0079005

SAF-RC-113
618-7 Burial Ground
Verification Sampling
FINAL VALIDATION PACKAGE

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Kathy Wendt H4-21 (2 copies)

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COMMENTS:

SDG K1382 **SAF-RC-113**

WASTE SITE: 618-7 Burial Ground – Verification Sampling

Date: 23 October 2008
To: Washington Closure Hanford Inc. (technical representative)
From: ELR Consulting
Project: 618-7 Burial Grounds Verification Sampling - Waste Site 618-7
Subject: Radiochemistry - Data Package No. K1382-EB

INTRODUCTION

This memo presents the results of data validation on Data Package No. K1382 prepared by Eberline Services (EB). 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	Analyte
J17J19	10/6/08	Soil	C	See note 1
J17J20	10/6/08	Soil	C	See note 1
J17J21	10/6/08	Soil	C	See note 1
J17J22	10/6/08	Soil	C	See note 1
J17J27	10/6/08	Soil	C	See note 1
J17J28	10/6/08	Soil	C	See note 1
J17J29	10/6/08	Soil	C	See note 1
J17J30	10/6/08	Soil	C	See note 1

1 – Alpha spectroscopy (isotopic uranium & thorium) & gamma spectroscopy.

Data validation was conducted in accordance with the Washington Closure Hanford Incorporated (WCH) validation statement of work and the 300 Area Remedial Action Sampling and Analysis Plan (DOE/RL-2001-48, May 2004). Appendices 1 through 6 provide the following 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 are calculated from Chain-of-Custody forms to determine the validity of the results. The maximum holding time for radiochemical analysis is 6 months.

All holding times were acceptable.

- **Preparation (Method) 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"; sample results above the MDA and greater than five times the highest blank concentration are not qualified.

All laboratory blank results were acceptable.

Field (Equipment) Blank

One equipment blank (J17J30) was submitted for analysis. Thorium-230 (aspec), uranium-233/234 (aspec), potassium-40, cesium-137, radium-226, radium-228, thorium-228 (gamma spec) and thorium-232 (gamma spec) were detected in the equipment blank. Under the WCH statement of work, no qualification is required.

- **Accuracy**

Accuracy is evaluated from laboratory control sample (LCS) or blank spike sample (BSS) batch samples and spiked samples from the analytical batch. Measured activities are compared to the known added amounts. The acceptable LCS or BSS and matrix spike (MS) recovery range is 70-130%. In addition, samples may be spiked with a radiochemical tracer to assist in isolating the radioisotope of interest with the yield of the tracer being used in calculating sample activity. The acceptable range for tracer recovery is 20% to 105%. Spike sample results outside the above ranges result in associated sample results being qualified as estimates, or not qualified, depending on the activity of the individual sample. Results are rejected for LCS/BSS recoveries of less than 30% and tracer recoveries of less than 20%; and tracer recoveries of greater than 115% for detected results.

Due to the lack of an LCS analysis, all thorium-228 (aspec) and thorium-232 (aspec) results were qualified as estimates and flagged "J".

All other accuracy results were acceptable.

- **Laboratory Duplicates**

Analytical precision is expressed by the relative percent differences (RPD) between the recoveries of duplicate matrix spike analyses performed on a sample in the analytical batch. Precision may alternatively be assessed using unspiked duplicate analyses performed on a sample in the analytical batch. If both sample and replicate activities (concentrations) are greater than five times the contract required detection limit (CRDL) and the RPD is less than 30%, no qualification is required. If either activity (concentration) is less than five times the CRDL, the RPD control limit is less than or equal to two times the CRDL. If the RPD is outside the applicable control limit, associated results are qualified as estimated detects or estimated non-detects.

Due to an RPD outside QC limits (31%), all thorium-232 (gamma spec) results were qualified as estimates and flagged "J".

All other duplicate results were acceptable.

Field Duplicates

One set of field duplicates (J17J19/J17J20) were submitted for analysis. Field Duplicates are compared using the same criteria as for laboratory duplicates. All field duplicate results were acceptable.

- **Detection Levels**

Reported analytical detection levels for undetected analytes are compared against the remaining waste sites RQLs to ensure that laboratory detection levels meet the required criteria. All analytes met the RQL.

- **Completeness**

Data package No. K1382 was submitted for validation and verified for completeness. Completeness is based on the percentage of data determined to be valid (i.e., not rejected). The completion percentage was 100%.

MAJOR DEFICIENCIES

None found.

MINOR DEFICIENCIES

The following minor deficiency was noted:

- Due to an RPD outside QC limits (31%), all thorium-232 (gamma spec) results were qualified as estimates and flagged "J".

- Due to the lack of an LCS analysis, all thorium-228 (aspec) and thorium-232 (aspec) results were qualified as estimates and flagged "J".

Data flagged "J" indicates that the associated concentration is an estimate, but under the WCH statement of work, the data may be usable for decision-making purposes. All other validated results are considered accurate within the standard error associated with the methods.

REFERENCES

Washington Closure Hanford Contract #S00W307A00 (March 2008), *Data Validation Services*.

DOE/RL-2001-48, Rev. 1, *300 Area Remedial Action Sampling and Analysis Plan*, U.S. Department of Energy, May 2004.

Appendix 1

Glossary of Data Reporting Qualifiers

Qualifiers which may be applied by data validators in compliance with the WCH statement of work 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 estimate, but the data are usable for decision-making purposes.

R - Indicates the compound or analyte was analyzed for, detected, and due to an identified 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

RADIOCHEMISTRY DATA QUALIFICATION SUMMARY*

SDG: K1382	REVIEWER: ELR	Project: 618-7	PAGE 1 OF 1
COMPOUND	QUALIFIER	SAMPLES AFFECTED	REASON
Thorium-228 (aspec) Thorium-232 (aspec)	J	All	No LCS analysis
Thorium-232 (gamma spec)	J	All	RPD

* - The Qualified Data Summary Table includes laboratory applied "U" qualifiers not specifically identified here. The laboratory applied "U" qualifiers are included to minimize misinterpretation of results contained in the table.

Appendix 3

Annotated Laboratory Reports

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP K1382

7721-001 J17J19

DATA SHEET

SDG	7721	Client/Case no	Hanford SDG K1382
Contact	Melissa C. Mannion	Contract	No. S00W235A00
Lab sample id	R810072-01	Client sample id	J17J19
Dept sample id	7721-001	Location/Matrix	618-7 BurialGrndVerifSam SOLID
Received	10/09/08	Collected/Weight	10/06/08 09:30 1045 g
% solids	96.9	Custody/SAF No	RC-113-004 RC-113

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Thorium 228	14274-82-9	0.419	0.28	0.402	1.00	J	TH
Thorium 230	14269-63-7	0.642	0.28	0.214	1.00		TH
Thorium 232	TH-232	0.251	0.17	0.214	1.00	J	TH
Uranium 233/234	U-233/234	1.63	0.43	0.176	1.00		U
Uranium 235	15117-96-1	0.251	0.17	0.213	1.00		U
Uranium 238	U-238	0.990	0.33	0.176	1.00		U
Potassium 40	13966-00-2	9.46	0.75	0.301			GAM
Cobalt 60	10198-40-0	U		0.028	0.050	U	GAM
Cesium 137	10045-97-3	0.071	0.028	0.030	0.100		GAM
Radium 226	13982-63-3	0.373	0.052	0.049	0.100		GAM
Radium 228	15262-20-1	0.582	0.14	0.133	0.200		GAM
Europium 152	14683-23-9	U		0.073	0.100	U	GAM
Europium 154	15585-10-1	U		0.096	0.100	U	GAM
Europium 155	14391-16-3	U		0.071	0.100	U	GAM
Thorium 228	14274-82-9	0.551	0.041	0.040			GAM
Thorium 232	TH-232	0.582	0.14	0.133		J	GAM
Uranium 235	15117-96-1	U		0.155		U	GAM
Uranium 238	U-238	U		3.20		U	GAM
Americium 241	14596-10-2	U		0.038		U	GAM

618-7 Burial Ground Verif.Sampling

10/22/08

Lab id	EBRLNE
Protocol	Hanford1
Version	Ver 1.0
Form	DVD-DS
Version	3.06
Report date	10/17/08

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP K1382

7721-002 J17J20

DATA SHEET

SDG	7721	Client/Case no	Hanford SDG K1382
Contact	Melissa C. Mannion	Contract	No. S00W235A00
Lab sample id	R810072-02	Client sample id	J17J20
Dept sample id	7721-002	Location/Matrix	618-7 BurialGrndVerifSam SOLID
Received	10/09/08	Collected/Weight	10/06/08 09:30 1098 g
% solids	97.6	Custody/SAF No	RC-113-004 RC-113

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALIFIERS	TEST
Thorium 228	14274-82-9	0.098	0.20	0.313	1.00	U J	TH
Thorium 230	14269-63-7	0.196	0.26	0.313	1.00	U	TH
Thorium 232	TH-232	0.098	0.13	0.250	1.00	U J	TH
Uranium 233/234	U-233/234	1.43	0.35	0.159	1.00		U
Uranium 235	15117-96-1	0.126	0.10	0.192	1.00	U	U
Uranium 238	U-238	1.06	0.30	0.159	1.00		U
Potassium 40	13966-00-2	9.26	0.44	0.180			GAM
Cobalt 60	10198-40-0	U		0.019	0.050	U	GAM
Cesium 137	10045-97-3	0.082	0.019	0.020	0.100		GAM
Radium 226	13982-63-3	0.336	0.037	0.036	0.100		GAM
Radium 228	15262-20-1	0.454	0.091	0.083	0.200		GAM
Europium 152	14683-23-9	U		0.048	0.100	U	GAM
Europium 154	15585-10-1	U		0.065	0.100	U	GAM
Europium 155	14391-16-3	U		0.050	0.100	U	GAM
Thorium 228	14274-82-9	0.458	0.026	0.025			GAM
Thorium 232	TH-232	0.454	0.091	0.083		J	GAM
Uranium 235	15117-96-1	U		0.112		U	GAM
Uranium 238	U-238	U		2.38		U	GAM
Americium 241	14596-10-2	U		0.033		U	GAM

618-7 Burial Ground Verif.Sampling

10/22/08

Lab id	EBRLNE
Protocol	Hanford1
Version	Ver 1.0
Form	DVD-DS
Version	3.06
Report date	10/17/08

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SAMPLE DELIVERY GROUP K1382

7721-003 J17J21

DATA SHEET

SDG	7721	Client/Case no	Hanford SDG K1382
Contact	Melissa C. Mannion	Contract	No. S00W235A00
Lab sample id	R810072-03	Client sample id	J17J21
Dept sample id	7721-003	Location/Matrix	618-7 BurialGrndVerifSam SOLID
Received	10/09/08	Collected/Weight	10/06/08 09:40 1036 g
% solids	97.6	Custody/SAF No	RC-113-004 RC-113

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Thorium 228	14274-82-9	0.496	0.31	0.415	1.00	J	TH
Thorium 230	14269-63-7	0.496	0.31	0.297	1.00		TH
Thorium 232	TH-232	0.279	0.19	0.237	1.00	J	TH
Uranium 233/234	U-233/234	0.655	0.28	0.173	1.00		U
Uranium 235	15117-96-1	0.164	0.11	0.209	1.00	U	U
Uranium 238	U-238	0.542	0.23	0.173	1.00		U
Potassium 40	13966-00-2	14.3	0.54	0.201			GAM
Cobalt 60	10198-40-0	U		0.020	0.050	U	GAM
Cesium 137	10045-97-3	U		0.019	0.100	U	GAM
Radium 226	13982-63-3	0.450	0.042	0.040	0.100		GAM
Radium 228	15262-20-1	0.695	0.089	0.082	0.200		GAM
Europium 152	14683-23-9	U		0.057	0.100	U	GAM
Europium 154	15585-10-1	U		0.070	0.100	U	GAM
Europium 155	14391-16-3	U		0.073	0.100	U	GAM
Thorium 228	14274-82-9	0.641	0.030	0.029			GAM
Thorium 232	TH-232	0.695	0.089	0.082		J	GAM
Uranium 235	15117-96-1	U		0.097		U	GAM
Uranium 238	U-238	U		2.46		U	GAM
Americium 241	14596-10-2	U		0.139		U	GAM

618-7 Burial Ground Verif.Sampling

✓ 10/22/08

Lab id	EBRLNE
Protocol	Hanford1
Version	Ver 1.0
Form	DVD-DS
Version	3.06
Report date	10/17/08

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SAMPLE DELIVERY GROUP K1382

7721-004 J17J22

DATA SHEET

SDG	7721	Client/Case no	Hanford	SDG K1382	
Contact	Melissa C. Mannion	Contract	No. S00W235A00		
Lab sample id	R810072-04	Client sample id	J17J22		
Dept sample id	7721-004	Location/Matrix	618-7 BurialGrndVerifSam	SOLID	
Received	10/09/08	Collected/Weight	10/06/08 12:50	1293 g	
% solids	97.5	Custody/SAF No	RC-113-004	RC-113	

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Thorium 228	14274-82-9	0.344	0.31	0.366	1.00	U J	TH
Thorium 230	14269-63-7	0.153	0.23	0.292	1.00	U	TH
Thorium 232	TH-232	0.153	0.15	0.292	1.00	U J	TH
Uranium 233/234	U-233/234	0.751	0.26	0.164	1.00		U
Uranium 235	15117-96-1	0.104	0.10	0.199	1.00	U	U
Uranium 238	U-238	0.730	0.26	0.164	1.00		U
Potassium 40	13966-00-2	9.05	0.34	0.124			GAM
Cobalt 60	10198-40-0	U		0.013	0.050	U	GAM
Cesium 137	10045-97-3	U		0.013	0.100	U	GAM
Radium 226	13982-63-3	0.309	0.030	0.028	0.100		GAM
Radium 228	15262-20-1	0.429	0.057	0.055	0.200		GAM
Europium 152	14683-23-9	U		0.040	0.100	U	GAM
Europium 154	15585-10-1	U		0.044	0.100	U	GAM
Europium 155	14391-16-3	U		0.053	0.100	U	GAM
Thorium 228	14274-82-9	0.401	0.021	0.020			GAM
Thorium 232	TH-232	0.429	0.057	0.055		J	GAM
Uranium 235	15117-96-1	U		0.076		U	GAM
Uranium 238	U-238	U		1.68		U	GAM
Americium 241	14596-10-2	U		0.063		U	GAM

618-7 Burial Ground Verif.Sampling

10/22/08

Lab id	EBRLNE
Protocol	Hanford1
Version	Ver 1.0
Form	DVD-DS
Version	3.06
Report date	10/17/08

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP K1382

7721-005 J17J27

DATA SHEET

SDG	7721	Client/Case no	Hanford SDG K1382
Contact	Melissa C. Mannion	Contract	No. S00W235A00
Lab sample id	R810072-05	Client sample id	J17J27
Dept sample id	7721-005	Location/Matrix	618-7 BurialGrndVerifSam SOLID
Received	10/09/08	Collected/Weight	10/06/08 12:55 1470 g
% solids	93.1	Custody/SAF No	RC-113-009 RC-113

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALIFIERS	TEST
Thorium 228	14274-82-9	0.189	0.25	0.422	1.00	U J	TH
Thorium 230	14269-63-7	0.157	0.19	0.241	1.00	U	TH
Thorium 232	TH-232	0.126	0.13	0.241	1.00	U J	TH
Uranium 233/234	U-233/234	0.697	0.30	0.222	1.00		U
Uranium 235	15117-96-1	0.035	0.070	0.269	1.00	U	U
Uranium 238	U-238	0.436	0.24	0.222	1.00		U
Potassium 40	13966-00-2	10.0	0.44	0.225			GAM
Cobalt 60	10198-40-0	U		0.017	0.050	U	GAM
Cesium 137	10045-97-3	U		0.017	0.100	U	GAM
Radium 226	13982-63-3	0.366	0.040	0.036	0.100		GAM
Radium 228	15262-20-1	0.535	0.089	0.084	0.200		GAM
Europium 152	14683-23-9	U		0.039	0.100	U	GAM
Europium 154	15585-10-1	U		0.059	0.100	U	GAM
Europium 155	14391-16-3	U		0.049	0.100	U	GAM
Thorium 228	14274-82-9	0.430	0.024	0.021			GAM
Thorium 232	TH-232	0.535	0.089	0.084		J	GAM
Uranium 235	15117-96-1	U		0.075		U	GAM
Uranium 238	U-238	U		2.31		U	GAM
Americium 241	14596-10-2	U		0.030		U	GAM

618-7 Burial Ground Verif.Sampling

10/22/08

Lab id	EBRLNE
Protocol	Hanford1
Version	Ver 1.0
Form	DVD-DS
Version	3.06
Report date	10/17/08

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP K1382

7721-006 J17J28

DATA SHEET

SDG	7721	Client/Case no	Hanford	SDG K1382	
Contact	Melissa C. Mannion	Contract	No. S00W235A00		
Lab sample id	R810072-06	Client sample id	J17J28		
Dept sample id	7721-006	Location/Matrix	618-7 BurialGrndVerifSam	SOLID	
Received	10/09/08	Collected/Weight	10/06/08 13:10	1703 g	
% solids	98.6	Custody/SAF No	RC-113-009	RC-113	

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Thorium 228	14274-82-9	0.037	0.22	0.459	1.00	U J	TH
Thorium 230	14269-63-7	0.186	0.22	0.285	1.00	U	TH
Thorium 232	TH-232	0.224	0.15	0.285	1.00	U J	TH
Uranium 233/234	U-233/234	5.62	0.81	0.239	1.00		U
Uranium 235	15117-96-1	0.655	0.27	0.200	1.00		U
Uranium 238	U-238	4.24	0.68	0.239	1.00		U
Potassium 40	13966-00-2	11.6	0.51	0.182			GAM
Cobalt 60	10198-40-0	U		0.018	0.050	U	GAM
Cesium 137	10045-97-3	U		0.019	0.100	U	GAM
Radium 226	13982-63-3	0.432	0.044	0.039	0.100		GAM
Radium 228	15262-20-1	0.564	0.083	0.078	0.200		GAM
Europium 152	14683-23-9	U		0.062	0.100	U	GAM
Europium 154	15585-10-1	U		0.065	0.100	U	GAM
Europium 155	14391-16-3	U		0.082	0.100	U	GAM
Thorium 228	14274-82-9	0.533	0.033	0.029			GAM
Thorium 232	TH-232	0.564	0.083	0.078		J	GAM
Uranium 235	15117-96-1	U		0.253		U	GAM
Uranium 238	U-238	U		5.41		U	GAM
Americium 241	14596-10-2	U		0.105		U	GAM

618-7 Burial Ground Verif.Sampling

10/22/08

Lab id	EBRLNE
Protocol	Hanford1
Version	Ver 1.0
Form	DVD-DS
Version	3.06
Report date	10/17/08

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP K1382

7721-007 J17J29

DATA SHEET

SDG	7721	Client/Case no	Hanford	SDG K1382	
Contact	Melissa C. Mannion	Contract	No. S00W235A00		
Lab sample id	R810072-07	Client sample id	J17J29		
Dept sample id	7721-007	Location/Matrix	618-7 BurialGrndVerifSam	SOLID	
Received	10/09/08	Collected/Weight	10/06/08 13:20	1189 g	
% solids	96.8	Custody/SAF No	RC-113-009	RC-113	

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Thorium 228	14274-82-9	0.141	0.24	0.380	1.00	U J	TH
Thorium 230	14269-63-7	0.353	0.24	0.180	1.00		TH
Thorium 232	TH-232	0.141	0.094	0.180	1.00	U J	TH
Uranium 233/234	U-233/234	0.689	0.28	0.211	1.00		U
Uranium 235	15117-96-1	0.067	0.067	0.255	1.00	U	U
Uranium 238	U-238	0.772	0.28	0.211	1.00		U
Potassium 40	13966-00-2	10.3	0.54	0.233			GAM
Cobalt 60	10198-40-0	U		0.022	0.050	U	GAM
Cesium 137	10045-97-3	U		0.021	0.100	U	GAM
Radium 226	13982-63-3	0.383	0.044	0.042	0.100		GAM
Radium 228	15262-20-1	0.625	0.087	0.080	0.200		GAM
Europium 152	14683-23-9	U		0.059	0.100	U	GAM
Europium 154	15585-10-1	U		0.069	0.100	U	GAM
Europium 155	14391-16-3	U		0.075	0.100	U	GAM
Thorium 228	14274-82-9	0.484	0.031	0.031			GAM
Thorium 232	TH-232	0.625	0.087	0.080		J	GAM
Uranium 235	15117-96-1	U		0.102		U	GAM
Uranium 238	U-238	U		2.49		U	GAM
Americium 241	14596-10-2	U		0.143		U	GAM

618-7 Burial Ground Verif.Sampling

10/22/08

Lab id	EBRLNE
Protocol	Hanford1
Version	Ver 1.0
Form	DVD-DS
Version	3.06
Report date	10/17/08

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP K1382

7721-008 J17J30

DATA SHEET

SDG	7721	Client/Case no	Hanford SDG K1382
Contact	Melissa C. Mannion	Contract	No. S00W235A00
Lab sample id	R810072-08	Client sample id	J17J30
Dept sample id	7721-008	Location/Matrix	618-7 BurialGrndVerifSam SOLID
Received	10/09/08	Collected/Weight	10/06/08 09:30 1606 g
% solids	99.9	Custody/SAF No	RC-113-009 RC-113

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Thorium 228	14274-82-9	0.211	0.26	0.426	1.00	U J	TH
Thorium 230	14269-63-7	0.527	0.27	0.202	1.00		TH
Thorium 232	TH-232	0.132	0.11	0.202	1.00	U J	TH
Uranium 233/234	U-233/234	0.237	0.16	0.202	1.00		U
Uranium 235	15117-96-1	0	0.064	0.244	1.00	U	U
Uranium 238	U-238	0.184	0.16	0.202	1.00	U	U
Potassium 40	13966-00-2	9.54	0.45	0.182			GAM
Cobalt 60	10198-40-0	U		0.020	0.050	U	GAM
Cesium 137	10045-97-3	0.086	0.022	0.023	0.100		GAM
Radium 226	13982-63-3	0.330	0.045	0.040	0.100		GAM
Radium 228	15262-20-1	0.451	0.080	0.075	0.200		GAM
Europium 152	14683-23-9	U		0.051	0.100	U	GAM
Europium 154	15585-10-1	U		0.071	0.100	U	GAM
Europium 155	14391-16-3	U		0.062	0.100	U	GAM
Thorium 228	14274-82-9	0.454	0.028	0.025			GAM
Thorium 232	TH-232	0.451	0.080	0.075		J	GAM
Uranium 235	15117-96-1	U		0.166		U	GAM
Uranium 238	U-238	U		2.43		U	GAM
Americium 241	14596-10-2	U		0.034		U	GAM

618-7 Burial Ground Verif.Sampling

10/22/08

Lab id	EBRLNE
Protocol	Hanford1
Version	Ver 1.0
Form	DVD-DS
Version	3.06
Report date	10/17/08

Appendix 4

Laboratory Narrative and Chain-of-Custody Documentation

1.0 GENERAL

Washington Closure Hanford (WCH) Sample Delivery Group K1382 was composed of eight solid (soil) samples designated under SAF No. RC-113 with a Project Designation of: 618-7 Burial Grounds Verification Sampling.

The samples were received as stated on the chain-of-custody document. Any discrepancies are noted on the Eberline Services Sample Receipt Checklist. The results were transmitted to WCH via e-mail on October 17, 2008.

2.0 ANALYSIS NOTES

2.1 Isotopic Thorium Analysis

The QC LCS for the initial analysis failed QC evaluation criteria and therefore the analyses were rejected. The samples were realiquoted and reanalyzed with new QC samples. No problems were encountered during the course of the reanalyses.

2.2 Isotopic Uranium Analysis

No problems were encountered during the course of the analyses.

2.3 Gamma Spectroscopy

No problems were encountered during the course of the analyses.

3.0 Case Narrative Certification Statement

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

Melissa Mannion

Melissa C. Mannion
Senior Program Manager

10/17/08

Date

Washington Closure Hanford	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST	RC-113-004	Page 1 of 1

Collector: T. Stephens, P. Pearson	Company Contact: Joan Kessner	Telephone No.: 509-375-4655	Project Coordinator: KESSNER, JH
Price Code: 8C	Data Turnaround: ~~15~~ 7 Days		
Project Designation: 618-7 Burial Ground Verification Sampling	Sampling Location: 618-7 Burial Ground - Verif. Sampling K1382 (7721)		SAF No.: RC-113
Ice Chest No.: ERC-02-803	Field Logbook No.: EL-1395-13	COA: RG61872600	Method of Shipment: FED EX RTC 10/6/08
Shipped To: EBERLINE SERVICES / LIONVILLE	Offsite Property No.: A090014		Bill of Lading/Air Bill No.: SEE OSPC

POSSIBLE SAMPLE HAZARDS/REMARKS

Potential Radiological contamination.

Special Handling and/or Storage

None

020000

Preservation	None	None										
Type of Container	P	P										
No. of Container(s)	1	1										
Volume	~~250mL~~ 500	1000mL										
SAMPLE ANALYSIS	See item (1) in Special Instructions.	See item (2) in Special Instructions.										

Sample No.	Matrix *	Sample Date	Sample Time										
J17J19	SOIL	10/6/08	0930		X								A1
J17J20	SOIL		0930		X								A1D
J17J21	SOIL		0940		X								B5
J17J22	SOIL	10/6/08	1250		X								C2

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

Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time
T Stephens / T Stephens	1630 10-6-08	RT Coffman / RT Coffman	1630 10/6/08
RT Coffman / RT Coffman	1655 10/6/08	Refer #1A, 1060	1655 10/6/08
Refer 1A / J. E. Bemhard	1230 10-8-08	J. E. Bemhard	1230 10-8-08
J. E. Bemhard	1245 10-8-08	FED EX	
FED EX		[illegible]	10/09/08 09:15

SPECIAL INSTRUCTIONS

(1) ICP Metals - 6010A (TAL) {Aluminum, Antimony, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Magnesium, Manganese, Nickel, Potassium, Silver, Sodium, Vanadium, Zinc}; ICP Metals - 6010A (Add-on) {Arsenic, Lead, Selenium, Thallium, Tin, Zirconium}; Mercury - 7471 - (CV)

(2) Gamma Spectroscopy (TCL List) {Cesium-137, Cobalt-60, Europium-152, Europium-154, Europium-155}; Isotopic Thorium; Isotopic Uranium

Sampler unavailable to remove samples from controlled storage. Shipper removed samples from storage location taking custody of samples for shipment to lab.

Matrix *

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

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

WCH-EE-011

Washington Closure Hanford	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST	RC-113-009	Page 1 of 1

Collector T. Stephens, P. Pearson	Company Contact Joan Kessner Telephone No. 509-375-4655	Project Coordinator KESSNER, JH	Price Code 8C Data Turnaround ~~15~~ Days 7 PJC 10/6/08
Project Designation 618-7 Burial Ground Verification Sampling	Sampling Location 618-7 Burial Ground - Verif. Sampling K1382 (772)	SAF No. RC-113	
Ice Chest No. ERC-02-803	Field Logbook No. EL-1395-13 COA RG61872600	Method of Shipment FED EX	
Shipped To EBERLINE SERVICES / LIONVILLE	Offsite Property No. A090014	Bill of Lading/Air Bill No. SEE OSPC	

POSSIBLE SAMPLE HAZARDS/REMARKS

Potential Radiological contamination.

Special Handling and/or Storage

None

Preservation	None	None									
Type of Container	P	P									
No. of Container(s)	1	1									
Volume	250mL	1000mL									
SAMPLE ANALYSIS	See item (1) in Special Instructions. #16108	See item (2) in Special Instructions.									

100021

Sample No.	Matrix *	Sample Date	Sample Time									
J17J27	SOIL	10/6/08	1255		X							D5
J17J28	SOIL		1310		X							C9
J17J29	SOIL		1320		X							B8
J17J30	SOIL	10/6/08	0930		X							A1 B

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

Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time
TStephens TStephens	1630 10/6/08	RTCoffman / RTCoffman	1630 10/6/08
RTCoffman / RTCoffman	1655 10/6/08	Refer# 1A, 1060,	1655 10/6/08
Refer 1A / J.E. Bernhard	1230 10-8-08	J.E. Bernhard	1230 10-8-08
J.E. Bernhard	1245 10-8-08	FED EX	
FED EX			10/09/08 09:15

SPECIAL INSTRUCTIONS

(1) ICP Metals - 6010A (TAL) (Aluminum, Antimony, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Magnesium, Manganese, Nickel, Potassium, Silver, Sodium, Vanadium, Zinc); ICP Metals - 6010A (Add-on) (Arsenic, Lead, Selenium, Thallium, Tin, Zirconium); Mercury - 7471 - (CV)
(2) Gamma Spectroscopy (TCL List) (Cesium-137, Cobalt-60, Europium-152, Europium-154, Europium-155); Isotopic Thorium; Isotopic Uranium

Sampler unavailable to remove samples from controlled storage. Shipper removed samples from storage location taking custody of samples for shipment to lab.

Matrix *

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

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

WCH-EE-011

Appendix 5

Data Validation Supporting Documentation

APPENDIX A

RADIOCHEMICAL DATA VALIDATION CHECKLIST

VALIDATION LEVEL:	A	B	C	D	E
PROJECT: 618-7			DATA PACKAGE: K1382		
VALIDATOR: ELR		LAB: ED		DATE: 10/22/08	
			SDG: K1382		
ANALYSES PERFORMED					
☐ Gross Alpha/Beta	☐ Strontium-90	☐ Technetium-99	X Alpha Spectroscopy	X Gamma Spectroscopy	
☐ Total Uranium	☐ Radium-22	☐ Tritium			
SAMPLES/MATRIX					
J17J19	J17J20	J17J21	J17J22		
J17J27	J17J28	J17J29	J17J30		
					Soil

1. Completeness ..... ☐ N/A

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

Comments: _____

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:

FB- thorium-230 (aspec), U-233/234 (aspec), K-40, CS-137, Ra-226, Ra-228, thorium-228 (gamma), thorium-232 (gamma)

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: thor-228 + 232 (aspec) - no LCS Jcell

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: Isotopic thorium - J20 - ok

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: thorium -232 (gamma spec) 3170- J calc

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: NO FS or PAS

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 by Client

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP K1382

7721-010 Method Blank

METHOD BLANK

SDG	7721	Client/Case no	Hanford SDG K1382
Contact	Melissa C. Mannion	Contract	No. S00W235A00
Lab sample id	R810072-10	Client sample id	Method Blank
Dept sample id	7721-010	Material/Matrix	SOLID
		SAF No	RC-113

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Uranium 233/234	U-233/234	0	0.055	0.212	1.00	U	U
Uranium 235	15117-96-1	0	0.067	0.256	1.00	U	U
Uranium 238	U-238	0	0.055	0.212	1.00	U	U
Potassium 40	13966-00-2	U		0.390		U	GAM
Cobalt 60	10198-40-0	U		0.015	0.050	U	GAM
Cesium 137	10045-97-3	U		0.016	0.100	U	GAM
Radium 226	13982-63-3	U		0.033	0.100	U	GAM
Radium 228	15262-20-1	U		0.070	0.200	U	GAM
Europium 152	14683-23-9	U		0.044	0.100	U	GAM
Europium 154	15585-10-1	U		0.050	0.100	U	GAM
Europium 155	14391-16-3	U		0.048	0.100	U	GAM
Thorium 228	14274-82-9	U		0.024		U	GAM
Thorium 232	TH-232	U		0.070		U	GAM
Uranium 235	15117-96-1	U		0.072		U	GAM
Uranium 238	U-238	U		1.69		U	GAM
Americium 241	14596-10-2	U		0.092		U	GAM

618-7 Burial Ground Verif.Sampling

QC-BLANK #67664

Lab id	EBRLNE
Protocol	Hanford1
Version	Ver 1.0
Form	DVD-DS
Version	3.06
Report date	10/17/08

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP K1382

7721-013 Method Blank

METHOD BLANK

SDG	7721	Client/Case no	Hanford	SDG K1382	
Contact	Melissa C. Mannion	Contract	No. S00W235A00		
Lab sample id	R810072-13	Client sample id	Method Blank		
Dept sample id	7721-013	Material/Matrix		SOLID	
		SAF No	RC-113		

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Thorium 228	14274-82-9	0	0.20	0.426	1.00	U	TH
Thorium 230	14269-63-7	0.100	0.15	0.240	1.00	U	TH
Thorium 232	TH-232	0	0.050	0.192	1.00	U	TH

618-7 Burial Ground Verif.Sampling

QC-BLANK #67679

Lab id	EBRLNE
Protocol	Hanford1
Version	Ver 1.0
Form	DVD-DS
Version	3.06
Report date	10/17/08

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP K1382

7721-009

Lab Control Sample

LAB CONTROL SAMPLE

SDG 7721

Contact Melissa C. Mannion

Client/Case no Hanford SDG K1382

Contract No. S00W235A00

Lab sample id R810072-09

Dept sample id 7721-009

Client sample id Lab Control Sample

Material/Matrix SOLID

SAF No RC-113

ANALYTE	RESULT pCi/g	2σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST	ADDED pCi/g	2σ ERR pCi/g	REC %	3σ LMTS (TOTAL)	PROTOCOL LIMITS
Uranium 233/234	4.67	0.82	0.535	1.00		U	5.58	0.22	84	75-125	80-120
Uranium 235	4.71	0.81	0.213	1.00		U	4.52	0.18	104	70-130	80-120
Uranium 238	6.14	0.91	0.510	1.00		U	6.04	0.24	102	74-126	80-120

618-7 Burial Ground Verif.Sampling

QC-LCS #67663

Lab id EBRLNE

Protocol Hanford1

Version Ver 1.0

Form DVD-LCS

Version 3.06

Report date 10/17/08

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP K1382

7721-012

Lab Control Sample

LAB CONTROL SAMPLE

SDG 7721
Contact Melissa C. Mannion

Client/Case no Hanford SDG K1382
Contract No. S00W235A00

Lab sample id R810072-12
Dept sample id 7721-012

Client sample id Lab Control Sample
Material/Matrix SOLID
SAF No RC-113

ANALYTE	RESULT pCi/g	2σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST	ADDED pCi/g	2σ ERR pCi/g	REC %	3σ LMTS (TOTAL)	PROTOCOL LIMITS
Thorium 230	34.5	2.8	0.177	1.00		TH	37.8	1.5	91	83-117	80-120

618-7 Burial Ground Verif.Sampling

QC-LCS #67678

Lab id EBRLNE
Protocol Hanford1
Version Ver 1.0
Form DVD-LCS
Version 3.06
Report date 10/17/08

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP K1382

7721-015

Lab Control Sample

LAB CONTROL SAMPLE

SDG 7721

Contact Melissa C. Mannion

Client/Case no Hanford SDG K1382

Contract No. S00W235A00

Lab sample id R810072-15

Dept sample id 7721-015

Client sample id Lab Control Sample

Material/Matrix SOLID

SAF No RC-113

ANALYTE	RESULT pCi/g	2σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST	ADDED pCi/g	2σ ERR pCi/g	REC %	3σ LMTS (TOTAL)	PROTOCOL LIMITS
Cobalt 60	0.312	0.040	0.025	0.050		GAM	0.322	0.013	97	78-122	80-120
Cesium 137	0.382	0.038	0.030	0.100		GAM	0.362	0.014	106	80-120	80-120

618-7 Burial Ground Verif.Sampling

QC-LCS 67701

Lab id EBRLNE

Protocol Hanford1

Version Ver 1.0

Form DVD-LCS

Version 3.06

Report date 10/17/08

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP K1382

7721-011 J17J19

DUPLICATE

SDG	7721			Client/Case no	Hanford SDG K1382
Contact	Melissa C. Mannion			Contract	No. S00W235A00
	DUPLICATE		ORIGINAL		
Lab sample id	R810072-11	Lab sample id	R810072-01	Client sample id	J17J19
Dept sample id	7721-011	Dept sample id	7721-001	Location/Matrix	618-7 BurialGrndVerifSam SOLID
		Received	10/09/08	Collected/Weight	10/06/08 09:30 1045 g
% solids	96.9	% solids	96.9	Custody/SAF No	RC-113-004 RC-113

ANALYTE	DUPLICATE pCi/g	2σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST	ORIGINAL pCi/g	2σ ERR (COUNT)	MDA pCi/g	QUALI-FIERS	RPD %	3σ TOT	DER σ
Uranium 233/234	1.55	0.40	0.180	1.00		U	1.63	0.43	0.176		5	58	0.3
Uranium 235	0.114	0.11	0.218	1.00	U	U	0.251	0.17	0.213		75	167	1.3
Uranium 238	1.44	0.39	0.180	1.00		U	0.990	0.33	0.176		37	65	1.7
Potassium 40	9.47	0.66	0.275			GAM	9.46	0.75	0.301		0	22	0
Cobalt 60	U		0.025	0.050	U	GAM	U		0.028	U	-		0.2
Cesium 137	0.078	0.024	0.026	0.100		GAM	0.071	0.028	0.030		9	76	0.4
Radium 226	0.294	0.056	0.051	0.100		GAM	0.373	0.052	0.049		24	37	1.9
Radium 228	0.425	0.088	0.092	0.200		GAM	0.582	0.14	0.133		31	52	1.8
Europium 152	U		0.061	0.100	U	GAM	U		0.073	U	-		0.3
Europium 154	U		0.086	0.100	U	GAM	U		0.096	U	-		0.2
Europium 155	U		0.062	0.100	U	GAM	U		0.071	U	-		0.2
Thorium 228	0.511	0.036	0.035			GAM	0.551	0.041	0.040		8	21	1.1
Thorium 232	0.425	0.088	0.092			GAM	0.582	0.14	0.133		31	52	1.8
Uranium 235	U		0.105		U	GAM	U		0.155	U	-		0.5
Uranium 238	U		3.17		U	GAM	U		3.20	U	-		0
Americium 241	U		0.034		U	GAM	U		0.038	U	-		0.2

618-7 Burial Ground Verif.Sampling

QC-DUP#1 67665

Lab id	EBRLNE
Protocol	Hanford1
Version	Ver 1.0
Form	DVD-DUP
Version	3.06
Report date	10/17/08

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP K1382

7721-014 J17J19

DUPLICATE

SDG	7721			Client/Case no	Hanford SDG K1382
Contact	Melissa C. Mannion			Contract	No. S00W235A00
	DUPLICATE		ORIGINAL		
Lab sample id	R810072-14	Lab sample id	R810072-01	Client sample id	J17J19
Dept sample id	7721-014	Dept sample id	7721-001	Location/Matrix	618-7 BurialGrndVerifSam SOLID
		Received	10/09/08	Collected/Weight	10/06/08 09:30 1045 g
% solids	96.9	% solids	96.9	Custody/SAF No	RC-113-004 RC-113

ANALYTE	DUPLICATE pCi/g	2σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST	ORIGINAL pCi/g	2σ ERR (COUNT)	MDA pCi/g	QUALI-FIERS	RPD %	3σ TOT	DER σ
Thorium 228	0.242	0.22	0.331	1.00	U	TH	0.419	0.28	0.402		54	163	1.0
Thorium 230	0.350	0.22	0.206	1.00		TH	0.642	0.28	0.214		59	109	1.6
Thorium 232	0.108	0.11	0.206	1.00	U	TH	0.251	0.17	0.214		80	170	1.4

618-7 Burial Ground Verif.Sampling

QC-DUP#1 67680

Lab id	EBRLNE
Protocol	Hanford1
Version	Ver 1.0
Form	DVD-DUP
Version	3.06
Report date	10/17/08

Date: 23 October 2008
To: Washington Closure Hanford Inc. (technical representative)
From: ELR Consulting
Project: 618-7 Burial Ground Verification Sampling - Waste Site 618-7
Subject: Inorganics - Data Package No. K1382-LLI

INTRODUCTION

This memo presents the results of data validation on Data Package No. K1382 prepared by Lionville Laboratory Inc. (LLI). 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	Analyte
J17J19	10/6/08	Soil	C	See note 1
J17J20	10/6/08	Soil	C	See note 1
J17J21	10/6/08	Soil	C	See note 1
J17J22	10/6/08	Soil	C	See note 1
J17J27	10/6/08	Soil	C	See note 1
J17J28	10/6/08	Soil	C	See note 1
J17J29	10/6/08	Soil	C	See note 1
J17J30	10/6/08	Soil	C	See note 1

1 – ICP metals (6010B) and mercury (7471A).

Data validation was conducted in accordance with the Washington Closure Hanford (WCH) validation statement of work and the 300 Area Remedial Action Sampling and Analysis Plan (DOE/RL-2001-48, May 2004). Appendices 1 through 6 provide the following 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 Documentation Requested by Client

DATA QUALITY PARAMETERS

- **Holding Times**

Analytical holding times for metals are assessed to ascertain whether the holding time requirements were met by the laboratory. The holding time requirements are as follows: Soil samples must be analyzed within 28 days for mercury and 6 months for ICP metals.

All holding times were acceptable.

- **Preparation (Method) Blanks**

Preparation Blanks

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

In the case of negative blank results, if the absolute value exceeds the contract required detection limit (CRDL), all nondetects are rejected and flagged "UR" and all detects that are less than ten times the absolute value of the associated preparation blank result are qualified as estimates and flagged "J". If the absolute value of the negative preparation blank is greater than the instrument detection limit (IDL) and less than or equal to the CRDL, all nondetects are qualified as estimates and flagged "UJ" and all detects less than ten times the absolute value of the blank are qualified as estimates and flagged "J". If the sample results are greater than ten times the absolute value of the preparation blank, no qualification is necessary.

Due to method blank contamination, the calcium, chromium, magnesium, sodium, tin and zirconium results in sample J17J30 were qualified as undetected and flagged "UJ".

All other preparation blank results were acceptable.

Field (Equipment) Blank

One field blank (J17J30) was submitted for analysis. Aluminum, arsenic, barium, beryllium, iron, potassium, manganese, lead, vanadium and zinc were detected in the equipment blank. Under the WCH statement of work, no qualification is required.

- **Accuracy**

Matrix Spike and Laboratory Control Sample

Matrix spike (MS) and laboratory control sample (LCS) analyses are used to assess the analytical accuracy of the reported data. The matrix spike is used to assess the effect of the matrix on the ability to accurately quantify sample concentrations. Recoveries must fall within the range of 70% to 130%. Samples with a recovery of less than 30% and a sample result below the IDL are rejected and flagged "UR". Samples with a recovery of 30% to 69% and a sample result less than the IDL are qualified "UJ". Samples with a recovery of greater than 130% or less than 70% and a sample result greater than the IDL are qualified as estimates and flagged "J". Finally, for samples with a recovery greater than 130% and a sample result less than the IDL, no qualification is

required.

Due to matrix spike recoveries outside QC limits, all antimony (46.9%) and detected calcium (155%) results were qualified as estimates and flagged "J".

All other accuracy results were acceptable.

- **Precision**

Laboratory Duplicate Samples

Analytical precision is expressed by the relative percent differences (RPD) between the recoveries of matrix spike duplicate (MSD) analyses performed on a sample in the analytical batch. Precision may alternatively be assessed using unspiked duplicate analyses performed on a sample in the analytical batch. If both sample and replicate activities (concentrations) are greater than five times the CRDL and the RPD is less than 30%, no qualification is required. If either activity (concentration) is less than five times the CRDL, the RPD control limit is less than or equal to two times the CRDL. If the RPD is outside the applicable control limit, associated results are qualified as estimated detects or estimated non-detects.

All laboratory duplicate results were acceptable.

Field Duplicate

One set of field duplicates (J17J19/J17J20) were submitted for analysis. Field Duplicates are compared using the same criteria as for laboratory duplicates. The RPD for chromium (86.8%) was outside QC limits. Under the WCH statement of work, no qualification is required. All other field duplicate results were acceptable.

- **Analytical Detection Levels**

Reported analytical detection levels are compared against the 100 Area RQLs to ensure that laboratory detection levels meet the required criteria. All results met the RQL.

- **Completeness**

Data package No. K1382 was submitted for validation and verified for completeness. Completeness is based on the percentage of data determined to be valid (i.e., not rejected). The completion percentage was 100%.

MAJOR DEFICIENCIES

None found.

MINOR DEFICIENCIES

The following minor deficiencies were noted:

- Due to method blank contamination, the calcium, chromium, magnesium, sodium, tin and zirconium results in sample J17J30 were qualified as undetected and flagged "UJ".

- Due to matrix spike recoveries outside QC limits, all antimony (46.9%) and detected calcium (155%) results were qualified as estimates and flagged "J".

Data flagged "J" indicates that the associated concentration is an estimate, but under the WCH statement of work, the data may be usable for decision-making purposes. All other validated results are considered accurate within the standard error associated with the methods.

REFERENCES

Washington Closure Hanford Contract #S00W307A00 (March 2008), *Data Validation Services*, March 2008.

DOE/RL-2001-48, Rev. 1, *300 Area Remedial Action Sampling and Analysis Plan*, U.S. Department of Energy, May 2004.

Appendix 1

Glossary of Data Reporting Qualifiers

Qualifiers which may be applied by data validators in compliance with WCH validation SOW are as follows:

U - Indicates the compound or analyte was analyzed for and not detected in the sample. The value reported is the sample quantitation limit corrected for sample dilution and moisture content by the laboratory.

UJ - Indicates the compound or analyte was analyzed for and not detected in the sample. Due to a minor QC deficiency identified during the data validation, the associated quantitation limit is an estimate.

J - Indicates the compound or analyte was analyzed for and detected. Due to a minor QC deficiency identified during the data validation, the associated concentration is an estimate, but the data are usable for decision-making purposes.

BJ - Applied to inorganic analyses only. Indicates the analyte concentration was greater than the IDL but less than the CRDL and is considered an estimated value.

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

NJ - Indicates presumptive evidence of a compound at an estimated value. The data may not be valid for some specific applications (i.e., usable for decision-making purposes).

N - Indicates presumptive evidence of a compound. The data may not be valid for some specific applications (i.e., usable for decision-making purposes).

Appendix 2

Summary of Data Qualification

METALS DATA QUALIFICATION SUMMARY*

SDG: K1382	REVIEWER: ELR	Project: 618-7	PAGE 1 OF 1
COMPOUND	QUALIFIER	SAMPLES AFFECTED	REASON
Calcium Chromium Magnesium Sodium Tin Zirconium	UJ	J17J30	Method blank contamination
Antimony	J	All	MS recovery
Calcium	J	All (except J17J30)	MS recovery

* - The Qualified Data Summary Table includes laboratory applied "U" qualifiers not specifically identified here. The laboratory applied "U" qualifiers are included to minimize misinterpretation of results contained in the table.

Appendix 3

Annotated Laboratory Reports

Lionville Laboratory, Inc.

INORGANICS DATA SUMMARY REPORT 10/20/08

CLIENT: WC-HANFORD RC-113 K1382 LVL LOT #: 0810L052

WORK ORDER: 60049-001-001-0001-00

SAMPLE	SITE ID	ANALYTE	RESULT	UNITS	REPORTING LIMIT	DILUTION FACTOR
-001	J17J19	Silver, Total	0.06 u	MG/KG	0.06	1.0
		Aluminum, Total	5240	MG/KG	2.5	1.0
		Arsenic, Total	1.7	MG/KG	0.31	1.0
		Barium, Total	69.5	MG/KG	0.06	1.0
		Beryllium, Total	0.17	MG/KG	0.03	1.0
		Calcium, Total	6280 J	MG/KG	2.5	1.0
		Cadmium, Total	0.06	MG/KG	0.03	1.0
		Cobalt, Total	8.2	MG/KG	0.13	1.0
		Chromium, Total	8.6	MG/KG	0.13	1.0
		Copper, Total	13.3	MG/KG	0.13	1.0
		Iron, Total	23300	MG/KG	2.8	1.0
		Mercury, Total	0.03	MG/KG	0.009	1.0
		Potassium, Total	749	MG/KG	2.5	1.0
		Magnesium, Total	4300	MG/KG	1.6	1.0
		Manganese, Total	316	MG/KG	0.03	1.0
		Sodium, Total	192	MG/KG	1.3	1.0
		Nickel, Total	11.7	MG/KG	0.13	1.0
		Lead, Total	2.9	MG/KG	0.19	1.0
		Antimony, Total	0.43 J	MG/KG	0.19	1.0
		Selenium, Total	0.38 u	MG/KG	0.38	1.0
		Tin, Total	0.38 u	MG/KG	0.38	1.0
		Thallium, Total	0.38 u	MG/KG	0.38	1.0
		Vanadium, Total	65.8	MG/KG	0.09	1.0
		Zinc, Total	43.8	MG/KG	0.38	1.0
		Zirconium, Total	22.0	MG/KG	3.1	1.0

10/22/08

Lionville Laboratory, Inc.

INORGANICS DATA SUMMARY REPORT 10/20/08

CLIENT: WC-HANFORD RC-113 K1382 LVL LOT #: 0810L052

WORK ORDER: 60049-001-001-0001-00

SAMPLE	SITE ID	ANALYTE	RESULT	UNITS	REPORTING LIMIT	DILUTION FACTOR
-002	J17J20	Silver, Total	0.06 u	MG/KG	0.06	1.0
		Aluminum, Total	4540	MG/KG	2.3	1.0
		Arsenic, Total	1.5	MG/KG	0.29	1.0
		Barium, Total	62.9	MG/KG	0.06	1.0
		Beryllium, Total	0.17	MG/KG	0.03	1.0
		Calcium, Total	5270 J	MG/KG	2.3	1.0
		Cadmium, Total	0.04	MG/KG	0.03	1.0
		Cobalt, Total	8.2	MG/KG	0.12	1.0
		Chromium, Total	21.8	MG/KG	0.12	1.0
		Copper, Total	12.7	MG/KG	0.12	1.0
		Iron, Total	23800	MG/KG	2.6	1.0
		Mercury, Total	0.06	MG/KG	0.009	1.0
		Potassium, Total	642	MG/KG	2.3	1.0
		Magnesium, Total	4170	MG/KG	1.4	1.0
		Manganese, Total	293	MG/KG	0.02	1.0
		Sodium, Total	209	MG/KG	1.2	1.0
		Nickel, Total	11.1	MG/KG	0.12	1.0
		Lead, Total	2.5	MG/KG	0.17	1.0
		Antimony, Total	0.35 J	MG/KG	0.17	1.0
		Selenium, Total	0.34 u	MG/KG	0.34	1.0
		Tin, Total	0.34 u	MG/KG	0.34	1.0
		Thallium, Total	0.34 u	MG/KG	0.34	1.0
		Vanadium, Total	72.4	MG/KG	0.08	1.0
		Zinc, Total	44.4	MG/KG	0.34	1.0
		Zirconium, Total	22.8	MG/KG	2.9	1.0

10/22/08

Lionville Laboratory, Inc.

INORGANICS DATA SUMMARY REPORT 10/20/08

CLIENT: WC-HANFORD RC-113 K1382 LVL LOT #: 0810L052

WORK ORDER: 60049-001-001-0001-00

SAMPLE	SITE ID	ANALYTE	RESULT	UNITS	REPORTING LIMIT	DILUTION FACTOR
-003	J17J21	Silver, Total	0.06 u	MG/KG	0.06	1.0
		Aluminum, Total	5460	MG/KG	2.6	1.0
		Arsenic, Total	2.1	MG/KG	0.32	1.0
		Barium, Total	58.4	MG/KG	0.06	1.0
		Beryllium, Total	0.21	MG/KG	0.03	1.0
		Calcium, Total	6670 J	MG/KG	2.6	1.0
		Cadmium, Total	0.03 u	MG/KG	0.03	1.0
		Cobalt, Total	6.7	MG/KG	0.13	1.0
		Chromium, Total	8.8	MG/KG	0.13	1.0
		Copper, Total	10.5	MG/KG	0.13	1.0
		Iron, Total	21000	MG/KG	2.9	1.0
		Mercury, Total	0.05	MG/KG	0.008	1.0
		Potassium, Total	1090	MG/KG	2.6	1.0
		Magnesium, Total	3870	MG/KG	1.6	1.0
		Manganese, Total	302	MG/KG	0.03	1.0
		Sodium, Total	199	MG/KG	1.3	1.0
		Nickel, Total	9.4	MG/KG	0.13	1.0
		Lead, Total	3.5	MG/KG	0.20	1.0
		Antimony, Total	0.70 J	MG/KG	0.20	1.0
		Selenium, Total	0.39 u	MG/KG	0.39	1.0
		Tin, Total	0.39 u	MG/KG	0.39	1.0
		Thallium, Total	0.39 u	MG/KG	0.39	1.0
		Vanadium, Total	54.5	MG/KG	0.09	1.0
		Zinc, Total	38.9	MG/KG	0.39	1.0
		Zirconium, Total	17.8	MG/KG	3.2	1.0

10/22/08

Lionville Laboratory, Inc.

INORGANICS DATA SUMMARY REPORT 10/20/08

CLIENT: WC-HANFORD RC-113 K1382 LVL LOT #: 0810L052

WORK ORDER: 60049-001-001-0001-00

SAMPLE	SITE ID	ANALYTE	RESULT	UNITS	REPORTING LIMIT	DILUTION FACTOR
-004	J17J22	Silver, Total	0.06 u	MG/KG	0.06	1.0
		Aluminum, Total	4130	MG/KG	2.6	1.0
		Arsenic, Total	1.8	MG/KG	0.32	1.0
		Barium, Total	64.7	MG/KG	0.06	1.0
		Beryllium, Total	0.15	MG/KG	0.03	1.0
		Calcium, Total	6300 J	MG/KG	2.6	1.0
		Cadmium, Total	0.06	MG/KG	0.03	1.0
		Cobalt, Total	9.4	MG/KG	0.13	1.0
		Chromium, Total	6.0	MG/KG	0.13	1.0
		Copper, Total	12.9	MG/KG	0.13	1.0
		Iron, Total	26800	MG/KG	2.9	1.0
		Mercury, Total	0.01 u	MG/KG	0.01	1.0
		Potassium, Total	552	MG/KG	2.6	1.0
		Magnesium, Total	4320	MG/KG	1.6	1.0
		Manganese, Total	325	MG/KG	0.03	1.0
		Sodium, Total	259	MG/KG	1.3	1.0
		Nickel, Total	9.2	MG/KG	0.13	1.0
		Lead, Total	1.9	MG/KG	0.19	1.0
		Antimony, Total	0.59 J	MG/KG	0.19	1.0
		Selenium, Total	0.39 u	MG/KG	0.39	1.0
		Tin, Total	0.39 u	MG/KG	0.39	1.0
		Thallium, Total	0.39 u	MG/KG	0.39	1.0
		Vanadium, Total	80.4	MG/KG	0.09	1.0
		Zinc, Total	48.3	MG/KG	0.39	1.0
		Zirconium, Total	24.4	MG/KG	3.2	1.0

10/22/08

Lionville Laboratory, Inc.

INORGANICS DATA SUMMARY REPORT 10/20/08

CLIENT: WC-HANFORD RC-113 K1382 LVL LOT #: 0810L052

WORK ORDER: 60049-001-001-0001-00

SAMPLE	SITE ID	ANALYTE	RESULT		UNITS	REPORTING LIMIT	DILUTION FACTOR
-005	J17J27	Silver, Total	0.07	u	MG/KG	0.07	1.0
		Aluminum, Total	4600		MG/KG	2.7	1.0
		Arsenic, Total	1.7		MG/KG	0.33	1.0
		Barium, Total	55.0		MG/KG	0.07	1.0
		Beryllium, Total	0.18		MG/KG	0.03	1.0
		Calcium, Total	5990	J	MG/KG	2.7	1.0
		Cadmium, Total	0.03	u	MG/KG	0.03	1.0
		Cobalt, Total	8.1		MG/KG	0.13	1.0
		Chromium, Total	6.5		MG/KG	0.13	1.0
		Copper, Total	13.2		MG/KG	0.13	1.0
		Iron, Total	24100		MG/KG	3.0	1.0
		Mercury, Total	0.009	u	MG/KG	0.009	1.0
		Potassium, Total	694		MG/KG	2.7	1.0
		Magnesium, Total	4010		MG/KG	1.7	1.0
		Manganese, Total	288		MG/KG	0.03	1.0
		Sodium, Total	214		MG/KG	1.3	1.0
		Nickel, Total	9.2		MG/KG	0.13	1.0
		Lead, Total	2.2		MG/KG	0.20	1.0
		Antimony, Total	0.66	J	MG/KG	0.20	1.0
		Selenium, Total	0.40	u	MG/KG	0.40	1.0
		Tin, Total	0.40	u	MG/KG	0.40	1.0
		Thallium, Total	0.40	u	MG/KG	0.40	1.0
		Vanadium, Total	70.4		MG/KG	0.09	1.0
		Zinc, Total	43.9		MG/KG	0.40	1.0
		Zirconium, Total	24.7		MG/KG	3.3	1.0

10/22/08

Lionville Laboratory, Inc.

INORGANICS DATA SUMMARY REPORT 10/20/08

CLIENT: WC-HANFORD RC-113 K1382 LVL LOT #: 0810L052

WORK ORDER: 60049-001-001-0001-00

SAMPLE	SITE ID	ANALYTE	RESULT	UNITS	REPORTING LIMIT	DILUTION FACTOR
-006	J17J28	Silver, Total	0.06 u	MG/KG	0.06	1.0
		Aluminum, Total	4500	MG/KG	2.5	1.0
		Arsenic, Total	1.2	MG/KG	0.31	1.0
		Barium, Total	61.6	MG/KG	0.06	1.0
		Beryllium, Total	0.17	MG/KG	0.03	1.0
		Calcium, Total	5410 J	MG/KG	2.5	1.0
		Cadmium, Total	0.04	MG/KG	0.03	1.0
		Cobalt, Total	9.2	MG/KG	0.13	1.0
		Chromium, Total	8.2	MG/KG	0.13	1.0
		Copper, Total	13.8	MG/KG	0.13	1.0
		Iron, Total	25700	MG/KG	2.8	1.0
		Mercury, Total	0.009u	MG/KG	0.009	1.0
		Potassium, Total	656	MG/KG	2.5	1.0
		Magnesium, Total	4120	MG/KG	1.6	1.0
		Manganese, Total	326	MG/KG	0.03	1.0
		Sodium, Total	289	MG/KG	1.3	1.0
		Nickel, Total	10.0	MG/KG	0.13	1.0
		Lead, Total	2.9	MG/KG	0.19	1.0
		Antimony, Total	0.44 J	MG/KG	0.19	1.0
		Selenium, Total	0.38 u	MG/KG	0.38	1.0
		Tin, Total	0.38 u	MG/KG	0.38	1.0
		Thallium, Total	0.38 u	MG/KG	0.38	1.0
		Vanadium, Total	76.8	MG/KG	0.09	1.0
		Zinc, Total	48.4	MG/KG	0.38	1.0
		Zirconium, Total	24.9	MG/KG	3.1	1.0

10/22/08

Lionville Laboratory, Inc.

INORGANICS DATA SUMMARY REPORT 10/20/08

CLIENT: WC-HANFORD RC-113 K1382 LVL LOT #: 0810L052

WORK ORDER: 60049-001-001-0001-00

SAMPLE	SITE ID	ANALYTE	RESULT	UNITS	REPORTING LIMIT	DILUTION FACTOR
-007	J17J29	Silver, Total	0.07 u	MG/KG	0.07	1.0
		Aluminum, Total	5660	MG/KG	2.7	1.0
		Arsenic, Total	1.9	MG/KG	0.34	1.0
		Barium, Total	89.5	MG/KG	0.07	1.0
		Beryllium, Total	0.20	MG/KG	0.03	1.0
		Calcium, Total	7690 J	MG/KG	2.7	1.0
		Cadmium, Total	0.03 u	MG/KG	0.03	1.0
		Cobalt, Total	8.4	MG/KG	0.14	1.0
		Chromium, Total	9.8	MG/KG	0.14	1.0
		Copper, Total	18.2	MG/KG	0.14	1.0
		Iron, Total	24400	MG/KG	3.1	1.0
		Mercury, Total	0.01	MG/KG	0.01	1.0
		Potassium, Total	924	MG/KG	2.7	1.0
		Magnesium, Total	4440	MG/KG	1.7	1.0
		Manganese, Total	310	MG/KG	0.03	1.0
		Sodium, Total	264	MG/KG	1.4	1.0
		Nickel, Total	12.0	MG/KG	0.14	1.0
		Lead, Total	4.6	MG/KG	0.20	1.0
		Antimony, Total	0.41 J	MG/KG	0.20	1.0
		Selenium, Total	0.41 u	MG/KG	0.41	1.0
		Tin, Total	0.41 u	MG/KG	0.41	1.0
		Thallium, Total	0.94	MG/KG	0.41	1.0
		Vanadium, Total	66.3	MG/KG	0.1	1.0
		Zinc, Total	49.0	MG/KG	0.41	1.0
		Zirconium, Total	24.0	MG/KG	3.4	1.0

10/22/08

Lionville Laboratory, Inc.

INORGANICS DATA SUMMARY REPORT 10/21/08

CLIENT: WC-HANFORD RC-113 K1382 LVL LOT #: 0810L052

WORK ORDER: 60049-001-001-0001-00

SAMPLE	SITE ID	ANALYTE	RESULT	UNITS	REPORTING LIMIT	DILUTION FACTOR
-008	J17J30	Silver, Total	0.06 u	MG/KG	0.06	1.0
		Aluminum, Total	148	MG/KG	2.6	1.0
		Arsenic, Total	0.32	MG/KG	0.32	1.0
		Barium, Total	1.8	MG/KG	0.06	1.0
		Beryllium, Total	0.04	MG/KG	0.03	1.0
		Calcium, Total	41.6 UJ	MG/KG	2.6	1.0
		Cadmium, Total	0.03 u	MG/KG	0.03	1.0
		Cobalt, Total	0.13 u	MG/KG	0.13	1.0
		Chromium, Total	0.21 UJ	MG/KG	0.13	1.0
		Copper, Total	0.13 u	MG/KG	0.13	1.0
		Iron, Total	206	MG/KG	2.9	1.0
		Mercury, Total	0.009u	MG/KG	0.009	1.0
		Potassium, Total	27.9	MG/KG	2.6	1.0
		Magnesium, Total	27.7 UJ	MG/KG	1.6	1.0
		Manganese, Total	4.1	MG/KG	0.03	1.0
		Sodium, Total	14.0 UJ	MG/KG	1.3	1.0
		Nickel, Total	0.13 u	MG/KG	0.13	1.0
		Lead, Total	0.22	MG/KG	0.19	1.0
		Antimony, Total	0.19 uJ	MG/KG	0.19	1.0
		Selenium, Total	0.38 u	MG/KG	0.38	1.0
		Tin, Total	0.73 UJ	MG/KG	0.38	1.0
		Thallium, Total	0.38 u	MG/KG	0.38	1.0
		Vanadium, Total	0.37	MG/KG	0.09	1.0
		Zinc, Total	0.60	MG/KG	0.38	1.0
		Zirconium, Total	1.9 UJ	MG/KG	0.32	1.0

10/22/08

Appendix 4

Laboratory Narrative and Chain-of-Custody Documentation

LIONVILLE LABORATORY INC.

Analytical Report

Client: WC-HANFORD RC-113
LVL#: 0810L052
SDG/SAF#: K1382/RC-113

W.O.#: 60049-001-001-0001-00
Date Received: 10-09-08

METALS CASE NARRATIVE

The following is a summary of the QC results accompanying the sample results. Lionville Laboratory (LvLI) certifies that all test results meet the requirements of NELAC except as noted below.

All soil samples are reported on a dry weight basis unless requested by the client, required by the method, or noted otherwise.

1. This narrative covers the analyses of 8 soil samples.

2. The samples were prepared and analyzed in accordance with methods checked on the attached glossary.

3. All analyses were performed within the required holding times.

4. All Initial and Continuing Calibration Verifications (ICV/CCVs) were within the 90-110% control limits (80-120% for Mercury) with the exception of the ICV and first CCV for Sodium in file TA1017C. The samples were rerun for Sodium in file PS1020B.

5. All Initial and Continuing Calibration Blanks (ICB/CCBs) were within control limits (less than the LOQ).

6. The preparation/method blank for 1 analyte was outside method criteria. {less than the Limit of Quantitation (3-10X the LOD), or samples greater than 20X MB value}. Refer to the Inorganics Method Blank Data Summary.

   a). The MB result for Manganese was greater than the Limit of Quantitation (LOQ) {3-10x the (LOD) Limit of Detection} and sample J17J30 read less than 20 times the MB concentration. However, no corrective action criteria for MBs were provided in SW846 method 6010B. The sample results were reported herein "uncorrected" for the levels found in the MB.

7. All ICP Interference Check Standards were within control limits.

8. All laboratory control samples (LCS) were within the 80-120% control limits. Refer to the

The results presented in this report relate only to the analytical testing and conditions of the samples at receipt and during storage. All pages of this report are integral parts of the analytical data. Therefore, this report should only be reproduced in its entirety of 33 pages.

Inorganics Laboratory Control Standards Report.

9. The matrix spike (MS) recoveries for 4 analytes were outside the 75-125% control limits. Refer to the Inorganics Accuracy Report.

   The matrix spike sample for Mercury was inadvertantly double spiked, per SDR #08MR004A. The recovery percentage was adjusted accordingly.

10. For analytes where the ICP MS is out-of-control, a post-digestion MS (PDS) and serial dilution are performed. A PDS was prepared at meaningful concentration level for the following analytes:

Sample ID	Element	PDS Concentration (ppb)	PDS % Recovery
J17J19	Aluminum	22,000	98.4
	Calcium	22,000	101.7
	Iron	22,000	123.9
	Antimony	100	97.8

11. The duplicate analyses for 2 analytes were outside the 20% Relative Percent Difference (RPD) control limits. Refer to the Inorganics Precision Report.

12. For the purposes of this report, the data has been reported to the Limit of Detection (LOD). Values between the LOD and the Limit of Quantitation (LOQ) are acquired in a region of less-certain quantification.

13. LvLI is NELAP accredited by the state of Pennsylvania. For a complete listing of accrediting authorities and the corresponding analytes/methods, please contact your Project Manager.

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

Iain Daniels
Laboratory Manager
Lionville Laboratory Incorporated

10/20/18
Date

jjw/m10-052

LvLI
LIONVILLE LABORATORY INC.

Lionville Laboratory Sample Discrepancy Report (SDR)

SDR #: 08MR054A

Initiator: TBRINGES
Date: 10/15/08
Client: WCH

Batch: 08IOL052
Samples: 001 5
Method: SW846/MCAWW/CLP/

Parameter: U8
Matrix: SOIL
Prep Batch: 08CO183

1. Reason for SDR

a. COC Discrepancy
__ Tech Profile Error __ Client Request __ Sampler Error on C-O-C
__ Transcription Error __ Wrong Test Code __ Other _____

b. General Discrepancy
__ Missing Sample/Extract* __ Container Broken __ Wrong Sample Pulled __ Label ID's Illegible
__ Hold Time Exceeded __ Insufficient Sample* __ Preservation Wrong __ Received Past Hold
__ Improper Bottle Type __ Not Amenable to Analysis

Note*: Verified by [Log-In] or [Prep Group] (circle)...signature/date: _____

c. Problem (Include all relevant specific results; attach data if necessary)

double spiked matrix spike

2. Known or Probable Causes(s)

3. Discussion and Proposed Action
__ Re-log
__ Entire Batch
__ Following Samples: _____
__ Re-leach
__ Re-extract
__ Re-digest
__ Revise EDD
__ Change Test Code to _____
__ Place On/Take Off Hold (circle)

Other Description:
Narrate

4. Project Manager Instructions...signature/date: 10/16/08
✓ Concur with Proposed Action
__ Disagree with Proposed Action; See Instruction
__ Include in Case Narrative
__ Client Contacted:
Date/Person _____
__ Add
__ Cancel

5. Final Action...signature/date: _____
__ Verified re-[log][leach][extract][digest][analysis] (circle)
__ Included in Case Narrative
__ Hard Copy COC Revised
__ Electronic COC Revised
__ EDD Corrections Completed

Other Explanation:

When Final Action has been recorded, forward original to QA for diposition.

Route
__ Lab Manager: Daniels
✓ Project Mgr (circle): Johnsen / Stone
__ Sample Prep (circle): Ford
__ Log-in: King

Route
✓ Metals: Welsh / _____
__ Inorganic: Perrone / _____
__ GC/LC: Carey / _____
__ MS VOA: Rubino / _____
__ MS BNA: Carden / _____
__ Other: _____

QA-139-A-0208

Washington Closure Hanford	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST	RC-113-004	Page 1 of 1

Collector T. Stephens, P. Pearson	Company Contact Joan Kessner	Telephone No. 509-375-4655	Project Coordinator KESSNER, JH
Price Code 8C	Data Turnaround ~~15~~ 7 Days RTC 10/6/08		
Project Designation 618-7 Burial Ground Verification Sampling	Sampling Location 618-7 Burial Ground - Verif. Sampling		SAF No. RC-113
Ice Chest No. SML-412	Field Logbook No. EL-1395-13	COA RG61872600	Method of Shipment FED EX
Shipped To EBERLINE SERVICES / LIONVILLE	Offsite Property No. A090030		Bill of Lading/Air Bill No. SEE OSR

POSSIBLE SAMPLE HAZARDS/REMARKS

Potential Radiological contamination.

Special Handling and/or Storage

None

220000

Preservation	None	None										
Type of Container	P	P										
No. of Container(s)	1	1										
Volume	~~250mL~~ 500	1000mL										
SAMPLE ANALYSIS	See Item (1) in Special Instructions.	See Item (2) in Special Instructions. RTC 10/6										
Sample No.	Matrix *	Sample Date	Sample Time									
J17J19	SOIL	10/6/08	0930	X								A1
J17J20	SOIL		0930	X								A1D
J17J21	SOIL		0940	X								B5
J17J22	SOIL	10/6/08	1250	X								C2

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

Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time
T Stephens / T Stephens	1630 10-6-08	RT Coffman / RT Coffman	1630 10/6/08
RT Coffman / RT Coffman	1655 10/6/08	REFER # 1A, 1060	1655 10/6/08
Refer 1A / J.E. Bernhard	1230 10-8-08	J.E. Bernhard	1230 10-8-08
J.E. Bernhard	1245 10-8-08	FED EX	
FED EX 10-9-08	0915	Rick Hernandez 10-9-08	0915
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time

SPECIAL INSTRUCTIONS

(1) ICP Metals - 6010A (TAL) (Aluminum, Antimony, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Magnesium, Manganese, Nickel, Potassium, Silver, Sodium, Vanadium, Zinc); ICP Metals - 6010A (Add-on) (Arsenic, Lead, Selenium, Thallium, Tin, Zirconium); Mercury - 7471 - (CV)

(2) Gamma Spectroscopy (TCL List) (Cesium-137, Cobalt-60, Europium-152, Europium-154, Europium-155); Isotopic Thorium; Isotopic Uranium

Sampler unavailable to remove samples from controlled storage. Shipper removed samples from storage location taking custody of samples for shipment to lab.

Matrix *

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

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

WCH-EE-011

000000031

Washington Closure Hanford	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST	RC-113-009	Page 1 of 1

Collector T. Stephens, P. Pearson	Company Contact Joan Kessner Telephone No. 509-375-4655	Project Coordinator KESSNER, JH	Price Code 8C Data Turnaround ~~15~~ Days 7 RTC
Project Designation 618-7 Burial Ground Verification Sampling	Sampling Location 618-7 Burial Ground - Verif. Sampling	SAF No. RC-113	
Ice Chest No. SML-412	Field Logbook No. EL-1395-13 COA RG61872600	Method of Shipment FED EX 10/6/08	
Shipped To EBERLINE SERVICES (LIONVILLE)	Offsite Property No. A090030	Bill of Lading/Air Bill No. SEE ASR	

POSSIBLE SAMPLE HAZARDS/REMARKS

Potential Radiological contamination.

Special Handling and/or Storage

None

Preservation	None	None									
Type of Container	P	P									
No. of Container(s)	1	1									
Volume	250mL	1000mL									
SAMPLE ANALYSIS	See item (1) in Special Instructions.	See item (2) in Special Instructions. RTC 10/6/08									

000023

Sample No.	Matrix *	Sample Date	Sample Time										
J17J27	SOIL	10/6/08	1255	X									D5
J17J28	SOIL		1310	X									C9
J17J29	SOIL		1320	X									B8
J17J30	SOIL	10/6/08	0930	X									D1 B

CHAIN OF POSSESSION — Sign/Print Names

Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time
T Stephens / T Stephens	1630 10-6-08	RT Coffman / RT Coffman	1630 10/6/08
RT Coffman / RT Coffman	1655 10/6/08	Refer #1A, 1060	1655 10/6/08
Refer 1A / J.E. Bernhard	1238 10-8-08	J.E. Bernhard	1238 10-8-08
J.E. Bernhard WCH	1245 10-8-08	FED EX	
FED EX 10908	0915	10908	0915

SPECIAL INSTRUCTIONS

(1) ICP Metals - 6010A (TAL) (Aluminum, Antimony, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Magnesium, Manganese, Nickel, Potassium, Silver, Sodium, Vanadium, Zinc); ICP Metals - 6010A (Add-on) (Arsenic, Lead, Selenium, Thallium, Tin, Zirconium); Mercury - 7471 - (CV)

(2) Gamma Spectroscopy (TCL List) (Cesium-137, Cobalt-60, Europium-152, Europium-154, Europium-155); Isotopic Thorium; Isotopic Uranium

Sampler unavailable to remove samples from controlled storage. Shipper removed samples from storage location taking custody of samples for shipment to lab.

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

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

WCH-EE-011

000000032

Appendix 5

Data Validation Supporting Documentation

INORGANIC ANALYSIS DATA VALIDATION CHECKLIST

VALIDATION LEVEL:	A	B	C	D	E
PROJECT:	618-7		DATA PACKAGE:	K1382	
VALIDATOR:	ELR	LAB:	LLI	DATE:	10/22/08
			SDG:[1]	K1382	

ANALYSES PERFORMED					
SW-846/ICP	SW-846/GFAA	SW-846/Hg	SW-846 Cyanide		

SAMPLES/MATRIX
J17J19 J17J20 J17J21 J17J22 J17J27
J17J28 J17J29 J17J30
soil

1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE

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

Comments:

2. INSTRUMENT PERFORMANCE AND CALIBRATIONS (Levels D and E)

Initial calibrations performed on all instruments? ..... Yes No N/A

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

ICP interference checks acceptable? ..... Yes No N/A

ICV and CCV checks performed on all instruments? ..... Yes No N/A

ICV and CCV checks acceptable? ..... Yes No N/A

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

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

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

Comments:

INORGANIC ANALYSIS DATA VALIDATION CHECKLIST

3. BLANKS (Levels B, C, D, and E)

ICB and CCB checks performed for all applicable analyses? (Levels D, E) ..... Yes No N/A

ICB and CCB results acceptable? (Levels D, E) ..... Yes No N/A

Laboratory blanks analyzed? ..... Yes No N/A

Laboratory blank results acceptable? ..... Yes No N/A

Field blanks analyzed? (Levels C, D, E) ..... Yes No N/A

Field blank results acceptable? (Levels C, D, E) ..... Yes No N/A

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

Comments: MB 30 - calcium, chromium, magnesium, sodium, tin, titanium - UJ

FB - al, arsenic, barium, beryllium, iron, potassium, manganese, lead, vanadium & zinc.

4. ACCURACY (Levels C, D, and E)

MS/MSD samples analyzed? ..... Yes No N/A

MS/MSD results acceptable? ..... Yes No N/A

MS/MSD standards NIST traceable? (Levels D, E) ..... Yes No N/A

MS/MSD standards expired? (Levels D, E) ..... Yes No N/A

LCS/BSS samples analyzed? ..... Yes No N/A

LCS/BSS results acceptable? ..... Yes No N/A

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

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

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

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

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

Comments: MS antimony (46.9%) - J all MS calcium (155%) - J all detects

no pts

INORGANIC ANALYSIS DATA VALIDATION CHECKLIST

5. PRECISION (Levels C, D, and E)

Duplicate RPD values acceptable? ..... Yes No N/A

Duplicate results acceptable? ..... Yes No N/A

MS/MSD standards NIST traceable? (Levels D, E) ..... Yes No N/A

MS/MSD standards expired? (Levels D, E) ..... Yes No N/A

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

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

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

Comments: FD - chromium 86.8%

6. ICP QUALITY CONTROL (Levels D and E)

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

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

ICP post digestion spike required? ..... Yes No N/A

ICP post digestion spike values acceptable? ..... Yes No N/A

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

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

Transcription/calculation errors? ..... Yes No N/A

Comments:

INORGANIC ANALYSIS DATA VALIDATION CHECKLIST

7. FURNACE AA QUALITY CONTROL (Levels D and E)

Duplicate injections performed as required? ..... Yes No N/A

Duplicate injection %RSD values acceptable? ..... Yes No N/A

Analytical spikes performed as required? ..... Yes No N/A

Analytical spike recoveries acceptable? ..... Yes No N/A

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

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

MSA performed as required? ..... Yes No N/A

MSA results acceptable? ..... Yes No N/A

Transcription/calculation errors? ..... Yes No N/A

Comments: _____

8. HOLDING TIMES (all levels)

Samples properly preserved? ..... Yes No N/A

Sample holding times acceptable? ..... Yes No N/A

Comments: _____

INORGANIC ANALYSIS DATA VALIDATION CHECKLIST

9. RESULT QUANTITATION AND DETECTION LIMITS (all levels)

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

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

Samples properly prepared? (Levels D, E) ..... Yes No N/A

Detection limits meet RDL? ..... Yes No N/A

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

Comments:

Appendix 6

Additional Documentation Requested by Client

Lionville Laboratory, Inc.

INORGANICS METHOD BLANK DATA SUMMARY PAGE 10/21/08

CLIENT: WC-HANFORD RC-113 K1382 LVL LOT #: 0810L052

WORK ORDER: 60049-001-001-0001-00

SAMPLE	SITE ID	ANALYTE	RESULT	UNITS	REPORTING LIMIT	DILUTION FACTOR
BLANK1	08L0378-MB1	Silver, Total	0.10 u	MG/KG	0.10	1.0
		Aluminum, Total	9.8	MG/KG	4.0	1.0
		Arsenic, Total	0.50 u	MG/KG	0.50	1.0
		Barium, Total	0.15	MG/KG	0.10	1.0
		Beryllium, Total	0.05 u	MG/KG	0.05	1.0
		Calcium, Total	12.9	MG/KG	4.0	1.0
		Cadmium, Total	0.05 u	MG/KG	0.05	1.0
		Cobalt, Total	0.20 u	MG/KG	0.20	1.0
		Chromium, Total	0.22	MG/KG	0.20	1.0
		Copper, Total	0.20 u	MG/KG	0.20	1.0
		Iron, Total	17.6	MG/KG	4.5	1.0
		Potassium, Total	4.0 u	MG/KG	4.0	1.0
		Magnesium, Total	6.2	MG/KG	2.5	1.0
		Manganese, Total	0.23	MG/KG	0.04	1.0
		Sodium, Total	10.0	MG/KG	2.0	1.0
		Nickel, Total	0.20 u	MG/KG	0.20	1.0
		Lead, Total	0.30 u	MG/KG	0.30	1.0
		Antimony, Total	0.30 u	MG/KG	0.30	1.0
		Selenium, Total	0.60 u	MG/KG	0.60	1.0
		Tin, Total	0.90	MG/KG	0.60	1.0
		Thallium, Total	0.60 u	MG/KG	0.60	1.0
		Vanadium, Total	0.14 u	MG/KG	0.14	1.0
		Zinc, Total	0.60 u	MG/KG	0.60	1.0
		Zirconium, Total	1.2	MG/KG	0.50	1.0
BLANK1	08C0183-MB1	Mercury, Total	0.01 u	MG/KG	0.01	1.0

Lionville Laboratory, Inc.

INORGANICS ACCURACY REPORT 10/20/08

CLIENT: WC-HANFORD RC-113 K1382 LVL LOT #: 0810L052

WORK ORDER: 60049-001-001-0001-00

SAMPLE	SITE ID	ANALYTE	SPIKED SAMPLE	INITIAL RESULT	SPIKED AMOUNT	%RECOV	DILUTION FACTOR(SPK)
-001	J17J19	Silver, Total	2.9	0.06u	3.2	90.6	1.0
		Aluminum, Total	6380	5240	126	905.3*	1.0
		Arsenic, Total	116	1.7	126	90.5	1.0
		Barium, Total	186	69.5	126	92.5	1.0
		Beryllium, Total	3.1	0.17	3.2	91.5	1.0
		Calcium, Total	8720	6280	1580	155.1	1.0
		Cadmium, Total	2.8	0.06	3.2	85.6	1.0
		Cobalt, Total	36.0	8.2	31.5	88.3	1.0
		Chromium, Total	20.1	8.6	12.6	91.3	1.0
		Copper, Total	27.9	13.3	15.8	92.4	1.0
		Iron, Total	23900	23300	63.0	1004 *	1.0
		Mercury, Total	0.38	0.03	0.31	111.3	1.0
		Potassium, Total	2290	749	1580	97.8	1.0
		Magnesium, Total	5810	4300	1580	95.8	1.0
		Manganese, Total	341	316	31.5	79.0*	1.0
		Sodium, Total	1710	192	1580	96.5	1.0
		Nickel, Total	38.9	11.7	31.5	86.3	1.0
		Lead, Total	33.3	2.9	31.5	96.5	1.0
		Antimony, Total	15.2	0.43	31.5	46.9	1.0
		Selenium, Total	109	0.38u	126	86.7	1.0
		Tin, Total	56.0	0.38u	63.0	88.9	1.0
		Thallium, Total	112	0.38u	126	88.7	1.0
		Vanadium, Total	98.5	65.8	31.5	103.8	1.0
		Zinc, Total	72.9	43.8	31.5	92.4	1.0
		Zirconium, Total	296	23.0	315	87.0	1.0

Lionville Laboratory, Inc.

INORGANICS PRECISION REPORT 10/20/08

CLIENT: WC-HANFORD RC-113 K1382 LVL LOT #: 0810L052

WORK ORDER: 60049-001-001-0001-00

SAMPLE	SITE ID	ANALYTE	INITIAL RESULT	REPLICATE	RPD	DILUTION FACTOR(REP)
-001REP	J17J19	Silver, Total	0.06u	0.06u	NC	1.0
		Aluminum, Total	5240	5190	1.0	1.0
		Arsenic, Total	1.7	1.8	5.7	1.0
		Barium, Total	69.5	60.8	13.4	1.0
		Beryllium, Total	0.17	0.19	10.1	1.0
		Calcium, Total	6280	5810	7.8	1.0
		Cadmium, Total	0.06	0.06	0.64	1.0
		Cobalt, Total	8.2	7.7	6.3	1.0
		Chromium, Total	8.6	7.7	11.0	1.0
		Copper, Total	13.3	12.1	9.4	1.0
		Iron, Total	23300	22900	1.8	1.0
		Mercury, Total	0.03	0.04	22.2	1.0
		Potassium, Total	749	729	2.7	1.0
		Magnesium, Total	4300	4090	5.0	1.0
		Manganese, Total	316	296	6.5	1.0
		Sodium, Total	192	201	4.6	1.0
		Nickel, Total	11.7	10.5	10.8	1.0
		Lead, Total	2.9	3.0	3.4	1.0
		Antimony, Total	0.43	0.26	50.4	1.0
		Selenium, Total	0.38u	0.37u	NC	1.0
		Tin, Total	0.38u	0.37u	NC	1.0
		Thallium, Total	0.38u	0.37u	NC	1.0
		Vanadium, Total	65.8	66.4	0.91	1.0
		Zinc, Total	43.8	43.0	1.8	1.0
		Zirconium, Total	22.0	22.2	0.90	1.0

Lionville Laboratory, Inc.

INORGANICS LABORATORY CONTROL STANDARDS REPORT 10/20/08

CLIENT: WC-HANFORD RC-113 K1382 LVL LOT #: 0810L052

WORK ORDER: 60049-001-001-0001-00

SAMPLE	SITE ID	ANALYTE	SPIKED SAMPLE	SPIKED AMOUNT	UNITS	%RECOV
LCS1	08L0378-LC1	Silver, LCS	47.7	50.0	MG/KG	95.4
		Aluminum, LCS	504	500	MG/KG	100.7
		Arsenic, LCS	932	1000	MG/KG	93.2
		Barium, LCS	470	500	MG/KG	93.9
		Beryllium, LCS	23.8	25.0	MG/KG	95.2
		Calcium, LCS	2370	2500	MG/KG	94.6
		Cadmium, LCS	23.3	25.0	MG/KG	93.2
		Cobalt, LCS	233	250	MG/KG	93.4
		Chromium, LCS	48.1	50.0	MG/KG	96.2
		Copper, LCS	118	125	MG/KG	94.8
		Iron, LCS	512	500	MG/KG	102.4
		Potassium, LCS	2250	2500	MG/KG	89.9
		Magnesium, LCS	2330	2500	MG/KG	93.3
		Manganese, LCS	71.6	75.0	MG/KG	95.5
		Sodium, LCS	2360	2500	MG/KG	94.4
		Nickel, LCS	189	200	MG/KG	94.6
		Lead, LCS	235	250	MG/KG	94.0
		Antimony, LCS	276	300	MG/KG	92.0
		Selenium, LCS	918	1000	MG/KG	91.8
		Tin, LCS	467	500	MG/KG	93.5
		Thallium, LCS	934	1000	MG/KG	93.4
		Vanadium, LCS	235	250	MG/KG	94.0
		Zinc, LCS	96.3	100	MG/KG	96.3
		Zirconium, LCS	469	500	MG/KG	93.7
LCS1	08C0183-LC1	Mercury, LCS	4.8	4.7	MG/KG	102.3