovery is unknown, however, the other base-neutral compounds that were spiked appear to be unaffected. Of the compounds of interest, only

n-tributylphosphate is in the base/neutral class. It is not chemically similar to nitrobenzene-d5, and is not likely to be affected by the poor recovery.

For the SVOA for sample B17TM6 (S03M000537), low surrogate recoveries were obtained because of the required 50-fold dilution. As discussed with the MS and MSD recovery failures, no reanalysis was requested based on these low recoveries. The sample results are considered usable.

5.6 OPPORTUNISTIC ANALYTES

The analytical instructions (reference 1) requested that the laboratory report opportunistic analyte results from the SVOA. These results are considered opportunistic because they are compounds that are calibrated for in the method, but are not requested.

For sample B17N46 (S03M000525), two opportunistic compounds were detected in the sample. Dimethylphthalate (chemical abstract system (CAS) number 131-11-3) was detected with a concentration of 1.38e+3 µg/Kg. Diethylphthalate (CAS number 84-66-2) was detected with a concentration of 4.31e+3 µg/Kg. Both of these results should be considered estimates because they were not greater than 10 times the detection limit of 960 µg/Kg.

For sample B17TM6 (S03M000537), no opportunistic compounds were detected.

5.7 TENTATIVELY IDENTIFIED COMPOUNDS

The analytical instructions (reference 1) list five compounds for VOA that the laboratory does not routinely report, as indicated in the letter from H. L. Anastos (reference 4). The laboratory was requested to perform a tentatively identified compound (TIC) search for these compounds. These compounds were not detected in either of the two samples. However, several other TICs were identified, as discussed below. TICs are identified by the instrument library search based only on masses in the spectra and are not based on retention times or verified with independent check standards. These compounds could be misidentified because of matrix effects. The concentrations are estimated based only on the nearest internal standard and a presumed response factor of 1.

For sample B17N46 (S03M000525) SVOA, an unknown phthalate was reported as a TIC. However, this unknown phthalate was also detected in the LCS and the preparation blank and, therefore, was considered to be contamination from an unknown source of plastic and not related to the sample matrix. In addition, 2,2'-methylenebis[6-tert-butyl-4-ethylphenol] (CAS# 88-24-4) was detected with estimated concentrations of 3.0e+3 µg/Kg in the MS and 5.5e+3 µg/Kg in the MSD.

For sample B17TM6 (S03M000534) VOA, two compounds were detected as TICs in the sample portion as well as the MS and MSD. Bromobenzene (CAS# 108-86-1) was detected with an estimated concentration of 4.0e+3 µg/Kg in the sample, 4.2e+3 µg/Kg in the MS and 4.1e+3 µg/Kg in the MSD. Estimated concentrations of hexachloroethane (CAS# 67-72-1) were 8.5e+4 µg/Kg in the sample, 9.0e+4 µg/Kg in the MS, and 8.7e+4 µg/Kg in the MSD. In addition, nonanal (CAS# 124-19-6) was detected in the MS with an estimated concentration of 3.9e+3 µg/Kg and in the MSD with an estimated concentration of 2.2e+3 µg/Kg. Tridecane (CAS# 629-50-5) was only detected in the MS with an estimated concentration of 1.0e+3 µg/Kg.

000011

No other compounds were reported as TICs from either the VOA or SVOA for the two samples.

5.8 TARGET QUANTITATION LIMITS

The laboratory was unable to meet all of the requested target quantitation limits due to necessary dilutions of the samples. These dilutions ensured analyte concentrations did not exceed calibration ranges and avoided contamination and carry-over problems. The laboratory used the largest feasible sample sizes.

6.0 ANALYTICAL PROCEDURES

Table 8 presents the 222-S Laboratory analytical procedures used to generate the reported results.

Table 8. Analytical Procedures.

Analysis	Preparation Procedure	Analysis Procedure
Inorganic Analyses		
pH	Direct	LA-212-105 Rev. D-0
Hg	Direct	LA-325-106 Rev. C-0
CN	Direct	LA-695-102 Rev. I-2
NH_4	Water Digest	LA-533-101 Rev. K-0
IC	Water Digest	LA-533-107 Rev. C-2
Sulfide	Direct	LA-361-101 Rev. A-0
Total U	Acid Digest	LA-925-009 Rev. D-5
ICP	Acid Digest	LA-505-161 Rev. D-1
ICP-MS	Acid Digest	LA-506-101 Rev. C-0
Radionuclide Analyses		
AT/TB	Environmental Digest	LA-508-101 Rev. I-1
GEA	Environmental Digest	LA-548-121 Rev. F-5
^{90}Sr	Environmental Digest	LA-220-101 Rev. F-0
^{237}Np	Environmental Digest	LA-933-141 Rev. H-7
^{238}Pu, $^{239/240}Pu$	Environmental Digest	LA-953-104 Rev. D-0
^{241}Am	Environmental Digest	LA-953-104 Rev. D-0
Organic Analyses		
VOA	Direct	LA-523-118 Rev. A-2
SVOA	Organic Extraction	LA-523-135 Rev. A-1
PCB	Organic Extraction	LA-523-140 Rev. B-0

Abbreviations:
Hg – mercury
CN – cyanide
NH_4 – ammonium
IC – ion chromatography
Total U – total uranium
ICP – inductively coupled plasma
ICP/MS – ICP/mass spectrometry
AT/TB – total alpha/total beta
GEA – gamma energy analysis
^{90}Sr – strontium-90
^{237}Np – neptunium-237
^{238}Pu – plutonium-238
$^{239/240}Pu$ – plutonium-239/240
^{241}Am – americium-241
VOA – volatile organic analysis
SVOA – semi-volatile organic analysis
PCB – polychlorinated biphenyls

Notes:
Acid digest procedure: LA-505-163 Rev. D-1
Water digest procedure: LA-504-101 Rev. I-0
Environmental acid digest procedure: LA-544-101 Rev. C-5
Organic extraction procedure: LA-523-138 Rev. C-2

006013

FH-Central Plateau Project	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST	F03-018-53	Page 1 of 1
Collector: Pope/Pfister/Hughes	Company Contact: Steve Trent — Telephone No.: 373-5869	Project Coordinator: TRENT, SJ	Price Code: 8N — Data Turnaround: 60 Days
Project Designation: 216-Z-9 Trench Characterization Borehole - Soil	Sampling Location: 216-Z-9/C3426 - Interval 25-25 ft — 43.5' - 46'	SAF No.: F03-018	Air Quality: [ ]
Ice Chest No.: VIKING 4HZV	Field Logbook No.: HNF-N-3361 — COA: 119152E820	Method of Shipment: Government Vehicle	
Shipped To: 222-S Lab Operations	Offsite Property No.: N/A	Bill of Lading/Air Bill No.: N/A	

PMG 10/20/03

POSSIBLE SAMPLE HAZARDS/REMARKS

RADIOACTIVE TIE TO: B17NM8

Hazard: Corrosive (Acidic)

Special Handling and/or Storage

SAMPLERS TO PUT 5 g soil into each vial with the encore sampler. Bottles are pre-labeled. Write the Hels number from the chain on each vial.

Preservation	Cool 4C	NONE	COOL 4C								
Type of Container	aGs*	P	aGs*								
No. of Container(s)	3	1	1								
Volume	40mL	500 mL	40 mL								
SAMPLE ANALYSIS	See item (1) in Special Instructions	SEE ITEM (2) IN SPECIAL INSTRUCTIONS	SEE ITEM (1)								

Sample No.	Matrix *	Sample Date	Sample Time										
B17N46	SOIL	10/20/03	1029	X	X	X							

CHAIN OF POSSESSION — Sign/Print Names

Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time
[illegible]	10/20/03 1430	MMA/change trailer	10/20/03 1430
Change trailer	10/22/03 1300	Site Fridge	10/22/03 1300
Site Fridge	10/27/03 1300	Greg Thomas/Greg Thomas	10/27/03 1300
Greg Thomas/Greg Thomas	10/27/03 1330	[illegible]	10/27/03 13:35

SPECIAL INSTRUCTIONS

** 222-S Laboratory will provide 40 mL VOA vials that have been pre-preserved with sodium bisulfate.

(1) VOA - 8260A - Complete; VOA - 8260A (Add-On) (Acetonitrile, Hexane, n-Butylbenzene)

Contact: Mark Duchsherer 373-7716

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
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

BH-EE-011 (03/01/2002)

FH-Central Plateau Project	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST	F03-018-54	Page 1 of 1
Collector: Pope/Tilster/Hughes	Company Contact: Steve Trent — Telephone No.: 373-5869	Project Coordinator: TRENT, SJ	Price Code: 8N — Data Turnaround: 60 Days
Project Designation: 216-Z-9 Trench Characterization Borehole - Soil	Sampling Location: 216-Z-9/C3426 - Interval ~~29-25~~ 43.5'-48'	SAF No.: F03-018	Air Quality ☐
Ice Chest No.: VIKING 4H2V	Field Logbook No.: IINF-N-3361 — COA: 119152ES10	Method of Shipment: Government Vehicle	
Shipped To: 222-S Lab Operations	Offsite Property No.: N/A	Bill of Lading/Air Bill No.: N/A	

POSSIBLE SAMPLE HAZARDS/REMARKS

RADIOACTIVE TIE TO: B17NM8

Special Handling and/or Storage 2X DOUBLE

SAMPLERS: Collect 25 g with the encore sampler. If the RAD <0.5 mrem/hr this sample can be taken to WSCF. Sample analysis must occur in 48 hours or preserve with methanol.

Preservation	Cool 4C										
Type of Container	G										
No. of Container(s)	1										
Volume	25g										
SAMPLE ANALYSIS	See item (1) in special Instructions.										

Sample No.	Matrix *	Sample Date	Sample Time										
~~B17N51~~ B17N46 PMG 10/30/03	SOIL	10-20-3	1029	X									

CHAIN OF POSSESSION — Sign/Print Names

Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time
JS Pope/ [illegible]	10/20/03 1430	RMA/chemo trailer	10/20/03 1470
RMA/chemo trailer	10/22/03 1300	Site Fridge	10/22/03 1300
Site Fridge	10/22/03 1300	Floor / Greg Thomas	1300
Greg Thomas / Greg Thomas	10/27/03 1330	Jackie Duty	10/27/03 1335

SPECIAL INSTRUCTIONS

(1) VOA - 8260A - Complete; VOA - 8260A (Add-On) (Acetonitrile, Hexane, n-Butylbenzene)

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
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

BHI-EE-011 (03/01/2002)

REQUEST FOR SAMPLE ANALYSIS (RSA)

Group ID No. (For lab use only)

1. Sample Origin	2. Date Sampled	4. Requestor's Name	6. CACN/COA	7. Cost Center
216-Z-9 Borehole		S J. PRENT		

Customer/Project Code	3. Submitted By	5. Requestor's Phone/MSIN/FAX
		528-1172 / A0-21 / 373-5869

8. Customer ID No.	9. Laboratory Sample No.	10. Volume of Sample	11. Matrix of Sample	12. Requested Analyses	13. Expected Rang
B17N46		~150mL	Soil	See COC	~10 DuCi Pu

14. Sample Disposition
- [x] Return to Customer
- [ ] Samples found to contain PCBs will be returned to the customer
- [ ] Dispose of per facility procedures with applied charges for analyses and disposal

Sample(s) Dose Rate at Contact

HPT Signature

15. QC Required
- [x] Per 222-S Laboratory Quality Assurance Plan (HNF-SD-CP-QAPP-016)
- [x] Other (list reference document or attach) See Analytical Instructions 216-Z-9 characterization

16. Special Instructions (Special Storage Requirements, Reporting format, holding times, etc.)
Bottles: 5 x 40 mL (Preserved; 5mL soil each)
1x25mL 1 x 40 mL
encore 1 x 500 mL (contains ~60mL soil)

17. Requested Turnaround Time
- [ ] 2 Weeks
- [ ] 4 Weeks
- [x] Other 60 days

18. Sample Received By:

Date Time

19. Chain of Custody
- [ ] No
- [ ] Yes

Number: 000022

A-6002-365 (03/02)

10/27/03 11:49 FAX 002

FLUOR Hanford Inc.	CENTRAL PLATEAU CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST	F03-018-069	Page 1 of 1
Collector: Pope/Pfister/Hughes	Company Contact: Steve Trent — Telephone No.: 373-5869	Project Coordinator: TRENT, SJ	Price Code: 8N — Data Turnaround: 45 Days
Project Designation: 216-Z-9 Trench Characterization Borehole - Soil	Sampling Location: 216-Z-9/C3426 - Interval	SAF No.: F03-018	Air Quality ☐
Ice Chest No.: VIAING 4#2V	Field Logbook No.: HNF-N-3361 — COA: 119152ES10	Method of Shipment: Government Vehicle	
Shipped To: MAB 10/31/03 ~~Waste Sampling & Characterization~~ 222-S	Offsite Property No.: ~~N/A~~ RSR 106973	Bill of Lading/Air Bill No.: N/A	

POSSIBLE SAMPLE HAZARDS/REMARKS
RADIOACTIVE TIE TO: B17WN4

Special Handling and/or Storage
SAMPLERS: Fill VOA vials with Zero head space.

Preservation	Cool 4C	Cool 4C	Cool 4C	~~Cool 4C~~	None	~~None~~					
Type of Container	aGs*	aG	aG	~~GP~~ aG	aG	P					
No. of Container(s)	3	1	1	~~1~~	1	1					
Volume	40mL	~~120mL~~ 60mL	~~120mL~~ 60mL	~~250mL~~ 120mL	~~120mL~~ 60mL	500mL					
SAMPLE ANALYSIS	See item (1) in Special Instructions.	See item (2) in Special Instructions.	PCBs - 8082	~~See item (3) in Special Instructions~~ MAB 10/31/03	See item (4) in Special Instructions	~~See item (5) in Special Instructions~~ MAB 10/31/03					

Sample No.	Matrix *	Sample Date	Sample Time										
B17TM6	SOIL	10/29/03	0856	X	X	X	X	X	X				
							MAB 10/31/03		MAB 10/31/03				

CHAIN OF POSSESSION — **Sign/Print Names**

Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time
JS Pate/GS Pfister	10/29/03 1400	Site fridge	10/29/03 1400
Site Fridge	10/31/03 0940	M.H. Daschner M.G. Daschner	10/31/03 0940
M.H. Daschner M.G. Daschner	10/31/03 1000	Teresa Dray	10/31/03 10:00

SPECIAL INSTRUCTIONS
The lab is to achieve a detection limit of 5 pCi/g & 10 pCi/g for gross alpha and beta, respectively.

(1) VOA - 8260A (TCL); VOA - 8260A (Add-On) {1-Butanol, Acetonitrile, cis-1,2-Dichloroethylene, Hexane, n-Butylbenzene, trans-1,2-Dichloroethylene}
(2) Semi-VOA - 8270A (TCL); Semi-VOA -- 8270A (Add-On) {1,2,4-Trimethylbenzene, Cyclohexanone, Tributyl phosphate}; TPH-Diesel Range - WTPH-D {Total petroleum hydrocarbons - diesel range, Total petroleum hydrocarbons - kerosene range}
(3) ICP Metals - 6010A (TAL); ICP Metals - 6010A (Add-on) {Arsenic, Beryllium, Bismuth, Lead, Lithium, Phosphorus, Selenium, Strontium}; ICP/MS - 200.8 (Add-on) {Mercury, Uranium}
(4) IC Anions - 300.0 {Chloride, Fluoride, Nitrogen in Nitrate, Nitrogen in Nitrite, Phosphate, Sulfate}; Cations (IC) - 300.7 {Nitrogen in ammonium}; Total Cyanide - 9010; pH (Soil) - 9045
(5) Gross Alpha; Gross Beta; Gamma Spectroscopy {Cesium-137, Cobalt-60, Europium-152, Europium-154, Europium-155}; Gamma Spec - Add-on {Antimony-125, Cesium-134}; Americium-241; Isotopic Plutonium; Isotopic Uranium; Neptunium-237

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
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

A-6003-616(03/03)

REQUEST FOR SAMPLE ANALYSIS (RSA)

Group ID No. (For lab use only)

1. Sample Origin	2. Date Sampled	4. Requestor's Name	6. CACN/COA	7. Cost Center
216-Z-9 Char. Borehole	10/29/2003	SJ Trent		

Customer/Project Code	3. Submitted By	5. Requestor's Phone/MSIN/FAX
		373-5869 A0-21

8. Customer ID No.	9. Laboratory Sample No.	10. Volume of Sample	11. Matrix of Sample	12. Requested Analyses	13. Expected Range
B17TM6		500 gm	soil	See Chain of Custody	200 uCi Pu

14. Sample Disposition
- [x] Return to Customer
- [ ] Samples found to contain IPCBs will be returned to the customer
- [ ] Dispose of per facility procedures with applied charges for analyses and disposal.

Sample(s) Dose Rate at Contact

HPT Signature

15. QC Required [x] Per 222-S Laboratory Quality Assurance Plan (HNF-SD-CP-QAPP-016)

[x] Other (list reference document or attach) 216-Z-9 Analytical Instructions

16. Special Instructions (Special Storage Requirements, Reporting format, holding times, etc.)

See 216-Z-9 Analytical Intstructions.

17. Requested Turnaround Time

[ ] 2 Weeks [ ] 4 Weeks

[x] Other: 60 days

18. Sample Received By:

Date Time

19. Chain of Custody 00002

[ ] No [x] Yes

Number:

A-6002-365 (03/02)

GENERATOR KNOWLEDGE INFORMATION

1. Chain of Custody Number _____ CACN/COA 118478ES20 Customer Identification Number _____

2. List generator knowledge or description of process that produced sample. Or list description of sample source:

216-Z-9 Trench DNAPL Investigation

MSDS Available? ◉ No ○ Yes Hanford MSDS No. _____

3. List all waste codes and constituents associated with the waste or media that was sampled, regardless of CERCLA status.

a) Does the sample contain any of the following listed waste codes?

By checking "unknown" the customer understands that no knowledge is available following a careful search.

	List Federal Waste Code(s):	List Constituent(s):			
P Codes:			○ Yes	◉ No	○ Unknown
U Codes:			○ Yes	◉ No	○ Unknown
K Codes:			○ Yes	◉ No	○ Unknown
F Codes:	F001	Carbon tetrachloride	◉ Yes	○ No	○ Unknown

b) List applicable characteristic waste codes, flash point, pH, constituents, and concentrations as appropriate.

D001:	☐ FP <100°F	☐ FP ≥100 <140°F	☐ DOT Oxidizer	○ Yes	◉ No	○ Unknown
D002:	☐ pH ≤2	☐ pH ≥12.5	☐ Solid Corrosive (WSC2)	○ Yes	◉ No	○ Unknown
D003:	☐ Cyanide	☐ Sulfide	☐ Water Reactive	☐ Other _____ (i.e., peroxide former, explosive, air reactive)	○ Yes	◉ No	○ Unknown
D004-D043 (identify applicable waste codes and concentrations):					○ Yes	◉ No	○ Unknown

c) If characteristic, list any known underlying hazardous constituents (UHCs) reasonably expected to be present, and their concentrations that may be present above the LDR treatment standard (40 CFR 268.48):

N/A

d) List any known Land Disposal Restrictions (LDR) subcategories, if applicable (40 CFR 268.40):

N/A

e) List any applicable Washington State dangerous waste codes: (not required if federally regulated)

WT01:	○ Yes	◉ No	○ Unknown
WT02:	○ Yes	◉ No	○ Unknown
W001:	○ Yes	◉ No	○ Unknown

List constituents and concentrations:

(*State mixture rule for ignitability)

WP01:	○ Yes	◉ No	○ Unknown
WP02:	○ Yes	◉ No	○ Unknown
WP03:	○ Yes	◉ No	○ Unknown
F003:*	○ Yes	◉ No	○ Unknown

4. Is this material TSCA regulated for PCBs? ○ Yes ◉ No ○ Unknown ○ Analysis Requested

List concentration if applicable: _____

If yes, what is the source of the PCBs? (see TSCA PCB Hanford Site User Guide, DOE/RL-2001-60)

☐ PCB Liquid Waste ☐ PCB Bulk Product Waste ☐ PCB Transformer ≥500 ppm ☐ Unknown
☐ PCB Remediation Waste ☐ PCB R&D Waste ☐ PCB contaminated electrical equipment (capacitor/ballast) <500 ppm
☐ PCB Spill Material ☐ PCB Item ☐ Other PCB Waste (list) _____

5. Is this material TRU? ○ Yes ○ No ◉ Unknown

000030

6. ACCURACY OF INFORMATION

Based on my inquiry of those individuals immediately responsible for obtaining this information, that to the best of my knowledge, the information entered in this document is true, accurate, and complete.

Print & Sign _____ Date 10/6/03

A-6002-990 (08/03)

?

Appendix 5

Data Validation Supporting Documentation

APPENDIX A

RADIOCHEMICAL DATA VALIDATION CHECKLIST

VALIDATION LEVEL:	A	B	C	D	E
PROJECT: 216-Z-9 Vertical Borehole			DATA PACKAGE: 222S20030383 and -0369		
VALIDATOR: JR Jewett		LAB: 222-S		DATE: 6/15/06	
			SDG:		
ANALYSES PERFORMED					
Gross Alpha/Beta	Strontium-90	Technetium-99	Alpha Spectrometry	Gamma Spectrometry	
Total Uranium	Radium-22	Tritium		Strontium-90	
SAMPLES/MATRIX					
B17N46 Soil					
B17TM6 Soil					

1. Completeness ..... ☐ N/A

Technical verification forms present? ..... (Yes) No N/A

Comments: Carrier recovery info was not in report, but was provided in e-mail from lab. See App. 6 of DVR.

2. Initial Calibration (Levels D, E) ..... ☑ N/A

Instruments/detectors calibrated? ..... Yes No N/A

Initial calibration acceptable? ..... Yes No N/A

Standards NIST traceable? ..... Yes No N/A

Standards Expired? ..... Yes No N/A

Calculation check acceptable? ..... Yes No N/A

Comments:

3. Continuing Calibration (Levels D, E) ..... ☒ N/A

Calibration checked within required frequency? ..... Yes No N/A

Calibration check acceptable? ..... Yes No N/A

Calibration check standards traceable? ..... Yes No N/A

Calibration check standards expired? ..... Yes No N/A

Calculation check acceptable? ..... Yes No N/A

Comments: _____

4. Background Counts (Levels D, E) ..... ☒ N/A

Background Counts checked within required frequency? ..... Yes No N/A

Background Counts acceptable? ..... Yes No N/A

Calculation check acceptable? ..... Yes No N/A

Comments: _____

5. Blanks (Levels B, C, D, E) ..... ☐ N/A

Method blank analyzed within required frequency? ..... 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? (Levels D, E) ..... Yes No N/A
Comments: _____

6. Laboratory Control Samples or Blank Spike Samples (Levels C, D, E) ..... ☐ N/A

LCS /BSS analyzed within required frequency? ..... Yes No N/A
LCS/BSS recoveries acceptable? ..... Yes No N/A
LCS/BSS traceable? (Levels D,E) ..... Yes No N/A
LCS/BSS expired? (Levels D,E) ..... Yes No N/A
LCS/BSS levels correct? (Levels D,E) ..... Yes No N/A
Transcription/Calculation Errors? (Levels D, E) ..... Yes No N/A
Comments: _____

7. Chemical Carrier Recovery (Levels C, D, E) ..... ☐ N/A

Chemical carrier added? ..... Yes No N/A
Chemical recovery acceptable? ..... Yes No N/A
Chemical carrier traceable? (Levels D, E) ..... Yes No N/A

A-3

Chemical carrier expired? (Levels D, E) ..... Yes No N/A

Transcription/Calculation errors? (Levels D, E) ..... Yes No N/A

Comments: _____

8. Tracer Recovery (Levels C, D, E) ..... ☒ N/A

Tracer added? ..... Yes No N/A

Tracer recovery acceptable? ..... Yes No N/A

Tracer traceable? (Levels D, E) ..... Yes No N/A

Tracer expired? (Levels D, E) ..... Yes No N/A

Transcription/Calculation errors? (Levels D, E) ..... Yes No N/A

Comments: ST Not used in Sr-90 method
JB 6/1/06

9. Matrix Spikes (Levels C, D, E) ..... ☐ N/A

Matrix spike analyzed? ..... Yes No N/A

Spike recoveries acceptable? ..... Yes No N/A

Spike source traceable? (Levels D, E) ..... Yes No N/A

Spike source expired? Levels D, E) ..... Yes No N/A

Transcription/Calculation Errors? (Levels D, E) ..... Yes No N/A

Comments: _____

A-4

10. Duplicates (Levels C, D, E) ..... ☐ N/A

Duplicates Analyzed at required frequency? ..... Yes No N/A

RPD Values Acceptable? ..... Yes No N/A

Transcription/Calculation Errors? (Levels D, E) ..... Yes No N/A

Comments:

~~RPD for B7TTM6 was 52%.~~

~~Results > ≥ 5X RDL Flagged "J"~~

6/21/06

11. Field QC Samples (Levels C, D E) ..... ~~X~~ N/A

8/7/06

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

8/7/06

Field split RPD values acceptable? ..... Yes No N/A

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

8/7/06

Performance audit sample results acceptable? ..... Yes No N/A

Comments:

12. Holding Times (All levels)

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

Comments:

A-5

13. Results and Detection Limits (All Levels) ☐ N/A

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

Results supported in raw data?(Levels D, E) Yes No N/A

Results Acceptable? (Levels D, E) Yes No N/A

Transcription/Calculation errors? (Levels D, E) Yes No N/A

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

Transcription/calculation errors? (Levels D, E) Yes No N/A

Comments:

A-6

Comments:

?

Appendix 6

Additional Documentation Requested
(e-mail from lab re carrier recoveries)

?

From: Bushaw, Ruth A
Sent: Monday, June 19, 2006 6:50 AM
To: Trent, Stephen J
Subject: RE: Tracer Recoveries.
Importance: High

Steve,

The Sr-90 analysis uses a carrier, not a tracer. The carrier recoveries for the Sr-90 analysis for these samples are listed below.

SDG 222S20030369
B17N46
S03M000528
Sr-90 tracer recovery = 81.6%

SDG 222S20030383
B17TM6
S03M000540
Sr-90 tracer recovery = 84.2%

Please let me know if there is any other information that you need.
Thanks,

Ruth A. Bushaw
Project Coordinator
222-S Laboratory
373-4314

From: Trent, Stephen J
Sent: Thursday, June 15, 2006 2:31 PM
To: Bushaw, Ruth A
Subject: Tracer Recoveries.

Ruth,

Need tracer recoveries for Sr-90 in SDG 222S20030369... samples B17TM6 and B17N46....
Email response is fine.

Steve Trent
Sample Management Project Coordinator
Fluor Hanford - Groundwater Remediation Project
Ph: (509) 373-5869
Cell: (509) 947-9354
EFax: (866) 252-5816
Site Pager: 85-7344