

0072031

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): 222S20030369, 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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Requested Validation Start Date: 7/10/2006

Requested Validation Completion Date: 7/31/2006

**Project Hartford Management System
COMMENT RESOLUTION SHEET**

Sheet 1 of 21
JAS 8/17/06

Document Number: SDG H2450-222520030369 and Revision Number N/A Date: Aug 3, 2006

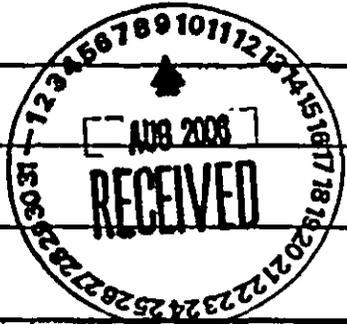
Document Title: 8/17/06 222520030383

Data Validation for Strontium-90 Analysis 222520030369 & 222520030383

<p>Reviewer: Bill Thackaberry Reviewers, if other than original:</p>	<p>Project/Organization: EH/GRP/OA</p> <p>Responsible Manager: Dana Farwick</p>
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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	<i>Rejected. Requested table is not required by data validation procedure. JAS 8/17/06</i>
	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)	<i>Accepted. JAS 8/17/06</i>
			<i>* All info in requested table is already in appendices 2 and 3 of the data validation report as written</i>		<i>JAS 8/17/06</i>



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 data are unusable.
- UR - Indicates the compound or analyte was analyzed for and not detected in the sample. Additionally, the data is unusable due to an identified major QC deficiency.

Appendix 2
Summary of Data Qualification

DATA QUALIFICATION SUMMARY

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

Appendix 3
Annotated Laboratory Reports

29 TRENCH
Data Summary Report

CORE NUMBER: 222620030369
SEGMENT #: 817946

SEGMENT PORTION: Acid Digest

Sampled	R AD	Analyte	Unit	Standard X	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Count Err%
S03W000527	A	Silver -ICP-Acid Digest	ug/g	99.9	<5.40e-03	<1.11	<1.06	n/a	n/a	n/a	1.1	n/a
S03W000527	A	Asgenic -ICP-Acid Digest	ug/g	117	<0.0514	11.0	<9.94	n/a	n/a	n/a	10	n/a
S03W000527	A	Barium -ICP-Acid Digest	ug/g	96.3	<0.0210	93.2	88.6	85.9	82.7	71.8	4.3	n/a
S03W000527	A	Beryllium -ICP-Acid Digest	ug/g	102	<1.35e-03	<0.270	<0.250	n/a	n/a	n/a	0.27	n/a
S03W000527	A	Bismuth -ICP-Acid Digest	ug/g	93.8	<0.0516	<10.4	<9.97	n/a	n/a	n/a	10	n/a
S03W000527	A	Cadmium -ICP-Acid Digest	ug/g	94.4	<2.12e-03	3.50	1.60	1.55	74.3	74.8	0.43	n/a
S03W000527	A	Chromium -ICP-Acid Digest	ug/g	97.2	<5.19e-03	16.0	15.2	14.8	15.7	76.9	1.0	n/a
S03W000527	A	Copper -ICP-Acid Digest	ug/g	97.4	<0.0122	16.8	15.0	15.8	16.4	77.3	2.5	n/a
S03W000527	A	Lithium -ICP-Acid Digest	ug/g	98.1	<1.79e-03	8.26	6.43	6.44	4.37	79.3	0.36	n/a
S03W000527	A	Manganese -ICP-Acid Digest	ug/g	94.2	<1.07e-03	157	164	160	4.57	79.4	0.32	n/a
S03W000527	A	Nickel -ICP-Acid Digest	ug/g	95.6	<0.0190	9.11	7.92	8.51	13.9	75.3	2.2	n/a
S03W000527	A	Phosphorus -ICP-Acid Digest	ug/g	94.9	<0.0190	464	594	529	24.6	82.1	4.0	n/a
S03W000527	A	Lead -ICP-Acid Digest	ug/g	94.3	<0.0235	8.21	5.79	6.90	32.3	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	n/a	4.3	n/a
S03W000527	A	Selenium -ICP-Acid Digest	ug/g	97.1	<0.0518	<10.5	<10.0	n/a	n/a	n/a	10	n/a
S03W000527	A	Strontium -ICP-Acid Digest	ug/g	98.0	<1.07e-03	11.7	12.7	12.2	7.78	78.1	0.22	n/a
S03W000527	A	Zinc -ICP-Acid Digest	ug/g	95.1	<2.14e-03	48.8	35.2	42.0	32.3	73.3	0.43	n/a

SEGMENT PORTION: Environmental Acid

Sampled	R AD	Analyte	Unit	Standard X	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Count Err%
S03W000528	E	Uranium by Phosphorometry	ug/g	104	<1.14e-04	0.897	0.745	0.821	2.41	n/a	0.847	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	93.2	<1.74e-03	0.446	0.439	0.449	16.9	n/a	4.4e-03	2.1
S03W000528	E	Pu-238 by TRU-SPEC Resin IonEx	uCi/g	n/a	<0.96e-03	<0.0106	<0.0103	n/a	n/a	n/a	0.011	3.1
S03W000528	E	Pp-237 by IIA Extraction	uCi/g	82.3	<2.03e-04	<3.04e-04	<3.96e-04	n/a	n/a	n/a	6.2e-04	1.8e-02
S03W000528	E	Thorium-232 by ICP/MS	ug/g	105	0.0261	2.94	3.41	3.18	14.6	99.0	1.7e-04	n/a
S03W000528	E	Uranium-235 by ICP/MS Acid Dig	ug/g	n/a	<1.80e-03	9.58e-03	1.10e-04	1.03e-04	13.8	n/a	2.6e-05	n/a
S03W000528	E	Uranium-234 by ICP/MS Acid Dig	ug/g	n/a	<6.00e-04	1.99e-04	1.56e-04	1.73e-04	19.5	n/a	7.5e-06	n/a
S03W000528	E	Uranium-235 by ICP/MS Acid Dig	ug/g	104	<2.20e-03	0.0104	8.91e-03	7.87e-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 SEA	uCi/g	104	<2.64e-04	<2.48e-04	<2.69e-04	n/a	n/a	n/a	2.6e-04	n/a
S03W000528	E	Antimony-125 by SEA	uCi/g	n/a	<5.80e-04	<3.91e-04	<3.19e-04	n/a	n/a	n/a	2.9e-04	n/a
S03W000528	E	Cesium-134 by SEA	uCi/g	n/a	<1.90e-04	<2.33e-04	<1.97e-04	n/a	n/a	n/a	2.2e-04	n/a
S03W000528	E	Cesium-137 by SEA	uCi/g	111	<3.84e-04	<3.94e-04	<3.83e-04	n/a	n/a	n/a	3.9e-04	n/a
S03W000528	E	Europium-152 by SEA	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 SEA	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 SEA	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	0.8979	0.108	15.2	n/a	0.013	2.1
S03W000528	E	Alpha of digested solid	uCi/g	95.4	<3.03e-04	0.148	0.125	0.136	16.8	95.0	1.2e-03	5.0
S03W000528	E	Beta of solid sample	uCi/g	105	<2.33e-03	0.0272	0.0191	0.0232	35.0	104	3.5e-03	1.9

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29 TRAENCS
Data Summary Report

CORE NUMBER: 222620090383
SEGMENT #: 017796

SEGMENT PORTION: Acid Digest

Sample#	R AS	Analyte	Unit	Standard X	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Count ErrX
S03W00559	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
S03W00559	A	Arsenic - ICP-Acid Digest	ug/g	113	<0.0514	<10.3	<10.3	n/a	n/a	113	10	n/a
S03W00559	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
S03W00559	A	Beryllium - ICP-Acid Digest	ug/g	103	<1.55e-03	0.293	<0.368	n/a	n/a	101	0.27	n/a
S03W00559	A	Bismuth - ICP-Acid Digest	ug/g	95.1	<0.0514	<10.4	10.8	n/a	n/a	93.2	10	n/a
S03W00559	A	Cadmium - ICP-Acid Digest	ug/g	93.8	<0.12e-03	1.79	1.43	1.62	20.6	90.8	0.42	n/a
S03W00559	A	Chromium - ICP-Acid Digest	ug/g	96.9	<0.19e-03	22.3	22.1	22.3	1.68	94.1	1.0	n/a
S03W00559	A	Copper - ICP-Acid Digest	ug/g	97.1	<0.0122	9.95	10.9	10.4	9.32	96.6	2.5	n/a
S03W00559	A	Lithium - ICP-Acid Digest	ug/g	98.8	<1.28e-03	10.6	9.80	10.2	7.94	97.2	0.16	n/a
S03W00559	A	Manganese - ICP-Acid Digest	ug/g	94.2	<1.07e-03	190	181	185	5.27	100	0.22	n/a
S03W00559	A	Nickel - ICP-Acid Digest	ug/g	95.2	<0.0110	20.2	18.2	19.2	10.3	92.8	2.2	n/a
S03W00559	A	Phosphorus - ICP-Acid Digest	ug/g	95.3	<0.0196	595	699	647	16.1	91.3	4.0	n/a
S03W00559	A	Lead - ICP-Acid Digest	ug/g	94.4	0.0257	6.38	<4.71	n/a	n/a	90.8	4.7	n/a
S03W00559	A	Antimony - ICP-Acid Digest	ug/g	96.7	0.0262	6.63	<4.27	n/a	n/a	82.3	4.3	n/a
S03W00559	A	Selenium - ICP-Acid Digest	ug/g	97.7	<0.0518	<10.4	<10.4	n/a	n/a	95.1	10	n/a
S03W00559	K	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
S03W00559	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 AS	Analyte	Unit	Standard X	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Count ErrX
S03W00540	E	Uranium by Phosphorescence	ug/g	104	<4.14e-04	2.04	1.07	1.04	21.1	99.9	0.041	n/a
S03W00540	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
S03W00540	E	Pu-239/240 by TRU-SPEC Resin	uCi/g	94.4	<7.86e-03	0.115	0.0097	0.102	24.7	n/a	0.014	2.7
S03W00540	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	1.6e+02
S03W00540	E	Pu-237 by ITA 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
S03W00540	E	Thorium-232 by ICP/MS	ug/g	183	0.0497	3.00	2.06	2.53	37.2	99.2	5.3e-04	n/a
S03W00540	E	Uranium-235 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
S03W00540	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
S03W00540	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
S03W00540	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
S03W00540	E	Cobalt-60 by GEA	uCi/g	101	<2.99e-04	<1.05e-04	<3.45e-04	n/a	n/a	n/a	3.8e-04	n/a
S03W00540	E	Antimony-125 by GEA	uCi/g	n/a	<8.08e-04	<7.92e-04	<8.75e-04	n/a	n/a	n/a	7.9e-04	n/a
S03W00540	E	Cesium-134 by GEA	uCi/g	n/a	<2.92e-04	<2.70e-04	<2.87e-04	n/a	n/a	n/a	3.8e-04	n/a
S03W00540	E	Cesium-137 by GEA	uCi/g	103	<7.53e-04	<7.66e-04	<7.64e-04	n/a	n/a	n/a	7.7e-04	n/a
S03W00540	E	Europium-152 by GEA	uCi/g	n/a	<6.28e-04	<7.01e-04	<6.49e-04	n/a	n/a	n/a	7.0e-04	n/a
S03W00540	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
S03W00540	E	Europium-153 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
S03W00540	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	3.1
S03W00540	E	Alpha of digested solid	uCi/g	87.0	<6.74e-04	0.145	0.127	0.136	13.8	85.5	1.6e-03	5.6
S03W00540	E	Beta of Solid Sample	uCi/g	104	<2.38e-03	0.0108	6.87e-03	8.84e-03	24.5	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 coarse sand, "pea" gravel and pebbles.

The samples were stirred with a spanula 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 $\mu\text{g/mL}$, rather than $\mu\text{g/g}$ 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) \pm 20% for radionuclides and \pm 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 re-preparation 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 ($^{239/240}\text{Pu}$), 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 re-preparation 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 ($\mu\text{g}/\text{Kg}$)	MS ($\mu\text{g}/\text{Kg}$)	MSD ($\mu\text{g}/\text{Kg}$)	%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, $^{239/240}\text{Pu}$, ^{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

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 $1.38\text{e}+3$ $\mu\text{g}/\text{Kg}$. Diethylphthalate (CAS number 84-66-2) was detected with a concentration of $4.31\text{e}+3$ $\mu\text{g}/\text{Kg}$. Both of these results should be considered estimates because they were not greater than 10 times the detection limit of 960 $\mu\text{g}/\text{Kg}$.

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 $3.0\text{e}+3$ $\mu\text{g}/\text{Kg}$ in the MS and $5.5\text{e}+3$ $\mu\text{g}/\text{Kg}$ 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 $4.0\text{e}+3$ $\mu\text{g}/\text{Kg}$ in the sample, $4.2\text{e}+3$ $\mu\text{g}/\text{Kg}$ in the MS and $4.1\text{e}+3$ $\mu\text{g}/\text{Kg}$ in the MSD. Estimated concentrations of hexachloroethane (CAS# 67-72-1) were $8.5\text{e}+4$ $\mu\text{g}/\text{Kg}$ in the sample, $9.0\text{e}+4$ $\mu\text{g}/\text{Kg}$ in the MS, and $8.7\text{e}+4$ $\mu\text{g}/\text{Kg}$ in the MSD. In addition, nonanal (CAS# 124-19-6) was detected in the MS with an estimated concentration of $3.9\text{e}+3$ $\mu\text{g}/\text{Kg}$ and in the MSD with an estimated concentration of $2.2\text{e}+3$ $\mu\text{g}/\text{Kg}$. Tridecane (CAS# 629-50-5) was only detected in the MS with an estimated concentration of $1.0\text{e}+3$ $\mu\text{g}/\text{Kg}$.

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-212-103 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

NH₄ - 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

⁹⁰Sr - strontium-90

²³⁷Np - neptunium-237

²³⁸Pu - plutonium-238

^{239/240}Pu - plutonium-239/240

²⁴¹Am - 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

FH-Central Plateau Project		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST				F03-018-S3	Page 1 of 1
Collector Pope/Pinner/Lughes	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-9C3426 - Interval 25-25 7- 43.5' - 46'	SAF No. F03-018	Air Quality <input type="checkbox"/>				
Ice Chest No. VIKING 4112V	Field Logbook No. 11NF-N-3361	CUA 119152ES20	Method of Shipment Government Vehicle				
Shipped To 222-S Lab Operations	ODM's Property No. N/A	Bill of Lading/Air Bill No. N/A					
POSSIBLE SAMPLE HAZARDS/REMARKS RADIOACTIVE TAG 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 file number from the chain on each vial.	Preservation	Label	None	COOL YC			
	Type of Container	Material	P	AGS*			
	No. of Container(s)	Size	1	1			
	Volume	Amount	500 ML	40 ML			
SAMPLE ANALYSIS	See item (1) in Special Instructions	See item (2) in Special Instructions	SEE ITEM (2) IN SPECIAL INSTRUCTIONS				
	Sample No.	Matrix *	Sample Date	Sample Time			
B17N46	SOIL	10/20/03	1029	X	X	X	
CHAIN OF POSSESSION			Sign/Print Names		SPECIAL INSTRUCTIONS		
Relinquished By/Removed From T. Pope	Date/Time 10/20/03 1430	Received By/Stored In ARR/CHANGE	Date/Time 10/20/03 1430	** 222-S Laboratory will provide 41 mL VOA vials that have been pre-preserved with sodium bisulfite. (1) VOA - E260A - Complete; VOA - E260A (Add On) (Acetonitrile, Hexane, n-Butylacetone)		Matrix * S-Sol SL-Solvent SO-Sol SL-Sol W-Water O-Oil A-Air D-Dry Bulk DL-Dry Liquid T-Tissue L-Liquid V-Vapor S-Solid	
Relinquished By/Removed From CHANGE TRADE	Date/Time 10/22/03 1300	Received By/Stored In SITE FRIDGE	Date/Time 10/22/03 1300	Contact: Mark Duesthener 373-7716			
Relinquished By/Removed From Sik Fridge	Date/Time 10/27/03	Received By/Stored In Greg Thomas/Chris Thomas	Date/Time 10/27/03				
Relinquished By/Removed From Greg Thomas/Chris Thomas	Date/Time 10/27/03	Received By/Stored In Zakaria Dey #4	Date/Time 10/27/03				
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time				
LABORATORY SECTION	Received By	Title			Date/Time		
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By			Date/Time		

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

FII-Central Plateau Project		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST				F03-018-54	Page 1 of 1
Collector Popo/T/Strat/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 Boreholes - Soil	Sampling Location 216-Z-9C3426 - Interval 29'-25" to 43.5' - 48'	Field Logbook No. IRF-N-3361	COA 119152ES10	Method of Shipment Government Vehicle	SAF No. F03-018	Air Quality <input type="checkbox"/>	
Ice Chest No. VIKING 4H2V	Shipped To 222-S Lab Operations	Office Property No. N/A	Bill of Lading/Air Bill No. N/A				
POSSIBLE SAMPLE HAZARDS/REMARKS RADIOACTIVE TIE TO: B17N48		Preservation -20°C					
Special Handling and/or Storage SAMPLERS: Collect 25 g with the encore sampler. If the T040-05 memorandum this sample can be taken to WSCF. Sample analysis must occur in 48 hours or preserve with methanol.		Type of Container 2X ONLY	No. of Container(s) 1	Volume 25g			
SAMPLE ANALYSIS		See item (1) in Special Instructions					
Sample No.	Matrix *	Sample Date	Sample Time				
B17N41 B17N46 MC 10/2/03	SOIL	10-20-03	1029	X			
CHAIN OF POSSESSION		Sign/Print Names		SPECIAL INSTRUCTIONS			Matrix *
Relinquished By/Retrieved From SS Adel 4/24	Date/Time 10/20/03 1430	Received By/Stored In Carter	Date/Time 10/20/03 1421	(1) VOA - 8260A - Complete; VOA - 8260A (Add-On) [Acetonitrile, Hexane, n-Butylbenzene]			1-Soil 20-Sediment 30-Sludge 40-Water 50-Gas 60-Other 70-From Solid 80-From Liquid 90-From 1-Asphalt 2-Asphalt 3-Other
Relinquished By/Retrieved From Carter	Date/Time 10/20/03 1300	Received By/Stored In St. George	Date/Time 10/20/03 1300				
Relinquished By/Retrieved From St. George	Date/Time 10/27/03 1300	Received By/Stored In Greg Thomas/Doug Thomas	Date/Time 10/27/03 1335				
Relinquished By/Retrieved From Greg Thomas/Doug Thomas	Date/Time 10/27/03	Received By/Stored In Sealco/Dig by	Date/Time 10/27/03				
Relinquished By/Retrieved From	Date/Time	Received By/Stored In	Date/Time				
LABORATORY SECTION	Received By	Title		Date/Time			
FINAL SAMPLE DISPOSITION	Disposed Method 012026	Disposed By		Date/Time			

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

FLUOR Hanford Inc.		CENTRAL PLATEAU CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST				F03-018-069		Page 1 of 1					
Collector Pop/P/Physical/Highes		Company Contact Steve Trent		Telephone No. 373-5869		Project Coordinator TRENT, SJ		Price Code 8N					
Project Designation 216-Z-9 Tranch Characterization Horehole - Soil		Sampling Location 216-Z-9C3426 - Interval		SAF No. F03-018		Air Quality <input type="checkbox"/>		Data Turnaround 45 Days					
Ice Chest No. VH116-442V		Field Logbook No. IDF-N-3361		COA 119152ES10		Method of Shipment Government Vehicle							
Shipped To <i>MAB 10/21/03</i> <i>Waste Sampling & Characterization 222-5</i>		Office Property No. JUA		<i>RSR 106973</i>		Bill of Lading/Air Bill No. N/A							
POSSIBLE SAMPLE HAZARDS/REMARKS <i>RADIOACTIVE DETO: B77UN4</i>				Preservation	Cool AC	Cool AC	Cool AC	Cool AC	None	None			
Special Handling and/or Storage <i>SAMPLERS: FBI YOA vials with Zero head space.</i>				Type of Container	aG*	aG	aG	aG	aG	P			
				No. of Container(s)	3	1	1	1	1	1	1	1	
				Volume	40mL	100mL	100mL	100mL	250mL	200mL	200mL	200mL	200mL
				See Item (1) in Special Instructions.	See Item (2) in Special Instructions.	PCN-902	See Item (3) in Special Instructions.	See Item (4) in Special Instructions.	See Item (5) in Special Instructions.				
SAMPLE ANALYSIS													
Sample No.	Matrix *	Sample Date	Sample Time										
B17TMB	SOIL	10/29/03	0856	X	X	X	X	X	X	X			

GENERATOR KNOWLEDGE INFORMATION

1. Chain of Custody Number CACHCOA 118478820 Customer Identification Number _____
 2. List generator knowledge or description of process that produced sample. Or list description of sample source:
216-2-9 Trench DMAPL Investigation

MSDS Available? No Yes Hazard MSDS No. _____

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

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

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

List Federal Waste Code(s):

List Constituent(s):

P Code:	_____	<input type="radio"/> Yes	<input checked="" type="radio"/> No	<input type="radio"/> Unknown
U Code:	_____	<input type="radio"/> Yes	<input checked="" type="radio"/> No	<input type="radio"/> Unknown
K Code:	_____	<input type="radio"/> Yes	<input checked="" type="radio"/> No	<input type="radio"/> Unknown
F Code:	<u>P001</u>	<input checked="" type="radio"/> Yes	<input type="radio"/> No	<input type="radio"/> 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

D002: pH ≤5 pH ≥12.5 Solid Corrosive (WSC2)

D003: Cyanide Sulfide Water Reactive Other _____
(i.e., peroxide former, explosive, air reactive)

D004-D043 (Identify applicable waste codes and concentrations):

_____	<input type="radio"/> Yes	<input checked="" type="radio"/> No	<input type="radio"/> Unknown
_____	<input type="radio"/> Yes	<input checked="" type="radio"/> No	<input type="radio"/> Unknown
_____	<input type="radio"/> Yes	<input checked="" type="radio"/> No	<input type="radio"/> Unknown
_____	<input type="radio"/> Yes	<input checked="" type="radio"/> No	<input type="radio"/> Unknown
_____	<input type="radio"/> Yes	<input checked="" type="radio"/> No	<input type="radio"/> Unknown
_____	<input type="radio"/> Yes	<input checked="" type="radio"/> No	<input type="radio"/> Unknown

c) If discarded, 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 268.40):

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)

W701: Yes No Unknown

W702: Yes No Unknown

W703: Yes No Unknown

List constituents and concentrations:

(*State mixture rule for ignitability)

W701: Yes No Unknown

W702: Yes No Unknown

W703: Yes No Unknown

W704: 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 PCB? (see TSCA PCB Handler Site User Guide, D0876L-2001-60)

PCB Liquid Waste PCB Bulk Product Waste PCB Transformer ≥200 ppm Unknown

PCB Remediation Waste PCB R&D Waste PCB contaminated electrical equipment (capacitor/wirelist) <500 ppm

PCB Soil Material PCB Item Other PCB Waste (list) _____

5. Is this material TRU? Yes No Unknown

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 S. Sign



Date

10/6/03

00:00:00

Appendix 5

Data Validation Supporting Documentation

APPENDIX A

RADIOCHEMICAL DATA VALIDATION CHECKLIST

VALIDATION LEVEL:	A	B	<u>C</u>	D	E
PROJECT:	216-3-9 Vertical Borehole		DATA PACKAGE: 222S20030383 am -0369		
VALIDATOR:	JR Jewett		LAB: 222-S	DATE: 6/15/06	
SDQ:					
ANALYSES PERFORMED					
Gamma Spectroscopy	Alpha Spectroscopy	Thin Layer Chromatography	Alpha Spectrometry	Gamma Spectrometry	Strontium - 90
Total Uranium	Radon-222	Lead-210			
SAMPLES/MATRIX					
B17 N46		Soil			
B17 T16		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: _____

HNF-20434 REV 0

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

HNF-20434 REV 0

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: Not used in Sr-90 method
JCL/dec

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 BITTME was 52%.~~
~~Results > ESA 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: _____

**Project Hanford Management System
COMMENT RESOLUTION SHEET**

Sheet 1 of 21

JTS 8/13/06

Document Number: ~~SDG 2225~~ 222520030369 and Revision Number N/A Date: Aug 3, 2006

Document Title: 222520030383 *JTS 8/13/06*

Data Validation for Strontium-90 Analysis 222520030369 & 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
	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	Accepted, although table is not required by the data validation procedure. <i>JTS 8/13/06</i>
<i>JTS 8/13/06</i>	33 pgs X Sec II	This section should not be N/A	it applies to level C	complete the individual lines (no and N/A answers)	Accepted. <i>JTS 8/13/06</i>

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 data are unusable.
- UR - Indicates the compound or analyte was analyzed for and not detected in the sample. Additionally, the data is unusable due to an identified major QC deficiency.

Appendix 2

Summary of Data Qualification

DATA QUALIFICATION SUMMARY

SDG: 222S20030369 and 222S20030383	REVIEWER: JRJ	DATE: 6/15/06	PAGE 1 OF 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 TRENCH
Data Summary Report

CORE NUMBER: 222520030369
SEGMENT #: 81746

SEGMENT PORTION: Acid Digest

Sample#	RA#	Analyte	Unit	Standard %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Count	Err%
S03H000527	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	n/a
S03H000527	A	Arsenic -ICP-Acid Digest	ug/g	117	<0.0514	11.0	<9.94	n/a	n/a	92.0	10	n/a	n/a
S03H000527	A	Barium -ICP-Acid Digest	ug/g	96.3	<0.0210	93.2	36.6	65.9	82.7	71.6	4.2	n/a	n/a
S03H000527	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	n/a
S03H000527	A	Bismuth -ICP-Acid Digest	ug/g	93.8	<0.0516	<10.4	<9.97	n/a	n/a	78.3	10	n/a	n/a
S03H000527	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	n/a
S03H000527	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	n/a
S03H000527	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	n/a
S03H000527	A	Lithium -ICP-Acid Digest	ug/g	98.1	<1.79e-03	0.26	0.63	0.44	4.57	79.5	0.36	n/a	n/a
S03H000527	A	Manganese -ICP-Acid Digest	ug/g	94.2	<1.07e-03	157	164	160	4.57	79.4	0.22	n/a	n/a
S03H000527	A	Nickel -ICP-Acid Digest	ug/g	95.6	<0.0140	9.11	7.92	8.51	13.9	75.3	2.2	n/a	n/a
S03H000527	A	Phosphorus -ICP-Acid Digest	ug/g	94.6	<0.0196	464	594	529	24.6	82.1	4.0	n/a	n/a
S03H000527	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	n/a
S03H000527	A	Antimony -ICP-Acid Digest	ug/g	94.8	<0.0212	<4.29	<4.30	n/a	n/a	67.5	4.3	n/a	n/a
S03H000527	A	Selenium -ICP-Acid Digest	ug/g	97.1	<0.0518	<10.5	<10.0	n/a	n/a	78.6	10	n/a	n/a
S03H000527	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	n/a
S03H000527	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	n/a

SEGMENT PORTION: Environmental Acid

Sample#	RA#	Analyte	Unit	Standard %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Count	Err%
S03H000528	E	Uranium by Phosphorescence	ug/g	104	<0.14e-04	0.697	0.942	0.921	5.41	n/a	0.041	n/a	n/a
S03H000528	E	Strontium-89/90 High Level	uCi/g	98.8	<1.05e-03	<7.86e-06	<9.44e-06	n/a	n/a	n/a	1.4e-03	8.4e+02	n/a
S03H000528	E	Pu-239/240 by TRU-SPEC Resin	uCi/g	93.9	<0.74e-03	0.8446	0.6592	0.6419	12.9	n/a	0.4e-03	3.1	n/a
S03H000528	E	Pu-238 by TRU-SPEC Resin IonEx	uCi/g	n/a	<0.96e-03	<0.0106	<0.0103	n/a	n/a	n/a	0.011	31	n/a
S03H000528	E	Np237 by IIA 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	n/a
S03H000528	E	Th232 by ICP/MS	ug/g	105	0.0261	2.94	3.41	3.18	14.6	99.0	3.7e-04	n/a	n/a
S03H000528	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	n/a
S03H000528	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	n/a
S03H000528	E	Uranium-235 by ICP/MS Acid Dig	ug/g	104	<2.20e-03	0.0104	8.91e-03	7.87e-03	15.6	112	3.4e-05	n/a	n/a
S03H000528	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	n/a
S03H000528	E	Cobalt-60 by GEA	uCi/g	104	<2.64e-04	<2.60e-04	<2.69e-04	n/a	n/a	n/a	2.6e-04	n/a	n/a
S03H000528	E	Antimony-125 by GEA	uCi/g	n/a	<5.00e-04	<5.91e-04	<6.19e-04	n/a	n/a	n/a	5.9e-04	n/a	n/a
S03H000528	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	n/a
S03H000528	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	n/a
S03H000528	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	n/a
S03H000528	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	n/a
S03H000528	E	Europium-155 by GEA	uCi/g	n/a	<2.84e-04	<2.80e-04	<2.66e-04	n/a	n/a	n/a	2.8e-04	n/a	n/a
S03H000528	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	n/a
S03H000528	E	Alpha of Digested Solid	uCi/g	95.4	<5.03e-04	0.148	0.123	0.136	16.8	95.0	1.2e-03	5.0	n/a
S03H000528	E	Beta of Solid Sample	uCi/g	105	<2.33e-03	0.0272	0.0191	0.0232	35.0	104	3.5e-03	13	n/a

11

OK
8/1/06

00000015
05/17/05

Z9 TRENCH
Data Summary Report

CORE NUMBER: 222520030383
SEGMENT #: 817116

SEGMENT PORTION: Acid Digest

Sample#	R#	Analyte	Unit	Standard %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Count	ErrK
803H000559	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	n/a
803H000559	A	Arsenic -ICP-Acid Digest	ug/g	115	<0.0514	<10.3	<10.3	n/a	n/a	113	10	n/a	n/a
803H000559	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	n/a
803H000559	A	Beryllium -ICP-Acid Digest	ug/g	103	<1.33e-03	0.293	<0.268	n/a	n/a	101	0.27	n/a	n/a
803H000559	A	Bismuth -ICP-Acid Digest	ug/g	95.1	<0.0516	<10.4	10.8	n/a	n/a	93.2	10	n/a	n/a
803H000559	A	Cadmium -ICP-Acid Digest	ug/g	93.8	<2.12e-03	1.79	1.45	1.62	20.6	99.8	0.42	n/a	n/a
803H000559	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	n/a
803H000559	A	Copper -ICP-Acid Digest	ug/g	97.3	<0.0122	7.95	10.9	10.4	9.32	96.6	2.5	n/a	n/a
803H000559	A	Lithium -ICP-Acid Digest	ug/g	98.8	<1.22e-03	10.6	9.80	10.2	7.94	97.2	0.36	n/a	n/a
803H000559	A	Manganese -ICP-Acid Digest	ug/g	94.5	<1.07e-03	190	181	185	5.27	108	0.22	n/a	n/a
803H000559	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	n/a
803H000559	A	Phosphorus -ICP-Acid Digest	ug/g	95.3	<0.0196	595	699	647	16.1	91.3	4.0	n/a	n/a
803H000559	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	n/a
803H000559	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	n/a
803H000559	A	Selenium -ICP-Acid Digest	ug/g	97.7	<0.0518	<10.4	<10.4	n/a	n/a	95.7	10	n/a	n/a
803H000559	A	Strontium -ICP-Acid Digest	ug/g	97.5	<1.07e-03	15.7	23.3	18.5	52.8	96.4	0.88	n/a	n/a
803H000559	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	n/a

SEGMENT PORTION: Environmental Acid

Sample#	R#	Analyte	Unit	Standard %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Count	ErrK
803H000540	E	Uranium by Phosphorescence	ug/g	104	<4.14e-04	2.04	1.65	1.84	21.1	99.9	0.041	n/a	n/a
803H000540	E	Strontium-89/90 High Level	uCi/g	100	<7.19e-06	1.34e-05	<1.29e-05	n/a	n/a	n/a	1.5e-05	88	n/a
803H000540	E	Pu-239/240 by TRU-SPEC Resin	ug/g	94.1	<7.26e-03	0.115	0.0977	0.102	24.7	n/a	0.014	277	n/a
803H000540	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	n/a
803H000540	E	Np-237 by IIA 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	n/a
803H000540	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	n/a
803H000540	E	Uranium-235 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	n/a
803H000540	E	Uranium-234 by ICP/MS Acid Dig	ug/g	n/a	<6.00e-04	3.34e-04	2.81e-04	3.08e-04	16.5	n/a	1.1e-05	n/a	n/a
803H000540	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	n/a
803H000540	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	n/a
803H000540	E	Cobalt-60 by GEA	uCi/g	101	<2.99e-04	2.05e-04	<3.45e-04	n/a	n/a	n/a	3.6e-04	n/a	n/a
803H000540	E	Antimony-125 by GEA	uCi/g	n/a	<9.68e-04	<7.92e-04	<8.75e-04	n/a	n/a	n/a	7.9e-04	n/a	n/a
803H000540	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	n/a
803H000540	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	n/a
803H000540	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	n/a
803H000540	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	n/a
803H000540	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	n/a
803H000540	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	n/a
803H000540	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	n/a
803H000540	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	n/a

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REVISION
POSITIONS

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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 coarse 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 $\mu\text{g/mL}$, rather than $\mu\text{g/g}$ 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) $\pm 20\%$ for radionuclides and $\pm 30\%$ 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 re-preparation 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 ($^{239/240}\text{Pu}$), 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 re-preparation 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 ($\mu\text{g/Kg}$)	MS ($\mu\text{g/Kg}$)	MSD ($\mu\text{g/Kg}$)	%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, $^{239/240}\text{Pu}$, ^{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

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 1.38×10^3 $\mu\text{g}/\text{Kg}$. Diethylphthalate (CAS number 84-66-2) was detected with a concentration of 4.31×10^3 $\mu\text{g}/\text{Kg}$. Both of these results should be considered estimates because they were not greater than 10 times the detection limit of 960 $\mu\text{g}/\text{Kg}$.

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 3.0×10^3 $\mu\text{g}/\text{Kg}$ in the MS and 5.5×10^3 $\mu\text{g}/\text{Kg}$ 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 4.0×10^3 $\mu\text{g}/\text{Kg}$ in the sample, 4.2×10^3 $\mu\text{g}/\text{Kg}$ in the MS and 4.1×10^3 $\mu\text{g}/\text{Kg}$ in the MSD. Estimated concentrations of hexachloroethane (CAS# 67-72-1) were 8.5×10^4 $\mu\text{g}/\text{Kg}$ in the sample, 9.0×10^4 $\mu\text{g}/\text{Kg}$ in the MS, and 8.7×10^4 $\mu\text{g}/\text{Kg}$ in the MSD. In addition, nonanal (CAS# 124-19-6) was detected in the MS with an estimated concentration of 3.9×10^3 $\mu\text{g}/\text{Kg}$ and in the MSD with an estimated concentration of 2.2×10^3 $\mu\text{g}/\text{Kg}$. Tridecane (CAS# 629-50-5) was only detected in the MS with an estimated concentration of 1.0×10^3 $\mu\text{g}/\text{Kg}$.

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
²³⁹ 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
 NH₄ - 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

⁹⁰Sr - strontium-90
²³⁷Np - neptunium-237
²³⁸Pu - plutonium-238
^{239/240}Pu - plutonium-239/240
²⁴¹Am - 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

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	
Project Designation 216-2-9 Trench Characterization Borehole - Soil		Sampling Location 216-2-9C3426 - Interval 25-25 7- 43.5' - 46'		SAF No. F03-018		Price Code 8N Data Turnaround 60 Days	
Ice Chest No. VIKING 4HZV		Field Logbook No. HNF-N-3361		CUA 119152ES20		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 TIS TO: B17NMS 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 file number from the chain on each vial.				Preservation Coolant NONE COOLANT			
				Type of Container P AGS			
				No. of Container(s) 1 1			
				Volume 500 ML 40 ML			
SAMPLE ANALYSIS				See one (1) in Special Instructions GREATER (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				SPECIAL INSTRUCTIONS		Matrix *	
Relinquished By/Removed From		Date/Time		Received By/Stored In		Date/Time	
SSR/PE/ASR		10/20/03 1430		AAA/charlie zentz		10/20/03 1430	
Relinquished By/Removed From		Date/Time		Received By/Stored In		Date/Time	
Charge to order		10/22/03 1300		Site fridge		10/22/03 1300	
Relinquished By/Removed From		Date/Time		Received By/Stored In		Date/Time	
Site fridge		10/27/03 1300		Greg Thomas/Chris Thomas		10/27/03	
Relinquished By/Removed From		Date/Time		Received By/Stored In		Date/Time	
Greg Thomas/Chris Thomas		10/27/03 1330		Katie Dieg		10/27/03 1335	
Relinquished By/Removed From		Date/Time		Received By/Stored In		Date/Time	
Relinquished By/Removed From		Date/Time		Received By/Stored In		Date/Time	
LABORATORY SECTION				FINAL SAMPLE DISPOSITION			
Received By		Title		Disposed By		Date/Time	
Disposal Method							

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/Pfister/Hughes		Company Contact Steve Trent		Telephone No. 373-5869		Project Coordinator TRENT, SJ		Price Code 8N Data Turnaround 60 Days	
Project Designation 216-2-9 Trinch Characterization Borehole - Soil		Sampling Location 216-2-9C3426 - Interval 44-45 ft - 43.5' - 46'		SAF No. F03-018		Air Quality <input type="checkbox"/>			
Ice Chest No. VIKING 4H2V		Field Logbook No. INF-N-3361		COA 119152ES10		Method of Shipment Government Vehicle			
Shipped To 272-S Lab Operations		Offsite Property No. N/A		Bill of Lading/Air Bill No. N/A					
POSSIBLE SAMPLE HAZARDS/REMARKS RADIOACTIVITY IS TO: B17N48				Preservation	Net Wt				
Special Handling and/or Storage SAMPLERS: Collect 25 g with the encore sampler. If the TOC is > 0.5 % then this sample can be taken to WSCF. Sample analysis must occur in 48 hours or preserve with methanol.				Type of Container					
				No. of Container(s)	1				
				Volume	25g				
SAMPLE ANALYSIS				See item (1) in special instructions.					
Sample No.	Matrix *	Sample Date	Sample Time						
B17N48 B17N46 PAC 10/27/03	SOIL	10-20-03	1029	X					
CHAIN OF POSSESSION				Sign/Print Names		SPECIAL INSTRUCTIONS			
Relinquished By/Removed From SS Pope 10/20/03 1430		Date/Time		Received By/Stored In Tom Lohmeier 10/20/03 1430		(1) VOA - E260A - Complete, VOA - E260A (Add-On) (Acetonitrile, Hexane, n-Butylbenzene)			
Relinquished By/Removed From Tom Lohmeier 10/24/03 1300		Date/Time		Received By/Stored In Site fridge 10/24/03 1300					
Relinquished By/Removed From Site fridge 10/27/03 1300		Date/Time		Received By/Stored In Greg Thomas/Mary Thomas 10/27/03 1300					
Relinquished By/Removed From Greg Thomas/Mary Thomas 10/27/03 1330		Date/Time		Received By/Stored In Sealed by H4 10/27/03 1335					
Relinquished By/Removed From		Date/Time		Received By/Stored In					
Relinquished By/Removed From		Date/Time		Received By/Stored In					
LABORATORY SECTION	Received By	Title				Date/Time			
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By				Date/Time			

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

01026

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. 373-3869		Project Coordinator TRENT, SJ		Price Code 8N Data Turnaround 45 Days							
Project Designation 216-Z-9 Trench Characterization Borehole - Soil		Sampling Location 216-Z-9C3426 - Interval		SAF No. F03-018		Air Quality <input type="checkbox"/>									
Ice Chest No. <i>VH/N6-4H2V</i>		Field Logbook No. JNF-N3361		COA 119152ES10		Method of Shipment Government Vehicle									
Shipped To <i>MMS 10/21/03</i> <i>Waste Sampling & Characterization 220-5</i>		Offsite Property No. <i>RSR 106-9.73</i>		N/A		B/M of Lading/Air B/M No. N/A									
POSSIBLE SAMPLE HAZARDS/REMARKS <i>RADIOACTIVE TIS TO: B77NN4</i>				Preservation	Cool AC	Cool AC	Cool AC	Cool AC	None	None					
Special Handling and/or Storage <i>SAMPLERS: Fill VOA vials with Zero head space.</i>				Type of Container	aGs ³	aG	aG	aG	aG	P					
				Na. of Container(s)	3	1	1	1	1	1					
				Volume	400L	1500L <i>600L</i>	1500L <i>600L</i>	300L <i>1200L</i>	300L	300L					
SAMPLE ANALYSIS				See Item (1) in Special Instructions.	See Item (2) in Special Instructions.	PCBs - 8092	See Item (3) in Special Instructions.	See Item (4) in Special Instructions.	See Item (5) in Special Instructions.						
Sample No.	Matrix *	Sample Date	Sample Time												
B17TMS	SOIL	10/29/03	0856	X	X	X	X	X	X						
							<i>MMS 10/21/03</i>		<i>MMS 10/21/03</i>						
CHAIN OF POSSESSION				SPECIAL INSTRUCTIONS				Matrix *							
Requisitioned By/Removed From <i>JS Paley 10/29/03</i>		Date/Time <i>14:00</i>		Received By/Stored In <i>Site Office</i>		Date/Time <i>10/29/03</i>		Date/Time <i>14:00</i>		Date/Time <i>10/29/03</i>		Date/Time <i>10/29/03</i>		Date/Time <i>10/29/03</i>	
Requisitioned By/Removed From <i>Site Office</i>		Date/Time <i>09:40</i>		Received By/Stored In <i>MMS</i>		Date/Time <i>10/29/03</i>		Date/Time <i>10/29/03</i>		Date/Time <i>10/29/03</i>		Date/Time <i>10/29/03</i>		Date/Time <i>10/29/03</i>	
Requisitioned By/Removed From <i>MMS</i>		Date/Time <i>10/29/03</i>		Received By/Stored In <i>Site Office</i>		Date/Time <i>10/31/03</i>		Date/Time <i>10/31/03</i>		Date/Time <i>10/31/03</i>		Date/Time <i>10/31/03</i>		Date/Time <i>10/31/03</i>	
Requisitioned By/Removed From		Date/Time		Received By/Stored In		Date/Time		Date/Time		Date/Time		Date/Time		Date/Time	
Requisitioned By/Removed From		Date/Time		Received By/Stored In		Date/Time		Date/Time		Date/Time		Date/Time		Date/Time	
Requisitioned By/Removed From		Date/Time		Received By/Stored In		Date/Time		Date/Time		Date/Time		Date/Time		Date/Time	
LABORATORY SECTION		Received By <i>DO</i>		Title		Date/Time		Date/Time		Date/Time		Date/Time		Date/Time	
FINAL SAMPLE DISPOSITION		Disposal Method <i>10/29/03</i>		Disposed By		Date/Time		Date/Time		Date/Time		Date/Time		Date/Time	

A-6003-618(03/03)

GENERATOR KNOWLEDGE INFORMATION

1. Chain of Custody Number _____ CACNCOA 118478E820 Customer Identification Number _____

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

216-2-9 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: _____	_____	<input type="radio"/> Yes	<input checked="" type="radio"/> No	<input type="radio"/> Unknown
U Codes: _____	_____	<input type="radio"/> Yes	<input checked="" type="radio"/> No	<input type="radio"/> Unknown
K Codes: _____	_____	<input type="radio"/> Yes	<input checked="" type="radio"/> No	<input type="radio"/> Unknown
F Codes: <u>F001</u>	<u>Carbon tetrachloride</u>	<input checked="" type="radio"/> Yes	<input type="radio"/> No	<input type="radio"/> Unknown

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

D001: <input type="checkbox"/> FP <100°F	<input type="checkbox"/> FP ≥100 <140°F	<input type="checkbox"/> DOT Oxidizer	<input type="radio"/> Yes	<input checked="" type="radio"/> No	<input type="radio"/> Unknown
D002: <input type="checkbox"/> pH ≤2	<input type="checkbox"/> pH ≥12.5	<input type="checkbox"/> Solid Corrosive (W5C2)	<input type="radio"/> Yes	<input checked="" type="radio"/> No	<input type="radio"/> Unknown
D003: <input type="checkbox"/> Cyanide	<input type="checkbox"/> Sulfide	<input type="checkbox"/> Water Reactive	<input type="radio"/> Yes	<input checked="" type="radio"/> No	<input type="radio"/> Unknown
D004-D043 (Identify applicable waste codes and concentrations):	<input type="checkbox"/> Other _____	(i.e., peroxide former, explosive, air reactive)	<input type="radio"/> Yes	<input checked="" type="radio"/> No	<input type="radio"/> 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
 FC03: 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)

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

5. Is this material TRU? Yes No Unknown

000000

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

Appendix 5

Data Validation Supporting Documentation

APPENDIX A

RADIOCHEMICAL DATA VALIDATION CHECKLIST

VALIDATION LEVEL:	A	B	<u>C</u>	D	E
PROJECT:	216-2-9 Vertical Borehole		DATA PACKAGE: 222S20030383 and -0369		
VALIDATOR:	JR Jowett		LAB: 222-S	DATE: 6/15/06	
SDG:					
ANALYSES PERFORMED					
Lower Alpha Data	Business-Dr	Gamma-Dr	Alpha Spectrometry	Gamma Spectrometry	
Total Uranium	Radium-226	Lead-210		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

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

12/1/06

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 BOTTOM 6 was 52%.~~
~~Results > ESA RDL Flagged "J"~~ JFJ 6/21/06

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: _____

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