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River Corridor
Closure Contract

100-B/C Remedial Investigation/Feasibility Study Data Quality Assessment Report

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Washington Closure Hanford

Prepared for the U.S. Department of Energy, Richland Operations Office
Office of Assistant Manager for River Corridor

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Title: 100-B/C Remedial Investigation/Feasibility Study Data Quality Assessment Report

Author Name: R. P. Wells

Approval: R. W. Ovink, Environmental Protection

Signature

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REVISION HISTORY

Revision	Date	Reason for revision	Revision initiator
1	07/2012	Update review qualifiers	R. P. Wells
0	12/2011	Initial issuance	R. P. Wells

1.0 INTRODUCTION

This data quality assessment (DQA) has been prepared to support the vadose zone characterization component of the 100-B/C Remedial Investigation/Feasibility Study. The DQA was performed in accordance with EPA/240/B-06/002, *Data Quality Assessment: A Reviewer's Guide*, and EPA/240/B-06/003, *Data Quality Assessment: Statistical Methods for Practitioners*. The contents of this DQA specifically address laboratory quality control (QC) results. The laboratory QC results were evaluated against the requirements and guidelines provided in *Sampling and Analysis Plan for the 100-BC-1, 100-BC-2, and 100-BC-5 Operable Units Remedial Investigation/Feasibility Study* (SAP) (DOE/RL-2009-44) and the associated Tri-Party Agreement Change Notices (TPA-CN-303, TPA-CN-348, TPA-CN-351, and TPA-CN-399).

Table 1 presents information on the analytical laboratories whose work was reviewed. Table 2 presents a summary of the analytical methods.

Table 1. Analytical Laboratories.

Name	Address
Lionville Laboratory, Inc.	208 Welsh Pond Road, Exton, Pennsylvania 19341
Eberline Analytical Corporation/Eberline Services	2030 Wright Avenue, Richmond, California 94804
Test America Laboratories	2800 George Washington Way, Richland, Washington 99354
	13715 Rider Trail North, Earth City, Missouri 63045

Table 2. Laboratory Analytical Methods. (2 Pages)

Parameter	Analytical Method
ICP metals	EPA Method 6010B [a] EPA Method 6020
Mercury	EPA Method 7471A (soil) EPA Method 7470A (water)
Hexavalent chromium (Cr-VI)	EPA Method 7196A
Anions	EPA Method 300.0
Nitrate/nitrite	EPA Method 353.1 EPA Method 353.2
Volatile organic compounds	EPA Method 8260B
pH	EPA Method 9045 (soil) EPA Method 9040 (water)
Polychlorinated biphenyls	EPA Method 8082
Polynuclear aromatic hydrocarbons	EPA Method 8310
Total petroleum hydrocarbons (WTPH-D)	EPA Method 8015

Table 2. Laboratory Analytical Methods. (2 Pages)

Parameter	Analytical Method
Gamma-emitting radioisotopes	Gamma energy analysis
Gross alpha/beta	Gas-flow proportional counting
Carbon-14	LSC - C-14
Tritium	LSC - Tritium
Total Radiostrontium	Gas-flow proportional counting
Nickel-63	LSC - Ni-63
Iodine-129	Low-energy gamma analysis
Technetium-99	Gas-flow proportional counting
Americium-241	Alpha energy analysis
Plutonium-238, -239/240	Alpha energy analysis
Uranium-233/234, -235, -238	Alpha energy analysis
Uranium (total)	Kinetic phosphorescence analysis

[a] Analysis was performed for the expanded list of ICP metals including aluminum, antimony, arsenic, barium, beryllium, bismuth, boron, cadmium, calcium, chromium (total), cobalt, copper, iron, lead, lithium, magnesium, manganese, molybdenum, nickel, phosphorous, potassium, selenium, silicon, silver, sodium, strontium, thallium, tin, vanadium, and zinc.

EPA = U.S. Environmental Protection Agency
ICP = inductively coupled plasma
LSC = liquid scintillation counting
pH = hydrogen ion concentration
WTPH-D = Washington total petroleum hydrocarbon-diesel

2.0 LABORATORY QUALITY CONTROL PARAMETERS DISCUSSION

A total of 195 sample delivery groups (SDGs) were reviewed with a combined 610 field samples and 2,803 sample analyses between them.

Each SDG that was assessed contained at least one, and often several, different analytical methods that were assessed as part of the DQA. Table 3 presents the reviewed SDGs, sorted by sample authorization forms. Also shown in Table 3 are the laboratory analyses, including the number of samples per analysis that were performed for each SDG.

Data assessment was not conducted for certain wet chemistry parameters (e.g., total solids and percent moisture) or physical property parameters (e.g., particle size distribution, porosity, bulk density, and saturated hydraulic conductivity), but these analyses are listed in Table 3 for completeness.

Table 3. Summary of Sample Delivery Groups Subject to Data Assessment. (6 Pages)

Sample Delivery Group	Site	Number of Samples in Sample Delivery Group	Analyses Performed																								
			Cr-VI	Tritium	Carbon-14	Nickel-63	Iodine-129	Total Radiostrontium	Technetium-99	Gross Alpha	Gross Beta	Isotopic Plutonium	Isotopic Uranium	Americium-241	Total Uranium	GEA	Metals	pH	Percent Solids	Percent Moisture	Physical Properties	Special Extraction	TPH - DRO	PAHs	PCBs	Anions	NO_2/NO_3	VOA
Sample Authorization Form RC-185 (Soil)																											
J00852	C7784	1	1													1											
J00867	C7784	1															1										
K2123	C7508	9	8					8								8	8	6	8	4	4	7					
K2205	C7784	1						1								1											
K2208	C7784	3						3								3											
K2220	C7784	1	1														1		1								
K2224	C7784	5	3														3	1	3		1	2					
K2246	C7784	1						1								1											
K2270	C7784	2	1														1	1	1	1		1					
K2305	C7784	3						3								3											
K2324	C7784	6	3														3	3	3	4	4	2					
K2950	C8244	4	4														4	4	4	4	1						
K2955	C8244	2																				2					
K2967	C8244	4																				4					
K2968	C8244	4																				4					
K2971	C8244	9	8														8	9	8	9	6						
K2975	C8244	12						12								12											
K2993	C7785	4						4								4											
K3005	C7785	3						3								3											
K3014	C7785	2																				2					
K3019	C7785	4	4														4	4	4	4							
K3026	C7785	2																				2					
K3029	C7785	3	3														3	3	3	3	1						
K3035	C7785	2						2								2											
K3055	C7785	2	2														2	2	2	2	1						
K3058	C7785	2																				2					
K3139	C8244	1																			1						
Sample Authorization Form RC-186 (Water)																											
J00846	C7784	1	1																								
J00857	C7842	2	2																								
J00919	C7845	2	2																								
J00937	C7849	2	2																								
J00942	C7844	2	2																								
J00955	C8239	2	2																								
J00991	C7785	1	1																								
J00992	C8244	1	1																								
J01005	C7843	2	2																								
J01009	C7846	3	3																								
K2126	C7508	1															1										
K2274	C7784	1						1								1											

Table 3. Summary of Sample Delivery Groups Subject to Data Assessment. (6 Pages)

Sample Delivery Group	Site	Number of Samples in Sample Delivery Group	Analyses Performed																								
			Cr-VI	Tritium	Carbon-14	Nickel-63	Iodine-129	Total Radiostrontium	Technetium-99	Gross Alpha	Gross Beta	Isotopic Plutonium	Isotopic Uranium	Americium-241	Total Uranium	GEA	Metals	pH	Percent Solids	Percent Moisture	Physical Properties	Special Extraction	TPH - DRO	PAHs	PCBs	Anions	NO_2/NO_3	VOA
K2284	C7784	1															1	1										
K2341	C7842	2		2	2	2	2	2	2	2	2				2	2												
K2357	C7842	3															2	2					2			2	2	3
K2491	C7845	2		2	2	2	2	2	2	2	2				2	2												
K2535	C7845	4															2	1					2			2	2	3
K2604	C7849	2		2	2	2	2	2	2	2	2				2	2												
K2644	C7849	3																										3
K2669	C7849	2															2	2					2			2	2	
K2720	C7844	2		2	2	2	2	2	2	2	2				2	2												
K2753	C7844	3															2	2					2			2	2	3
K2831	C8239	3															2	2					2			2	2	3
K2869	C8239	2		2	2	2	2	2	2	2	2				2	2												
K2994	C8244	1						1																				
K3003	C7785	1						1																				
K3020	C8244	1															1	1										
K3028	C7785	1															1	1										
K3099	C7843	2		2	2	2	2	2	2	2	2				2	2												
K3101	C7846	3		3	3	3	3	3	3	3	3				3	3												
K3107	C7846	1															1						1			1	1	1
K3109	C7843	2															2	2					2			2	2	
K3113	C7843	3																										3
K3123	C7846	3															2	1					2			2	2	3
Sample Authorization Form RC-195 (Soil)																												
K2335	C7842	2		2			2	2	2			2	2			2												
K2337	C7842	4		4	4	4	4	4	4			4	4	4		4												
K2338	C7842	1						1																				
K2342	C7842	3		3	3	3	3	3	3			3	3	3		3												
K2345	C7843	1		1	1	1	1	1	1			1	1	1		1												
K2349	C7842	2																										2
K2352	C7842	6	3														3		5			1				3	3	2
K2354	C7842	4																										4
K2355	C7842	4																				4						
K2356	C7842	4	4														4	4	4						4	4	4	
K2358	C7842	1																				1						
K2361	C7842	1	1														1	1	1									
K2364	C7842	1																										1
K2369	C7842	2																				2						
K2372	C7842	3	3														3	3	3						3	3	3	
K2375	C7843	1	1														1	1	1				1	1		1	1	
K2377	C7843	2																										2
K2380	C7843	1																										1

Table 3. Summary of Sample Delivery Groups Subject to Data Assessment. (6 Pages)

Sample Delivery Group	Site	Number of Samples in Sample Delivery Group	Analyses Performed																									
			Cr-VI	Tritium	Carbon-14	Nickel-63	Iodine-129	Total Radiostrontium	Technetium-99	Gross Alpha	Gross Beta	Isotopic Plutonium	Isotopic Uranium	Americium-241	Total Uranium	GEA	Metals	pH	Percent Solids	Percent Moisture	Physical Properties	Special Extraction	TPH - DRO	PAHs	PCBs	Anions	NO_2/NO_3	VOA
K2382	C7843	4		4	4	4	4	4	4			4	4	4		4												
K2384	C7843	3		3	3	3	3	3	3			3	3	3		3												
K2385	C7843	4																				4						
K2386	C7843	4	4														4	4	4	4			4	4		4	4	
K2387	C7843	4																				4						
K2394	C7846	1	1														1		1							1	1	
K2395	C7846	1																										1
K2407	C7846	1		1	1	1	1	1	1			1		1		1												
K2408	C7843	5	5														5	5	5	5			4	4		4	4	
K2409	C7843	1																										1
K2463	C7843	1																				1						
K2464	C7843	2	2														2	2	2	2						2		
K2478	C7845	1		1			1	1																				
K2488	C7845	1		1			1	1																				
	C7846	5		5	3	4	5	5	4			3		3		5												
K2492	C7846	2		2	2	2	2	2	2			2		2		2												
K2497	C7845	1	1														1			1						1	1	
K2499	C7845	1																										1
K2501	C7845	1																										1
K2508	C7845	2																										2
K2515	C7845	9		9			9	9																				
	C7846	3		3	3	3	3	3	3			3		3		3												
K2522	C7846	7																										7
K2525	C7845	1																										1
K2541	C7846	5																										5
K2555	C7849	1		1	1	1	1	1	1			1	1	1		1												
K2560	C7846	5	5														5	5	5	5						5	5	
K2565	C7846	5																				5						
K2567	C7846	4	4														4	4	4	4						4	4	
K2571	C7845	3																				3						
K2578	C7846	3	3														3	3	3	3						3	3	
K2579	C7845	8																										8
K2584	C7845	7	7														7	7	7	7	1					7	7	
K2586	C7845	5																				5						
K2587	C7846	2																				2						
K2589	C7845	5	5														5	5	5	5						5	5	
K2592	C7845	1																				1						
K2599	C7846	4																				4						
K2602	C7849	6		6	6	6	6	6	6			6	6	6		6												
K2617	C7849	2	1														1	1	2	1			2	1	1	1	1	
K2634	C7847	1																										1

Table 3. Summary of Sample Delivery Groups Subject to Data Assessment. (6 Pages)

Sample Delivery Group	Site	Number of Samples in Sample Delivery Group	Analyses Performed																								
			Cr-VI	Tritium	Carbon-14	Nickel-63	Iodine-129	Total Radiostrontium	Technetium-99	Gross Alpha	Gross Beta	Isotopic Plutonium	Isotopic Uranium	Americium-241	Total Uranium	GEA	Metals	pH	Percent Solids	Percent Moisture	Physical Properties	Special Extraction	TPH - DRO	PAHs	PCBs	Anions	NO_2/NO_3	VOA
K2635	C7849	6																										8
K2636	C7849	5																				5						
K2637	C7849	6	6														6	6	6	6			6	6	6	6	6	
K2638	C7649	1																				1						
K2639	C7849	10																										10
K2640	C7847	2																										2
K2645	C7847	2																										2
K2646	C7845	1																										1
K2647	C7849	6																										6
K2657	C7849	9		9	9	9	9	9	9			9	9	9		9												
	C7845	3		3			2	3																				
K2661	C7844	1		1	1	1	1	1	1							1												
	C7846	1						1																				
	C7847	1		1	1	1	1	1	1			1	1	1		1												
K2662	C7844	3		3	3	3	3	3	3							3												
K2670	C7847	2	2														2	2	2	2			2	2	2	2	2	
K2671	C7849	9	9														9	8	9	9			8	8	8	8	8	
K2677	C7847	2																				2						
K2678	C7849	2																				2						
K2679	C7849	2																				2						
K2680	C7849	3																				3						
K2682	C7845	1																										1
K2687	C7845	2	2														2	2	2	2	1					1	1	
K2688	C7846	1	1														1	1	1	1								
K2689	C7847	1	1														1	1	1	1			1	1	1	1	1	
K2690	C7849	7	7														7	7	7	7			7	7	7	7	7	
K2694	C7845	2																				2						
K2695	C7846	1																				1						
K2696	C7847	1																				1						
K2697	C7849	5																				5						
K2699	C7849	2																				2						
K2703	C7844	5																										5
K2708	C7844	4	4														4	4	4	4						4	4	
K2709	C7847	1	1														1	1	1	1			1	1	1	1	1	
K2710	C7849	1	1														1	1	1	1			1	1	1	1	1	
K2713	C7844	2																				2						
K2714	C7847	1																				1						
K2715	C7849	1																				1						
K2718	C7844	12		12	12	12	12	12	12							12												
	C8239	1		1	1	1	1	1	1			1	1	1		1												

Table 3. Summary of Sample Delivery Groups Subject to Data Assessment. (6 Pages)

Sample Delivery Group	Site	Number of Samples in Sample Delivery Group	Analyses Performed																								
			Cr-VI	Tritium	Carbon-14	Nickel-63	Iodine-129	Total Radiostrontium	Technetium-99	Gross Alpha	Gross Beta	Isotopic Plutonium	Isotopic Uranium	Americium-241	Total Uranium	GEA	Metals	pH	Percent Solids	Percent Moisture	Physical Properties	Special Extraction	TPH - DRO	PAHs	PCBs	Anions	NO_2/NO_3	VOA
K2722	C8239	6	6														6	6	6	6	1					6	6	
K2723	C8239	2																										2
K2724	C7844	6																										6
K2726	C7844	5																				5						
K2729	C8239	1	1														1	1	1	1			1	1	1	1	1	
K2732	C8239	5		5	5	5	5	5	5			5	5	5		5												
K2734	C7844	5																										5
K2735	C7844	2	2														2	2	2	2						2	2	
K2737	C7844	2																				2						
K2738	C7844	2	2														2	2	2	2						1	1	
K2741	C8239	4		4	3	3	4	4	3			3	4	3		4												
K2743	C8239	2	2														2	2	2	2			2	2	2	2	2	
K2747	C8239	2																				2						
K2752	C8239	5																										5
K2754	C7844	3	3														3	3	3	3							3	
K2755	C8239	4	4														4	4	4	4			4	4	4		4	
K2756	C7844	5																				5						
K2757	C8239	4																				4						
K2758	C8239	2																				2						
K2759	C8239	4																										4
K2760	C8239	3															3	3	3	3			3	3	3		2	
K2768	C8239	2		2	2	2	2	2	2			2	2	2		2												
K2772	C8239	1		1	1	1	1	1	1			1	1	1		1												
K2775	C8239	2																				2						
K2776	C8239	2	2														2	2	2	2			2	2	2		2	
K2784	C8239	2																										2
K2795	C8239	2																				2						
K2796	C8239	1																										1
K2800	C8239	2	2														2	2	2	2			2	2	2	2	1	
K2802	C7844	1		1				1																				
	C8239	10		8	7	7	7	8	7			7	9	7		7												
K2809	C8239	6																										6
K2814	C8239	5	5														5	5	5	5			4	4	4		3	
K2820	C8239	3																				3						
K2824	C8239	4	4														4	4		4			4	4	4		4	
K2828	C8239	4																				4						
K3041	C7849	8		8	7	7	8	8	7			7	7	7		8												
	C7847	3		3	3	3	3	3	3			3	3	3		3												
Sample Authorization Form RC-202 (Soil)																												
J00998	118-B-8:3	1	1																									
K2980	118-B-6B	3	2	2	2	2	2	2	2			2		2		2	2	2	3	2	2	2				2	2	3

Table 3. Summary of Sample Delivery Groups Subject to Data Assessment. (6 Pages)

Sample Delivery Group	Site	Number of Samples in Sample Delivery Group	Analyses Performed																									
			Cr-VI	Tritium	Carbon-14	Nickel-63	Iodine-129	Total Radiostrontium	Technetium-99	Gross Alpha	Gross Beta	Isotopic Plutonium	Isotopic Uranium	Americium-241	Total Uranium	GEA	Metals	pH	Percent Solids	Percent Moisture	Physical Properties	Special Extraction	TPH - DRO	PAHs	PCBs	Anions	NO_2/NO_3	VOA
K3038	118-B-8:3	1		1	1	1	1	1	1			1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1
K3065	118-B-9	3	2	2	2	2	2	2	2			2		2		2	2	2	3	2	2	2				2	2	3
K3066	118-B-8:3	5	4	4	4	4	4	4	4			4	4	4		4	4	2	5	2	2	2	4	4	4	4	4	5

DRO = diesel range organic
GEA = gamma energy analysis
PAH = polynuclear aromatic hydrocarbons
PCB = polychlorinated biphenyl
pH = hydrogen ion concentration
TPH = total petroleum hydrocarbons
VOA = volatile organic analysis

The QC parameters evaluated for each SDG included the following as appropriate and applicable for each analytical method:

- Holding time
- Method detection limits
- Method blank results
- Field equipment blank results
- Field trip blank results
- Matrix spikes/matrix spike duplicates
- Laboratory control sample (LCS) results
- Laboratory duplicate results
- Field duplicate results
- Field split results.

Each QC parameter was assessed, and noncompliant results were summarized on DQA worksheets. Reviewer qualifications applied to the data were also noted on the worksheets. The individual worksheets as Microsoft® Excel® files are maintained in the project file.

Minor and major deficiencies were identified in the data packages. Minor deficiencies noted by the reviewer resulted in a "J" flag being assigned to the laboratory result. Major deficiencies resulted in an "R" flag being assigned to the laboratory result. In addition to the data qualifiers that have been assigned by the analytical laboratory, the following data qualifiers were assigned during data assessment:

- UJ – The compound or analyte was analyzed for and detected in the sample. However, due to a minor QC deficiency associated with method blank results, the associated results are labeled as estimated quantitation limits. The data are considered usable for decision-making purposes.

- J – Due to a minor QC deficiency identified during the data assessment, the associated concentration is an estimate. The data are considered usable for decision-making purposes.

- UR – Indicates that the constituent was analyzed for and not detected; however, due to an identified major QC deficiency, the data are not considered usable for decision-making purposes (i.e., rejected).

Due to the large volume of data that were reviewed, it is not possible to discuss in detail each of the qualifiers that were applied to the individual results. The following sections provide a general discussion of the data quality issues identified.

2.1 HOLDING TIMES

Holding times that comply with the established limit are in compliance with the requirement. Holding times between one and two times the limit defined by the method are considered minor deficiencies with all associated sample results qualified as estimated and flagged "J" for detects

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and "UJ" for nondetects. Holding times greater than two times the limit are considered major deficiencies with all associated detectable sample results qualified as estimates and flagged "J" and all nondetects are rejected and flagged "UR." Table 4 lists the holding times applicable to the analytical methods by matrix.

Table 4. Holding Times.

Parameter	Method	Soil Holding Time	Water Holding Time
ICP metals	EPA Method 6010B EPA Method 6020	6 months	6 months
Mercury	EPA Method 7471A (soil) EPA Method 7470A (water)	28 days	28 days
Hexavalent chromium	EPA Method 7196A	30 days	24 hours
Anions	EPA Method 300.0	28 days/48 hours [a]	28 days/48 hours [a]
Nitrate/nitrite	EPA Method 353.1 EPA Method 353.2	28 days	28 days
Volatile organic compounds	EPA Method 8260B	14 days	14 days
pH	EPA Method 9045 (soil) EPA Method 9040 (water)	As soon as possible	As soon as possible
Polychlorinated biphenyls	EPA Method 8082	1 year/1 year	[b]
Polynuclear aromatic hydrocarbons	EPA Method 8310	14 days/40 days	[b]
Total petroleum hydrocarbons	EPA Method 8015	14 days	14 days
Gamma-emitting radioisotopes	Gamma energy analysis	6 months	6 months
Gross alpha/beta	Gross alpha/beta	[b]	6 months
Carbon-14	LSC – C-14	6 months	6 months
Tritium	LSC – tritium	6 months	6 months
Total radiostrontium	Gas-flow proportional counting	6 months	6 months
Nickel-63	LSC – Ni-63	6 months	6 months
Iodine-129	Low-energy gamma analysis	6 months	6 months
Technetium-99	Gas-flow proportional counting	6 months	6 months
Americium-241	Alpha energy analysis	6 months	[b]
Plutonium isotopes	Alpha energy analysis	6 months	[b]
Uranium isotopes	Alpha energy analysis	6 months	[b]
Uranium – total	Kinetic phosphorescence analysis	6 months	6 months

[a] Holding time for anions is 28 days except for nitrate, nitrite, and phosphate for which the holding time is 48 hours.
[b] Samples did not undergo this particular analysis.

EPA = U.S. Environmental Protection Agency
ICP = inductively coupled plasma
LSC = liquid scintillation counter
pH = hydrogen ion concentration

The hexavalent chromium holding time presented a consistent and significant QC issue in the reviewed data packages. The holding time for hexavalent chromium as defined by the EPA Method 3060A extraction procedure for soils to be analyzed by EPA Method 7196 is 30 days. A significant number of SDGs had holding times greater than 30 days; many had holding times greater than 60 days. Based on established data qualification protocols, the Cr-VI detected results should be qualified as estimates ("J" flagged) and numerous nondetected results should be rejected ("UR" flagged). Rather than reject the data based on the above criteria, the nondetected results will instead be flagged as an "undetected-estimated value" ("UJ") flag. The technical basis supporting this decision is found in EPA/600/R-05/124, *Sample Holding Time Reevaluation*. Among other findings reported in this study, a 5% decrease in Cr-VI was estimated to require at least 140 days regardless of soil type or holding temperature, which is 5 times longer than the SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*, prescribed maximum holding time of 30 days.

Anions with a 48-hour holding time (nitrate, nitrite, and phosphate) frequently exceeded the requirement by more than double, resulting in the qualification of data as "J" if the result is a detectable concentration or "UR" if the result is a nondetect. The delays in analyses were attributed to the delays between sample collection and analysis because of shipping preparation, sample screening for radionuclides, and shipping time. This was a consistent problem with the data that affected all nitrate, nitrite, and phosphate analytical results.

The pH analyses were analyzed as soon as possible by the laboratory, which recognized that there would be a delay between sample collection and analysis because of the same problems experienced for the nitrate, nitrite, and phosphate analyses. Ideally, pH analysis would be performed within 24 hours of sample collection. Because this was never achieved, the pH results for all samples requiring analysis were flagged "J" as estimated quantities.

2.2 DETECTION LIMITS

Estimated quantitation limits (EQLs) for individual analytes and tables for specific methods are defined in Section 2 and Appendix A of the SAP (DOE/RL-2009-44). Reported analytical detection levels for undetected analytes are compared against the EQLs to ensure that laboratory detection levels met the required criteria.

For most analytes, the EQLs were met. However, the EQL was occasionally exceeded for several gamma-emitting radionuclides. The EQL being exceeded was minor in absolute terms, with the minimum detectable activity (MDA) achieved for the analyses being below the action levels provided in the SAP. No qualification of the gamma-emitting radionuclide results is required for exceeding the EQL and none were applied.

Similarly, the EQL for iron was frequently exceeded with the quantitation limits achieved by the laboratory being below the action level provided in the SAP. For iron, the concentrations in the field samples always were at detectable levels; therefore, the fact that the EQLs were exceeded was inconsequential. For field quality assurance samples such as field blanks, the iron concentrations were frequently below detection; however, this does not affect the overall quality of the data generated for the field samples themselves.

The EQLs for anions were frequently exceeded; however, as with the gamma-emitting radionuclides and the metals, the quantitation limits achieved by the laboratory were below the action levels provided in the SAP. Again, no qualification of the data is required.

2.3 METHOD BLANK RESULTS

Method blank samples are analyzed to determine if positive results may be attributed to laboratory reagent, sample container, or detector contamination. At least 1 acceptable method blank analysis must be conducted for every 20 samples. If the method blank analysis results indicate the presence of an analyte above the method detection limit or 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 EQL or MDA are qualified as undetected and flagged "UJ"
- Sample results above the EQL or MDA and greater than five times the highest blank concentration are not qualified.

Method blank contamination was regularly observed in inductively coupled plasma metal analyses, primarily for tin. Generally, the amount observed in the blank was between the detection level and the reporting level. Because the concentration of tin detected in the sample was usually low, the method blank contamination usually required applying a "UJ" flag to the result.

Occasionally, blank contamination was encountered for other analyses as noted in the worksheets. The analytical data were flagged appropriately in accordance with the above criteria.

2.4 FIELD EQUIPMENT BLANK RESULTS

Field equipment blank samples are analyzed to determine if positive results may be attributed to contaminants introduced as a result of the field sampling process. If the field equipment blank analysis results indicate the presence of an analyte above the method detection limit or MDA, the following qualifiers may be applied:

- All positive sample results less than five times the highest blank concentration are qualified as estimates and flagged "J"
- Sample results below the EQL or MDA are qualified as undetected and flagged "UJ"
- Sample results above the EQL or MDA and greater than five times the highest blank concentration are not qualified.

Periodically, field equipment blanks contained detectable concentrations of specific analytes above concentrations seen in field samples. Notation was made in the individual worksheets and the data flagged in accordance with the above criteria. Only those samples in the same analytical group as the offending field equipment blank were qualified because it could not be determined whether the contamination was attributed to field sample collection techniques or laboratory analytical techniques. More often than not, the same contamination was detected in

the laboratory method blank providing evidence that the discrepancy was attributed to the laboratory rather than the field.

2.5 FIELD TRIP BLANK RESULTS

Field trip blank samples are analyzed to determine if positive results may be attributed to contaminants introduced as a result of the transfer of samples from the field to the laboratory. In addition to field trip blanks, field transfer blanks were collected specifically for VOA samples. The two primary analytes detected in both field trip blanks and field transfer blanks are methylene chloride and acetone. These are common laboratory contaminants and are frequently detected in the laboratory method blanks. The field trip blank and field transfer blank results for VOAs are provided in Table 5.

Table 5. Field Trip Blank and Field Transfer Blank Volatile Organic Analysis Results.

Location	Interval	Sample	Concentration (µg/kg)			
			Methylene Chloride	Acetone	2-Hexanone	2-Butanone
Field Transfer Blanks						
C7842	I-001	B27MX8	ND	ND	ND	ND
C7842	I-010	B27MX7	ND	ND	ND	ND
C7843	I-001	B27MY2	13.4	ND	ND	ND
C7843	I-006	B27N32	5.81	ND	4.09	ND
C7843	I-012	B27N47	4.13	ND	ND	ND
C7844	I-002	B27H90	2.30	ND	ND	ND
C7844	I-016	B27R04	ND	ND	ND	ND
C7845	I-004	B27KH4	2.51	ND	ND	ND
C7845	I-016	B27WL2	ND	ND	ND	ND
C7846	I-003	B27Y52	ND	ND	ND	ND
C7846	I-015A	B27TM9	5.44	ND	ND	ND
C7847	I-002	B28N88	ND	ND	ND	ND
C7849	I-002	B28DL6	ND	ND	ND	ND
C7849	I-027	B28N24	2.64	4.69	ND	ND
C8239	I-002	B29K61	3.04	4.08	ND	ND
C8239	I-026	B291M1	ND	3.87	ND	ND
116-B-6B	NA	J1CM87	ND	18.4	ND	4.06
Trip Blanks						
C7842	I-001	B27FC7	ND	ND	ND	ND
C7844	I-004	B27H95	1.93	10.4	ND	ND
C7845	I-003	B27KF5	2.99	ND	ND	ND
C7846	I-001	B27Y41	ND	ND	7.31	ND
C7846	I-015 [a]	B27YL6	ND	ND	ND	ND
C7849	I-010	B28DP9	ND	ND	ND	ND
116-B-9	NA	J1CN27	2.71	19.2	ND	ND
118-B-8:3	NA	J1CN50	3.56	29.3	ND	6.22

[a] Water sample.
NA = not applicable
ND = nondetect

No qualification of the data will be applied to the analytical data based on the field transfer or field trip blank results.

2.6 MATRIX SPIKE RECOVERIES

Matrix spike recoveries allow for evaluation of accuracy. Measured concentrations or activities are compared to the known added amounts. The SAP (DOE/RL-2009-44) defines the acceptable recovery range as 70% to 130%, with data falling outside this range being flagged "J."

The accuracy criteria provided in the SAP (DOE/RL-2009-44) are based on the initial guidance values for percent recoveries as defined in SW-846. As per SW-846 Method 8000 and applicable to all SW-846 organic analyses, it is essential that laboratories calculate in-house performance criteria for matrix spike recoveries and surrogate recoveries. It may also be useful to calculate such in-house criteria for LCS recoveries and for the initial demonstration of proficiency when experience indicates that the criteria recommended in specific methods are frequently missed for some analytes or matrices. The development of in-house performance criteria and the use of control charts or similar procedures to track laboratory performance cannot be over-emphasized. Many data systems and commercially-available software packages support the use of control charts. The SW-846 outlines the procedures for the calculation of in-house performance criteria for matrix spike recovery and surrogate recovery. The procedures may also be applied to the development of in-house criteria for the initial demonstration of proficiency and for LCS recoveries. For organic analyses where the laboratory has defined acceptance criteria for matrix spike recoveries, these criteria will be used to assess the quality of the data rather than the 70% to 130% limits provided in the SAP (DOE/RL-2009-44).

For tritium and carbon-14 analyses, matrix spikes are required by the method validation procedure but are not routinely included by the analytical method for soil samples. Therefore, the tritium and carbon-14 data from soil analyses are flagged "J" as estimated quantities because matrix spikes were not analyzed with the SDGs.

2.7 LABORATORY CONTROL SAMPLES

Laboratory control samples allow for evaluation of accuracy. Measured concentrations or activities are compared to the known added amounts. The acceptable recovery range is 70% to 130%. Results less than 70% or greater than 130% will be flagged "J" as estimated quantities. As discussed above, laboratory-established criteria were used to assess LCS results for organic analyses where such criteria are provided.

2.8 MATRIX SPIKE DUPLICATES

Analytical precision is expressed by the relative percent difference (RPD) between the recoveries of duplicate matrix spike analyses performed on a sample in the analytical batch. If both the sample and replicate concentrations are greater than five times the EQL and the RPD is less than 30%, no qualification is required. If either concentration is less than five times the EQL, the RPD control limit is less than or equal to two times the EQL. If the RPD is outside the applicable control limit, associated results are qualified as estimated detects or estimated nondetects and flagged "J" accordingly. Sample results greater than five times the spike concentration require no qualification.

2.9 LABORATORY DUPLICATE RESULTS

Laboratory duplicate results are a second method by which to assess analytical precision. Precision may be assessed using unspiked duplicate analyses performed on a sample in the analytical batch. If both the sample and replicate concentrations are greater than five times the EQL and the RPD is less than 30%, no qualification is required. If either concentration is less than five times the EQL, the RPD control limit is less than or equal to two times the EQL. If the RPD is outside the applicable control limit, associated results are qualified as estimated detects or estimated nondetects and flagged "J" accordingly.

Out-of-compliance laboratory duplicate analyses were one of the most common deficiencies noted in the reviewed data sets. All of the laboratory duplicates that were out of compliance were minor and required applying a "J" flag to the appropriate results. No results were rejected based on the laboratory duplicates.

2.10 FIELD DUPLICATE RESULTS

Field duplicate results are a method by which to assess field precision. Precision is assessed from the analysis of a primary sample and its duplicate collected in the field. If both the sample and its field duplicate concentrations are greater than five times the EQL and the RPD is less than 30%, no qualification is required. Where direct evaluation of the sample data showed that a given analyte was not detected in the primary, duplicate, or split sample, further evaluation of the RPD was not performed.

When an analyte is detected in the primary or duplicate/split sample, but is quantified at less than five times the EQL in one or both samples, an additional parameter is evaluated. In this case, if the difference between the primary and duplicate/split results exceeds a control limit of two times the EQL, further assessment regarding the usability of the data is performed whereby the RPD control limit will be considered as less than or equal to two times the EQL.

A calculation brief was prepared to assess the RPD between duplicate and split sample pairs (Calculation No. 0100X-CA-V0057). This calculation brief is presented in Appendix A.

Twenty sample pairs were evaluated including 19 field duplicates and 1 split sample. Based on the methodology explained in the calculation, RPDs were calculated for 295 analyte pairs. Of these 295 RPDs, 29 exceeded the 30% guideline. Of the 29, 13 were not contaminants of interest (e.g., calcium, silicon, K-40) and were not evaluated further. The remaining 16 RPDs were further assessed as required by the method. Further assessment showed that two were below the secondary parameter being quantified at less than five times the EQL with the RPD control limit considered to be two times the EQL. The remaining 14 listed in Table 6 were reviewed for laboratory QC issues, such as matrix spikes or duplicate analyses that were out of specification. Those analytes with laboratory QC issues have been qualified as estimated by the laboratory, the analytical data validator, and/or the DQA reviewer.

Table 6. Field Duplicate Laboratory Quality Control Review.

Location	Analyte	Relative Percent Difference	Laboratory Quality Control Issue
118-B-8:3	Cobalt-60 Europium-152 Chromium Manganese Zinc	82.0 32.4 68.1 50.3 48.9	No No No Yes Yes
C7784 I-003	Chromium Copper	116.3 54.3	No No
C7785 I-005	Chromium Vanadium	94.9 37.7	No No
C7843 I-012	Copper	64.6	No
C7846 I-002	Chromium	93.8	Yes
C7849 I-005	Chromium	52.1	No
C8239 I-007	Chromium	51.8	No
C8239 I-026	Nitrate/nitrite in nitrogen	133.7	No

Further assessment showed that 3 of the 14 were associated with analyte pairs where one or both had laboratory QC issues, such as matrix spikes or duplicate analyses that were out of specification. Those analytes with laboratory QC issues have been qualified as estimates by the laboratory, the validator, and/or the data reviewer. The other 11 analyte pairs have no apparent laboratory QC issues.

Duplicate and split sample pair analyses results that exceed guidelines are considered a minor deficiency. No further qualification of the data is required.

3.0 DATA USABILITY

Based on the results of this DQA, all of the laboratory analytical results that were not qualified as rejected are considered useable for their intended purpose. Table 7 presents the reviewer qualifiers that were applied to the sample results for inorganic analytes including metals, anions, uranium metal, and pH. Table 8 presents the qualifiers for radionuclides. Table 9 lists the qualifiers for the total petroleum hydrocarbons and polynuclear aromatic hydrocarbons. Table 10 provides the reviewer qualifiers for polychlorinated biphenyls (PCBs), with Tables 11 and 12 listing those for VOAs and special extraction analyses, respectively.

Table 7. 100-B/C Review Qualifiers for Inorganic Analytes. (6 Pages)

Sample Delivery Group Number	Sample Number	Metals																															Anions									
		Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Lithium	Magnesium	Manganese	Molybdenum	Nickel	Phosphorous	Potassium	Selenium	Silicon	Silver	Sodium	Strontium	Thallium	Tin	Vanadium	Zinc	Mercury	Cr-VI	Bromide	Chloride	Fluoride	Nitrate	Nitrite	Orthophosphate	Sulfate	Nitrate/Nitrite	pH	Total Uranium
Sampling Authorization Form RC-185 (Soil)																																												
J00852	B26HY4																																J											
J00867	B26HY5							J																	J																			
K2123	B26F05		J							J							UJ							J																		J	
	B26F06		J							J			J				J				J									J														
	B26F07		J							J														J																		J	
	B26F09		J							J			J				J				J									J												J	
	B26F10		J							J			J				J				J									J												J	
	B26F11		J							J			J				J				J									J												J	
	B26F12		J							J			J				J				J									J													
	B26F18		J							J			J				J				J									J												J	
K2220	B26HY2	J																						J																			
K2224	B26HX4		J								J				J					J										J												J	
	B26HY0		J								J				J					J										J													
	B26HY1		J								J				J					J										J													
K2270	B26TC6		J																		J			J						J												J	
K2324	B26J09		J							J							J																J									J	
	B26HX5		J							J							J																J									J	
	B26HX6		J							J							J																J									J	
K2950	B26RC8		J	J		J					J				J		J		J		J		J	J					UJ	J	J											J	
	B26RC9		J														J				J		J	J					UJ	J	J											J	
	B28687		J	J		J					J				J		J				J		J	J					UJ	J	J											J	
	B28688		J	J		J					J				J		J		J		J		J	J					UJ	J	J											J	
K2971	B28689		J																					J					UJ				UJ									J	
	B28690		J																					J					UJ				UJ									J	
	B28691		J																					J					UJ				UJ									J	
	B286F7		J																					J					UJ				UJ									J	
	B286F8		J																					J					UJ				UJ									J	
	B286H0		J																					J					UJ				UJ									J	
	B286H1		J																					J					UJ				UJ									J	
	B286V9		J																					J					UJ				UJ									J	
	B26RD4																																									J	
K3019	B274R3	J	J										J											J					UJ													J	
	B274R4	J	J										J											J					UJ													J	
	B274R6	J	J										J											J					UJ													J	
	B274R7	J	J										J											J					UJ													J	
K3029	B274R5	J	J								J							J		J				J					UJ													J	
	B274T0	J	J								J							J		J				J					UJ													J	
	B274T6	J	J								J							J		J				J					UJ													J	

Table 7. 100-B/C Review Qualifiers for Inorganic Analytes. (6 Pages)

Sample Delivery Group Number	Sample Number	Metals																															Anions									
		Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Lithium	Magnesium	Manganese	Molybdenum	Nickel	Phosphorous	Potassium	Selenium	Silicon	Silver	Sodium	Strontium	Thallium	Tin	Vanadium	Zinc	Mercury	Cr-VI	Bromide	Chloride	Fluoride	Nitrate	Nitrite	Orthophosphate	Sulfate	Nitrate/Nitrite	pH	Total Uranium
K3055	B274R8	J	J								J			J					J					J					UJ				J									J	
	B274R9	J	J								J			J					J					J					UJ				J									J	
Sampling Authorization Form RC-186 (Water)																																										
K2126	B26FB5																	J																								
K2284	B26J91																		J																						J	
K2357	B27FH9	UJ																																							J	
	B27FJ2	UJ																																							J	
K2535	B27WL3	UJ							J															J																		
	B27KN2	UJ							J															J																	J	
K2669	B28F78																																		J		J	UR	UR			J	
	B28F81																																		J		J	UR	UR			J	
K2753	B27HP4																																				J	UR	UR			J	
	B27HP7																																				J	UR	UR			J	
K2831	B28NL5																																				J	UR	UR			J	
	B28NL8																																				J	UR	UR			J	
K3020	B26RY1					UJ								UJ						UJ																					J	
K3028	B274V1	UJ																					UJ																		J	
K3107	B2BTM7																	UJ													J			J	J	J	J	UR	UR	J	J		
K3109	B27FT5																																	J	J	J	J	UR	UR	J	J	J	
	B27FT8																																	J	J	J	J	UR	UR	J	J	J	
K3123	B27YL6																		UJ															J	J	J	UR	UR	UR	J	J		
	B2BTM4																																	J	J	J	J	UR	UR	J	J	J	
Sampling Authorization Form RC-195 (Soil)																																										
K2352	B27FC4		J																																		J	UR	UR				
	B27FC6		J																																		J	UR	UR				
	B27FC9		J																																		J	UR	UR				
K2356	B27FD2		J																					J													J	UR	UR			J	
	B27FD4		J																					J													J	UR	UR			J	
	B27FD6		J																					J													J	UR	UR			J	
	B27FD8		J																					J													J	UR	UR			J	
K2361	B27FF5	J	J							J	J							J		J				J																		J	
K2372	B27FF0	J	J							J	J						J	J						J		J											J	UR	UR			J	
	B27FF2	J	J							J	J						J	J						J		J											J	UR	UR			J	
	B27FF4	J	J							J	J						J	J						J		J											J	UR	UR			J	
K2375	B27FR1	J																						J													UR	UR	UR			J	
K2386	B27FR7		J								J		J								J			J													J	UR	UR				
	B27FR8		J								J		J								J			J													J	UR	UR				
	B27FR9		J								J		J								J			J													J	UR	UR				
	B27FT0		J								J		J								J			J													J	UR	UR				

Table 7. 100-B/C Review Qualifiers for Inorganic Analytes. (6 Pages)

Sample Delivery Group Number	Sample Number	Metals																																	Anions									
		Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Lithium	Magnesium	Manganese	Molybdenum	Nickel	Phosphorous	Potassium	Selenium	Silicon	Silver	Sodium	Strontium	Thallium	Tin	Vanadium	Zinc	Mercury	Cr-VI	Bromide	Chloride	Fluoride	Nitrate	Nitrite	Orthophosphate	Sulfate	Nitrate/Nitrite	pH	Total Uranium
K2394	B27J45	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J						UR	UR	UR				
K2408	B27FR4		J								J		J				J	J						J		J	J										J	UR	UR			J	
	B27FR5		J								J		J				J	J						J		J	J										J	UR	UR			J	
	B27FR6		J								J		J				J	J						J		J	J										J	UR	UR			J	
	B27FR0		J								J		J				J	J						J		J	J										UR	UR	UR			J	
	B27FT2		J								J		J				J	J						J		J	J																
K2464	B27FP8		J										J				J				J			J						J			J	J	J	J	J	UR	J	J		J	
	B27FP9		J										J				J				J			J						J		J	J	J	J	J	J	UR	UR	J		J	
K2497	B27KD9				J									J				J						J					UJ		J			J	UJ	J	UR	UR	UR	J	J		
K2560	B27Y60		J		J								J								J			J	J		J		UJ				J	J	UJ	J	J	UR	UR	J	J	J	
	B27Y63		J		J								J								J			J	J		J		UJ				J	J	UJ	J	J	UR	UR	J	J	J	
	B27Y66		J		J								J								J			J	J		J		UJ				J	J	J	J	J	UR	UR	J	J	J	
	B27Y69		J		J								J								J			J	J		J		UJ				J	J	UJ	J	J	UR	UR	J	J	J	
	B27Y72		J		J								J								J			J	J		J		UJ				J	J	UJ	J	J	UR	UR	J	J	J	
K2567	B27Y49		J		J							J	J				J	J						J	J				UJ	J	J			J	UJ	J	J	UR	UR	J	J	J	
	B27Y53		J		J							J	J				J	J						J	J				UJ	J	J			J	UJ	J	J	UR	UR	J	J	J	
	B27Y54		J		J							J	J				J	J						J	J				UJ	J	J			J	UJ	J	J	UR	UR	J	J	J	
	B27Y57		J		J							J	J				J	J						J	J				UJ	J	J			J	UJ	J	J	UR	UR	J	J	J	
K2578	B27Y38		J								J						J												UJ	J			J	J	J	J	J	UR	UR	J	J	J	
	B27Y42		J								J						J												UJ	J			J	J	J	J	J	UR	UR	J	J	J	
	B27Y45		J								J						J												UJ	J			J	J	J	J	J	UR	UR	J	J	J	
K2584	B27KD3		J							J		J			J						J	J		J					UJ				J	J	J	J	J	UR	UR	J	J	J	
	B27KF2		J							J		J			J						J	J		J					UJ				J	J	J	J	J	UR	UR	J	J	J	
	B27KH8		J							J		J			J						J	J		J					UJ				J	J	J	J	J	UR	UR	J	J	J	
	B27KJ1		J							J		J			J						J	J		J					UJ				J	J	J	J	J	UR	UR	J	J	J	
	B27KK0		J							J		J			J						J	J		J					UJ				J	J	J	J	J	UR	UR	J	J	J	
	B27KK6		J							J		J			J						J	J		J					UJ				J	J	J	J	J	UR	UR	J	J	J	
	B27KK3		J							J		J			J						J	J		J					UJ				J	J	J	J	J	UR	UR	J	J	J	
K2589	B27KD6		J														J			J	J			J					UJ				J	J	UJ	J	J	UR	UR	J	J	J	
	B27KF6		J														J			J	J			J					UJ				J	J	UJ	J	J	UR	UR	J	J	J	
	B27KH5		J														J			J	J			J					UJ				J	J	UJ	J	J	UR	UR	J	J	J	
	B27KJ4		J														J			J	J			J					UJ				J	J	UJ	J	J	UR	UR	J	J	J	
	B27KJ7		J														J			J	J			J					UJ				J	J	UJ	J	J	UR	UR	J	J	J	
K2617	B28DM6	J								J				J			J							J					UJ				J	J	J	J	UR	UR	UR	J	J	J	

Table 7. 100-B/C Review Qualifiers for Inorganic Analytes. (6 Pages)

Sample Delivery Group Number	Sample Number	Metals																															Anions									
		Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Lithium	Magnesium	Manganese	Molybdenum	Nickel	Phosphorous	Potassium	Selenium	Silicon	Silver	Sodium	Strontium	Thallium	Tin	Vanadium	Zinc	Mercury	Cr-VI	Bromide	Chloride	Fluoride	Nitrate	Nitrite	Orthophosphate	Sulfate	Nitrate/Nitrite	pH	Total Uranium
K2637	B28DM9		J							J											J			J	J			J	UJ				J	J	J	J	J	UR	UR	J	J	J	
	B28DN3		J							J											J			J	J			J	UJ				J	J	J	J	J	UR	UR	J	J	J	
	B28DN6		J							J											J			J	J			J	UJ				J	J	J	J	J	UR	UR	J	J	J	
	B28DN9		J							J											J			J	J			J	UJ				J	J	J	J	J	UR	UR	J	J	J	
	B28DP2		J							J											J			J	J			J	UJ				J	J	J	J	J	UR	UR	J	J	J	
	B28DP5		J							J											J			J	J			J	UJ				J	J	J	J	J	UR	UR	J	J	J	
K2670	B28N87		J																										UJ				J	J	J	J	J	UR	UR	J	J	J	
	B28N91		J																										UJ				J	J	J	J	J	UR	UR	J	J	J	
K2671	B28DL0		J							J							J												UJ				J	J	J	J	J	UR	UR	J	J	J	
	B28DL3		J							J							J												UJ				J	J	J	J	J	UR	UR	J	J	J	
	B28DL7		J							J							J												UJ				J	J	J	J	J	UR	UR	J	J	J	
	B28DM0		J							J							J												UJ				J	J	J	J	J	UR	UR	J	J	J	
	B28DM3		J							J							J												UJ				J	J	J	J	J	UR	UR	J	J	J	
	B28DV1		J							J							J												UJ				J	J	J	J	UR	UR	UR	J	J	J	
	B28DV4		J							J							J												UJ				J	J	J	J	UR	UR	UR	J	J	J	
	B28DV7		J							J							J												UJ				J	J	J	J	UR	UR	UR	J	J	J	
	B28DX8		J							J							J												UJ				J										
K2687	B27KM9		J		J						J		J					J			J			J		J			UJ			J	J									J	
	B27KL5		J		J						J		J					J			J			J		J			UJ			J	J	J	J	J	UR	UR	UR	J	J	J	
K2688	B27Y84		J		J								J								J	J					J		UJ	J	J		J									J	
K2689	B28N94	J	J		J					J	J				J			J						J			J		UJ	J		J	J	J	J	J	J	UR	UR	J	J	J	
K2690	B28DR0		J								J																		UJ	J			J	UR	J	J	J	UR	UR	J	J	J	
	B28DR3		J								J																		UJ	J			J	UR	UR	J	J	UR	UR	J	J	J	
	B28DR6		J								J																		UJ	J			J	UR	J	J	J	UR	UR	J	J	J	
	B28DR9		J								J																		UJ	J			J	J	J	J	J	UR	UR	J	J	J	
	B28DT2		J								J																		UJ	J			J	J	J	J	J	UR	UR	J	J	J	
	B28DT5		J								J																		UJ	J			J	J	J	J	UR	UR	UR	J	J	J	
	B28DT8		J								J																		UJ	J			J	J	J	J	UR	UR	UR	J	J	J	
K2708	B27J63		J						J		J													J					UJ				J	J	J	J	J	UR	UR	J	J	J	
	B27J64		J						J		J													J					UJ				J	J	J	J	J	UR	UR	J	J	J	
	B27J68		J						J		J					UJ								J					UJ				J	J	J	J	UR	UR	UR	J	UJ	J	
	B27J70		J						J		J					UJ								J					UJ				J	J	J	J	UR	UR	UR	J	UJ	J	
K2709	B28N97		J														J				J					J			UJ			J	J	UR	J	J	J	UR	UR	J	J	J	
K2710	B28DX5	J	J		J					J	J		J	J			J	J			J					J	J		UJ	J			J	UR	J	J	UR	UR	UR	J	UJ	J	

Table 7. 100-B/C Review Qualifiers for Inorganic Analytes. (6 Pages)

Sample Delivery Group Number	Sample Number	Metals																															Anions									
		Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Lithium	Magnesium	Manganese	Molybdenum	Nickel	Phosphorous	Potassium	Selenium	Silicon	Silver	Sodium	Strontium	Thallium	Tin	Vanadium	Zinc	Mercury	Cr-VI	Bromide	Chloride	Fluoride	Nitrate	Nitrite	Orthophosphate	Sulfate	Nitrate/Nitrite	pH	Total Uranium
K2722	B27J66		J					J																				J	UJ			J	J	J	J	J	J	UR	UR	J	J	J	
	B27J67		J					J																				J	UJ			J	J	J	J	J	J	UR	UR	J	J	J	
	B27J71		J					J																				J	UJ			J	J	J	J	J	J	UR	UR	J	J	J	
	B27J69		J					J																				J	UJ			J	J	J	J	J	J	UR	UR	J	J	J	
	B27J72		J					J																				J	UJ			J	J	J	J	J	J	UR	UR	J	J	J	
	B27J73		J					J																				J	UJ			J	J	J	J	J	J	UR	UR	J	J	J	
K2729	B28NB9	J												J				J						J					UJ				J	J	J	J	UR	UR	UR	J	UJ	J	
K2735	B27J76		J							J	J		J	J			J	J	J	J	J			J					UJ		J		J	J	UJ	J	J	UR	UR	J	J	J	
	B27J77		J							J	J		J	J			J	J	J	J	J			J					UJ		J		J	J	UJ	J	J	UR	UR	J	J	J	
K2738	B27J81		J							J					J			J			J								UJ	J			J	J	UJ	J	UR	UR	UR	J	J	J	
	B27J82		J							J					J			J			J								UJ	J			J									J	
K2743	B29K57		J							J					J														UJ				J	J	UJ	J	UR	UR	UR	J	UJ	J	
	B29K60		J							J					J														UJ				J	J	J	J	UR	UR	UR	J	J	J	
K2754	B27J74		J							J	J		J			J	J				J			J		J			UJ	J	J	J	J								J	J	
	B27J75		J							J	J		J			J	J				J			J		J			UJ	J	J	J	J								J	J	
	B27J78		J							J	J		J			J	J				J			J		J			UJ	J	J	J	J								J	J	
K2755	B28NB0		J							J								J											UJ				J								J	J	
	B28NC5		J							J								J											UJ				J								J	J	
	B29K64		J							J								J											UJ				J								J	J	
	B29K67		J							J								J											UJ				J								J	J	
K2760	B28NB3		J								J						J				J			J					UJ	J	J											J	
	B28NB6		J								J						J				J			J					UJ	J	J										J	J	
	B28NC2		J								J						J				J			J					UJ	J	J										J	J	
K2776	B28NC8		J							J											J												J								J	J	
	B28ND1		J							J											J								UJ				J								J	J	
K2800	B28ND4		J																					J						J			J	J		UJ	UR	UR	UR	J	J	J	
	B28NF3		J																					J					UJ	J			J	J		UJ	UR	UR	UR	J		J	
K2814	B28NF9	J	J																					J					UJ				J								J	J	
	B28NH2	J	J																					J					UJ				J								J	J	
	B28NH8	J	J																					J					UJ				J								J	J	
	B28NJ1	J	J																					J					UJ				J									J	
	B28NK5	J	J																					J					UJ				J									J	
K2824	B28ND7	J	J		J								J											J		J			UJ				J								J	J	
	B28NF0	J	J		J								J											J		J			UJ				J								J	J	
	B28NF6	J	J		J								J											J		J			UJ				J								J	J	
	B28NH5	J	J		J								J											J		J			UJ				J								J	J	

Table 7. 100-B/C Review Qualifiers for Inorganic Analytes. (6 Pages)

Sample Delivery Group Number	Sample Number	Metals																																Anions									
		Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Lithium	Magnesium	Manganese	Molybdenum	Nickel	Phosphorous	Potassium	Selenium	Silicon	Silver	Sodium	Strontium	Thallium	Tin	Vanadium	Zinc	Mercury	Cr-VI	Bromide	Chloride	Fluoride	Nitrate	Nitrite	Orthophosphate	Sulfate	Nitrate/Nitrite	pH	Total Uranium
Sampling Authorization Form RC-202 (Soil)																																											
J00998	J1CN58																																J										
K2980	J1CM85		J							J														J					UJ			UJ		J	J	J	J	UR	UR	J	J	J	
	J1CM86		J							J														J					UJ			UJ		J	J	J	J	UR	UR	J	J	J	
K3038	J1CN47		J		J				J	J			J		J						J			J				J	J		J			J	J	J	UR	J	UR	J	J	J	
K3065	J1CN25	J	J	J																		J		J			J		UJ		J		J	J	J	J	J	UR	UR	J	J	J	
	J1CN26	J	J	J																		J		J			J		UJ		J		J	J	J	J	J	UR	UR	J	J	J	
K3066	J1CN48	J	J		J					J		J		J			J	J			J					J	J		UJ	J	J		J	J	J	J	J	UR	UR	J	J	J	
	J1CN49	J	J		J					J		J		J			J	J			J					J	J		UJ	J	J		J	J	J	J	J	UR	UR	J	J	J	
	J1CN51	J	J		J					J		J		J			J	J			J					J	J		UJ	J	J		J	J	J	J	J	UR	UR	J	J		
	J1CN52	J	J		J					J		J		J		UJ	J	J			J					J	J		UJ	J	J		J	J	J	J	UR	UR	UR	J	UJ		

J = Due to a minor quality control deficiency identified during the data assessment, the associated concentration is an estimate. The data are considered usable for decision-making purposes.
pH = hydrogen ion concentration
UJ = The compound or analyte was analyzed for and detected in the sample. However, due to a minor quality control deficiency associated with method blank results, the associated results are labeled as estimated quantitation limits. The data are considered usable for decision-making purposes.
UR = Indicates that the constituent was analyzed for and not detected; however, due to an identified quality control issues, the data should be considered unusable for decision-making purposes.

Table 8. 100-B/C Review Qualifiers for Radionuclides. (4 Pages)

Sample Delivery Group Number	Sample Number	Radionuclides														
		Tritium	Carbon-14	Nickel-63	Iodine-129	Total Radiostrontium	Technetium-99	Gross Alpha	Gross Beta	Plutonium-238	Plutonium-239/240	Uranium-233/234	Uranium-235	Uranium-238	Americium-241	GEA
Sampling Authorization Form RC-186 (Water)																
K2341	B27FH8							J								
	B27FJ1							J								
K2720	B27HP3							J								
	B27HP6							J								
Sampling Authorization Form RC-195 (Soil)																
K2335	B27FB2	J												J		
	B27FB3	J												J		
K2337	B27FB5	J	J													
	B27FB6	J	J													
	B27FB7	J	J													
	B27FB8	J	J													
K2342	B27FB9	J	J													
	B27FC0	J	J													
	B27FC1	J	J													
K2345	B27FH5	J	J													
K2382	B27FP0	J	J													
	B27FP1	J	J													
	B27FP7	J	J													
	B27FH4	J	J													
K2384	B27FP2	J	J													
	B27FP3	J	J													
	B27FP5	J	J													
K2407	B27Y24	J	J													
K2478	B27KB7	J														
K2488	B27KB8	J														
	B27Y21	J														
	B27Y22	J	J													
	B27Y25	J	J													
	B27Y26	J														
	B27Y28	J	J													
K2492	B27Y32	J	J													
	B27Y33	J	J													

Table 8. 100-B/C Review Qualifiers for Radionuclides. (4 Pages)

Sample Delivery Group Number	Sample Number	Radionuclides														
		Tritium	Carbon-14	Nickel-63	Iodine-129	Total Radiostrontium	Technetium-99	Gross Alpha	Gross Beta	Plutonium-238	Plutonium-239/240	Uranium-233/234	Uranium-235	Uranium-238	Americium-241	GEA
K2515	B27KB4	J														
	B27KB6	J														
	B27KB9	J														
	B27KC0	J														
	B27KC1	J														
	B27KC2	J														
	B27KC3	J														
	B27KC4	J														
	B27KC5	J														
	B27Y27	J	J													
	B27Y29	J	J													
	B27Y31	J	J													
K2555	B28D67	J	J													
K2602	B28D68	J	J													
	B28D69	J	J													
	B28D70	J	J													
	B28D71	J	J													
	B28D72	J	J													
	B28D73	J	J													
K2657	B27KC6	J														
	B27KM8	J														
	B27J48	J														
	B28D62	J	J													
	B28D63	J	J													
	B28D64	J	J													
	B28D65	J	J													
	B28D66	J	J													
	B28D74	J	J													
	B28D75	J	J													
	B28D76	J	J													
	B28D77	J	J													
K2657	B28N57	J	J													
	B28N58	J	J													
	B28N59	J	J													
K2661	B27H74	J	J													
	B28N60	J	J											J		

Table 8. 100-B/C Review Qualifiers for Radionuclides. (4 Pages)

Sample Delivery Group Number	Sample Number	Radionuclides														
		Tritium	Carbon-14	Nickel-63	Iodine-129	Total Radiostrontium	Technetium-99	Gross Alpha	Gross Beta	Plutonium-238	Plutonium-239/240	Uranium-233/234	Uranium-235	Uranium-238	Americium-241	GEA
K2662	B27H70	J	J													
	B27H71	J	J													
	B27HL6	J	J													
K2718	B27H72	J	J													
	B27H73	J	J													
	B27H75	J	J													
	B27H76	J	J													
	B27H77	J	J													
	B27H78	J	J													
	B27H79	J	J													
	B27H80	J	J													
	B27H81	J	J													
	B27H82	J	J													
	B27H83	J	J													
	B27H86	J	J													
	B28N64	J	J													
K2732	B28N61	J	J													
	B29K68	J	J													
	B29K69	J	J													
	B29K70	J	J													
	B29K71	J	J													
K2741	B28N62	J														
	B28N63	J	J													
	B28N65	J	J													
	B28N66	J	J													
K2768	B28N67	J	J													
	B28N68	J	J													
K2772	B28N69	J	J													
K2802	B27H87	J														
	B28N70	J	J													
	B28N71	J	J													
	B28N72	J	J													
	B28N73	J	J													
	B28N74	J	J													
	B28N75	J	J													
	B28N76	J	J													
	B29MV5	J														

Table 8. 100-B/C Review Qualifiers for Radionuclides. (4 Pages)

Sample Delivery Group Number	Sample Number	Radionuclides														
		Tritium	Carbon-14	Nickel-63	Iodine-129	Total Radiostrontium	Technetium-99	Gross Alpha	Gross Beta	Plutonium-238	Plutonium-239/240	Uranium-233/234	Uranium-235	Uranium-238	Americium-241	GEA
K3041	B28D78	J	J													
	B28D79	J	J													
	B28D80	J	J													
	B28D81	J	J													
	B28D82	J	J													
	B28D83	J	J													
	B28D90	J														
	B28N34	J	J													
	B28N57	J	J													
	B28N58	J	J													
	B28N59	J	J													
Sampling Authorization Form RC-202 (Soil)																
K2980	J1CM85	J	J													
	J1CM86	J	J													
K3038	J1CN47	J	J													
K3065	J1CN25	J	J													
	J1CN26	J	J													
K3066	J1CN48	J	J													
	J1CN49	J	J													
	J1CN51	J	J									J				
	J1CN52	J	J													

GEA = gamma energy analysis
J = Due to a minor quality control deficiency identified during the data assessment, the associated concentration is an estimate. The data are considered usable for decision-making purposes.

Table 9. 100-B/C Review Qualifiers for Total Petroleum Hydrocarbons and Polynuclear Aromatic Hydrocarbons. (4 Pages)

Sample Delivery Group Number	Sample Number	TPH			Polynuclear Aromatic Hydrocarbons															
		Diesel Range Organics	Motor Oil	Kerosene	Acenaphthene	Acenaphthylene	Anthracene	Benz[a]anthracene	Benzo[b]fluoranthene	Benzo[k]fluoranthene	Benzo[a]pyrene	Benzo[g,h,i]perylene	Chrysene	Dioben[a,h]anthracene	Fluoranthene	Fluorene	Indeno[1,2,3-cd]pyrene	Naphthalene	Phenanthrene	Pyrene
Sampling Authorization Form RC-186 (Water)																				
K2357	B27FH9	J	J	J																
	B27FJ2	J	J	J																
K2535	B27WL3		J	J																
	B27KN2		J	J																
K2669	B28F78	J	J	J																
	B28F81	J	J	J																
K2753	B27HP4	J	J	J																
	B27HP7	J	J	J																
K2831	B28NL5	J	J	J																
	B28NL8	J	J	J																
K3107	B2BTM7	J	J	J																
K3109	B27FT5	J	J	J																
	B27FT8	J	J	J																
Sampling Authorization Form RC-195 (Soil)																				
K2375	B27FR1		J	J																
K2386	B27FR7	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J
	B27FR8	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J
	B27FR9	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J
	B27FT0	J	J	J																

Table 9. 100-B/C Review Qualifiers for Total Petroleum Hydrocarbons and Polynuclear Aromatic Hydrocarbons. (4 Pages)

Sample Delivery Group Number	Sample Number	TPH			Polynuclear Aromatic Hydrocarbons															
		Diesel Range Organics	Motor Oil	Kerosene	Acenaphthene	Acenaphthylene	Anthracene	Benz[a]anthracene	Benzo[b]fluoranthene	Benzo[k]fluoranthene	Benzo[a]pyrene	Benzo[g,h,i]perylene	Chrysene	Dioben[a,h]anthracene	Fluoranthene	Fluorene	Indeno[1,2,3-cd]pyrene	Naphthalene	Phenanthrene	Pyrene
K2408	B27FR4		J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J
	B27FR5		J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J
	B27FR6		J	J																
	B27FR0		J	J				J												
K2617	B28DM6		J																	
	B28DP8		J																	
K2637	B28DM9		J	J																
	B28DN3		J	J																
	B28DN6		J	J																
	B28DN9		J	J																
	B28DP2		J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J
	B28DP5		J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J
K2670	B28N87	J	J		J	J		J	J				J				J			J
	B28N91	J	J		J	J		J	J				J				J			J
K2671	B28DL0	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J
	B28DL3	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J
	B28DL7	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J
	B28DM0	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J
	B28DM3	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J
	B28DV1	J	J																	
	B28DV4	J	J																	
	B28DV7	J	J																	

Table 9. 100-B/C Review Qualifiers for Total Petroleum Hydrocarbons and Polynuclear Aromatic Hydrocarbons. (4 Pages)

Sample Delivery Group Number	Sample Number	TPH			Polynuclear Aromatic Hydrocarbons															
		Diesel Range Organics	Motor Oil	Kerosene	Acenaphthene	Acenaphthylene	Anthracene	Benz[a]anthracene	Benzo[b]fluoranthene	Benzo[k]fluoranthene	Benzo[a]pyrene	Benzo[g,h,i]perylene	Chrysene	Dibenz[a,h]anthracene	Fluoranthene	Fluorene	Indeno[1,2,3-cd]pyrene	Naphthalene	Phenanthrene	Pyrene
K2689	B28N94	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J
K2690	B28DR0	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J
	B28DR3	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J
	B28DR6	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J
	B28DR9	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J
	B28DT2	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J
	B28DT5	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J
	B28DT8	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J
K2709	B28N97	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J
K2710	B28DX5	J	UJ	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J
K2729	B28NB9		J	J																
K2743	B29K57	J	J	J	J	J			J	J		J	J	J	J		J			J
	B29K60	J	J	J	J	J			J	J		J	J	J	J		J			J
K2755	B28NB0		J																	
	B28NC5		J																	
	B29K64		J																	
	B29K67		J																	
K2760	B28NB3		J																	
	B28NB6		J																	
	B28NC2		J																	
K2776	B28NC8		J																	
	B28ND1		J																	

Table 9. 100-B/C Review Qualifiers for Total Petroleum Hydrocarbons and Polynuclear Aromatic Hydrocarbons. (4 Pages)

Sample Delivery Group Number	Sample Number	TPH			Polynuclear Aromatic Hydrocarbons															
		Diesel Range Organics	Motor Oil	Kerosene	Acenaphthene	Acenaphthylene	Anthracene	Benz[a]anthracene	Benzo[b]fluoranthene	Benzo[k]fluoranthene	Benzo[a]pyrene	Benzo[g,h,i]perylene	Chrysene	Dioben[a,h]anthracene	Fluoranthene	Fluorene	Indeno[1,2,3-cd]pyrene	Naphthalene	Phenanthrene	Pyrene
K2800	B28ND4		J																	
	B28NF3		J																	
K2814	B28NF9		J																	
	B28NH2		J																	
	B28NH8		J																	
	B28NJ1		J																	
K2824	B28ND7		J		J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J
	B28NF0		J		J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J
	B28NF6		J		J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J
	B28NH5		J																	
Sampling Authorization Form RC-202 (Soil)																				
K3038	J1CN47	J	J		J	J	J	J	J	J	J	J	J		J	J	J	J	J	J
K3066	J1CN48		J												J					J
	J1CN49		J												J					J
	J1CN51		J												J					J
	J1CN52		J												J					J

J = Due to a minor quality control deficiency identified during the data assessment, the associated concentration is an estimate. The data are considered usable for decision-making purposes.
TPH = total petroleum hydrocarbons

Table 10. 100-B/C Review Qualifiers for Polychlorinated Biphenyls.

Sample Delivery Group Number	Sample Number	PCBs								
		Aroclor-1016	Aroclor-1221	Aroclor-1232	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260	Aroclor-1262	Aroclor-1268
Sampling Authorization Form RC-195 (Soil)										
K2670	B28N87	J	J	J	J	J	J	J	J	J
	B28N91	J	J	J	J	J	J	J	J	J
K2709	B28N97	J	J	J	J	J	J	J	J	J
K2729	B28NB9	J	J	J	J	J	J	J	J	J
Sampling Authorization Form RC-202 (Soil)										
K3066	J1CN48	J	J	J	J	J	J	J	J	J
	J1CN49	J	J	J	J	J	J	J	J	J
	J1CN51	J	J	J	J	J	J	J	J	J
	J1CN52	J	J	J	J	J	J	J	J	J

J = Due to a minor quality control deficiency identified during the data assessment, the associated concentration is an estimate. The data are considered usable for decision-making purposes.

PCB = polychlorinated biphenyl

Table 11. 100-B/C Review Qualifiers for Volatile Organic Compounds. (4 Pages)

Sample Delivery Group Number	Sample Number	VOAs																																		
		1,1,1-Trichloroethane	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	1,1-Dichloroethene	1,2-Dichloroethane	1,2-Dichloroethene (total)	1,2-Dichloropropane	2-Butanone	2-Hexanone	4-Methyl-2-pentanone	Acetone	Benzene	Bromodichloromethane	Bromoform	Bromomethane	Carbon Disulfide	Carbon Tetrachloride	Chlorobenzene	Chloroethane	Chloroform	Chloromethane	cis-1,2-Dichloroethene	cis-1,3-Dichloropropene	Dibromochloromethane	Ethylbenzene	Methylene Chloride	Styrene	Tetrachloroethene	trans-1,2-Dichloroethene	Toluene	trans-1,3-Dichloropropene	Trichloroethene	Vinyl chloride	Xylenes, total
Sampling Authorization Form RC-186 (Water)																																				
K2357	B27FH9									J	J	J	J												J											
	B27FJ2									J	J	J	J												J											
	B27MX7									J	J	J	J												J											
K2535	B27WL2								J																											
	B27KN2								J																											
	B27KN5								J																											
K2644	B28F77												J					J																		
	B28F80												J					J																		
	B28N24												J					J																		
Sampling Authorization Form RC-195 (Soil)																																				
K2377	B27MY2																											J								
	B27N69																											J								
K2380	B27N32																											UJ								
K2395	B27Y48																											UJ								
K2409	B27N31	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	UJ	J	J	J	J	J	J	J	J
K2508	B27KF5																											UJ								
	B27KH4																											UJ								
K2522	B27Y50					J												J																		
	B27Y85					J												J																		
	B27Y52					J												J																		
	B27Y40					J												J																		
	B27Y44					J												J																		
	B27Y55					J												J																		
	B27Y58					J												J																		
K2525	B27KF4																													J						
K2541	B27Y61																		J									UJ								
	B27Y64																		J									UJ								
	B27Y67																		J									UJ								
	B27Y70																		J									UJ								
	B27Y73																		J									UJ								

Table 11. 100-B/C Review Qualifiers for Volatile Organic Compounds. (4 Pages)

Sample Delivery Group Number	Sample Number	VOAs																																		
		1,1,1-Trichloroethane	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	1,1-Dichloroethene	1,2-Dichloroethane	1,2-Dichloroethene (total)	1,2-Dichloropropane	2-Butanone	2-Hexanone	4-Methyl-2-pentanone	Acetone	Benzene	Bromodichloromethane	Bromoform	Bromomethane	Carbon Disulfide	Carbon Tetrachloride	Chlorobenzene	Chloroethane	Chloroform	Chloromethane	cis-1,2-Dichloroethene	cis-1,3-Dichloropropene	Dibromochloromethane	Ethylbenzene	Methylene Chloride	Styrene	Tetrachloroethene	trans-1,2-Dichloroethene	Toluene	trans-1,3-Dichloropropene	Trichloroethene	Vinyl chloride	Xylenes, total
K2579	B27KD8					J																														
	B27KH3					J																						J								
	B27KJ0					J																						J								
	B27KJ3					J																						J								
	B27KJ6					J																														
	B27KJ9					J																														
	B27KK5					J																														
	B27KK2					J																														
K2634	B28N88																			J					J	J	J		J			J	J			J
K2639	B28DL2	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J
	B28DL5	J	J	J	J	J	J	J	J		J	J	J	J	J	J		J	J	J		J		J	J	J	J	J	J	J	J	J	J	J		J
	B28DL6	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J
	B28DL9	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J
	B28DM2	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J
	B28DM5	J	J	J	J	J	J	J	J		J	J	J	J	J	J		J	J	J		J		J	J	J	J	J	J	J	J	J	J	J		J
	B28DR2	J	J	J	J	J	J	J	J		J	J	J	J	J	J		J	J	J		J		J	J	J	J	J	J	J	J	J	J	J		J
	B28DR5	J	J	J	J	J	J	J	J		J	J	J	J	J	J		J	J	J		J		J	J	J	J	J	J	J	J	J	J	J		J
	B28DR8	J	J	J	J	J	J	J	J		J	J	J	J	J	J		J	J	J		J		J	J	J	J	J	J	J	J	J	J	J		J
	B28DT1	J	J	J	J	J	J	J	J		J	J	J	J	J	J		J	J	J		J		J	J	J	J	J	J	J	J	J	J	J		J
K2640	B28N85		J										J												J		J	UJ	J							J
	B28N89	J	J	J		J		J	J					J	J	J		J	J	J	J	J		J	J	J	J		J	J	J	J	J	J		J
K2645	B28N92	J	J	J	J	J	J	J	J	J	J	J		J	J	J		J	J	J		J		J	J	J	J	J	J	J	J	J	J	J	J	J
	B28N95	J	J	J	J	J	J	J	J	J	J	J		J	J	J		J	J	J		J		J	J	J	J	J	J	J	J	J	J	J	J	J
K2646	B27KK8		J																	J					J	J	J		J				J			J
K2647	B28DT4																											UJ								
	B28DT7																											UJ								
	B28DV0																											UJ								
	B28DV3																											UJ								
	B28DV6																											UJ								
	B28DV9																											UJ								
K2682	B27KM7																											UJ								
K2703	B27H88												UJ															UJ								
	B27H89												UJ															UJ								
	B27H90																											UJ								
	B27H93																											UJ								
	B27H95												J															UJ								

Table 11. 100-B/C Review Qualifiers for Volatile Organic Compounds. (4 Pages)

Sample Delivery Group Number	Sample Number	VOAs																																	
		1,1,1-Trichloroethane	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	1,1-Dichloroethene	1,2-Dichloroethane	1,2-Dichloroethene (total)	1,2-Dichloropropane	2-Butanone	2-Hexanone	4-Methyl-2-pentanone	Acetone	Benzene	Bromodichloromethane	Bromoform	Bromomethane	Carbon Disulfide	Carbon Tetrachloride	Chlorobenzene	Chloroethane	Chloroform	Chloromethane	cis-1,2-Dichloroethene	cis-1,3-Dichloropropene	Dibromochloromethane	Ethylbenzene	Methylene Chloride	Styrene	Tetrachloroethene	trans-1,2-Dichloroethene	Toluene	trans-1,3-Dichloropropene	Trichloroethene	Vinyl chloride	Xylenes, total
K2723	B28NB7																											UJ								
	B29K61																											UJ								
K2724	B27H91																											UJ								
	B27H92																											UJ								
	B27H94																											UJ								
	B27H96																											UJ								
	B27H98																											UJ								
K2734	B27H99																											UJ								
	B27HB1																											UJ								
	B27HB2																											UJ								
	B27HB3																											UJ								
	B27HB6																											UJ								
K2752	B29K55																											UJ								
	B29K58																											UJ								
	B29K62																											UJ								
	B29K65																											UJ								
	B28N98																											UJ								
K2759	B28NB1																											UJ								
	B28NB4																											UJ								
	B28NC0																											UJ								
	B28NC3																											UJ								
K2784	B28NC6																											UJ								
	B28NC9																											UJ								
Sampling Authorization Form RC-202 (Soil)																																				
K2980	J1CM85																		J																	
	J1CM86																		J																	
	J1CM87																		J																	
K3038	J1CN47		J										J															J						J		
K3065	J1CN25						J			J			J															J						J		
	J1CN26						J			J			J															UJ						J		
	J1CN27						J			J			J															UJ						J		

Table 11. 100-B/C Review Qualifiers for Volatile Organic Compounds. (4 Pages)

Sample Delivery Group Number	Sample Number	VOAs																																		
		1,1,1-Trichloroethane	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	1,1-Dichloroethene	1,2-Dichloroethane	1,2-Dichloroethene (total)	1,2-Dichloropropane	2-Butanone	2-Hexanone	4-Methyl-2-pentanone	Acetone	Benzene	Bromodichloromethane	Bromoform	Bromomethane	Carbon Disulfide	Carbon Tetrachloride	Chlorobenzene	Chloroethane	Chloroform	Chloromethane	cis-1,2-Dichloroethene	cis-1,3-Dichloropropene	Dibromochloromethane	Ethylbenzene	Methylene Chloride	Styrene	Tetrachloroethene	trans-1,2-Dichloroethene	Toluene	trans-1,3-Dichloropropene	Trichloroethene	Vinyl chloride	Xylenes, total
K3066	J1CN48																											UJ								
	J1CN49																											UJ								
	J1CN50																											UJ								
	J1CN51																											UJ								
	J1CN52																											UJ								

J = Due to a minor quality control deficiency identified during the data assessment, the associated concentration is an estimate. The data are considered usable for decision-making purposes.
UJ = The compound or analyte was analyzed for and detected in the sample. However, due to a minor quality control deficiency associated with method blank results, the associated results are labeled as estimated quantitation limits. The data are considered usable for decision-making purposes.
VOA = volatile organic analysis

Table 12. 100-B/C Review Qualifiers for Special Extraction. (4 Pages)

Sample Delivery Group Number	Sample Number	Arsenic	Barium	Cadmium	Chromium	Lead	Selenium	Silver	Hexavalent Chromium
Sampling Authorization Form RC-185 (Soil)									
K2123	B26F05				J				J
	B26F07								J
	B26F09				J				J
	B26F10				J				J
	B26F11								J
	B26F12								J
	B26F18				J				J
K2224	B272L3				J				J
	B272L4				J				J
K2270	B272M4				J	J			J
K2324	B272L6								J
	B272L7				J				J
K2955	B26RC6				J				J
	B26RC7				J				J
K2967	B26RD1								J
	B26RD2								J
	B26RD3		J						J
	B26RD5								J
K2968	B26RD6		J						J
	B26RD8		J		J				J
	B2B8K3		J		J				J
	B26RD9		J		J				J
K3014	B274M5		J						J
	B274M6		J						J
K3026	B274N2				J				J
	B274N8				J				J
K3058	B274N0								J
	B274N1								J
Sampling Authorization Form RC-195 (Soil)									
K2352	B27MV3								J
K2355	B27MV6				J				J
	B27MV7				J				J
	B27MV8				J				J
	B27MV9				J				J
K2358	B27MW3				J				J

Table 12. 100-B/C Review Qualifiers for Special Extraction. (4 Pages)

Sample Delivery Group Number	Sample Number	Arsenic	Barium	Cadmium	Chromium	Lead	Selenium	Silver	Hexavalent Chromium
K2369	B27MW1								J
	B27MW2				J				J
K2385	B27MY8				J				J
	B27N01				J				J
	B27N30				J				J
	B27N46				J				
K2387	B27FH5A				J				J
	B27N36				J				J
	B27N39				J				J
	B27N40				J				J
K2463	B27MY0				J		UJ	J	J
K2565	B27Y62				J				
	B27Y65				J				
	B27Y68				J				
	B27Y71				J				J
	B27Y74				J				J
K2571	B27KF7				J				J
	B27KJ5								J
	B27KJ8				J				J
K2586	B27KJ2				J				J
	B27KK1				J				J
	B27KK4	J			J				J
	B27KK7				J				J
	B27KF3				J				J
K2587	B27Y43				J				J
	B27Y39								J
K2592	B27KH9				J				J
K2599	B27Y51				J				
	B27Y56				J				
	B27Y59				J				
	B27Y86				J				
K2636	B28DN2					J			J
	B28DN4								J
	B28DN7								J
	B28DP0					J			J
	B28DP3								J
K2638	B28DP6								J

Table 12. 100-B/C Review Qualifiers for Special Extraction. (4 Pages)

Sample Delivery Group Number	Sample Number	Arsenic	Barium	Cadmium	Chromium	Lead	Selenium	Silver	Hexavalent Chromium
K2677	B28N86				J				J
	B28N90				J				J
K2678	B28DL1								J
	B28DL4				J				J
K2679	B28DL8								J
	B28DM1								J
K2680	B28DV2								J
	B28DV5				J				J
	B28DV8								J
K2694	B27KM6	J			J				J
	B27WL1				J	J			J
K2695	B27J47				J				J
K2696	B28N93								J
K2697	B28DR1								J
	B28DR4								J
	B28DR7				J				J
	B28DT0								J
	B28DT3				J				J
K2699	B28DT6				J				J
	B28DT9				J	J			J
K2713	B27J43								J
	B27J44				J				J
K2714	B28N96								J
K2715	B28DX6								J
K2726	B27J46							J	J
	B27J49				J			J	J
	B27J51				J			J	J
	B27J52				J			J	J
	B27J53				J			J	J
K2737	B27J61				J				J
	B27J62				J				J
K2747	B29K56					J			J
	B29K59					J			J
K2756	B27J54		J					J	J
	B27J55				J			J	J
	B27J56				J			J	J
	B27J57				J			J	J
	B27J58							J	J

Table 12. 100-B/C Review Qualifiers for Special Extraction. (4 Pages)

Sample Delivery Group Number	Sample Number	Arsenic	Barium	Cadmium	Chromium	Lead	Selenium	Silver	Hexavalent Chromium
K2757	B28N99				J				J
	B28NC4								J
	B29K63								J
	B29K66								J
K2758	B28NB2								J
	B28NB2-3						UJ		
	B28NC1								J
	B28NC1-1						UJ		
	B28NC1-2						UJ		
	B28NC1-4						UJ		
K2775	B28NC7								J
	B28ND0								J
K2795	B28ND3				J				J
	B28NF2				J				J
K2820	B28NF8				J			J	J
	B28NH1				J			J	J
	B28NJ0				J			J	J
K2828	B28ND6			J					J
	B28ND9		J	J					J
	B28NF5			J					J
	B28NH4			J		J			J
Sampling Authorization Form RC-202 (Soil)									
K2980	J1CM85		J						J
	J1CM86		J						J
	J1CM87								
K3038	J1CN47	J	J	J	J	J	J	J	J
K3065	J1CN25				J				J
	J1CN26				J				J
K3066	J1CN48		J						J
	J1CN49		J						J

J = Due to a minor quality control deficiency identified during the data assessment, the associated concentration is an estimate. The data are considered usable for decision-making purposes.

UJ = The compound or analyte was analyzed for and detected in the sample. However, due to a minor quality control deficiency associated with method blank results, the associated results are labeled as estimated quantitation limits. The data are considered usable for decision-making purposes.

4.0 REFERENCES

DOE/RL-2009-44, 2010, *Sampling and Analysis Plan for the 100-BC-1, 100-BC-2, and 100-BC-5 Operable Units Remedial Investigation/Feasibility Study*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

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EPA/600/R-05/124, 2005, *Sample Holding Time Reevaluation*, U.S. Environmental Protection Agency, Office of Research and Development, Washington, D.C.

SW-846, 1990, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods,* Update IV of the Third Edition, U.S. Environmental Protection Agency, Office of Environmental Information, Washington, D.C.

APPENDIX A

100-B/C REMEDIAL INVESTIGATION RELATIVE PERCENT DIFFERENCE CALCULATIONS

Acrobat 8.0

CALCULATION COVER SHEET

Project Title: 100-B/C Remedial Investigation **Job No. 14655**

Area: 100-B/C

Discipline: Environmental *Calculation No: 0100X-CA-V0057

Subject: 100-B/C Remedial Investigation Relative Percent Difference (RPD) Calculations

Computer Program: Excel Program No: Excel 2007

The attached calculations have been generated for a specific purpose and task. Use of the calculations by persons who do not have access to all pertinent facts may lead to incorrect conclusions and/or results. Before applying these calculations to your work, the underlying basis, rationale, and other pertinent information relevant to these calculations must be thoroughly reviewed with appropriate Washington Closure Hanford LLC (WCH) officials or other authorized personnel. WCH is not responsible for the use of a calculation not under its direct control.

Committed Calculation ☒ Preliminary ☐ Superseded ☐ Voided ☐

Rev.	Sheet Numbers	Originator	Checker	Reviewer	Approval	Date
0	Cover = 1 Sheets = 23 Total = 24	P. L. Benjamin	H. M. Sulloway		J. M. Capron	8/9/11

SUMMARY OF REVISION

WCH-DE-019 (05/08/2007) *Obtain Calc. No. from Document Control and Form from Intranet

CALCULATION SHEET

Washington Closure Hanford

Originator P. L. Benjamin	**Date** 8/3/2011	**Calc. No.** 0100X-CA-V0057	**Rev. No.** 0
Project 100-B/C Remedial Investigation	**Job No.** 14855	**Checked** H. M. Sulloway	**Date** 8/4/11
Subject 100-B/C Remedial Investigation Relative Percent Difference (RPD) Calculation			**Sheet No.** 1 of 23

Summary

PURPOSE:

Provide documentation to support the calculation of the relative percent difference (RPD) for primary-duplicate and primary-split sample pairs from 100-B/C Area remedial investigation sample results, as necessary.

TABLE OF CONTENTS:

Sheets 1 to 3 - Summary
Sheet 4 - 118-B-8:3 Soil Samples
Sheet 5 - C7508 Interval 2 Soil Samples
Sheet 6 - C7784 Interval 2 Soil Samples
Sheet 7 - C7784 Interval 3 Soil Samples
Sheet 8 - C7785 Interval 5 Soil Samples
Sheet 9 - C7842 Interval 1 Soil Samples
Sheet 10 - C7842 Interval 10 Groundwater Samples
Sheet 11 - C7843 Interval 12 Groundwater Samples
Sheet 12 - C7843 Interval 12 Soil Samples
Sheet 13 - C7844 Interval 3 Soil Samples
Sheet 14 - C7844 Interval 16 Groundwater Samples
Sheet 15 - C7845 Interval 8 Soil Samples
Sheet 16 - C7845 Interval 16 Groundwater Samples
Sheet 17 - C7846 Interval 2 Soil Samples
Sheet 18 - C7846 Interval 15 Groundwater Samples
Sheet 19 - C7849 Interval 5 Soil Samples
Sheet 20 - C7849 Interval 27 Groundwater Samples
Sheet 21 - C8239 Interval 7 Soil Samples
Sheet 22 - C8239 Interval 26 Groundwater Samples
Sheet 23 - C8244 Interval 2 Soil Samples

GIVEN/REFERENCES:

1) DOE-RL, 2010, *Sampling and Analysis Plan for the 100-BC-1, 100-BC-2, and 100-BC-5 Operable Units Remedial Investigation/Feasibility Study,* DOE/RL-2009-44, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Solution:

1) Use data obtained from remedial investigation soil, aquifer sediment, and groundwater samples to perform the RPD calculations for primary-duplicate and primary-split sample pairs, as required.

METHODOLOGY:

The RPD is calculated when both the primary sample value and either the duplicate or split sample value for a given analyte are above detection limits and are greater than 5 times the target detection limit (TDL). The TDL is a laboratory detection limit pre-determined for each analytical method. The 100-B/C SAP lists laboratory performance standards as estimated quantitation limits (EQLs) for soil/aquifer sediment samples from sampling targets in Tables 2-2 through 2-12 of the SAP (DOE/RL 2010) for selected constituents. Where TDL values lower than those listed in the SAP were available, the lower values were used.

Where direct evaluation of the attached sample data showed that a given analyte was not detected in the primary, duplicate, and/or split sample, further evaluation of the RPD value was not performed.

CALCULATION SHEET

Washington Closure Hanford

Originator P. L. Benjamin PB	**Date** 8/3/2011	**Calc. No.** 0100X-CA-V0057	**Rev. No.** 0
Project 100-B/C Remedial Investigation	**Job No.** 14655	**Checked** H. M. Sulloway HMS	**Date** 8/8/11
Subject 100-B/C Remedial Investigation Relative Percent Difference (RPD) Calculation			**Sheet No.** 2 of 23

Summary

METHODOLOGY CONTINUED:

The RPD calculations use the following formula:

$$RPD = [\ |M-D|/((M+D)/2)]*100$$

where, M = main sample value D = duplicate (or split) sample value

When an analyte is detected in the primary or duplicate/split sample, but is quantified at less than 5 times the TDL in one or both samples, an additional parameter is evaluated. In this case, if the difference between the primary and duplicate/split results exceeds a control limit of 2 times the TDL, further assessment regarding the usability of the data is performed as part of the overall quality assessment.

For quality assurance/quality control (QA/QC) duplicate RPD calculations, a value less than 30% indicates the data compare favorably. If the RPD is greater than 30%, further investigation regarding the usability of the data is performed. Additional discussion is provided in the data quality assessment.

RESULTS:

The results presented in the tables that follow include the summary of the results of the RPD calculations and are for use in data quality assessment of the remedial investigation sampling.

Washington Closure Hanford CALCULATION SHEET

Originator P. L. Benjamin PB Date 8/3/2011
Project 100-B/C Remedial Investigation Job No. 14655
Subject 100-B/C Remedial Investigation Relative Percent Difference (RPD) Calculation

Calc. No. 0100X-CA-V0057
Checked H. M Sullaway HMS

Rev. No. 0
Date 8/8/11
Sheet No. 13 of 23

1 Summary (continued)
2
3 Relative Percent Difference Results and
4 QA/QC Analysis

5 Analyte	118-B-9:3, Soil	C7508, Soil, Interval 2	C7784, Soil, Interval 2	C7784, Soil, Interval 3	C7785, Soil, Interval 5	C7842, Soil, Interval 1	C7842, Groundwater, Interval 10	C7843, Groundwater, Interval 12	C7843, Soil, Interval 12	C7844, Soil, Interval 3	C7844, Groundwater, Interval 16	C7845, Soil, Interval 8	C7845, Groundwater, Interval 16	C7846, Soil, Interval 2	C7846, Groundwater, Interval 15	C7849, Soil, Interval 5	C7849, Groundwater, Interval 27	C8239, Soil, Interval 7	C8239, Groundwater, Interval 28	C8244, Soil, Interval 2
6	Duplicate Analysis	Duplicate Analysis	Duplicate Analysis	Split Analysis	Duplicate Analysis	Duplicate Analysis	Duplicate Analysis	Duplicate Analysis	Duplicate Analysis	Duplicate Analysis	Duplicate Analysis	Duplicate Analysis	Duplicate Analysis	Duplicate Analysis	Duplicate Analysis	Duplicate Analysis	Duplicate Analysis	Duplicate Analysis	Duplicate Analysis	Duplicate Analysis
7 Cesium-137	7.8%	--	--	--	--	14.5%	--	--	--	--	--	--	--	--	--	--	--	--	--	--
8 Cobalt-60	82.0%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
9 Europium-152	32.4%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
10 Potassium-40	14.5%	29.3%	13.3%	7.5%	0.8%	6.6%	--	--	1.8%	0.3%	--	--	--	--	--	3.3%	--	79.0%	--	22.2%
11 Radium-226	--	--	--	8.5%	--	3.9%	--	--	--	--	--	--	--	--	--	--	--	--	--	--
12 Radium-228	--	--	9.2%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
13 Total Beta Radiostrontium	--	--	--	--	--	--	10.3%	0.4%	--	--	4.3%	--	6.4%	--	--	--	--	--	6.7%	--
14 Tritium	--	--	--	--	--	--	5.0%	6.2%	--	--	0.0%	14.9%	1.5%	--	5.5%	--	--	--	9.6%	--
15 Aluminum	62.4%	14.1%	6.2%	7.7%	25.8%	3.7%	--	--	19.1%	2.5%	--	22.1%	--	6.2%	--	17.1%	--	9.6%	--	32.0%
16 Barium	48.5%	9.8%	0.7%	5.6%	11.3%	26.9%	1.9%	1.2%	22.6%	5.6%	0.0%	8.7%	--	18.3%	--	4.1%	--	30.2%	--	10.3%
17 Calcium	27.7%	17.5%	0.2%	5.6%	4.8%	2.9%	1.4%	0.6%	6.2%	0.2%	0.8%	2.9%	0.4%	3.1%	1.4%	1.4%	2.6%	5.0%	2.2%	16.0%
18 Chromium	68.1%	10.0%	18.0%	116.3%	94.9%	14.4%	--	0.6%	10.6%	14.2%	1.3%	40.9%	5.2%	93.8%	0.0%	52.1%	--	51.6%	2.5%	29.3%
19 Copper	1.3%	9.1%	6.4%	54.3%	0.6%	4.1%	--	--	64.6%	4.7%	--	2.2%	--	1.2%	--	10.5%	--	13.7%	--	6.6%
20 Iron	49.3%	14.5%	1.5%	29.2%	17.5%	3.8%	--	--	13.8%	0.8%	--	2.5%	--	10.8%	--	9.6%	--	10.3%	--	18.1%
21 Lead	29.5%	--	10.3%	26.0%	23.7%	16.0%	--	--	--	--	--	--	--	--	--	7.4%	--	--	--	--
22 Magnesium	65.8%	10.4%	4.4%	8.6%	16.7%	5.8%	2.7%	1.2%	26.3%	4.1%	0.6%	4.0%	0.2%	15.1%	0.6%	19.3%	2.3%	11.3%	1.4%	19.5%
23 Manganese	50.3%	20.6%	4.1%	10.5%	6.8%	6.4%	3.8%	--	24.3%	6.7%	5.2%	23.7%	--	16.0%	--	12.5%	3.4%	15.7%	--	21.7%
24 Phosphorus	13.6%	4.0%	3.0%	--	--	10.3%	--	--	--	1.5%	--	19.6%	--	1.5%	--	19.6%	--	8.3%	--	16.7%
25 Silicon	17.4%	25.1%	20.5%	44.6%	47.6%	1.3%	0.9%	0.9%	7.2%	8.1%	2.4%	91.9%	1.1%	2.5%	4.0%	29.4%	4.0%	24.3%	2.3%	90.8%
26 Sodium	25.4%	19.7%	5.5%	--	--	9.3%	2.3%	1.6%	24.7%	5.2%	0.0%	26.5%	1.6%	8.9%	0.0%	14.5%	3.1%	17.2%	0.8%	44.9%
27 Strontium	41.3%	9.5%	9.6%	27.8%	12.6%	0.0%	0.6%	0.4%	6.3%	1.6%	0.4%	25.4%	1.0%	9.7%	1.5%	9.2%	3.3%	19.3%	1.6%	24.3%
28 Vanadium	25.4%	7.7%	3.6%	15.1%	37.7%	3.0%	--	--	26.4%	5.8%	--	6.0%	--	10.4%	--	20.6%	--	4.8%	--	16.7%
29 Zinc	48.9%	2.0%	3.2%	6.4%	6.9%	10.9%	--	--	20.7%	0.7%	--	4.8%	--	6.6%	--	8.7%	--	2.3%	2.5%	13.0%
30 Chloride	--	--	--	--	--	--	2.5%	0.0%	--	--	6.1%	--	2.2%	--	8.7%	0.4%	6.5%	--	6.8%	--
31 Nitrate	--	--	--	--	--	17.8%	2.0%	2.9%	--	11.7%	4.1%	--	2.9%	--	34.5%	--	2.1%	--	1.4%	--
32 Nitrogen in Nitrite and Nitrate	--	--	--	--	--	13.4%	0.2%	4.4%	--	13.2%	6.1%	--	0.9%	--	1.5%	--	11.0%	--	133.7%	--
33 Sulfate	--	--	--	--	--	--	0.3%	3.5%	--	6.4%	4.7%	--	0.5%	--	4.1%	--	0.8%	--	1.2%	--
34 Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.5%	--

35
36 -- = Analysis not required

CALCULATION SHEET

Washington Closure Hanford

Originator P. L. Benjamin PB
Project 100-B/C Remedial Investigation
Subject 100-B/C Remedial Investigation Relative Percent Difference (RPD) Calculations

Date 08/03/11
Job No. 14655

Calc. No. 0100X-CA-V0057
Checked H. M. Sullaway HMS

Rev. No. 0
Date 8/8/11
Sheet No. 4 of 23

1 **Duplicate Analysis - 118-B-8:3 Soil Samples**

2	Sampling Area	Sample Number	Sample Date	Cesium-137			Cobalt-60			Europium-152			Nickel-63			Potassium-40			Radium-226			Radium-228			Total beta radiostrontium			Uranium-233/234			Uranium-238		
3				pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
4	118-B-8:3	J1CN49	1/25/11	0.801		0.108	0.650		0.068	2.17		0.243	14.2		3.23	10.2		0.919	0.369		0.191	0.894		0.393	0.877		0.259	0.538		0.217	0.595		0.217
5	118-B-8:3 DUP	J1CN51	1/25/11	0.741		0.112	0.272		0.096	3.01		0.275	63.6		3.22	8.82		0.910	0.374		0.199	0.565		0.353	2.25		0.242	0.803		0.094	0.723		0.059
6	**Analysis:**																																
7		TDL		0.1			0.05			0.1			30			0.5			0.1			0.2			1			1			1		
8	Duplicate Analysis	Both > PQL?		Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)		
9		Both >5xTDL?		Yes (calc RPD)			Yes (calc RPD)			Yes (calc RPD)			No-Stop (acceptable)			Yes (calc RPD)			No-Stop (acceptable)			No-Stop (acceptable)			No-Stop (acceptable)			No-Stop (acceptable)			No-Stop (acceptable)		
10		RPD		7.8%			82.0%			32.4%						14.5%																	
11		Difference > 2 TDL?		Not applicable			Not applicable			Not applicable			No - acceptable			Not applicable			No - acceptable			No - acceptable			No - acceptable			No - acceptable			No - acceptable		

12																																	
13	Sampling Area	HEIS Number	Sample Date	Aluminum			Arsenic			Barium			Beryllium			Bismuth			Boron			Cadmium			Calcium			Chromium			Cobalt		
14				mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
15	118-B-8:3	J1CN49	1/25/11	3890		3.68	1.73		0.74	41.2		0.37	0.178		0.15	0.409	B	7.35	0.706	B	1.47	0.105	B	0.15	4850		73.5	7.48		0.15	4.84		1.47
16	118-B-8:3 DUP	J1CN51	1/25/11	7420		4.57	2.35		0.91	67.6		0.46	0.300		0.18	0.826	B	9.13	0.928	B	1.83	0.167	B	0.18	6410		91.3	15.2		0.18	8.40		1.83
17	**Analysis:**																																
18		TDL		5			1			0.5			0.2			10			2			0.2			100			0.2			2		
19	Duplicate Analysis	Both > PQL?		Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			No-Stop (acceptable)			No-Stop (acceptable)			No-Stop (acceptable)			Yes (continue)			Yes (continue)			Yes (continue)		
20		Both >5xTDL?		Yes (calc RPD)			No-Stop (acceptable)			Yes (calc RPD)			No-Stop (acceptable)												Yes (calc RPD)			Yes (calc RPD)			No-Stop (acceptable)		
21		RPD		62.4%						48.5%															27.7%			68.1%					
22		Difference > 2 TDL?		Not applicable			No - acceptable			Not applicable			No - acceptable			No - acceptable			No - acceptable			No - acceptable			Not applicable			Not applicable			No - acceptable		

23																																	
24	Sampling Area	HEIS Number	Sample Date	Copper			Iron			Lead			Lithium			Magnesium			Manganese			Mercury			Molybdenum			Nickel			Phosphorus		
25				mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
26	118-B-8:3	J1CN49	1/25/11	15.5		0.74	16200		14.7	3.29		0.37	6.64		1.84	2510		55.1	177		3.68	0.14		0.03	0.220	B	1.470	5.05		2.94	986		36.8
27	118-B-8:3 DUP	J1CN51	1/25/11	15.3		0.91	26800		18.3	4.43		0.46	9.51		2.28	4970		68.5	296		4.57	0.18		0.03	0.267	B	1.830	10.2		3.7	1130		45.7
28	**Analysis:**																																
29		TDL		1			5			0.5			2.5			75			5			0.2			2			4			100		
30	Duplicate Analysis	Both > PQL?		Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			No-Stop (acceptable)			Yes (continue)			Yes (continue)			Yes (continue)		
31		Both >5xTDL?		Yes (calc RPD)			Yes (calc RPD)			Yes (calc RPD)			No-Stop (acceptable)			Yes (calc RPD)			Yes (calc RPD)			No-Stop (acceptable)						No-Stop (acceptable)			Yes (calc RPD)		
32		RPD		1.3%			49.3%			29.5%						65.8%			50.3%												13.6%		
33		Difference > 2 TDL?		Not applicable			Not applicable			Not applicable			No - acceptable			Not applicable			Not applicable			No - acceptable			No - acceptable			No - acceptable			Not applicable		

34																																	
35	Sampling Area	Sample Number	Sample Date	Potassium			Silicon			Sodium			Strontium			Tin			Vanadium			Zinc			Methylene chloride			Nitrate			Nitrogen in Nitrite and Nitrate		
36				mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	µg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
37	118-B-8:3	J1CN49	1/25/11	932		294	568		1.47	439		36.8	19.0		0.74	1.48	B	7.35	35.4		1.84	27.8		7.35	3.73	BJ	5.1	10.3		5.4	2.64		0.54
38	118-B-8:3 DUP	J1CN51	1/25/11	1560		365	674		1.83	567		45.7	28.9		0.91	1.67	B	9.13	45.7		2.28	45.8		9.13	4.24	BJ	5.4	7.0		5.7	1.65		0.57
39	**Analysis:**																																
40		TDL		400			2			50			1			10			2.5			1			5			2.5			0.75		
41	Duplicate Analysis	Both > PQL?		Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			No-Stop (acceptable)			Yes (continue)			Yes (continue)			No-Stop (acceptable)			Yes (continue)			Yes (continue)		
42		Both >5xTDL?		No-Stop (acceptable)			Yes (calc RPD)			Yes (calc RPD)			Yes (calc RPD)						Yes (calc RPD)			Yes (calc RPD)						No-Stop (acceptable)			No-Stop (acceptable)		
43		RPD					17.4%			25.4%			41.3%						25.4%			48.9%											
44		Difference > 2 TDL?		No - acceptable			Not applicable			Not applicable			Not applicable			No - acceptable			Not applicable			Not applicable			No - acceptable			No - acceptable			No - acceptable		

45									
46	Sampling Area	Sample Number	Sample Date	Sulfate			Total petroleum hydrocarbons - diesel		
47				mg/kg	Q	PQL	µg/kg	Q	PQL
48	118-B-8:3	J1CN49	1/25/11	21.7		5.4	1250	J	3590
49	118-B-8:3 DUP	J1CN51	1/25/11	16.5		5.7	1220	J	3600
50	**Analysis:**								
51		TDL		5			5000		
52	Duplicate Analysis	Both > PQL?		Yes (continue)			No-Stop (acceptable)		
53		Both >5xTDL?		No-Stop (acceptable)					
54		RPD							
55		Difference > 2 TDL?		No - acceptable			No - acceptable		

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Washington Closure Hanford

Originator P. L. Benjamin PB
Project 100-B/C Remedial Investigation
Subject 100-B/C Remedial Investigation Relative Percent Difference (RPD) Calculations

Date 08/03/11
Job No. 14655

Calc. No. 0100X-CA-V0057
Checked H. M. Sulloway HMS

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1 **Duplicate Analysis - C7508 Interval 2 Soil Samples**

	Sampling Area	Sample Number	Sample Date	Potassium-40			Radium-226			Radium-228			Aluminum			Arsenic			Barium			Beryllium			Boron		
3				pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
4	C7508; I-002	B26F09	6/30/10	9.56		0.509	0.346		0.095	0.627		0.210	4470		3.47	0.943		0.69	50.2		0.35	0.158		0.14	0.448	B	1.39
5	C7508; I-002 DUP	B26F06	6/30/10	7.12		0.391	0.306		0.065	0.479		0.149	5150		4.62	1.31		0.92	55.4		0.46	0.155	B	0.19	1.71	B	1.85

6 **Analysis:**

7		TDL		0.5			0.1			0.2			5			1			0.5			0.2			2		
8	Duplicate Analysis	Both > PQL?		Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			No-Stop (acceptable)			No-Stop (acceptable)		
9		Both >5xTDL?		Yes (calc RPD)			No-Stop (acceptable)			No-Stop (acceptable)			Yes (calc RPD)			No-Stop (acceptable)			Yes (calc RPD)								
10		RPD		29.3%									14.1%						9.8%								
11		Difference > 2 TDL?		Not applicable			No - acceptable			No - acceptable			Not applicable			No - acceptable			Not applicable			No - acceptable			No - acceptable		

12

	Sampling Area	HEIS Number	Sample Date	Cadmium			Calcium			Chromium			Cobalt			Copper			Hexavalent chromium			Iron			Lead		
14				mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
15	C7508; I-002	B26F09	6/30/10	0.085	B	0.14	5160	J	69.4	3.8		0.14	9.93		1.39	13.7	J	0.69	0.07	B	0.21	25000		13.9	0.375		0.35
16	C7508; I-002 DUP	B26F06	6/30/10	0.090	B	0.19	6150	J	92.4	4.2		0.19	10.8		1.85	15.0	J	0.92	0.13	B	0.21	28900		18.5	0.745		0.46

17 **Analysis:**

18		TDL		0.2			100			0.2			2			1			0.5			5			0.5		
19	Duplicate Analysis	Both > PQL?		No-Stop (acceptable)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			No-Stop (acceptable)			Yes (continue)			Yes (continue)		
20		Both >5xTDL?					Yes (calc RPD)			Yes (calc RPD)			No-Stop (acceptable)			Yes (calc RPD)						Yes (calc RPD)			No-Stop (acceptable)		
21		RPD					17.5%			10.0%						9.1%						14.5%					
22		Difference > 2 TDL?		No - acceptable			Not applicable			Not applicable			No - acceptable			Not applicable			No - acceptable			Not applicable			No - acceptable		

23

	Sampling Area	HEIS Number	Sample Date	Lithium			Magnesium			Manganese			Molybdenum			Nickel			Phosphorus			Potassium			Silicon		
25				mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
26	C7508; I-002	B26F09	6/30/10	1.70	B	1.73	4450	J	52.0	278		3.47	0.570	B	1.39	5.59		2.77	1230	J	34.7	532		277	129		1.39
27	C7508; I-002 DUP	B26F06	6/30/10	1.68	B	2.31	4940	J	69.3	342		4.62	0.710	B	1.85	6.34		3.70	1280	J	46.2	559		370	166		1.85

28 **Analysis:**

29		TDL		2.5			75			5			2			4			100			400			2		
30	Duplicate Analysis	Both > PQL?		No-Stop (acceptable)			Yes (continue)			Yes (continue)			No-Stop (acceptable)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)		
31		Both >5xTDL?					Yes (calc RPD)			Yes (calc RPD)						No-Stop (acceptable)			Yes (calc RPD)			No-Stop (acceptable)			Yes (calc RPD)		
32		RPD					10.4%			20.6%									4.0%						25.1%		
33		Difference > 2 TDL?		No - acceptable			Not applicable			Not applicable			No - acceptable			No - acceptable			Not applicable			No - acceptable			Not applicable		

34

	Sampling Area	Sample Number	Sample Date	Sodium			Strontium			Tin			Vanadium			Zinc		
36				mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
37	C7508; I-002	B26F09	6/30/10	362		34.7	22.1		0.69	3.06	B	6.94	79.0	J	1.73	49.7		6.94
38	C7508; I-002 DUP	B26F08	6/30/10	441		46.2	24.3		0.92	3.43	B	9.24	85.3	J	2.31	50.7		9.24

39 **Analysis:**

40		TDL		50			1			10			2.5			1		
41	Duplicate Analysis	Both > PQL?		Yes (continue)			Yes (continue)			No-Stop (acceptable)			Yes (continue)			Yes (continue)		
42		Both >5xTDL?		Yes (calc RPD)			Yes (calc RPD)						Yes (calc RPD)			Yes (calc RPD)		
43		RPD		19.7%			9.5%						7.7%			2.0%		
44		Difference > 2 TDL?		Not applicable			Not applicable			No - acceptable			Not applicable			Not applicable		

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Originator P. L. Benjamin PB
Project 100-B/C Remedial Investigation
Subject 100-B/C Remedial Investigation Relative Percent Difference (RPD) Calculations

Date 08/03/11
Job No. 14655

Calc. No. 0100X-CA-V0057
Checked H. M. Sulloway HMS

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Duplicate Analysis - C7784 Interval 2 Soil Samples

Sampling Area	Sample Number	Sample Date	Potassium-40			Radium-226			Radium-228			Total beta radiostrontium		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
C7784; I-002	B26HY9	8/17/10	14.7		1.47	0.337		0.274	1.14		0.412	0.813		0.218
C7784; I-002 DUP	B26J00	8/17/10	16.8		1.30	0.492		0.196	1.04		0.492	0.649		0.229

Analysis:

	TDL	0.5	0.1	0.2	1
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)
	RPD	13.3%		9.2%	
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable

Sampling Area	HEIS Number	Sample Date	Aluminum			Arsenic			Barium			Beryllium			Boron			Cadmium			Calcium			Chromium			Cobalt		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
C7784; I-002	B26HY0	8/17/10	8610		4.59	3.00		0.92	83.0		0.46	0.263		0.18	1.14	B	1.84	0.071	B	0.18	4090		91.8	15.2		0.18	5.60		1.84
C7784; I-002 DUP	B26HY1	8/17/10	8090		3.75	3.13		0.75	82.4		0.38	0.243		0.15	0.884	B	1.50	0.062	B	0.15	4100		75.0	18.2		0.15	5.65		1.50

Analysis:

	TDL	5	1	0.5	0.2	2	0.2	100	0.2	2
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)			Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)
	RPD	6.2%		0.7%				0.2%	18.0%	
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable	No - acceptable	No - acceptable	Not applicable	Not applicable	No - acceptable

Sampling Area	HEIS Number	Sample Date	Copper			Hexavalent chromium			Iron			Lead			Lithium			Magnesium			Manganese			Molybdenum			Nickel		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
C7784; I-002	B26HY0	8/17/10	16.7		0.92	0.08	B	0.21	19700		18.4	3.05		0.46	10.2		2.30	5060		68.9	346		4.59	0.504	B	1.84	19.3		3.67
C7784; I-002 DUP	B26HY1	8/17/10	17.8		0.75	0.19	B	0.21	19400		15.0	2.75		0.38	9.6		1.88	5290		56.3	332		3.75	0.482	B	1.50	24.8		3.00

Analysis:

	TDL	1	0.5	5	0.5	2.5	75	5	2	4
Duplicate Analysis	Both > PQL?	Yes (continue)	No-Stop (acceptable)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)		Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)		No-Stop (acceptable)
	RPD	6.4%		1.5%	10.3%		4.4%	4.1%		
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable

Sampling Area	Sample Number	Sample Date	Phosphorus			Potassium			Silicon			Sodium			Strontium			Tin			Vanadium			Zinc		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
C7784; I-002	B26HY0	8/17/10	540		45.9	1030		367	376		1.84	357		45.9	26.2		0.92	1.83	B	9.18	42.5		2.30	37.9		9.18
C7784; I-002 DUP	B26HY1	8/17/10	524		37.5	986		300	306		1.50	338		37.5	23.8		0.75	7.82		7.50	41.0		1.88	36.7		7.50

Analysis:

	TDL	100	400	2	50	1	10	2.5	1
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)		Yes (calc RPD)	Yes (calc RPD)
	RPD	3.0%		20.5%	5.5%	9.6%		3.6%	3.2%
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable

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1 **Spilt Analysis - C7784 Interval 3 Soil Samples**

Sampling Area	Sample Number	Sample Date	Potassium-40 pCi/g	Q	MDA	Radium-226 pCi/g	Q	MDA	Radium-228 pCi/g	Q	MDA
C7784; I-003	B26JO3	8/25/10	14.1		0.954	0.505		0.153	0.738		0.276
C7784; I-003 SPLIT	B26HY4	8/25/10	15.2		0.232	0.550		0.0437	0.828		0.0979

Analysis:

	TDL	0.5	0.1	0.2
Split Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)
	RPD	7.5%	8.5%	
	Difference > 2 TDL?	Not applicable	Not applicable	No - acceptable

Sampling Area	HEIS Number	Sample Date	Aluminum mg/kg	Q	PQL	Antimony mg/kg	Q	PQL	Arsenic mg/kg	Q	PQL	Barium mg/kg	Q	PQL	Beryllium mg/kg	Q	PQL	Cadmium mg/kg	Q	PQL	Calcium mg/kg	Q	PQL	Chromium mg/kg	Q	PQL	Cobalt mg/kg	Q	PQL
C7784; I-003	B26HX5	8/25/10	6710		4.03	0.608		0.480	2.31		0.81	64.2		0.40	0.203		0.16	0.091	B	0.16	2390		80.5	51.0		0.16	4.06		1.61
C7784; I-003 SPLIT	B26HY5	8/25/10	8210		14.4	1.2		0.21	23.2		3.3	60.7		0.26	0.400	B	0.17	3.4	B	0.51	2260		13.7	13.5		0.32	6.9		0.96

Analysis:

	TDL	5	0.6	1	0.5	0.2	0.2	100	0.2	2
Split Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)		Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)
	RPD	7.7%			5.6%			5.6%	116.3%	
	Difference > 2 TDL?	Not applicable	No - acceptable	Yes - assess further	Not applicable	No - acceptable	Yes - assess further	Not applicable	Not applicable	No - acceptable

Sampling Area	HEIS Number	Sample Date	Copper mg/kg	Q	PQL	Iron mg/kg	Q	PQL	Lead mg/kg	Q	PQL	Lithium mg/kg	Q	PQL	Magnesium mg/kg	Q	PQL	Manganese mg/kg	Q	PQL	Nickel mg/kg	Q	PQL	Phosphorus mg/kg	Q	PQL	Potassium mg/kg	Q	PQL
C7784; I-003	B26HX5	8/25/10	17.1		0.81	16900		16.1	3.08		0.40	10.0		2.01	4370		60.4	250		4.03	20.4		3.22	381		40.3	1360		322
C7784; I-003 SPLIT	B26HY5	8/25/10	9.8		0.75	12600		30.5	4.0		0.18	9.5		0.68	4010		8.5	225	C	0.16	17.5		0.23	306	C	15.2	1620		346

Analysis:

	TDL	1	5	0.5	2.5	75	5	4	100	400
Split Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)
	RPD	54.3%	29.2%	26.0%		8.6%	10.5%			
	Difference > 2 TDL?	Not applicable	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable	No - acceptable

Sampling Area	Sample Number	Sample Date	Silicon mg/kg	Q	PQL	Sodium mg/kg	Q	PQL	Strontium mg/kg	Q	PQL	Tin mg/kg	Q	PQL	Vanadium mg/kg	Q	PQL	Zinc mg/kg	Q	PQL
C7784; I-003	B26HX5	8/25/10	738		1.61	234		40.3	18.6		0.81	1.43	B	8.05	25.6		2.01	29.1		8.05
C7784; I-003 SPLIT	B26HY5	8/25/10	469		10.3	177		48.4	24.6		0.26	1.7	B	0.84	22.0		1.3	27.3		2.0

Analysis:

	TDL	2	50	1	10	2.5	1
Split Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)		Yes (calc RPD)	Yes (calc RPD)
	RPD	44.6%		27.8%		15.1%	6.4%
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable	Not applicable	Not applicable

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1 **Duplicate Analysis - C7785 Interval 5 Soil Samples**

2 Sampling Area	Sample Number	Sample Date	Potassium-40			Radium-226			Radium-228			Total beta radiostrontium		
3			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
4 C7785; I-005	B274P6	1/18/11	12.0		0.616	0.500		0.123	0.716		0.276	0.376		0.237
5 C7785; I-005 DUP	B274P1	1/18/11	12.1		1.11	0.575		0.183	0.854		0.325	0.396		0.262

6 **Analysis:**

7	TDL	0.5	0.1	0.2	1
8 Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
9	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)
10	RPD	0.8%			
11	Difference > 2 TDL?	Not applicable	No - acceptable	No - acceptable	No - acceptable

12

13 Sampling Area	HEIS Number	Sample Date	Aluminum			Arsenic			Barium			Beryllium			Boron			Cadmium			Calcium			Chromium			Cobalt		
14			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
15 C7785; I-005	B274T0	1/18/11	4800		3.70	1.09		0.74	60.6		0.37	0.187		0.15	0.416	B	1.48	0.062	B	0.15	2260		74.0	37.3		0.15	4.48		1.48
16 C7785; I-005 DUP	B274R5	1/18/11	6220		4.48	1.41		0.90	54.1		0.45	0.189		0.18	0.598	B	1.79	0.058	B	0.18	2370		89.6	13.3		0.18	3.77		1.79

17 **Analysis:**

18	TDL	5	1	0.5	0.2	2	0.2	100	0.2	2
19 Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (continue)	Yes (continue)	Yes (continue)
20	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)			Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)
21	RPD	25.8%		11.3%				4.8%	94.9%	
22	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable	No - acceptable	No - acceptable	Not applicable	Not applicable	No - acceptable

23

24 Sampling Area	HEIS Number	Sample Date	Copper			Hexavalent chromium			Iron			Lead			Lithium			Magnesium			Manganese			Molybdenum			Nickel		
25			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
26 C7785; I-005	B274T0	1/18/11	9.90		0.74	0.30	B	0.57	12400		14.8	2.53		0.37	7.34		1.85	2800		55.5	184		3.70	0.493	B	1.48	23.9		2.96
27 C7785; I-005 DUP	B274R5	1/18/11	10.0		0.90	0.27		0.56	10400		17.9	3.21		0.45	10.8		2.24	3310		67.2	197		4.48	0.264	B	1.79	11.5		3.58

28 **Analysis:**

29	TDL	1	0.5	5	0.5	2.5	75	5	2	4
30 Duplicate Analysis	Both > PQL?	Yes (continue)	No-Stop (acceptable)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	Yes (continue)
31	Both >5xTDL?	Yes (calc RPD)		Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)		No-Stop (acceptable)
32	RPD	0.6%		17.5%	23.7%		16.7%	6.8%		
33	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	Yes - assess further

34

35 Sampling Area	Sample Number	Sample Date	Phosphorus			Potassium			Silicon			Sodium			Strontium			Tin			Vanadium			Zinc		
36			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
37 C7785; I-005	B274T0	1/18/11	294		37.0	647		296	628		1.48	226		37.0	14.6		0.74	1.42	B	7.40	32.5		1.85	22.3		7.40
38 C7785; I-005 DUP	B274R5	1/18/11	278		44.8	768		358	1020		1.79	214		44.8	16.6		0.90	1.71	B	8.96	22.2		2.24	23.9		8.96

39 **Analysis:**

40	TDL	100	400	2	50	1	10	2.5	1
41 Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	Yes (continue)	Yes (continue)
42	Both >5xTDL?	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)		Yes (calc RPD)	Yes (calc RPD)
43	RPD			47.6%		12.8%		37.7%	6.9%
44	Difference > 2 TDL?	No - acceptable	No - acceptable	Not applicable	No - acceptable	Not applicable	No - acceptable	Not applicable	Not applicable

CALCULATION SHEET

Washington Closure Hanford

Originator P. L. Benjamin
Project 100-B/C Remedial Investigation
Subject 100-B/C Remedial Investigation Relative Percent Difference (RPD) Calculations

Date 08/03/11
Job No. 14655

Calc. No. 0100X-CA-V0057
Checked H. M. Sulloway

Rev. No. 0
Date 8/8/11
Sheet No. 9 of 23

Duplicate Analysis - C7842 Interval 1 Soil Samples

Sampling Area	Sample Number	Sample Date	Cesium-137 pCi/g	Q	MDA	Potassium-40 pCi/g	Q	MDA	Radium-226 pCi/g	Q	MDA	Radium-228 pCi/g	Q	MDA	Total beta radiostrontium pCi/g	Q	MDA	Uranium-233/234 pCi/g	Q	MDA	Uranium-238 pCi/g	Q	MDA
C7842; I-001	B27FB2	9/8/10	3.55		0.086	14.0		0.685	0.501		0.139	0.442		0.275	0.297		0.210	0.860		0.193	0.708		0.193
C7842; I-001 DUP	B27FB3	9/8/10	3.07		0.076	13.1		0.507	0.521		0.125	0.864		0.227	0.312		0.306	0.484		0.185	0.484		0.185

Analysis:

	TDL	0.1	0.5	0.1	0.2	1	1	1
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)
	RPD	14.5%	6.6%	3.9%				
	Difference > 2 TDL?	Not applicable	Not applicable	Not applicable	No - acceptable	No - acceptable	No - acceptable	No - acceptable

Sampling Area	HEIS Number	Sample Date	Aluminum mg/kg	Q	PQL	Arsenic mg/kg	Q	PQL	Barium mg/kg	Q	PQL	Beryllium mg/kg	Q	PQL	Boron mg/kg	Q	PQL	Cadmium mg/kg	Q	PQL	Calcium mg/kg	Q	PQL	Chromium mg/kg	Q	PQL	Cobalt mg/kg	Q	PQL
C7842; I-001	B27FC4	9/8/10	7160		4.17	2.28		0.83	75.8		0.42	0.231		0.17	0.818	B	1.67	0.099	B	0.17	4710		83.4	13.5		0.17	5.83		1.67
C7842; I-001 DUP	B27FC6	9/8/10	7430		4.16	2.53		0.84	99.4		0.42	0.243		0.17	0.921	B	1.67	0.096	B	0.17	4850		83.6	15.6		0.17	5.83		1.67

Analysis:

	TDL	5	1	0.5	0.2	2	0.2	100	0.2	2
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)			Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)
	RPD	3.7%		26.9%				2.9%	14.4%	
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable	No - acceptable	No - acceptable	Not applicable	Not applicable	No - acceptable

Sampling Area	HEIS Number	Sample Date	Copper mg/kg	Q	PQL	Iron mg/kg	Q	PQL	Lead mg/kg	Q	PQL	Lithium mg/kg	Q	PQL	Magnesium mg/kg	Q	PQL	Manganese mg/kg	Q	PQL	Molybdenum mg/kg	Q	PQL	Nickel mg/kg	Q	PQL	Phosphorus mg/kg	Q	PQL
C7842; I-001	B27FC4	9/8/10	14.8		0.83	17900		16.7	3.22		0.42	8.58		2.09	4300		62.6	289		4.17	0.846	B	1.67	10.2		3.34	592		41.7
C7842; I-001 DUP	B27FC6	9/8/10	14.2		0.84	18600		16.7	3.78		0.42	10.0		2.09	4550		62.7	306		4.18	1.04	B	1.67	10.7		3.34	656		41.8

Analysis:

	TDL	1	5	0.5	2.5	75	5	2	4	100
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)		No-Stop (acceptable)	Yes (calc RPD)
	RPD	4.1%	3.8%	16.0%		5.6%	6.4%			10.3%
	Difference > 2 TDL?	Not applicable	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable	Not applicable

Sampling Area	Sample Number	Sample Date	Potassium mg/kg	Q	PQL	Silicon mg/kg	Q	PQL	Sodium mg/kg	Q	PQL	Strontium mg/kg	Q	PQL	Tin mg/kg	Q	PQL	Vanadium mg/kg	Q	PQL	Zinc mg/kg	Q	PQL	Nitrate mg/kg	Q	PQL	Nitrogen in Nitrite and Nitrate mg/kg	Q	PQL	Sulfate mg/kg	Q	PQL
C7842; I-001	B27FC4	9/8/10	1110		334	924		1.67	299		41.7	26.5		0.83	1.35	B	8.34	46.7		2.09	34.8		8.34	20.0		4.9	4.51		0.49	15.1		4.9
C7842; I-001 DUP	B27FC6	9/8/10	1230		334	912		1.67	328		41.8	26.5		0.84	1.55	B	8.36	45.3		2.09	38.8		8.36	23.9		5.0	5.16		0.50	16.8		5.0

Analysis:

	TDL	400	2	50	1	10	2.5	1	2.5	0.75	5
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)		Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)
	RPD		1.3%	9.3%	0.0%		3.0%	10.9%	17.8%	13.4%	
	Difference > 2 TDL?	No - acceptable	Not applicable	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable	Not applicable	Not applicable	No - acceptable

CALCULATION SHEET

Washington Closure Hanford

Originator P. L. Benjamin PB
Project 100-B/C Remedial Investigation
Subject 100-B/C Remedial Investigation Relative Percent Difference (RPD) Calculations

Date 08/03/11
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Date 8/8/11
Sheet No. 10 of 23

1 **Duplicate Analysis - C7842 Interval 10 Groundwater Samples**

Sampling Area	Sample Number	Sample Date	Technetium-99			Total beta radiostrontium			Tritium			Total Uranium (chemical)		
			pCi/L	Q	MDA	pCi/L	Q	MDA	pCi/L	Q	MDA	µg/L	Q	MDA
C7842; I-010	B27FH8	9/14/10	13.0		3.90	13.3		0.501	27400		144	4.35		0.322
C7842; I-010 DUP	B27FJ1	9/14/10	14.1		4.05	12.0		0.498	28800		154	4.78		0.322

Analysis:

	TDL	15	2	400	1
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)
	RPD		10.3%	5.0%	
	Difference > 2 TDL?	No - acceptable	Not applicable	Not applicable	No - acceptable

Sampling Area	HEIS Number	Sample Date	Barium			Boron			Calcium			Chromium			Cobalt			Magnesium			Manganese		
			µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL
C7842; I-010	B27FH9	9/14/10	42.2		2	13.4		10	63100		100	1.93	B	2	0.738	B	2	11300		100	180		2
C7842; I-010 DUP	B27FJ2	9/14/10	43.0		2	13.9		10	62200		100	1.30	B	2	0.904	B	2	11000		100	187		2

Analysis:

	TDL	5	20	1000	2	20	750	5
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)			Yes (calc RPD)	Yes (calc RPD)
	RPD	1.9%		1.4%			2.7%	3.8%
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable	No - acceptable	Not applicable	Not applicable

Sampling Area	HEIS Number	Sample Date	Molybdenum			Nickel			Potassium			Silicon			Sodium			Strontium			Vanadium		
			µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL
C7842; I-010	B27FH9	9/14/10	4.05		2	3.09	B	5	2350		500	7450		50	13400		100	323		5	6.95		5
C7842; I-010 DUP	B27FJ2	9/14/10	6.88		2	2.98	B	5	2410		500	7520		50	13100		100	325		5	7.16		5

Analysis:

	TDL	20	40	4000	20	500	10	25
Duplicate Analysis	Both > PQL?	Yes (continue)	No-Stop (acceptable)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)		No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)
	RPD				0.9%	2.3%	0.6%	
	Difference > 2 TDL?	No - acceptable	No - acceptable	No - acceptable	Not applicable	Not applicable	Not applicable	No - acceptable

Sampling Area	Sample Number	Sample Date	Chloride			Nitrate			Nitrogen in Nitrite and Nitrate			Sulfate		
			mg/L	Q	PQL	mg/L	Q	PQL	mg/L	Q	PQL	mg/L	Q	PQL
C7842; I-010	B27FH9	9/14/10	15.5	D	5	24.9	D	5	5.48	D	0.5	60.3	D	5
C7842; I-010 DUP	B27FJ2	9/14/10	15.9	D	5	24.4	D	5	5.47	D	0.5	60.5	D	5

Analysis:

	TDL	0.2	0.25	0.075	0.5
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)
	RPD	2.5%	2.0%	0.2%	0.3%
	Difference > 2 TDL?	Not applicable	Not applicable	Not applicable	Not applicable

CALCULATION SHEET

Washington Closure Hanford

Originator P. L. Benjamin PB
Project 100-B/C Remedial Investigation
Subject 100-B/C Remedial Investigation Relative Percent Difference (RPD) Calculations

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Sheet No. 11 of 23

Duplicate Analysis - C7843 Interval 12 Groundwater Samples

Sampling Area	Sample Number	Sample Date	Technetium-99			Total beta radiostrontium			Tritium			Total Uranium (chemical)		
			pCi/L	Q	MDA	pCi/L	Q	MDA	pCi/L	Q	MDA	µg/L	Q	MDA
C7843; I-012	B27FT4	2/1/11	13.0		3.92	54.1		0.86	12600		146	3.00		0.031
C7843; I-012 DUP	B27FT7	2/1/11	11.8		3.69	53.9		0.77	13400		145	2.98		0.031

Analysis:

	TDL	15	2	400	1
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)
	RPD		0.4%	6.2%	
	Difference > 2 TDL?	No - acceptable	Not applicable	Not applicable	No - acceptable

Sampling Area	HEIS Number	Sample Date	Barium			Boron			Calcium			Chromium			Iron			Magnesium			Manganese			Molybdenum		
			µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL
C7843; I-012	B27FT5	2/1/11	40.9		2	11.6		10	59600		100	32.6		2	70.1		50	9650		100	0.721	B	2	4.65		2
C7843; I-012 DUP	B27FT8	2/1/11	41.4		2	11.1		10	60100		100	32.8		2	13.2	B	50	9770		100	0.550	B	2	3.21		2

Analysis:

	TDL	5	20	1000	2	50	750	5	20
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	Yes (continue)	No-Stop (acceptable)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)		Yes (calc RPD)		No-Stop (acceptable)
	RPD	1.2%		0.8%	0.6%		1.2%		
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	Not applicable	No - acceptable	No - acceptable

Sampling Area	HEIS Number	Sample Date	Phosphorus			Potassium			Silicon			Sodium			Strontium			Vanadium			Zinc		
			µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL
C7843; I-012	B27FT5	2/1/11	20.6	B	50	2810		500	11500		50	12300		100	273		5	9.51		5	37.0		20
C7843; I-012 DUP	B27FT8	2/1/11	19.8	B	50	2970		500	11400		50	12500		100	272		5	10.5		5	37.3		20

Analysis:

	TDL	100	4000	20	500	10	25	10
Duplicate Analysis	Both > PQL?	No-Stop (acceptable)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?		No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)
	RPD			0.9%	1.6%	0.4%		
	Difference > 2 TDL?	No - acceptable	No - acceptable	Not applicable	Not applicable	Not applicable	No - acceptable	No - acceptable

Sampling Area	Sample Number	Sample Date	Chloride			Nitrate			Nitrogen in Nitrite and Nitrate			Sulfate		
			mg/L	Q	PQL	mg/L	Q	PQL	mg/L	Q	PQL	mg/L	Q	PQL
C7843; I-012	B27FT5	2/1/11	10.6	D	5	20.7	D	5	3.95	D	0.5	57.6	D	5
C7843; I-012 DUP	B27FT8	2/1/11	10.6	D	5	21.3	D	5	3.78	D	0.5	55.6	D	5

Analysis:

	TDL	0.2	0.25	0.075	0.5
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)
	RPD	0.0%	2.9%	4.4%	3.5%
	Difference > 2 TDL?	Not applicable	Not applicable	Not applicable	Not applicable

Sampling Area	Sample Number	Sample Date	Hexavalent chromium		
			mg/L	Q	PQL
C7843; I-012	B27FT3	2/1/11	0.029		0.0037
C7843; I-012 DUP	B27FT6	2/1/11	0.027		0.0037

Analysis:

	TDL	0.01
Duplicate Analysis	Both > PQL?	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)
	RPD	
	Difference > 2 TDL?	No - acceptable

CALCULATION SHEET

Washington Closure Hanford

Originator P. L. Benjamin PB
Project 100-B/C Remedial Investigation
Subject 100-B/C Remedial Investigation Relative Percent Difference (RPD) Calculations

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Rev. No. 0
Date 8/8/11
Sheet No. 12 of 23

1 **Duplicate Analysis - C7843 Interval 12 Soil Samples**

	Sampling Area	Sample Number	Sample Date	Potassium-40			Radium-226			Radium-228			Total beta radiostrontium			Uranium-233/234			Uranium-238		
3				pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
4	C7843; I-012	B27FP7	9/21/10	11.5		0.531	0.376		0.127	0.389		0.246	0.399		0.217	0.335		0.146	0.365		0.116
5	C7843; I-012 DUP	B27FH4	9/21/10	11.3		0.540	0.421		0.125	0.451		0.283	0.370		0.180	0.400		0.113	0.356		0.113

6 **Analysis:**

7	TDL	0.5	0.1	0.2	1	1	1
8	Duplicate Analysis: Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
9	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)
10	RPD	1.8%					
11	Difference > 2 TDL?	Not applicable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	No - acceptable

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	Sampling Area	HEIS Number	Sample Date	Aluminum			Arsenic			Barium			Beryllium			Boron			Cadmium			Calcium			Chromium			Cobalt		
14				mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
15	C7843; I-012	B27FT2	9/21/10	5200		3.82	1.63		0.76	41.5		0.38	0.170		0.15	0.389	B	1.53	0.074	B	0.15	3730		76.4	8.54		0.15	6.48		1.53
16	C7843; I-012 DUP	B27FR0	9/21/10	6300		4.41	2.46		0.88	52.1		0.44	0.191		0.18	0.490	B	1.76	0.096	B	0.18	3970		88.2	7.68		0.18	9.26		1.76

17 **Analysis:**

18	TDL	5	1	0.5	0.2	2	0.2	100	0.2	2
19	Duplicate Analysis: Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (continue)	Yes (continue)	Yes (continue)
20	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)			Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)
21	RPD	19.1%		22.6%				6.2%	10.6%	
22	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable	No - acceptable	No - acceptable	Not applicable	Not applicable	No - acceptable

23

	Sampling Area	HEIS Number	Sample Date	Copper			Iron			Lead			Lithium			Magnesium			Manganese			Molybdenum			Nickel			Phosphorus		
25				mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
26	C7843; I-012	B27FT2	9/21/10	20.1		0.76	20300		15.3	2.33		0.38	3.50		1.91	3540		57.3	253		3.82	1.25	B	1.53	8.03		3.05	481		38.2
27	C7843; I-012 DUP	B27FR0	9/21/10	39.3		0.88	23300		17.6	2.73		0.44	5.35		2.21	4610		66.2	323		4.41	0.612	B	1.76	12.3		3.53	592		44.1

28 **Analysis:**

29	TDL	1	5	0.5	2.5	75	5	2	4	100
30	Duplicate Analysis: Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	Yes (continue)	Yes (continue)
31	Both >5xTDL?	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)		No-Stop (acceptable)	No-Stop (acceptable)
32	RPD	64.6%	13.8%			26.3%	24.3%			
33	Difference > 2 TDL?	Not applicable	Not applicable	No - acceptable	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable	No - acceptable

34

	Sampling Area	Sample Number	Sample Date	Potassium			Silicon			Sodium			Strontium			Tin			Vanadium			Zinc		
36				mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
37	C7843; I-012	B27FT2	9/21/10	383		305	360		1.53	273		38.2	18.4		0.76	1.07	B	7.64	50.7		1.91	31.2		7.64
38	C7843; I-012 DUP	B27FR0	9/21/10	552		353	387		1.76	350		44.1	19.6		0.88	1.47	B	8.82	68.1		2.21	38.4		8.82

39 **Analysis:**

40	TDL	400	2	50	1	10	2.5	1
41	Duplicate Analysis: Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	Yes (continue)	Yes (continue)
42	Both >5xTDL?	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)		Yes (calc RPD)	Yes (calc RPD)
43	RPD		7.2%	24.7%	6.3%		26.4%	20.7%
44	Difference > 2 TDL?	No - acceptable	Not applicable	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable

CALCULATION SHEET

Washington Closure Hanford

Originator P. L. Benjamin **Date** 08/03/11 **Calc. No.** 0100X-CA-V0057 **Rev. No.** 0
Project 100-B/C Remedial Investigation **Job No.** 14655 **Checked** H. M. Sulloway **Date** 8/8/11
Subject 100-B/C Remedial Investigation Relative Percent Difference (RPD) Calculations **Sheet No.** 13 of 23

Duplicate Analysis - C7844 Interval 3 Soil Samples

Sampling Area	Sample Number	Sample Date	Potassium-40 pCi/g	Q	MDA	Radium-226 pCi/g	Q	MDA	Radium-228 pCi/g	Q	MDA
C7844; I-003	B27H72	12/2/10	9.17		0.188	0.392		0.042	0.496		0.099
C7844; I-003 DUP	B27H73	12/2/10	9.14		0.276	0.351		0.085	0.573		0.148

Analysis:

	TDL	0.5	0.1	0.2
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)
	RPD	0.3%		
	Difference > 2 TDL?	Not applicable	No - acceptable	No - acceptable

Sampling Area	HEIS Number	Sample Date	Aluminum mg/kg	Q	PQL	Arsenic mg/kg	Q	PQL	Barium mg/kg	Q	PQL	Beryllium mg/kg	Q	PQL	Bismuth mg/kg	Q	PQL	Boron mg/kg	Q	PQL	Cadmium mg/kg	Q	PQL	Calcium mg/kg	Q	PQL	Chromium mg/kg	Q	PQL	Cobalt mg/kg	Q	PQL	Copper mg/kg	Q	PQL
C7844; I-003	B27J66	12/2/10	3690		3.54	1.17		0.71	53.6		0.35	0.214		0.14	0.508	B	7.08	0.794	B	1.42	0.068	B	0.14	4980		70.8	3.54		0.14	7.95		1.42	12.5		0.71
C7844; I-003 DUP	B27J67	12/2/10	3600		3.36	1.11		0.67	56.7		0.34	0.190		0.13	0.932	B	6.71	0.784	B	1.34	0.083	B	0.13	4990		67.1	4.08		0.13	8.19		1.34	13.1		0.67

Analysis:

	TDL	5			1			0.5			0.2			10			2			0.2			100			0.2			2			1		
Duplicate Analysis	Both > PQL?	Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			No-Stop (acceptable)			No-Stop (acceptable)			No-Stop (acceptable)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)		
	Both >5xTDL?	Yes (calc RPD)			No-Stop (acceptable)			Yes (calc RPD)			No-Stop (acceptable)												Yes (calc RPD)			Yes (calc RPD)			No-Stop (acceptable)			Yes (calc RPD)		
	RPD	2.5%						5.6%															0.2%			14.2%						4.7%		
	Difference > 2 TDL?	Not applicable			No - acceptable			Not applicable			No - acceptable			No - acceptable			No - acceptable			No - acceptable			Not applicable			Not applicable			No - acceptable			Not applicable		

Sampling Area	HEIS Number	Sample Date	Iron mg/kg	Q	PQL	Lead mg/kg	Q	PQL	Lithium mg/kg	Q	PQL	Magnesium mg/kg	Q	PQL	Manganese mg/kg	Q	PQL	Mercury mg/kg	Q	PQL	Molybdenum mg/kg	Q	PQL	Nickel mg/kg	Q	PQL	Phosphorus mg/kg	Q	PQL	Potassium mg/kg	Q	PQL
C7844; I-003	B27J66	12/2/10	25600		14.2	1.93		0.35	2.23		1.77	3710		53.1	288		3.54	0.823		0.03	0.781	B	1.42	5.22		2.83	1300		35.4	411		283
C7844; I-003 DUP	B27J67	12/2/10	25400		13.4	1.88		0.34	1.97		1.68	3560		50.4	308		3.36	0.913		0.03	0.831	B	1.34	5.48		2.69	1320		33.6	380		269

Analysis:

	TDL	5			0.5			2.5			75			5			0.2			2			4			100			400					
Duplicate Analysis	Both > PQL?	Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			No-Stop (acceptable)			Yes (continue)			Yes (continue)			Yes (continue)					
	Both >5xTDL?	Yes (calc RPD)			No-Stop (acceptable)			No-Stop (acceptable)			Yes (calc RPD)			Yes (calc RPD)			No-Stop (acceptable)						No-Stop (acceptable)			Yes (calc RPD)			No-Stop (acceptable)					
	RPD	0.8%									4.1%			6.7%												1.5%								
	Difference > 2 TDL?	Not applicable			No - acceptable			No - acceptable			Not applicable			Not applicable			No - acceptable			No - acceptable			No - acceptable			Not applicable			No - acceptable					

Sampling Area	Sample Number	Sample Date	Silicon mg/kg	Q	PQL	Sodium mg/kg	Q	PQL	Strontium mg/kg	Q	PQL	Tin mg/kg	Q	PQL	Vanadium mg/kg	Q	PQL	Zinc mg/kg	Q	PQL	Fluoride mg/kg	Q	PQL	Nitrate mg/kg	Q	PQL	Nitrogen in Nitrite and Nitrate mg/kg	Q	PQL	Sulfate mg/kg	Q	PQL
C7844; I-003	B27J66	12/2/10	348		1.42	373		35.4	18.3		0.71	2.58	B	7.08	70.8		1.77	45.5		7.08	0.3	B	2.6	35.3		2.6	8.70		0.53	57.1		2.6
C7844; I-003 DUP	B27J67	12/2/10	321		1.34	393		33.6	18.6		0.67	2.46	B	6.71	75.0		1.68	45.2		6.71	0.3	B	2.4	31.4		2.4	7.62		0.46	52.5		2.4

Analysis:

	TDL	2			50			1			10			2.5			1			5			2.5			0.75			5					
Duplicate Analysis	Both > PQL?	Yes (continue)			Yes (continue)			Yes (continue)			No-Stop (acceptable)			Yes (continue)			Yes (continue)			No-Stop (acceptable)			Yes (continue)			Yes (continue)			Yes (continue)					
	Both >5xTDL?	Yes (calc RPD)			Yes (calc RPD)			Yes (calc RPD)						Yes (calc RPD)			Yes (calc RPD)						Yes (calc RPD)			Yes (calc RPD)			Yes (calc RPD)					
	RPD	8.1%			5.2%			1.6%						5.8%			0.7%						11.7%			13.2%			8.4%					
	Difference > 2 TDL?	Not applicable			Not applicable			Not applicable			No - acceptable			Not applicable			Not applicable			No - acceptable			Not applicable			Not applicable			Not applicable					

Sampling Area	Sample Number	Sample Date	Methylene chloride ug/kg	Q	PQL
C7844; I-003	B27H91	12/2/10	2.25	BJ	5.82
C7844; I-003 DUP	B27H92	12/2/10	1.87	BJ	5.12

Analysis:

	TDL	0.005
Duplicate Analysis	Both > PQL?	No-Stop (acceptable)
	Both >5xTDL?	Yes (calc RPD)
	RPD	
	Difference > 2 TDL?	Not applicable

CALCULATION SHEET

Washington Closure Hanford

Originator P. L. Benjamin
Project 100-B/C Remedial Investigation
Subject 100-B/C Remedial Investigation Relative Percent Difference (RPD) Calculations

Date 08/03/11
Job No. 14655

Calc. No. 0100X-CA-V0057
Checked H. M. Sulloway

Rev. No. 0
Date 8/8/11
Sheet No. 14 of 23

1 **Duplicate Analysis - C7844 Interval 16 Groundwater Samples**

	Sampling Area	Sample Number	Sample Date	Technetium-99			Total beta radiostrontium			Tritium			Total Uranium (chemical)		
3				pCi/L	Q	MDA	pCi/L	Q	MDA	pCi/L	Q	MDA	µg/L	Q	MDA
4	C7844; I-016	B27HP3	12/7/10	8.4		4.44	20.7		0.402	18000		365	1.79		0.02
5	C7844; I-016 DUP	B27HP6	12/7/10	8.2		4.12	21.8		0.374	18000		360	1.84		0.02

6 **Analysis:**

7		TDL	15	2	400	1
8	Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
9		Both >5xTDL?	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)
10		RPD		4.3%	0.0%	
11		Difference > 2 TDL?	No - acceptable	Not applicable	Not applicable	No - acceptable

12

	Sampling Area	HEIS Number	Sample Date	Aluminum			Arsenic			Barium			Boron			Calcium			Chromium			Iron			Magnesium		
14				µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL
15	C7844; I-016	B27HP4	12/7/10	28.4	B	50	3.23	B	10	35.6		2	15.8		10	53100		100	15.3		2	54.4		50	8630		100
16	C7844; I-016 DUP	B27HP7	12/7/10	31.1	B	50	3.09	B	10	35.6		2	16.0		10	53500		100	15.1		2	49.3	B	50	8680		100

17 **Analysis:**

18		TDL	50	10	5	20	1000	2	50	750
19	Duplicate Analysis	Both > PQL?	No-Stop (acceptable)	No-Stop (acceptable)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	Yes (continue)
20		Both >5xTDL?			Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)		Yes (calc RPD)
21		RPD			0.0%		0.8%	1.3%		0.6%
22		Difference > 2 TDL?	No - acceptable	No - acceptable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	Not applicable

23

	Sampling Area	HEIS Number	Sample Date	Manganese			Molybdenum			Nickel			Phosphorus			Potassium			Silicon			Sodium			Strontium		
25				µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL
26	C7844; I-016	B27HP4	12/7/10	53.4		2	5.09		2	1.38	B	5	40.2	B	50	4550		500	16700		50	12100		100	229		5
27	C7844; I-016 DUP	B27HP7	12/7/10	50.7		2	6.68		2	1.35	B	5	39.7	B	50	4540		500	17100		50	12100		100	230		5

28 **Analysis:**

29		TDL	5	20	40	100	4000	20	500	10
30	Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
31		Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)			No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)
32		RPD	5.2%					2.4%	0.0%	0.4%
33		Difference > 2 TDL?	Not applicable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	Not applicable	Not applicable	Not applicable

34

	Sampling Area	Sample Number	Sample Date	Vanadium			Zinc			Chloride			Fluoride			Nitrate			Nitrogen in Nitrite and Nitrate			Sulfate		
36				µg/L	Q	PQL	µg/L	Q	PQL	mg/L	Q	PQL	mg/L	Q	PQL	mg/L	Q	PQL	mg/L	Q	PQL	mg/L	Q	PQL
37	C7844; I-016	B27HP4	12/7/10	8.81		5	37.4		20	9.03		0.25	0.14	B	0.25	10.3	D	2.5	2.71	D	0.5	43.5	D	2.5
38	C7844; I-016 DUP	B27HP7	12/7/10	8.41		5	33.0		20	9.60		0.25	0.11	B	0.25	9.89	D	2.5	2.55	D	0.5	45.6	D	2.5

39 **Analysis:**

40		TDL	25	10	0.2	0.5	0.25	0.075	0.5
41	Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	Yes (continue)	Yes (continue)	Yes (continue)
42		Both >5xTDL?	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)		Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)
43		RPD			6.1%		4.1%	6.1%	4.7%
44		Difference > 2 TDL?	No - acceptable	No - acceptable	Not applicable	No - acceptable	Not applicable	Not applicable	Not applicable

CALCULATION SHEET

Washington Closure Hanford

Originator P. L. Benjamin PB
Project 100-B/C Remedial Investigation
Subject 100-B/C Remedial Investigation Relative Percent Difference (RPD) Calculations

Date 08/03/11
Job No. 14655

Calc. No. 0100X-CA-V0057
Checked H. M. Sulloway HMS

Rev. No. 0
Date 8/8/11
Sheet No. 15 of 23

Duplicate Analysis - C7845 Interval 8 Soil Samples

Sampling Area	Sample Number	Sample Date	Tritium pCi/g	Q	MDA
C7845; I-008	B27KC2	11/5/10	461		8.04
C7845; I-008 DUP	B27KB6	11/5/10	397		6.97

Analysis:

	TDL	10
Duplicate Analysis	Both > PQL?	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)
	RPD	14.9%
	Difference > 2 TDL?	Not applicable

Sampling Area	HEIS Number	Sample Date	Aluminum mg/kg	Q	PQL	Arsenic mg/kg	Q	PQL	Barium mg/kg	Q	PQL	Beryllium mg/kg	Q	PQL	Bismuth mg/kg	Q	PQL	Cadmium mg/kg	Q	PQL	Calcium mg/kg	Q	PQL	Chromium mg/kg	Q	PQL	Cobalt mg/kg	Q	PQL	Copper mg/kg	Q	PQL
C7845; I-008	B27KJ4	11/5/10	4190		3.65	0.773		0.73	53.7		0.37	0.193		0.15	1.73	B	7.30	0.106	B	0.15	5100		73.0	2.82		0.15	20.8		1.46	13.6		0.73
C7845; I-008 DUP	B27KD6	11/5/10	5230		4.19	1.12		0.84	58.6		0.42	0.186		0.17	1.49	B	8.39	0.093	B	0.17	5250		83.9	4.27		0.17	7.48		1.68	13.9		0.84

Analysis:

		Aluminum	Arsenic	Barium	Beryllium	Bismuth	Cadmium	Calcium	Chromium	Cobalt	Copper
	TDL	5	1	0.5	0.2	10	0.2	100	0.2	2	1
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)			Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)
	RPD	22.1%		8.7%				2.9%	40.9%		2.2%
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable	No - acceptable	No - acceptable	Not applicable	Not applicable	Yes - assess further	Not applicable

Sampling Area	HEIS Number	Sample Date	Iron mg/kg	Q	PQL	Lead mg/kg	Q	PQL	Lithium mg/kg	Q	PQL	Magnesium mg/kg	Q	PQL	Manganese mg/kg	Q	PQL	Molybdenum mg/kg	Q	PQL	Nickel mg/kg	Q	PQL	Phosphorus mg/kg	Q	PQL	Potassium mg/kg	Q	PQL	Silicon mg/kg	Q	PQL
C7845; I-008	B27KJ4	11/5/10	23800		14.6	1.69		0.37	2.95		1.82	3200		54.7	311		3.65	0.571	B	1.46	7.58		2.92	1290		36.5	474		292	237		1.46
C7845; I-008 DUP	B27KD6	11/5/10	24400		16.8	1.94		0.42	4.08		2.10	3330		62.9	245		4.19	0.501	B	1.68	4.59		3.35	1060		41.9	554		335	840		1.68

Analysis:

		Iron	Lead	Lithium	Magnesium	Manganese	Molybdenum	Nickel	Phosphorus	Potassium	Silicon
	TDL	5	0.5	2.5	75	5	2	4	100	400	2
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)		No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)
	RPD	2.5%			4.0%	23.7%			19.6%		91.9%
	Difference > 2 TDL?	Not applicable	No - acceptable	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable	Not applicable	No - acceptable	Not applicable

Sampling Area	Sample Number	Sample Date	Sodium mg/kg	Q	PQL	Strontium mg/kg	Q	PQL	Tin mg/kg	Q	PQL	Vanadium mg/kg	Q	PQL	Zinc mg/kg	Q	PQL	Chloride mg/kg	Q	PQL	Fluoride mg/kg	Q	PQL	Nitrate mg/kg	Q	PQL	Nitrogen in Nitrite and Nitrate mg/kg	Q	PQL	Sulfate mg/kg	Q	PQL
C7845; I-008	B27KJ4	11/5/10	413		36.5	21.7		0.73	2.60	B	7.30	77.0		1.82	45.1		7.30	1.1	B	2.7	0.3	B	2.7	2.3	B	2.7	0.69		0.54	25.2		2.7
C7845; I-008 DUP	B27KD6	11/5/10	539		41.9	28.0		0.84	3.05	B	8.39	81.8		2.10	43.0		8.39	1.3	B	2.4	0.4	B	2.4	2.5		2.4	0.68		0.49	19.1		2.4

Analysis:

		Sodium	Strontium	Tin	Vanadium	Zinc	Chloride	Fluoride	Nitrate	Nitrogen in Nitrite and Nitrate	Sulfate
	TDL	50	1	10	2.5	1	2	5	2.5	0.75	5
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	No-Stop (acceptable)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	Yes (calc RPD)		Yes (calc RPD)	Yes (calc RPD)				No-Stop (acceptable)	No-Stop (acceptable)
	RPD	26.5%	25.4%		6.0%	4.8%					
	Difference > 2 TDL?	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	No - acceptable

Sampling Area	Sample Number	Sample Date	Methylene chloride µg/kg	Q	PQL
C7845; I-008	B27KJ6	11/5/10	12.7		5.41
C7845; I-008 DUP	B27KD8	11/5/10	14.2		5.92

Analysis:

	TDL	5
Duplicate Analysis	Both > PQL?	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)
	RPD	
	Difference > 2 TDL?	No - acceptable

CALCULATION SHEET

Washington Closure Hanford

Originator P. L. Benjamin
Project 100-B/C Remedial Investigation
Subject 100-B/C Remedial Investigation Relative Percent Difference (RPD) Calculations

Date 08/03/11
Job No. 14855

Calc. No. 0100X-CA-V0057
Checked H. M. Sulloway

Rev. No. 0
Date 8/8/11
Sheet No. 16 of 23

Duplicate Analysis - C7845 Interval 16 Groundwater Samples

Sampling Area	Sample Number	Sample Date	Technetium-99			Total beta radiostrontium			Tritium			Total Uranium (chemical)		
			pCi/L	Q	MDA	pCi/L	Q	MDA	pCi/L	Q	MDA	µg/L	Q	MDA
C7845; I-016	B27KN1	11/9/10	9.23		3.97	68.4		0.750	19600		130	68.0		0.29
C7845; I-016 DUP	B27KN4	11/9/10	6.78		4.49	72.9		0.859	19900		129	1.61		0.29

Analysis:

TDL		15	2	400	1
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)
	RPD		6.4%	1.5%	
	Difference > 2 TDL?	No - acceptable	Not applicable	Not applicable	Yes - assess further

Sampling Area	HEIS Number	Sample Date	Aluminum			Barium			Boron			Calcium			Chromium			Iron			Lithium			Magnesium		
			µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL
C7845; I-016	B27KN2	11/9/10	23.8	B	50	22.4		2	17.9		10	48500		100	29.4		2	40.9	B	50	5.04	B	20	8380		100
C7845; I-016 DUP	B27WL3	11/9/10	28.2	B	50	22.1		2	18.3		10	48300		100	27.9		2	29.1	B	50	6.62	B	20	8360		100

Analysis:

TDL		50	5	20	1000	2	50	25	750
Duplicate Analysis	Both > PQL?	No-Stop (acceptable)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (continue)
	Both >5xTDL?		No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)			Yes (calc RPD)
	RPD				0.4%	5.2%			0.2%
	Difference > 2 TDL?	No - acceptable	No - acceptable	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable	Not applicable

Sampling Area	HEIS Number	Sample Date	Manganese			Molybdenum			Nickel			Phosphorus			Potassium			Silicon			Sodium			Strontium		
			µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL
C7845; I-016	B27KN2	11/9/10	10.1		2	6.64		2	1.11	B	5	46.2	B	50	4660		500	17500		50	12100		100	203		5
C7845; I-016 DUP	B27WL3	11/9/10	10.1		2	5.40		2	0.79	B	5	39.8	B	50	4680		500	17300		50	12300		100	205		5

Analysis:

TDL		5	20	40	100	4000	20	500	10
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	No-Stop (acceptable)			No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)
	RPD						1.1%	1.6%	1.0%
	Difference > 2 TDL?	No - acceptable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	Not applicable	Not applicable	Not applicable

Sampling Area	Sample Number	Sample Date	Vanadium			Zinc			Chloride			Fluoride			Nitrate			Nitrogen in Nitrite and Nitrate			Sulfate		
			µg/L	Q	PQL	µg/L	Q	PQL	mg/L	Q	PQL	mg/L	Q	PQL	mg/L	Q	PQL	mg/L	Q	PQL	mg/L	Q	PQL
C7845; I-016	B27KN2	11/9/10	9.20		5	38.6		20	9.10		0.25	0.15	B	0.25	9.69	D	0.5	2.16	D	0.25	40.1	D	10
C7845; I-016 DUP	B27WL3	11/9/10	9.29		5	40.2		20	8.90		0.25	0.14	B	0.25	9.98	D	0.5	2.14	D	0.25	40.3	D	2.5

Analysis:

TDL		25	10	0.2	0.5	0.25	0.075	0.5
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)		Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)
	RPD			2.2%		2.9%	0.9%	0.5%
	Difference > 2 TDL?	No - acceptable	No - acceptable	Not applicable	No - acceptable	Not applicable	Not applicable	Not applicable

Sampling Area	Sample Number	Sample Date	Hexavalent chromium		
			mg/L	Q	PQL
C7845; I-016	B27KN0	11/9/10	0.024		0.0037
C7845; I-016 DUP	B27KN3	11/9/10	0.023		0.0037

Analysis:

TDL		0.01
Duplicate Analysis	Both > PQL?	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)
	RPD	
	Difference > 2 TDL?	No - acceptable

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Washington Closure Hanford

Originator P. L. Benjamin PB
Project 100-B/C Remedial Investigation
Subject 100-B/C Remedial Investigation Relative Percent Difference (RPD) Calculations

Date 08/03/11
Job No. 14655

Calc. No. 0100X-CA-V0057
Checked H. M. Sullaway HMS

Rev. No. 0
Date 8/8/11
Sheet No. 17 of 23

Duplicate Analysis - C7846 Interval 2 Soil Samples

Sampling Area	Sample Number	Sample Date	Aluminum mg/kg	Q	PQL	Arsenic mg/kg	Q	PQL	Barium mg/kg	Q	PQL	Beryllium mg/kg	Q	PQL	Cadmium mg/kg	Q	PQL	Calcium mg/kg	Q	PQL	Chromium mg/kg	Q	PQL	Cobalt mg/kg	Q	PQL
C7846; I-002	B27Y42	11/2/10	5500		3.90	1.76		0.78	63.6		0.39	0.290		0.16	0.099	B	0.16	5460		78.0	87.1		0.16	8.3		1.56
C7846; I-002 DUP	B27Y45	11/2/10	5850		3.93	1.86		0.79	76.4		0.39	0.323		0.16	0.100	B	0.16	5630		78.5	31.5		0.16	9.0		1.57

Analysis:

	TDL		5			1			0.5			0.2			0.2			100			0.2			2		
Duplicate Analysis	Both > PQL?		Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			No-Stop (acceptable)			Yes (continue)			Yes (continue)			Yes (continue)		
	Both >5xTDL?		Yes (calc RPD)			No-Stop (acceptable)			Yes (calc RPD)			No-Stop (acceptable)						Yes (calc RPD)			Yes (calc RPD)			No-Stop (acceptable)		
	RPD		6.2%						18.3%									3.1%			93.8%					
	Difference > 2 TDL?		Not applicable			No - acceptable			Not applicable			No - acceptable			No - acceptable			Not applicable			Not applicable			No - acceptable		

Sampling Area	HEIS Number	Sample Date	Copper mg/kg	Q	PQL	Hexavalent chromium mg/kg	Q	PQL	Iron mg/kg	Q	PQL	Lead mg/kg	Q	PQL	Lithium mg/kg	Q	PQL	Magnesium mg/kg	Q	PQL	Manganese mg/kg	Q	PQL	Mercury mg/kg	Q	PQL
C7846; I-002	B27Y42	11/2/10	16.2		0.78	0.52	B	0.53	26300		15.6	2.14		0.39	2.63		1.95	3610		58.5	300		3.90	0.073		0.03
C7846; I-002 DUP	B27Y45	11/2/10	16.0		0.79	0.39	B	0.53	29300		15.7	2.35		0.39	2.99		1.96	4200		58.9	352		3.93	0.047		0.03

Analysis:

	TDL		1			0.5			5			0.5			2.5			75			5			0.2		
Duplicate Analysis	Both > PQL?		Yes (continue)			No-Stop (acceptable)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)		
	Both >5xTDL?		Yes (calc RPD)						Yes (calc RPD)			No-Stop (acceptable)			No-Stop (acceptable)			Yes (calc RPD)			Yes (calc RPD)			No-Stop (acceptable)		
	RPD		1.2%						10.8%									15.1%			16.0%					
	Difference > 2 TDL?		Not applicable			No - acceptable			Not applicable			No - acceptable			No - acceptable			Not applicable			Not applicable			No - acceptable		

Sampling Area	HEIS Number	Sample Date	Molybdenum mg/kg	Q	PQL	Nickel mg/kg	Q	PQL	Phosphorus mg/kg	Q	PQL	Potassium mg/kg	Q	PQL	Silicon mg/kg	Q	PQL	Sodium mg/kg	Q	PQL	Strontium mg/kg	Q	PQL	Thallium mg/kg	Q	PQL
C7846; I-002	B27Y42	11/2/10	0.903	B	1.56	33.5		3.12	1350		39.0	359		312	275		1.56	311		39.0	18.7		0.78	0.180	B	0.39
C7846; I-002 DUP	B27Y45	11/2/10	0.497	B	1.57	7.23		3.14	1370		39.3	415		314	282		1.57	340		39.3	20.6		0.79	0.214	B	0.39

Analysis:

	TDL		2			4			100			400			2			50			1			5		
Duplicate Analysis	Both > PQL?		No-Stop (acceptable)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			No-Stop (acceptable)		
	Both >5xTDL?					No-Stop (acceptable)			Yes (calc RPD)			No-Stop (acceptable)			Yes (calc RPD)			Yes (calc RPD)			Yes (calc RPD)					
	RPD								1.5%						2.5%			8.9%			9.7%					
	Difference > 2 TDL?		No - acceptable			Yes - assess further			Not applicable			No - acceptable			Not applicable			Not applicable			Not applicable			No - acceptable		

Sampling Area	Sample Number	Sample Date	Tin mg/kg	Q	PQL	Vanadium mg/kg	Q	PQL	Zinc mg/kg	Q	PQL	Chloride mg/kg	Q	PQL	Fluoride mg/kg	Q	PQL	Nitrate mg/kg	Q	PQL	Nitrogen in Nitrite and mg/kg	Q	PQL	Sulfate mg/kg	Q	PQL
C7846; I-002	B27Y42	11/2/10	3.44	B	7.80	76.5		1.95	48.6		7.80	2.4	B	2.5	0.7	B	2.5	10.8		2.5	2.88		0.49	19.5		2.5
C7846; I-002 DUP	B27Y45	11/2/10	3.52	B	7.85	84.9		1.96	51.9		7.85	2.5	B	2.6	0.5	B	2.6	12.7		2.6	3.31		0.51	20.7		2.6

Analysis:

	TDL		10			2.5			1			2			5			2.5			0.75			5		
Duplicate Analysis	Both > PQL?		No-Stop (acceptable)			Yes (continue)			Yes (continue)			No-Stop (acceptable)			No-Stop (acceptable)			Yes (continue)			Yes (continue)			Yes (continue)		
	Both >5xTDL?					Yes (calc RPD)			Yes (calc RPD)									No-Stop (acceptable)			No-Stop (acceptable)			No-Stop (acceptable)		
	RPD					10.4%			6.6%																	
	Difference > 2 TDL?		No - acceptable			Not applicable			Not applicable			No - acceptable			No - acceptable			No - acceptable			No - acceptable			No - acceptable		

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Washington Closure Hanford

Originator P. L. Benjamin PB
Project 100-B/C Remedial Investigation
Subject 100-B/C Remedial Investigation Relative Percent Difference (RPD) Calculations

Date 08/03/11
Job No. 14655

Calc. No. 0100X-CA-V0057
Checked H. M. Sulloway, HMS

Rev. No. 0
Date 8/8/11
Sheet No. 18 of 23

Duplicate Analysis - C7846 Interval 15 Groundwater Samples

Sampling Area	Sample Number	Sample Date	Technetium-99			Total beta radiostrontium			Tritium			Total Uranium (chemical)		
			pCi/L	Q	MDA	pCi/L	Q	MDA	pCi/L	Q	MDA	µg/L	Q	MDA
C7846; I-015	B2BTM3	2/3/11	9.97		3.93	8.61		0.422	12400		298	1.66		0.031
C7846; I-015 DUP	B2BTM5	2/3/11	9.30		4.94	7.54		0.650	13100		297	1.59		0.031

Analysis:

TDL		15	2	400	1
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)
	RPD			5.5%	
	Difference > 2 TDL?	No - acceptable	No - acceptable	Not applicable	No - acceptable

Sampling Area	HEIS Number	Sample Date	Barium			Boron			Calcium			Chromium			Magnesium			Manganese			Molybdenum		
			µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL
C7846; I-015	B2BTM4	2/3/11	23.0		2	12.4		10	50300		100	23.2		2	8870		100	0.990	B	2	6.71		2
C7846; I-015 DUP	B2BTM7	2/3/11	24.2		2	12.3		10	49600		100	23.2		2	8920		100	0.993	B	2	6.06		2

Analysis:

TDL		5	20	1000	2	750	5	20
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)		No-Stop (acceptable)
	RPD			1.4%	0.0%	0.6%		
	Difference > 2 TDL?	No - acceptable	No - acceptable	Not applicable	Not applicable	Not applicable	No - acceptable	No - acceptable

Sampling Area	HEIS Number	Sample Date	Phosphorus			Potassium			Silicon			Sodium			Strontium			Vanadium			Zinc		
			µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL
C7846; I-015	B2BTM4	2/3/11	29.6	B	50	5240		500	17800		50	12400		100	199		5	12.5		5	44.1		20
C7846; I-015 DUP	B2BTM7	2/3/11	29.6	B	50	5080		500	17100		50	12400		100	198		5	12.2		5	46.3		20

Analysis:

TDL		100	4000	20	500	10	25	10
Duplicate Analysis	Both > PQL?	No-Stop (acceptable)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?		No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)
	RPD			4.0%	0.0%	1.5%		
	Difference > 2 TDL?	No - acceptable	No - acceptable	Not applicable	Not applicable	Not applicable	No - acceptable	No - acceptable

Sampling Area	Sample Number	Sample Date	Chloride			Fluoride			Nitrate			Nitrogen in Nitrite and Nitrate			Sulfate		
			mg/L	Q	PQL	mg/L	Q	PQL	mg/L	Q	PQL	mg/L	Q	PQL	mg/L	Q	PQL
C7846; I-015	B2BTM4	2/3/11	10.0	D	5	0.13	B	0.5	15.1	D	5	2.72	D	0.25	53.1	D	5
C7846; I-015 DUP	B2BTM7	2/3/11	9.17		0.50	0.12	B	0.5	21.4	D	5	2.76	D	0.25	55.3	D	5

Analysis:

TDL		0.2	0.5	0.25	0.075	0.5
Duplicate Analysis	Both > PQL?	Yes (continue)	No-Stop (acceptable)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)		Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)
	RPD	8.7%		34.5%	1.5%	4.1%
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	Not applicable	Not applicable

Sampling Area	Sample Number	Sample Date	Hexavalent chromium		
			mg/L	Q	PQL
C7846; I-015	B2BTM2	2/3/11	0.017		0.0037
C7846; I-015 DUP	B2BTM6	2/3/11	0.017		0.0037

Analysis:

TDL		0.01
Duplicate Analysis	Both > PQL?	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)
	RPD	
	Difference > 2 TDL?	No - acceptable

CALCULATION SHEET

Washington Closure Hanford

Originator P. L. Benjamin PB
Project 100-B/C Remedial Investigation
Subject 100-B/C Remedial Investigation Relative Percent Difference (RPD) Calculations

Date 08/03/11
Job No. 14655

Calc. No. 0100X-CA-V0057
Checked H. M. Sulloway HMS

Rev. No. 0
Date 8/8/11
Sheet No. 19 of 23

1 **Duplicate Analysis - C7849 Interval 5 Soil Samples**

2	Sampling	Sample	Sample	Potassium-40			Radium-226			Radium-228			Total beta radiostrontium			Uranium-233/234			Uranium-238		
3	Area	Number	Date	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
4	C7849; I-005	B28D66	11/16/10	8.91		0.667	0.347		0.129	0.494		0.337	0.566		0.229	0.410		0.045	0.416		0.025
5	C7849; I-005 DUP	B28D66	11/16/10	8.62		0.596	0.271		0.146	0.762		0.259	0.464		0.218	0.564		0.188	0.270		0.188

6 **Analysis:**

7																													
	TDL		0.5			0.1			0.2			1			1			1											
8	Duplicate Analysis	Both > PQL?	Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)											
9		Both >5xTDL?	Yes (calc RPD)			No-Stop (acceptable)			No-Stop (acceptable)			No-Stop (acceptable)			No-Stop (acceptable)			No-Stop (acceptable)											
10		RPD	3.3%																										
11		Difference > 2 TDL?	Not applicable			No - acceptable			No - acceptable			No - acceptable			No - acceptable			No - acceptable											

12

13	Sampling	HEIS	Sample	Aluminum			Arsenic			Barium			Beryllium			Cadmium			Calcium			Chromium			Cobalt			Copper		
14	Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
15	C7849; I-005	B28DM9	11/16/10	4020		3.5	1.92		0.70	62.1		0.35	0.321		0.14	0.068	B	0.14	4900	J	70.1	7.10		0.14	5.88		1.40	12.6		0.70
16	C7849; I-005 DUP	B28DM3	11/16/10	4770		4.3	1.74		0.86	59.6		0.43	0.302		0.17	0.071	B	0.17	4970		86.0	12.1		0.17	7.12		1.72	14.0		0.86

17 **Analysis:**

18																													
	TDL		5			1			0.5			0.2			0.2			100			0.2			2			1		
19	Duplicate Analysis	Both > PQL?	Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			No-Stop (acceptable)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)		
20		Both >5xTDL?	Yes (calc RPD)			No-Stop (acceptable)			Yes (calc RPD)			No-Stop (acceptable)						Yes (calc RPD)			Yes (calc RPD)			No-Stop (acceptable)			Yes (calc RPD)		
21		RPD	17.1%						4.1%									1.4%			52.1%						10.5%		
22		Difference > 2 TDL?	Not applicable			No - acceptable			Not applicable			No - acceptable			No - acceptable			Not applicable			Not applicable			No - acceptable			Not applicable		

23

24	Sampling	HEIS	Sample	Iron			Lead			Lithium			Magnesium			Manganese			Molybdenum			Nickel			Phosphorus			Potassium		
25	Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
26	C7849; I-005	B28DM9	11/16/10	21900		14.0	2.60		0.35	2.43		1.75	3270		52.5	254		3.5	0.801	B	1.40	4.20		2.80	928	J	35	484		280
27	C7849; I-005 DUP	B28DM3	11/16/10	24100		17.2	2.80		0.43	2.88		2.15	3970		64.5	288		4.3	1.13	B	1.72	5.72		3.44	1130		43	518		344

28 **Analysis:**

29																													
	TDL		5			0.5			2.5			75			5			2			4			100			400		
30	Duplicate Analysis	Both > PQL?	Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			No-Stop (acceptable)			Yes (continue)			Yes (continue)			Yes (continue)		
31		Both >5xTDL?	Yes (calc RPD)			Yes (calc RPD)			No-Stop (acceptable)			Yes (calc RPD)			Yes (calc RPD)						No-Stop (acceptable)			Yes (calc RPD)			No-Stop (acceptable)		
32		RPD	9.6%			7.4%						19.3%			12.5%									19.6%					
33		Difference > 2 TDL?	Not applicable			Not applicable			No - acceptable			Not applicable			Not applicable			No - acceptable			No - acceptable			Not applicable			No - acceptable		

34

35	Sampling	Sample	Sample	Silicon			Sodium			Strontium			Vanadium			Zinc			Chloride			Nitrate			Nitrogen in Nitrite and Nitrate			Sulfate		
36	Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
37	C7849; I-005	B28DM9	11/16/10	307		1.40	314		35.0	22.7		0.70	58.0		1.75	37.6		7.01	26.9		2.6	2.5	BJ	2.6	0.88		0.47	24.4		2.6
38	C7849; I-005 DUP	B28DM3	11/16/10	413		1.72	363		43.0	20.7		0.86	71.3		2.15	41.0		8.60	26.8		2.6	2.9		2.6	1.02		0.51	29.1		2.6

39 **Analysis:**

40																													
	TDL		2			50			1			2.5			1			2			2.5			0.75			5		
41	Duplicate Analysis	Both > PQL?	Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			No-Stop (acceptable)			Yes (continue)			Yes (continue)		
42		Both >5xTDL?	Yes (calc RPD)			Yes (calc RPD)			Yes (calc RPD)			Yes (calc RPD)			Yes (calc RPD)			Yes (calc RPD)						No-Stop (acceptable)			No-Stop (acceptable)		
43		RPD	29.4%			14.5%			9.2%			20.6%			8.7%			0.4%											
44		Difference > 2 TDL?	Not applicable			Not applicable			Not applicable			Not applicable			Not applicable			Not applicable			No - acceptable			No - acceptable			No - acceptable		

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Washington Closure Hanford

Originator P. L. Benjamin PB
Project 100-B/C Remedial Investigation
Subject 100-B/C Remedial Investigation Relative Percent Difference (RPD) Calculations

Date 08/03/11
Job No. 14655

Calc. No. 0100X-CA-V0057
Checked H. M. Sulloway

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1 **Duplicate Analysis - C7849 Interval 27 Groundwater Samples**

Sampling Area	Sample Number	Sample Date	Technetium-99 pCi/L	Q	MDA	Tritium pCi/L	Q	MDA	Total Uranium (chemical) µg/L	Q	MDA
C7849; I-027	B28F76	11/22/10	10.2		4.23	1740		130	1.24		0.028
C7849; I-027 DUP	B28F79	11/22/10	8.68		4.18	1730		131	1.22		0.028

Analysis:

		Technetium-99	Tritium	Total Uranium (chemical)
	TDL	15	400	1
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)
	RPD			
	Difference > 2 TDL?	No - acceptable	No - acceptable	No - acceptable

Sampling Area	HEIS Number	Sample Date	Aluminum µg/L	Q	PQL	Arsenic µg/L	Q	PQL	Barium µg/L	Q	PQL	Boron µg/L	Q	PQL	Calcium µg/L	Q	PQL	Chromium µg/L	Q	PQL	Cobalt µg/L	Q	PQL	Iron µg/L	Q	PQL	Lithium µg/L	Q	PQL
C7849; I-027	B28F78	11/22/10	32.1	B	50	2.00	B	10	23.1		2	11.4		10	37800		100	2.37		2	0.863	B	2	13.6	B	50	7.99	B	20
C7849; I-027 DUP	B28F81	11/22/10	44.2	B	50	2.62	B	10	23.7		2	12.1		10	38800		100	2.45		2	0.883	B	2	19.6	B	50	8.68	B	20

Analysis:

		Aluminum	Arsenic	Barium	Boron	Calcium	Chromium	Cobalt	Iron	Lithium
	TDL	50	10	5	20	1000	2	20	50	25
Duplicate Analysis	Both > PQL?	No-Stop (acceptable)	No-Stop (acceptable)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)
	Both >5xTDL?			No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)			
	RPD					2.6%				
	Difference > 2 TDL?	No - acceptable	No - acceptable	No - acceptable	No - acceptable	Not applicable	No - acceptable	No - acceptable	No - acceptable	No - acceptable

Sampling Area	HEIS Number	Sample Date	Magnesium µg/L	Q	PQL	Manganese µg/L	Q	PQL	Molybdenum µg/L	Q	PQL	Nickel µg/L	Q	PQL	Phosphorus µg/L	Q	PQL	Potassium µg/L	Q	PQL	Silicon µg/L	Q	PQL	Sodium µg/L	Q	PQL	Strontium µg/L	Q	PQL
C7849; I-027	B28F78	11/22/10	9550		100	174		2	10.1		2	1.48	B	5	37.4	B	50	5810		500	17300		50	12800		100	151		5
C7849; I-027 DUP	B28F81	11/22/10	9770		100	180		2	12.1		2	1.43	B	5	39.6	B	50	5920		500	18000		50	13200		100	156		5

Analysis:

		Magnesium	Manganese	Molybdenum	Nickel	Phosphorus	Potassium	Silicon	Sodium	Strontium
	TDL	750	5	20	40	100	4000	20	500	10
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)			No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)
	RPD	2.3%	3.4%					4.0%	3.1%	3.3%
	Difference > 2 TDL?	Not applicable	Not applicable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	Not applicable	Not applicable	Not applicable

Sampling Area	Sample Number	Sample Date	Vanadium µg/L	Q	PQL	Chloride mg/L	Q	PQL	Fluoride mg/L	Q	PQL	Nitrate mg/L	Q	PQL	Nitrogen in Nitrite and Nitrate mg/L	Q	PQL	Sulfate mg/L	Q	PQL
C7849; I-027	B28F78	11/22/10	11.5		5	8.02		0.25	0.27		0.25	9.70		0.25	2.30	D	0.25	38.9	D	2.5
C7849; I-027 DUP	B28F81	11/22/10	11.5		5	8.56		0.25	0.21	B	0.25	9.91		0.25	2.06	D	0.25	39.2	D	2.5

Analysis:

		Vanadium	Chloride	Fluoride	Nitrate	Nitrogen in Nitrite and Nitrate	Sulfate
	TDL	25	0.2	0.5	0.25	0.075	0.5
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	No-Stop (acceptable)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	Yes (calc RPD)		Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)
	RPD		6.5%		2.1%	11.0%	0.8%
	Difference > 2 TDL?	No - acceptable	Not applicable	No - acceptable	Not applicable	Not applicable	Not applicable

Sampling Area	Sample Number	Sample Date	Ethylbenzene µg/L	Q	PQL	Trichloroethene µg/L	Q	PQL	Xylenes (total) µg/L	Q	PQL
C7849; I-027	B28F77	11/22/10	1.01	J	5	1.01	J	5	3.46	J	5
C7849; I-027 DUP	B28F80	11/22/10	1.12	J	5	1.16	J	5	4.93	J	5

Analysis:

		Ethylbenzene	Trichloroethene	Xylenes (total)
	TDL	5	5	10
Duplicate Analysis	Both > PQL?	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)
	Both >5xTDL?			
	RPD			
	Difference > 2 TDL?	No - acceptable	No - acceptable	No - acceptable

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Date 08/03/11
Job No. 14655

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Checked H. M. Sulloway HMS

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1 **Duplicate Analysis - C8239 Interval 7 Soil Samples**

	Sampling Area	Sample Number	Sample Date	Potassium-40			Radium-226			Radium-228			Total beta radiostrontium			Uranium-233/234			Uranium-238		
3				pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
4	C8239; I-007	B28N65	12/8/10	11.3		0.293	0.411		0.056	0.673		0.124	3.56		0.332	0.512		0.158	0.611		0.126
5	C8239; I-007 DUP	B28N63	12/8/10	4.90		0.550	0.338		0.140	0.513		0.290	3.60		0.326	0.497		0.144	0.392		0.115

6 **Analysis:**

7	TDL	0.5	0.1	0.2	1	1	1
8	Duplicate Analysis: Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
9	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)
10	RPD	79.0%					
11	Difference > 2 TDL?	Not applicable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	No - acceptable

12

	Sampling Area	HEIS Number	Sample Date	Aluminum			Arsenic			Barium			Beryllium			Bismuth			Cadmium			Calcium			Chromium			Cobalt		
14				mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
15	C8239; I-007	B28NC2	12/8/10	4470		4.41	1.19		0.88	47.5		0.44	0.220		0.18	0.643	B	8.83	0.100	B	0.18	5710		88.3	4.73		0.18	9.25		1.77
16	C8239; I-007 DUP	B28NB6	12/8/10	4920		3.46	1.55		0.69	64.4		0.35	0.236		0.14	1.14	B	6.91	0.089	B	0.14	6000		69.1	8.04		0.14	9.97		1.38

17 **Analysis:**

18	TDL	5	1	0.5	0.2	10	0.2	100	0.2	2
19	Duplicate Analysis: Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (continue)	Yes (continue)	Yes (continue)
20	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)			Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)
21	RPD	9.6%		30.2%				5.0%	51.8%	
22	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable	No - acceptable	No - acceptable	Not applicable	Not applicable	No - acceptable

23

	Sampling Area	HEIS Number	Sample Date	Copper			Iron			Lead			Lithium			Magnesium			Manganese			Molybdenum			Nickel			Phosphorus		
25				mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
26	C8239; I-007	B28NC2	12/8/10	14.3		0.88	27500		17.7	2.46		0.44	3.13		2.21	4010		66.2	305		4.41	0.274	B	1.77	6.63		3.53	1380		44.1
27	C8239; I-007 DUP	B28NB6	12/8/10	16.4		0.69	30500		13.8	2.29		0.35	3.38		1.73	4490		51.9	357		3.46	0.282	B	1.38	10.1		2.77	1500		34.6

28 **Analysis:**

29	TDL	1	5	0.5	2.5	75	5	2	4	100
30	Duplicate Analysis: Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	Yes (continue)	Yes (continue)
31	Both >5xTDL?	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)		No-Stop (acceptable)	Yes (calc RPD)
32	RPD	13.7%	10.3%			11.3%	15.7%			8.3%
33	Difference > 2 TDL?	Not applicable	Not applicable	No - acceptable	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable	Not applicable

34

	Sampling Area	Sample Number	Sample Date	Potassium			Silicon			Sodium			Strontium			Tin			Vanadium			Zinc			Nitrogen in Nitrite and Nitrate		
36				mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
37	C8239; I-007	B28NC2	12/8/10	600		353	503		1.77	383		44.1	18.7		0.88	2.40	B	8.83	73.6		2.21	47.3		8.83	1.11		0.48
38	C8239; I-007 DUP	B28NB6	12/8/10	528		277	642		1.38	455		34.8	22.7		0.69	2.42	B	6.91	77.2		1.73	48.4		6.91	1.34		0.50

39 **Analysis:**

40	TDL	400	2	50	1	10	2.5	1	0.75
41	Duplicate Analysis: Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	Yes (continue)	Yes (continue)	Yes (continue)
42	Both >5xTDL?	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)		Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)
43	RPD		24.3%	17.2%	19.3%		4.8%	2.3%	
44	Difference > 2 TDL?	No - acceptable	Not applicable	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable

45

	Sampling Area	Sample Number	Sample Date	Methylene chloride		
47				µg/kg	Q	PQL
48	C8239; I-007	B28NC0	12/8/10	3.34	BJ	6.62
49	C8239; I-007 DUP	B28NB4	12/8/10	3.15	BJ	6.35

50 **Analysis:**

51	TDL	5
52	Duplicate Analysis: Both > PQL?	No-Stop (acceptable)
53	Both >5xTDL?	
54	RPD	
55	Difference > 2 TDL?	No - acceptable

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Duplicate Analysis - C8239 Interval 26 Groundwater Samples

Sampling Area	Sample Number	Sample Date	Technetium-99			Total beta radiostrontium			Tritium			Total Uranium (chemical)		
			pCi/L	Q	MDA	pCi/L	Q	MDA	pCi/L	Q	MDA	µg/L	Q	MDA
C8239; I-026	B28NL6	12/20/10	8.75		4.62	41.4		0.404	15800		267	1.56		0.027
C8239; I-026 DUP	B28NL9	12/20/10	7.08		3.82	38.7		0.423	17400		273	1.56		0.027

Analysis:

	TDL	15	2	400	1
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)
	RPD		6.7%	9.6%	
	Difference > 2 TDL?	No - acceptable	Not applicable	Not applicable	No - acceptable

Sampling Area	HEIS Number	Sample Date	Barium			Boron			Calcium			Chromium			Magnesium			Manganese			Molybdenum			Nickel		
			µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL
C8239; I-026	B28NL5	12/20/10	17.1		2	14.4		10	44900		100	19.5		2	8500		100	13.3		2	5.04		2	1.1	B	5
C8239; I-026 DUP	B28NL8	12/20/10	18.0		2	14.2		10	45900		100	20.0		2	8620		100	12.9		2	4.73		2	1.0	B	5

Analysis:

	TDL	5	20	1000	2	750	5	20	40
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)
	Both >5xTDL?	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	
	RPD			2.2%	2.5%	1.4%			
	Difference > 2 TDL?	No - acceptable	No - acceptable	Not applicable	Not applicable	Not applicable	No - acceptable	No - acceptable	No - acceptable

Sampling Area	HEIS Number	Sample Date	Phosphorus			Potassium			Silicon			Sodium			Strontium			Vanadium			Zinc			Chloride		
			µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	mg/L	Q	PQL
C8239; I-026	B28NL5	12/20/10	34.6	B	50	4850		500	17000		50	11900		100	182		5	9.40		5	67.7		20	9.61		0.25
C8239; I-026 DUP	B28NL8	12/20/10	34.7	B	50	4990		500	17400		50	12000		100	185		5	9.84		5	69.4		20	8.98		0.25

Analysis:

	TDL	100	4000	20	500	10	25	10	0.2
Duplicate Analysis	Both > PQL?	No-Stop (acceptable)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?		No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)
	RPD			2.3%	0.8%	1.6%		2.5%	6.8%
	Difference > 2 TDL?	No - acceptable	No - acceptable	Not applicable	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable

Sampling Area	Sample Number	Sample Date	Fluoride			Nitrate			Nitrogen in Nitrite and Nitrate			Sulfate			Toluene		
			mg/L	Q	PQL	mg/L	Q	PQL	mg/L	Q	PQL	mg/L	Q	PQL	µg/L	Q	PQL
C8239; I-026	B28NL5	12/20/10	0.16	B	0.25	10.0		0.25	2.48	D	0.25	43.1	D	2.5	46.0		5
C8239; I-026 DUP	B28NL8	12/20/10	0.20	B	0.25	9.86		0.25	0.493		0.05	43.6	D	2.5	48.6		5

Analysis:

	TDL	0.5	0.25	0.075	0.5	5
Duplicate Analysis	Both > PQL?	No-Stop (acceptable)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?		Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)
	RPD		1.4%	133.7%	1.2%	5.5%
	Difference > 2 TDL?	No - acceptable	Not applicable	Not applicable	Not applicable	Not applicable

Sampling Area	Sample Number	Sample Date	Hexavalent chromium		
			mg/L	Q	PQL
C8239; I-026	B28NL4	12/20/10	0.015		0.0037
C8239; I-026 DUP	B28NL7	12/20/10	0.015		0.0037

Analysis:

	TDL	0.01
Duplicate Analysis	Both > PQL?	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)
	RPD	
	Difference > 2 TDL?	No - acceptable

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Duplicate Analysis - C8244 Interval 2 Soil Samples

Sampling Area	Sample Number	Sample Date	Potassium-40 pCi/g	Q	MDA	Radium-226 pCi/g	Q	MDA	Radium-228 pCi/g	Q	MDA
C8244; I-002	B26RB4	1/7/11	9.20		0.762	0.358		0.137	0.709		0.344
C8244; I-002 DUP	B26RB5	1/7/11	11.5		1.03	0.376		0.211	0.711		0.422

Analysis:

	TDL	0.5	0.1	0.2
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)
	RPD	22.2%		
	Difference > 2 TDL?	Not applicable	No - acceptable	No - acceptable

Sampling Area	HEIS Number	Sample Date	Aluminum mg/kg	Q	PQL	Arsenic mg/kg	Q	PQL	Barium mg/kg	Q	PQL	Beryllium mg/kg	Q	PQL	Cadmium mg/kg	Q	PQL	Calcium mg/kg	Q	PQL	Chromium mg/kg	Q	PQL	Cobalt mg/kg	Q	PQL	Copper mg/kg	Q	PQL
C8244; I-002	B28688	1/7/11	4120		3.60	1.71		0.72	53.5		0.36	0.204		0.14	0.119	B	0.14	5970		72.0	4.43		0.14	8.91		1.44	14.1		0.72
C8244; I-002 DUP	B26RC8	1/7/11	5690		4.45	2.02		0.89	59.3		0.45	0.218		0.18	0.135	B	0.18	7010		88.9	5.95		0.18	9.62		1.78	15.1		0.89

Analysis:

	TDL	5	1	0.5	0.2	0.2	100	0.2	2	1
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)		Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)
	RPD	32.0%		10.3%			16.0%	29.3%		6.8%
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable	No - acceptable	Not applicable	Not applicable	No - acceptable	Not applicable

Sampling Area	HEIS Number	Sample Date	Hexavalent chromium mg/kg	Q	PQL	Iron mg/kg	Q	PQL	Lead mg/kg	Q	PQL	Lithium mg/kg	Q	PQL	Magnesium mg/kg	Q	PQL	Manganese mg/kg	Q	PQL	Molybdenum mg/kg	Q	PQL	Nickel mg/kg	Q	PQL	Phosphorus mg/kg	Q	PQL
C8244; I-002	B28688	1/7/11	0.28	B	0.53	26100		14.4	1.88		0.36	2.64		1.80	3710		54.0	296		3.60	0.581	B	1.44	6.69		2.88	1210		36.0
C8244; I-002 DUP	B26RC8	1/7/11	0.49	B	0.53	31300		17.8	1.83		0.45	3.26		2.22	4510		88.7	388		4.45	0.654	B	1.78	6.99		3.56	1430		44.5

Analysis:

	TDL	0.5	5	0.5	2.5	75	5	2	4	100
Duplicate Analysis	Both > PQL?	No-Stop (acceptable)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	Yes (continue)	Yes (continue)
	Both >5xTDL?		Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)		No-Stop (acceptable)	Yes (calc RPD)
	RPD		18.1%			19.5%	21.7%			16.7%
	Difference > 2 TDL?	No - acceptable	Not applicable	No - acceptable	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable	Not applicable

Sampling Area	Sample Number	Sample Date	Potassium mg/kg	Q	PQL	Silicon mg/kg	Q	PQL	Sodium mg/kg	Q	PQL	Strontium mg/kg	Q	PQL	Tin mg/kg	Q	PQL	Vanadium mg/kg	Q	PQL	Zinc mg/kg	Q	PQL
C8244; I-002	B28688	1/7/11	573		288	361		1.44	423		36.0	19.5		0.72	2.65	B	7.20	77.8		1.80	46.2		7.20
C8244; I-002 DUP	B26RC8	1/7/11	598		356	961		1.78	668		44.5	24.9		0.89	3.52	B	8.89	92.0		2.22	52.8		8.89

Analysis:

	TDL	400	2	50	1	10	2.5	1
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)		Yes (calc RPD)	Yes (calc RPD)
	RPD		90.8%	44.9%	24.3%		16.7%	13.0%
	Difference > 2 TDL?	No - acceptable	Not applicable	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable

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