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Rev. 1

River Corridor Closure Contract

100-N Remedial Investigation/Feasibility Study Data Quality Assessment Report

July 2012

For Public Release

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-N Remedial Investigation/Feasibility Study Data Quality Assessment Report

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Approval: R. W. Ovink, Environmental Protection

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REVISION HISTORY

Revision	Date	Reason for revision	Revision initiator
1	07/2012	Update review qualifiers	R. P. Wells
0	03/2012	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-N 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 the *Sampling and Analysis Plan for the 100-NR-1 and 100-NR-2 Operable Units Remedial Investigation/Feasibility Study* (SAP) (DOE/RL-2009-42).

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
Hexavalent chromium (Cr-VI)	EPA Method 7196A
Anions	EPA Method 300.0
Nitrate/nitrite	EPA Method 353.1 EPA Method 353.2
Cyanide	EPA Method 9012A EPA Method 9014
Volatile organic compounds	EPA Method 8260B
Nonhalogenated volatile organic compounds	EPA Method 8015
pH	EPA Method 9045 (soil) EPA Method 9040 (water)
Semivolatile organic compounds	EPA Method 8270C
Pesticides	EPA Method 8081A

Table 2. Laboratory Analytical Methods. (2 Pages)

Parameter	Analytical Method
Polychlorinated biphenyls	EPA Method 8082
Herbicides	EPA Method 8151A
Total petroleum hydrocarbons – diesel range organics	EPA Method 8015
Total petroleum hydrocarbons – gasoline range organics	EPA Method 8015
Polynuclear aromatic hydrocarbons	EPA Method 8310
Gamma-emitting radioisotopes	Gamma energy analysis
Carbon-14	LSC - C-14
Tritium	LSC – Tritium
Total Radiostrontium	Gas-flow proportional counting
Nickel-63	LSC - Ni-63
Iodine-129	Low-energy photon spectrometry
Technetium-99	Gas-flow proportional counting
Americium-241	Alpha energy analysis
Curium-242, - 243/244	Alpha energy analysis
Neptunium-237	Alpha energy analysis
Plutonium-238, -239/240	Alpha energy analysis
Uranium-233/234, -235, -238	Alpha energy analysis
Total uranium metal	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

2.0 LABORATORY QUALITY CONTROL PARAMETERS DISCUSSION

A total of 136 sample delivery groups (SDGs) were reviewed with a combined 335 field samples and 2,187 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. (5 Pages)

Sample Delivery Group	Well	Number of Samples in Sample Delivery Group	Analyses Performed																																	
			Cr-VI	Tritium	Carbon-14	Nickel-63	Iodine-129	Total Radiostrontium	Technetium-99	Isotopic Plutonium	Isotopic Uranium	Americium-241	Curium Isotopes	Neptunium-237	Total Uranium	GEA	Metals	pH	Percent Solids	Percent Moisture	Physical Properties	Special Extraction	TPH - DRO	TPH - GRO	Methanol	Glycols	SVOA	PAHs	Pesticides	PCBs	Herbicides	Cyanide	Anions	NO_2/NO_3	VOA
Sample Authorization Form RC-204 (Soil)																																				
J00985	C8188	2																					1	1	1	1										1
J00986	C8188	2															1			2							1	1	1	1	1	1	1	1	
J01220	C8188	1	1	1	1	1	1	1	1	1	1	1		1	1	1																				
J01222	C8188	1	1																																	
K3267	C8187	2		2				2								2																				
K3268	C8187	5		5				5								5																				
K3272	C8187	2	2														2	2	2	2	1															
K3273	C8187	1																				1														
K3278	C8187	5	5														5	5	5	5	1															
K3279	C8187	4																				4														
K3307	C8185	6		6	6		6	6	6	6						6																				
K3313	C8185	2																				2														
K3314	C8185	5																																		5
K3315	C8185	6	3														3	4	6	6	4		4	4				3					3	3		
K3320	C8185	3	3														3	3	3	3			3	3				3					3	3		
K3323	C8185	2																				2														
K3325	C8185	3																																		3
K3326	C8185	1		1	1		1	1	1	1						1																				
K3330	C8185	1																																		1
K3331	C8185	1																				1														
K3332	C8185	1	1														1	1	1	1			1	1				1					1	1		
K3451	C8191	2																		2	2															
K3464	C8191	10		10				10								10																				
K3468	C8191	5																				5														
K3469	C8191	3																				3														
K3470	C8191	12	10														10	10	12	12	2															
K3508	C8189	1		1	1	1	1	1	1	1	1	1	1	1		1																				
K3511	C8189	1																																		1
K3512	C8189	1	1														1	1	1	1			1	1	1	1	1	1	1	1	1	1	1	1		
K3515	C8188	1		1	1	1	1	1	1	1	1	1	1	1		1																				
K3516	C8188	1		1	1	1	1	1	1	1	1	1	1	1		1																				
K3518	C8188	2																																		2

Table 3. Summary of Sample Delivery Groups Subject to Data Assessment. (5 Pages)

Sample Delivery Group	Well	Number of Samples in Sample Delivery Group	Analyses Performed																																		
			Cr-VI	Tritium	Carbon-14	Nickel-63	Iodine-129	Total Radiostrontium	Technetium-99	Isotopic Plutonium	Isotopic Uranium	Americium-241	Curium Isotopes	Neptunium-237	Total Uranium	GEA	Metals	pH	Percent Solids	Percent Moisture	Physical Properties	Special Extraction	TPH - DRO	TPH - GRO	Methanol	Glycols	SVOA	PAHs	Pesticides	PCBs	Herbicides	Cyanide	Anions	NO_2/NO_3	VOA
K3519	C8188	2	2														2	2	2	2			2	2	2	2	2	2	2	2	2	2	2	2	
K3528	C8188	1		1	1	1	1	1	1	1	1	1	1	1		1																				
K3529	C8188	3		3	3	3	3	3	3	3	3	3	3	3		3																				
K3531	C8188	4																																		4
K3532	C8188	5	4														4	5	5	5	3		5	5	5	5	5	4	4	4	4	4	4	4	
K3536	C8188	3		3	3	3	3	3	3	3	3	3	3	3		3																				
K3538	C8188	1		1	1	1	1	1	1	1	1	1	1	1		1																				
K3539	C8188	5																																		5
K3540	C8188	3	3														3	3	3	3			3	3	3	3	3	3	3	3	3	3	3	3	
K3543	C8188	1																				1														
K3544	C8188	1																																		1
K3545	C8188	1	1														1	1	1	1			1	1	1	1	1	1	1	1	1	1	1	1	
K3549	C8188	3		3	3	3	3	3	3	3	3	3	3	3		3																				
	C8189	1		1	1	1	1	1	1	1	1	1	1	1		1																				
K3552	C8189	1																																		1
K3553	C8189	1	1														1	1	1	1			1	1	1	1	1	1	1	1	1	1	1	1	
K3554	C8188	3																																		3
K3555	C8188	3	3														3	3	3	3	1		3	3	3	3	3	3	3	3	3	3	3	3	
K3558	C8188	2		2	2	2	2	2	2	2	2	2	2	2		2																				
K3562	C8188	2																																		2
K3563	C8188	2	2														2	2	2	2			2	2	2	2	2	2	2	2	2	2	2	2	
K3564	C8188	1																				1														
K3566	C8188	2		2	2	2	2	2	2	2	2	2	2	2		2																				
	C8190	1		1	1	1	1	1	1	1	1	1	1	1		1																				
K3567	C8188	2																				2														
K3568	C8188	2																																		2
K3569	C8190	1																																		1
K3570	C8190	1	1														1	1	1	1			1	1	1	1	1	1	1	1	1	1	1	1	
K3571	C8188	2	2														2	2	2	2			2	2	2	2	2	2	2	2	2	2	2	2	
K3579	C8189	6		6	6	6	6	6	6	6	6	6	6	6		6																				
K3581	C8189	11	6														6	11	7	11	4		7	7	7	7	7	6	6	6	6	6	6	6	
K3582	C8189	6																																		6
K3583	C8190	1		1	1	1	1	1	1	1	1	1	1	1		1																				

Table 3. Summary of Sample Delivery Groups Subject to Data Assessment. (5 Pages)

Sample Delivery Group	Well	Number of Samples in Sample Delivery Group	Analyses Performed																																		
			Cr-VI	Tritium	Carbon-14	Nickel-63	Iodine-129	Total Radiostrontium	Technetium-99	Isotopic Plutonium	Isotopic Uranium	Americium-241	Curium Isotopes	Neptunium-237	Total Uranium	GEA	Metals	pH	Percent Solids	Percent Moisture	Physical Properties	Special Extraction	TPH - DRO	TPH - GRO	Methanol	Glycols	SVOA	PAHs	Pesticides	PCBs	Herbicides	Cyanide	Anions	NO_2/NO_3	VOA
K3585	C8190	1																																			1
K3586	C8189	2																																			2
K3587	C8190	1	1														1	1	1	1			1	1	1	1	1	1	1	1	1	1	1	1		
K3595	C8189	6		6	6	6	6	6	6	6	6	6	6	6		6																					
K3596	C8186	3		3	3		3	3	3	3						3																					
K3597	C8189	6	6														6	6	6	6			6	6	6	6	6	6	6	6	6	6	6	6		
K3598	C8190	6	6														6	6	6	6	4		6	6	6	6	6	6	6	6	6	6	6	6		
K3601	C8190	6																																			6
K3602	C8189	6																																			8
K3603	C8189	2																				2															
K3605	C8186	3																																			3
K3606	C8190	1																																			1
K3607	C8190	1																1	1	1			1	1	1	1	1	1								
K3608	C8186	3	3														3	3	3	3			3					3				3	3	3		
K3611	C8189	1		1	1	1	1	1	1	1	1	1	1	1		1																					
K3614	C8190	3	3														3	3	3	3			3	3	3	3	3	3	3	3	3	3	3	3		
K3615	C8190	3																																			3
K3616	C8190	1																				1															
K3617	C8189	1																				1															
K3618	C8189	1																																			1
K3619	C8189	1	1														1	1	1	1			1	1	1	1	1	1	1	1	1	1	1	1		
K3621	C8186	4		4	4		4	4	4	4						4																					
K3622	C8189	1		1	1	1	1	1	1	1	1	1	1	1		1																					
K3623	C8190	6		6	8	6	6	6	6	6	6	6	6	6		6																					
K3624	C8190	3		3	3	3	3	3	3	3	3	3	3	3		3																					
K3627	C8186	4	4														4	4	4	4	4		4					4				4	4	4		
K3626	C8189	1	1														1	1	1	1			1	1	1	1	1	1	1	1	1	1	1	1		
K3629	C8189	1																				1															
K3630	C8186	6																																			6
K3634	C8190	2		2	2	2	2	2	2	2	2	2	2	2		2																					
K3639	C8190	2		2	2	2	2	2	2	2	2	2	2	2		2																					
K3640	C8190	1		1	1	1	1	1	1	1	1	1	1	1		1																					
K3641	C8186	4		4	4		4	4	4	4						4																					

Table 3. Summary of Sample Delivery Groups Subject to Data Assessment. (5 Pages)

Sample Delivery Group	Well	Number of Samples in Sample Delivery Group	Analyses Performed																																	
			Cr-VI	Tritium	Carbon-14	Nickel-63	Iodine-129	Total Radiostrontium	Technetium-99	Isotopic Plutonium	Isotopic Uranium	Americium-241	Curium Isotopes	Neptunium-237	Total Uranium	GEA	Metals	pH	Percent Solids	Percent Moisture	Physical Properties	Special Extraction	TPH - DRO	TPH - GRO	Methanol	Glycols	SVOA	PAHs	Pesticides	PCBs	Herbicides	Cyanide	Anions	NO_2/NO_3	VOA
K3644	C8190	2	2														2	2	2	2			2	2	2	2	2	2	2	2	2	2	2	2	
K3645	C8189	1																																		1
K3646	C8190	3																																		3
K3647	C8190	2																				2														
K3655	C8190	3	3														3	3	3	3			3	3	3	3	3	3	3	3	3	3	3	3		
K3656	C8190	3																																		3
K3657	C8190	2																				2														
K3658	C8186	1																					1													
K3659	C8186	1																				1														
K3660	C8186	3																																		3
K3661	C8186	3	3														3	3	3	3			3					3				3	3	3		
K3662	C8186	3																																		3
K3664	C8186	1																				1														
K3665	C8186	3	3														3	3	3	3			3					3				3	3	3		
K3668	C8186	3		3	3		3	3	3	3						3																				
K3670	C8186	2		2	2		2	2	2	2						2																				
K3677	C8186	2																				2														
K3678	C8186	2																																		2
K3679	C8186	2	2														2	2	2	2			2					2				2	2	2		
Sample Authorization Form RC-205 (Water)																																				
J01051	C8187	1	1																																	
J01079	C8185	1	1																																	
J01164	C8191	1	1																																	
J01221	C8188	1	1																																	
J01254	C8189	1	1																																	
J01266	C8190	1	1																																	
J01267	C8186	1	1																																	
K3269	C8187	1						1																												
K3276	C8187	1															1	1																		
K3327	C8185	1						1																												
K3333	C8185	1															1	1																		
K3463	C8191	1						1																												
K3483	C8191	1															1	1																		

Table 3. Summary of Sample Delivery Groups Subject to Data Assessment. (5 Pages)

Sample Delivery Group	Well	Number of Samples in Sample Delivery Group	Analyses Performed																																		
			Cr-VI	Tritium	Carbon-14	Nickel-63	Iodine-129	Total Radiostrontium	Technetium-99	Isotopic Plutonium	Isotopic Uranium	Americium-241	Curium Isotopes	Neptunium-237	Total Uranium	GEA	Metals	pH	Percent Solids	Percent Moisture	Physical Properties	Special Extraction	TPH - DRO	TPH - GRO	Methanol	Glycols	SVOA	PAHs	Pesticides	PCBs	Herbicides	Cyanide	Anions	NO_2/NO_3	VOA
K3559	C8188	1						1																													
K3560	C8188	1															1	1																			
K3631	C8189	1						1																													
K3642	C8189	1															1	1																			
K3663	C8190	1															1	1																			
K3666	C8186	1						1																													
K3667	C8190	1						1																													
K3673	C8186	1															1	1																			

GEA = gamma energy analysis
PAH = polynuclear aromatic hydrocarbons
PCB = polychlorinated biphenyl
pH = hydrogen ion concentration
SVOA = semivolatile organic analysis
TPH - DRO = total petroleum hydrocarbons - diesel range organic
TPH - GRO = total petroleum hydrocarbons - gasoline range organic
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. (2 Pages)

Parameter	Method	Soil Holding Time	Water Holding Time
ICP metals	EPA Method 6010B EPA Method 6020	6 months	6 months
Mercury	EPA Method 7471A	28 days	[a]
Hexavalent chromium	EPA Method 7196A	30 days	24 hours
Anions	EPA Method 300.0	28 days/48 hours[b]	[a]
Nitrate/nitrite	EPA Method 353.1 EPA Method 353.2	28 days	[a]
Cyanide	EPA Method 9012A EPA Method 9014	14 days	[a]
Volatile organic compounds	EPA Method 8260B	14 days	[a]
Nonhalogenated volatile organic compounds	EPA Method 8015	14 days	[a]
pH	EPA Method 9045 (soil) EPA Method 9040 (water)	As soon as possible	As soon as possible
Semivolatile organic compounds	EPA Method 8270C	14 days/40 days[c]	[a]
Pesticides	EPA Method 8081A	14 days/40 days	[a]
Polychlorinated biphenyls	EPA Method 8082	1 year/1 year	[a]
Herbicides	EPA Method 8151A	14 days/40 days	[a]
Total petroleum hydrocarbons – diesel range organics	EPA Method 8015	14 days/40 days	[a]
Total petroleum hydrocarbons – gasoline range organics	EPA Method 8015	14 days	[a]
Polynuclear aromatic hydrocarbons	EPA Method 8310	14 days/40 days	[a]
Gamma-emitting radioisotopes	Gamma energy analysis	6 months	[a]
Carbon-14	LSC – C-14	6 months	[a]
Tritium	LSC – tritium	6 months	[a]
Total Radiostrontium	Gas-flow proportional counting	6 months	6 months
Nickel-63	LSC – Ni-63	6 months	[a]
Iodine-129	Low-energy photon spectrometry	6 months	[a]
Technetium-99	Gas-flow proportional	6 months	[a]

Table 4. Holding Times. (2 Pages)

Parameter	Method	Soil Holding Time	Water Holding Time
	counting		
Americium-241	Alpha energy analysis	6 months	[a]
Curium isotopes	Alpha energy analysis	6 months	[a]
Neptunium-237	Alpha energy analysis	6 months	[a]
Plutonium isotopes	Alpha energy analysis	6 months	[a]
Uranium isotopes	Alpha energy analysis	6 months	[a]
Total uranium metal	Kinetic phosphorescence analysis	6 months	[a]

[a] Samples did not undergo this particular analysis.
[b] Holding time for anions is 28 days except for nitrate, nitrite, and phosphate for which the holding time is 48 hours.
[c] Holding time is 14 days to extraction, then 40 days to analysis.
EPA = U.S. Environmental Protection Agency
ICP = inductively coupled plasma
LSC = liquid scintillation counter
pH = hydrogen ion concentration

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 METHOD DETECTION LIMITS

Estimated quantitation limits (EQLs) for individual analytes and tables for specific methods are defined in Section 2.0 and Appendix A of the SAP (DOE/RL-2009-42). 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 (DOE/RL-2009-42). No qualification of the gamma-emitting radionuclide results is required for exceeding the EQL, and none were applied.

Similarly, the EQLs for iron and zinc were frequently exceeded with the quantitation limits achieved by the laboratory being below the action levels provided in the SAP. For both iron and zinc, 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 and zinc 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.

For herbicide analyses, the quantitation limits achieved by the laboratory for 2,4,5-T, 2,4,5-TP, and Dinoseb exceeded the estimated quantitation limits listed in the SAP; however, they were less than the action levels provided. No qualification of the data is necessary.

The quantitation limits achieved by the laboratory for the semivolatile organic analyses (SVOAs) 2,4-dinitrophenol, 2-nitroaniline, 3,3'-dichlorobenzidine, 3-nitroaniline, 4-nitroaniline, 4-nitrophenol, and pentachlorophenol were greater than the estimated quantitation limit. It was recognized in the SAP that even the estimated quantitation limits for several of the semivolatile organic compounds were higher than the defined action levels. This will need to be addressed as part of the overall project data evaluation process.

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 volatile organic analysis (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. Occasionally, ethyl ether and xylenes (total) were also detected at concentrations near the method quantitation limits for the analytes. The field trip blank and field transfer blank results for VOAs are provided in Table 5.

Three of the trip blanks were also analyzed for SVOAs and nonhalogenated VOAs (ethylene glycol, propylene glycol, and methanol) with none detected. One trip blank was analyzed concurrently with samples collected from C8190 for PAHs with acenaphthylene, anthracene, fluorene, and phenanthrene detected at concentrations of 2.02 µg/kg, 1.23 µg/kg, 11.6 µg/kg, and 10.1 µg/kg, respectively. Neither acenaphthylene nor anthracene was detected in any of the field samples collected from this well. Fluorene was detected in six field samples, all at concentrations less than that in the trip blank and well below the action levels defined in the SAP (DOE/RL-2009-42). Similarly, phenanthrene was detected in one field sample at a concentration of 0.914 µg/kg that is below the SAP (DOE/RL-2009-42) action level.

Trip blanks for total petroleum hydrocarbons were analyzed for both diesel range organics and gasoline range organics. Diesel, kerosene, and motor oil were occasionally detected in the

diesel range organics analysis at concentrations less than the quantitation limits. For gasoline range organics, gasoline was detected in one sample below the method quantitation limit.

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

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

Location	Interval	Sample	Concentration (µg/kg)			
			Methylene Chloride	Acetone	Ethyl Ether	Xylenes
Field Transfer Blanks						
C8185	I-004	B2C1Y9	U	4.08	2.50	U
C8186	I-007	B2C3Y0	3.88	10.7	U	U
C8188	I-010	B2CY64	3.66	6.16	U	1.34
C8189	I-014	B2C7B0	3.60	4.29	U	14.8
C8190	I-011	B2CB73	U	U	U	U
Trip Blanks						
C8185	I-003	B2C1Y6	U	7.48	1.73	U
C8186	I-009	B2C3Y1	2.75	7.93	U	U
C8188	I-008	B2C6Y1	3.82	7.61	U	1.79
C8189	I-012	B2C797	3.28	5.47	U	19.0
C8190	I-009	B2CB70	3.33	7.86	U	U

U = undetect

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-2009-42) 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-2009-42) are based on the initial guidance values for percent recoveries as defined in SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*. 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-2009-42).

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. 0100N-CA-V0115). This calculation brief is presented in Appendix A.

Nine sample pairs were evaluated including seven soil field duplicates and two split samples with the two split samples undergoing different analyses. Based on the methodology explained in the calculation, RPDs were calculated for 129 analyte pairs. Of these 129 RPDs, 11 exceeded the 30% guideline. Of the 11, 5 were not contaminants of interest (i.e., calcium, magnesium, silicon, strontium, and potassium-40) and were not evaluated further. The remaining six RPDs were further assessed as required by the method. Further assessment showed that none 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 six 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/Split Quality Control Review.

Location	Analyte	Relative Percent Difference	Laboratory Quality Control Issue
C8185 I-005	Fluoranthene	109.5%	Yes
	Phenanthrene	113.6%	Yes
	Total petroleum hydrocarbons – diesel	114.0%	Yes
C8186 I-011	Barium	40.6%	Yes
	Zinc	98.0%	Yes
C8188 I-007	Total Radiostrontium	34.3%	No

Further assessment showed that five of the six analyte pairs had laboratory QC issues in one or both (e.g., 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 remaining analyte pair associated with total beta radiostrontium analyzed in a split sample has no apparent laboratory QC issues.

Field 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, pH, and total uranium metal. Table 8 presents the qualifiers for radionuclides. Table 9 lists the qualifiers for the pesticides. Tables 10 and 11 provide the reviewer qualifiers for VOAs and nonhalogenated VOAs, respectively. Table 12 lists the qualifiers for total petroleum hydrocarbons (both diesel range organics and gasoline range organics) and polynuclear aromatic hydrocarbons. Tables 13 and 14 present the data qualifiers for the herbicide and polychlorinated biphenyl (PCB) analyses, respectively. Because of the number of analytes associated with the SVOAs, the data qualifiers have been split and are presented in Tables 15 and 16. The data qualifiers for the special extraction (batch leach) analyses are presented in Table 17.

Table 7. 100-N Review Qualifiers for Inorganic Analytes. (4 Pages)

Sample Delivery Group	Sample Number	Metals																																				Anions								pH	Total Uranium Metal
		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	Cyanide	Bromide	Chloride	Fluoride	Nitrate	Nitrite	Orthophosphate	Sulfate	Nitrate/Nitrite		
Sample Authorization Form RC-204 (Soil)																																													
J00986	B2C6V1									J							J	J								J						UJ		J							UR					
J01220	B2C6X9																																												J
K3272	B2C468		J		J						J		J	J			J	J	J	J	J			J					UJ	J														J	
	B2C475		J		J						J		J	J			J	J	J	J	J			J					UJ	J														J	
K3278	B2C466		J														J							J					UJ														J	
	B2C467		J														J							J					UJ														J	
	B2C469		J														J							J					UJ														J	
	B2C470		J														J							J					UJ														J	
	B2C474		J														J							J					UJ														J	
K3315	B2C213																																												J	
	B2C214		J																					J									J					J	UR	UR			J	
	B2C215		J																					J									J					UR	UR	UR			J	
	B2C217		J							UJ	J													J									J					UR	UR	UR	UJ		J	
K3320	B2C216		J															J			J																	UR	UR	UR			J	
	B2C218		J															J			J								UJ									UR	UR	UR			J	
	B2C219		J															J			J								UJ									UR	UR	UR			J	
K3332	B2C226				J									J							J								UJ									UR	UR	UR			J	
K3470	B2C4L3		J							J	J									J				J					UJ				J										J	
	B2C4L4		J							J	J									J				J					UJ				J										J	
	B2C4L5		J							J	J									J				J					UJ				J										J	
	B2C4L6		J							J	J									J				J					UJ				J										J	
	B2C4L7		J							J	J									J				J					UJ				J										J	
	B2C4L8		J							J	J									J				J									J										J	
	B2C4L9		J							J	J									J				J									J										J	
	B2C4M3		J							J	J									J				J					UJ				J										J	
	B2C4M4		J							J	J									J				J					UJ				J										J	
	B2C4M0		J							J	J									J				J					UJ				J										J	
K3512	B2C7C2	J	J								J						J				J			J					UJ									J	UR	UR			J	
K3519	B2C709	J	J							J							J				J			J					UJ	J								J	UR	UR			J	
	B2C712	J	J							J							UJ				J			J					UJ	J								UR	UR	UR	UJ		J	

Table 7. 100-N Review Qualifiers for Inorganic Analytes. (4 Pages)

Sample Delivery Group	Sample Number	Metals																																				Anions								pH	Total Uranium Metal
		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	Cyanide	Bromide	Chloride	Fluoride	Nitrate	Nitrite	Orthophosphate	Sulfate	Nitrate/Nitrite		
K3532	B2C710		J																					J					UJ					J				J	UR	J			J	
	B2C711		J																					J					UJ					J				J	UR	UR			J	
	B2C713		J																					J					UJ					J				J	UR	UR			J	
	B2C714		J																					J					UJ					J				J	UR	UR			J	
K3540	B2C717		J							J							J							J		J			UJ									J	UR	UR			J	
	B2C719		J							J							J							J		J			UJ									J	UR	UR			J	
	B2C726		J							J							J							J		J			UJ									J	UR	UR			J	
K3545	B2C720	J	J												J		J			J				J			J		UJ									J	UR	UR			J	
K3553	B2C7C5	J												J				J						J					UJ									UR	UR	UR	UJ		J	
K3555	B2C715	J	J								J						J			J	J								UJ	J								J	UR	UR			J	
	B2C716	J	J								J						J			J	J								UJ	J								J	UR	UR			J	
	B2C722	J	J								J						J			J	J								UJ	J								J	UR	UR			J	
K3563	B2C723	J	J								J				J														UJ									J	UR	UR			J	
	B2C724	J	J								J				J														UJ									J	UR	UR			J	
K3570	B2CKL5	J	J							J	J						J												UJ	J								J	UR	UR		J	J	
K3571	B2C731	J	J							J							J	J			J			J			J		UJ	J								J	UR	UR			J	
	B2C732	J	J							J							J	J			J			J			J		UJ	J								J	UR	UR			J	
K3581	B2C7D3	J	J																		J			J					UJ									J	UR	UR			J	
	B2C7F3	J	J																		J			J					UJ									J	UR	UR			J	
	B2C7D1	J	J																		J			J					UJ									J	UR	UR			J	
	B2C7D5																																											J	
	B2C7C4	J	J																		J			J					UJ									J	UR	UR			J	
	B2C7C9	J	J																		J			J					UJ									J	UR	UR			J	
	B2C7C7	J	J																		J			J					UJ									J	UR	J			J	
	B2C7D2																																										J	
	B2C7C6																																										J	
	B2C7D0																																										J	
	B2C7C8																																										J	
K3587	B2CKL9	J								J				J										J					UJ									UR	UR	UR			J	

Table 7. 100-N Review Qualifiers for Inorganic Analytes. (4 Pages)

Sample Delivery Group	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	Cyanide	Bromide	Chloride	Fluoride	Nitrate	Nitrite	Orthophosphate	Sulfate	Nitrate/Nitrite	pH	Total Uranium Metal
K3597	B2C7F1		J								J		J															UJ									J	UR	UR			J	
	B2C7F0		J								J		J															UJ									J	UR	UR			J	
	B2C7D4		J								J		J															UJ									J	UR	UR			J	
	B2C7D6		J								J		J															UJ									J	UR	UR			J	
	B2C7D7		J								J		J															UJ									J	UR	UR			J	
	B2C7D9		J								J		J															UJ									J	UR	UR			J	
K3598	B2CKM0	J	J															J		J				J		J			UJ									J	UR	UR			J	
	B2CKM1	J	J															J		J				J		J			UJ									J	UR	UR			J	
	B2CKN1	J	J															J		J				J		J			UJ									J	UR	UR			J	
	B2CKL6	J	J															J		J				J		J			UJ									J	UR	UR			J	
	B2CKL7	J	J															J		J				J		J			UJ									J	UR	UR			J	
	B2CKL8	J	J															J		J				J		J			UJ									J	UR	UR			J	
K3607	B2CKM5																																											J	
K3608	B2C3T8		J																					J					UJ									J	UR	UR			J	
	B2C3T9		J																					J					UJ									J	UR	UR			J	
	B2C3V2		J							J														J					UJ									UR	UR	UR			J	
K3614	B2CKM2	J	J							J				J	J									J					UJ									J	UR	UR			J	
	B2CKM3	J	J							J				J	J									J					UJ									J	UR	UR			J	
	B2CKM4	J	J							J				J	J									J					UJ									J	UR	UR			J	
K3619	B2C7F2	J	J								J													J					UJ									J	UR	UR			J	
K3627	B2C3V0	J	J		J						J													J					UJ									J	UR	UR			J	
	B2C3V1	J	J		J						J													J					UJ									J	UR	UR			J	
	B2C3V3	J	J		J						J													J					UJ									J	UR	UR			J	
	B2C3V4	J	J		J						J													J					UJ									J	UR	UR			J	
K3628	B2C7F9	J	J		J						J		J				J	J						J					UJ									UR	UR	UR			J	
K3644	B2CKM6	J	J																					J			J		UJ									J	UR	UR			J	
	B2CKN6	J	J																					J			J		UJ									J	UR	UR			J	
K3655	B2CKM7	J	J										J											J					UJ									J	UR	UR			J	
	B2CKM9	J	J										J											J					UJ		J							J	UR	UR			J	
	B2CKN7	J	J										J											J					UJ		J							J	UR	UR			J	

Table 7. 100-N Review Qualifiers for Inorganic Analytes. (4 Pages)

Sample Delivery Group	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	Cyanide	Bromide	Chloride	Fluoride	Nitrate	Nitrite	Orthophosphate	Sulfate	Nitrate/Nitrite	pH	Total Uranium Metal
K3661	B2C3V5	J	J								J													J					UJ			J						J	UR	UR	J		J	
	B2C3V6	J	J								J													J					UJ			J						UR	UR	UR	J		J	
	B2C3V8	J	J								J													J					UJ			J						UR	UR	UR	J		J	
K3665	B2C3V9	J	J		J																			J			J		UJ		J						J	UR	UR			J	
	B2C3W0	J	J		J																			J			J		UJ		J						UR	UR	UR			J	
	B2C3W1	J	J		J																			J			J		UJ		J						UR	UR	UR			J	
K3679	B2C3W2		J															J						J					UJ								J	UR	UR			J	
	B2C3W9		J															J						J					UJ								J	UR	UR			J	
Sample Authorization Form RC-205 (Water)																																															
J01079	B2C292																															UR														
K3276	B2C541	UJ																						J																				J	
K3333	B2C291	UJ																						J																				J	
K3483	B2C4P2																																												J	
K3560	B2C741																							J																				J	
K3642	B2C7R1													UJ					J					J																				J	
K3663	B2CKV8	UJ																						J																				J	
K3673	B2C406	UJ																																										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.
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 issue, the data should be considered unusable for decision-making purposes.

Table 8. 100-N Review Qualifiers for Radionuclides. (3 Pages)

Sample Delivery Group	Sample Number	Radionuclides															
		Tritium	Carbon-14	Nickel-63	Iodine-129	Total Radiostrontium	Technetium-99	Plutonium-238	Plutonium-239/240	Uranium-233/234	Uranium-235	Uranium-238	Americium-241	Curium-242	Curium-243/244	Neptunium-237	GEA
Sample Authorization Form RC-204 (Soil)																	
J01220	B2C6X9	J	J														
K3267	B2C402	J															
	B2C464	J															
K3268	B2C1Y4	J															
	B2C1Y5	J															
	B2C403	J															
	B2C438	J															
	B2C463	J															
K3307	B2C1X1	J	J														
	B2C1X2	J	J														
	B2C1X3	J	J														
	B2C1X4	J	J														
	B2C1X5	J	J														
	B2C1X6	J	J														
K3326	B2C1Y3	J	J														
K3464	B2C4J7	J															
	B2C4J8	J															
	B2C4J9	J															
	B2C4K0	J															
	B2C4K1	J															
	B2C4K2	J															
	B2C4K3	J															
	B2C4K4	J															
	B2C4K7	J															
	B2C4K8	J															
K3508	B2C756	J	J														
K3515	B2C6T3	J	J														
K3516	B2C6T6	J	J														
K3528	B2C6T8	J	J														
K3529	B2C6T4	J	J														
	B2C6T5	J	J														

Table 8. 100-N Review Qualifiers for Radionuclides. (3 Pages)

Sample Delivery Group	Sample Number	Radionuclides															
		Tritium	Carbon-14	Nickel-63	Iodine-129	Total Radiostrontium	Technetium-99	Plutonium-238	Plutonium-239/240	Uranium-233/234	Uranium-235	Uranium-238	Americium-241	Curium-242	Curium-243/244	Neptunium-237	GEA
	B2C6T7	J	J														
K3536	B2C6V2	J	J														
	B2C6V4	J	J														
	B2C6W4	J	J														
K3538	B2C6V5	J	J														
K3549	B2C6T9	J	J														
	B2C6V0	J	J														
	B2C6V7	J	J														
	B2C772	J	J														
K3558	B2C6V9	J	J														
	B2C6W1	J	J														
K3566	B2C6W9	J	J														
	B2C6X0	J	J														
	B2C7P2	J	J														
K3579	B2C758	J	J														
	B2C761	J	J														
	B2C763	J	J														
	B2C765	J	J														
	B2C767	J	J														
	B2C777	J	J														
K3583	B2C7P6	J	J														
K3595	B2C768	J	J														
	B2C770	J	J														
	B2C771	J	J														
	B2C773	J	J														
	B2C774	J	J														
	B2C775	J	J														
K3596	B2C3M4	J	J														
	B2C3M5	J	J														
	B2C3M8	J	J														
K3611	B2C776	J	J														

Table 8. 100-N Review Qualifiers for Radionuclides. (3 Pages)

Sample Delivery Group	Sample Number	Radionuclides															
		Tritium	Carbon-14	Nickel-63	Iodine-129	Total Radiostrontium	Technetium-99	Plutonium-238	Plutonium-239/240	Uranium-233/234	Uranium-235	Uranium-238	Americium-241	Curium-242	Curium-243/244	Neptunium-237	GEA
K3621	B2C3M6	J	J														
	B2C3M7	J	J														
	B2C3M9	J	J														
	B2C3N0	J	J														
K3622	B2C783	J	J														
K3623	B2C7P3	J	J														
	B2C7P4	J	J														
	B2C7P5	J	J														
	B2C7P7	J	J														
	B2C7P8	J	J														
	B2C803	J	J														
K3624	B2C7V4	J	J														
	B2C7V5	J	J														
	B2C7Y6	J	J														
K3634	B2C7Y8	J	J														
	B2C808	J	J														
K3639	B2C7Y9	J	J														
	B2C801	J	J														
K3640	B2CB59	J	J														
K3641	B2C3N1	J	J														
	B2C3N2	J	J														
	B2C3N3	J	J														
	B2C3N4	J	J														
K3668	B2C3N5	J	J														
	B2C3N6	J	J														
	B2C3N7	J	J														
K3670	B2C3N8	J	J														
	B2C3P5	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-N Review Qualifiers for Pesticides. (2 Pages)

Sample Delivery Group	Sample Number	alpha-BHC	beta-BHC	delta-BHC	gamma-BHC	alpha-Chlordane	gamma-Chlordane	4,4'-DDD	4,4'-DDE	4,4'-DDT	Aldrin	Dieldrin	Endosulfan I	Endosulfan II	Endrin	Endrin Aldehyde	Endrin Ketone	Endosulfan Sulfate	Heptachlor	Heptachlor Epoxide	Methoxychlor	Toxaphene
Sampling Authorization Form RC-204 (Soil)																						
J00986	B2C6Y8			J			J	J	J	J		J			J		J	J	J		J	
K3140	B28NW8	J	J	J	J	J	J		J	J	J	J	J	J		J	J	J	J	J		
K3540	B2C717					J									J		J					
	B2C719					J									J		J					
	B2C726					J									J		J					
K3545	B2C720										J											
K3555	B2C715										J											
	B2C716										J											
	B2C722										J											
K3570	B2CKL5															J						
K3581	B2C7D3															J						
	B2C7F3															J						
	B2C7D1															J						
	B2C7C4															J						
	B2C7C9															J						
	B2C7C7															J						
K3614	B2CKM2															J						
	B2CKM3															J						
	B2CKM4															J						
K3619	B2C7F2															J						

Table 9. 100-N Review Qualifiers for Pesticides. (2 Pages)

Sample Delivery Group	Sample Number	alpha-BHC	beta-BHC	delta-BHC	gamma-BHC	alpha-Chlordane	gamma-Chlordane	4,4'-DDD	4,4'-DDE	4,4'-DDT	Aldrin	Dieldrin	Endosulfan I	Endosulfan II	Endrin	Endrin Aldehyde	Endrin Ketone	Endosulfan Sulfate	Heptachlor	Heptachlor Epoxide	Methoxychlor	Toxaphene
K3655	B2CKM7									J												
	B2CKM9									J												
	B2CKN7									J												

BHC = benzene hexachloride
DDD = dichlorodiphenyldichloroethane
DDE = dichlorodiphenyldichloroethene
DDT = dichlorodiphenyltrichloroethane
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 10. 100-N Review Qualifiers for Volatile Organic Compounds. (3 Pages)

Sample Delivery Group	Sample Number	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)	Cyclohexanone	Diethyl Ether	Ethyl Acetate	n-Butyl Alcohol
Sample Authorization Form RC-204 (Soil)																																								
J00985	B2C721									J	J	J	J															J										J	J	J
K3314	B2C1Y6												J															UJ										UJ		
	B2C1Y7												J															UJ										UJ		
	B2C1Y8												J															UJ										UJ		
	B2C1Y9												UJ															UJ										UJ		
	B2C201												UJ															UJ										UJ		
K3325	B2C202												UJ																												
K3511	B2C784																											J												
K3518	B2C6X1												UJ															UJ								UJ				
	B2C6X4																											UJ												
K3531	B2C6X2																											J												
	B2C6X3																											J												
	B2C6X5																											J												
	B2C6X6																											J												
K3539	B2C702																											UJ												
	B2C6Y0																											UJ												
	B2C6Y1																											UJ												
	B2C6Y2																											UJ												
	B2C6Y4																											UJ												
K3544	B2C6Y3																											J												
K3552	B2C787																											J												
K3554	B2C6X7	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	J	J	J	J
	B2C6X8																											UJ												
	B2C6Y5																											UJ												
K3562	B2C6Y7																											J												
	B2C6Y9																											J												
K3568	B2C708																											UJ												
	B2C707																											UJ												
K3569	B2CB60												UJ															J												

Table 10. 100-N Review Qualifiers for Volatile Organic Compounds. (3 Pages)

Sample Delivery Group	Sample Number	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)	Cyclohexanone	Diethyl Ether	Ethyl Acetate	n-Butyl Alcohol
K3582	B2C7B5																										UJ													
	B2C793																										UJ													
	B2C795																										UJ													
	B2C786																										UJ													
	B2C791																										UJ													
	B2C789																										UJ													
K3585	B2CB64																										UJ													
K3586	B2C797																										UJ													
	B2C7B0																										UJ													
K3601	B2CB61																										J													
	B2CB62																										J													
	B2CB63																										J													
	B2CB65																										J													
	B2CB66																										J													
	B2CB76																										J													
K3602	B2C7B1																										UJ													
	B2C7B2																										UJ													
	B2C7B3																										UJ													
	B2C796																										UJ													
	B2C798																										UJ													
	B2C799																										UJ													
K3605	B2C3P6																										UJ													
	B2C3P7																										UJ													
	B2C3R0																										UJ													
K3606	B2CB70																J										UJ													
K3615	B2CB67																										UJ													
	B2CB68																										UJ													
	B2CB69																										UJ													
K3618	B2C7B4																J										UJ													

Table 10. 100-N Review Qualifiers for Volatile Organic Compounds. (3 Pages)

Sample Delivery Group	Sample Number	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)	Cyclohexanone	Diethyl Ether	Ethyl Acetate	n-Butyl Alcohol
K3630	B2C3P8																J										UJ													
	B2C3P9																J										UJ													
	B2C3R2																J										UJ													
	B2C3R1																J										UJ													
	B2C3Y0																J										UJ													
	B2C3Y1																J										UJ													
K3645	B2C7C1																										UJ													
K3646	B2CB71																										J													
K3656	B2CB72																										UJ													
	B2CB74																										UJ													
	B2CB82																										UJ													
K3660	B2C3R3									J																	UJ													
	B2C3R4									J																	UJ													
	B2C3R6									J																	UJ													
K3662	B2C3R7		J							J	J	J	J														UJ													
	B2C3R8		J							J	J	J	J														UJ													
	B2C3R9		J							J	J	J	J														UJ													
K3678	B2C3T0																										UJ													
	B2C3T7																										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.

Table 11. 100-N Review Qualifiers for Nonhalogenated Volatile Organic Analysis.

Sample Delivery Group	Sample Number	Methanol	Ethylene Glycol	Propylene Glycol
Sample Authorization Form RC-204 (Soil)				
J00985	B2C6Y6	J	J	J
K3519	B2C709		J	
	B2C712		J	
K3532	B2C710	J	J	J
K3555	B2C715	J	J	J
	B2C716	J	J	J
K3607	B2CKM5		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.

Table 12. 100-N Review Qualifiers for Total Petroleum Hydrocarbons and Polynuclear Aromatic Hydrocarbon Analysis. (6 Pages)

Sample Delivery Group	Sample Number	Total Petroleum Hydrocarbons				Polynuclear Aromatic Hydrocarbons															
		Diesel Range Organics	Motor Oil	Kerosene	Gasoline Range Organics	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
Sample Authorization Form RC-204 (Soil)																					
J00985	B2C6Y6	J		J																	
J00986	B2C6Y8					J	J												J		
K3315	B2C213	J	J	J																	
	B2C214	J	J	J								J									
	B2C215	J	J	J								J									
	B2C217	J	J	J								J									
K3320	B2C216	J	J	J	J		J	J				J				J	J			J	
	B2C218	J	J	J	J		J	J				J				J	J			J	
	B2C219	J	J	J	J		J	J				J				J	J			J	
K3332	B2C226	J	J	J								J				J				J	
K3512	B2C7C2	J	J														UJ				
K3519	B2C709		J			J	J										J		J		
	B2C712		J			J	J										J		J		

Table 12. 100-N Review Qualifiers for Total Petroleum Hydrocarbons and Polynuclear Aromatic Hydrocarbon Analysis. (6 Pages)

Sample Delivery Group	Sample Number	Total Petroleum Hydrocarbons				Polynuclear Aromatic Hydrocarbons															
		Diesel Range Organics	Motor Oil	Kerosene	Gasoline Range Organics	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
K3532	B2C710		UJ		J																
	B2C711		J		J																
	B2C713		J		J																
	B2C714		J		J													UJ			
	B2C718		J																		
K3540	B2C717		J			J															
	B2C719		J			J															
	B2C726		J			J															
K3545	B2C720		J																		
K3553	B2C7C5		J																		
K3555	B2C715		J		J														J		
	B2C716		J		J														J		
	B2C722		J		J	J													J		
K3563	B2C723	J	J																		
	B2C724	J	J			J															
K3570	B2CKL5		J			J															
K3571	B2C731		J			J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J
	B2C732		J			J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J

Table 12. 100-N Review Qualifiers for Total Petroleum Hydrocarbons and Polynuclear Aromatic Hydrocarbon Analysis. (6 Pages)

Sample Delivery Group	Sample Number	Total Petroleum Hydrocarbons				Polynuclear Aromatic Hydrocarbons															
		Diesel Range Organics	Motor Oil	Kerosene	Gasoline Range Organics	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
K3581	B2C7D3		J																		
	B2C7F3		J			J															
	B2C7D1		J																		
	B2C7D5		J																		
	B2C7C4		J		J	J															
	B2C7C9		J			J															
	B2C7C7		J														UJ				
K3587	B2CKL9		J																		
K3597	B2C7F1		J																		
	B2C7F0		J																		
	B2C7D4		J																		
	B2C7D6		J																		
	B2C7D7		J																		
	B2C7D9		J																		

Table 12. 100-N Review Qualifiers for Total Petroleum Hydrocarbons and Polynuclear Aromatic Hydrocarbon Analysis. (6 Pages)

Sample Delivery Group	Sample Number	Total Petroleum Hydrocarbons				Polynuclear Aromatic Hydrocarbons															
		Diesel Range Organics	Motor Oil	Kerosene	Gasoline Range Organics	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
K3598	B2CKM0		J																		
	B2CKM1		J																		
	B2CKN1		J																		
	B2CKL6		J																		
	B2CKL7		J																		
	B2CKL8		J																		
K3607	B2CKM5		J			J															
K3608	B2C3T8		J																		
	B2C3T9		J																		
	B2C3V2		J																		
K3611	B2C776																				
K3614	B2CKM2		J		J																
	B2CKM3		J		J																
	B2CKM4		J		J	J															
K3619	B2C7F2		J																		

Table 12. 100-N Review Qualifiers for Total Petroleum Hydrocarbons and Polynuclear Aromatic Hydrocarbon Analysis. (6 Pages)

Sample Delivery Group	Sample Number	Total Petroleum Hydrocarbons				Polynuclear Aromatic Hydrocarbons															
		Diesel Range Organics	Motor Oil	Kerosene	Gasoline Range Organics	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
K3627	B2C3V0		J	J															J		
	B2C3V1		J	J															J		
	B2C3V3		J	J															J		
	B2C3V4		J	J															J		
K3628	B2C7F9		J		J		J												J		
K3644	B2CKM6		J																J		
	B2CKN6		J																J		
K3655	B2CKM7		J																		
	B2CKM9		J																		
	B2CKN7		J																		
K3658	B2C3Y2		J	J																	
K3661	B2C3V5		J				J												J		
	B2C3V6		J	UJ			J												J		
	B2C3V8		J				J												J		
K3665	B2C3V9		J			J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J
	B2C3W0		J			J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J
	B2C3W1		J			J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J

Table 12. 100-N Review Qualifiers for Total Petroleum Hydrocarbons and Polynuclear Aromatic Hydrocarbon Analysis. (6 Pages)

Sample Delivery Group	Sample Number	Total Petroleum Hydrocarbons				Polynuclear Aromatic Hydrocarbons															
		Diesel Range Organics	Motor Oil	Kerosene	Gasoline Range Organics	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
K3679	B2C3W2		J			J															
	B2C3W9		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.

Table 13. 100-N Review Qualifiers for Herbicide Analysis. (2 Pages)

Sample Delivery Group	Sample Number	2,4-Dichlorophenoxyacetic acid	4-(2,4-Dichlorophenoxy) butyric acid	2,4,5-Trichlorophenoxyacetic acid	2-(2,4,5-Trichlorophenoxy) propionic acid	Dalapon	Dicamba	Dichloroprop	2,4-Dinitro-6-sec-butylphenol	2-Methyl-4-chlorophenoxyacetic acid	2-(2-Methyl-4-chlorophenoxy) proprionic acid
Sample Authorization Form RC-204 (Soil)											
J00986	B2C6Y8	J							J		
K3512	B2C7C2					J			J		
K3519	B2C709	J	J	J	J	J	J	J	J		
	B2C712	J	J	J	J	J	J	J	J		
K3532	B2C710	J	J	J	J	J	J	J	J	J	J
	B2C711	J	J	J	J	J	J	J	J	J	J
	B2C713	J	J	J	J	J	J	J	J	J	J
	B2C714	J	J	J	J	J	J	J	J	J	J
K3540	B2C717	J	J	J	J	J	J	J	J	J	J
	B2C719	J	J	J	J	J	J	J	J	J	J
	B2C726	J	J	J	J	J	J	J	J	J	J
K3545	B2C720		J		J			J	J		
K3563	B2C723								J		
	B2C724								J		
K3571	B2C731	J									
	B2C732	J									
K3581	B2C7D3	J									
	B2C7F3	J									
	B2C7D1	J									
	B2C7C4	J									
	B2C7C9	J									
	B2C7C7	J									
K3587	B2CKL9	J	J	J	J		J		J	J	J
K3598	B2CKM0		J						J		
	B2CKM1		J						J		
	B2CKN1		J						J		
	B2CKL6		J						J		
	B2CKL7		J						J		
	B2CKL8		J						J		

Table 13. 100-N Review Qualifiers for Herbicide Analysis. (2 Pages)

Sample Delivery Group	Sample Number	2,4-Dichlorophenoxyacetic acid	4-(2,4-Dichlorophenoxy) butyric acid	2,4,5-Trichlorophenoxyacetic acid	2-(2,4,5-Trichlorophenoxy) propionic acid	Dalapon	Dicamba	Dichloroprop	2,4-Dinitro-6-sec-butylphenol	2-Methyl-4-chlorophenoxyacetic acid	2-(2-Methyl-4-chlorophenoxy) proprionic acid
K3614	B2CKM2	J	J	J	J	J	J	J	J	J	J
	B2CKM3	J	J	J	J	J	J	J	J	J	J
	B2CKM4	J	J	J	J	J	J	J	J	J	J
K3619	B2C7F2		J						J		
K3628	B2C7F9				J				J		
K3644	B2CKM6	J		J		J	J			J	J
	B2CKN6	J		J		J	J			J	J
K3655	B2CKM7	J	J	J	J		J	J	J	J	J
	B2CKM9	J	J	J	J		J	J	J	J	J
	B2CKN7	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.

Table 14. 100-N Review Qualifiers for Polychlorinated Biphenyl Analysis.

Sample Delivery Group	Sample Number	Aroclor-1016	Aroclor-1221	Aroclor-1232	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260	Aroclor-1262	Aroclor-1268
Sample Authorization Form RC-204 (Soil)										
K3519	B2C709	J	J	J	J	J	J	J	J	J
	B2C712	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.

Table 15. 100-N Review Qualifiers for Semivolatile Organic Analysis - Part 1. (2 Pages)

Sample Delivery Group	Sample Number	1,2-Dichlorobenzene	1,3-Dichlorobenzene	1,4-Dichlorobenzene	1,2,4-Trichlorobenzene	2-Chloronaphthalene	2-Chlorophenol	2-Methylnaphthalene	2-Methylphenol	2-Nitroaniline	2-Nitrophenol	2,4-Dichlorophenol	2,4-Dimethylphenol	2,4-Dinitrophenol	2,4-Dinitrotoluene	2,4,5-Trichlorophenol	2,4,6-Trichlorophenol	2,6-Dinitrotoluene	3-Nitroaniline	3,3'-Dichlorobenzidine	3- and/or 4-Methylphenol	4-Bromophenyl Phenyl Ether	4-Chloroaniline	4-Chlorophenyl Phenyl Ether	4-Chloro-3-methylphenol	4-Nitroaniline	4-Nitrophenol	4,6-Dinitro-2-methylphenol	Acenaphthalene	Acenaphthylene	Anthracene	Benzo[a]anthracene	Benzo[a]pyrene	Benzo[b]fluoranthene	Benzo[g,h,i]perylene
Sample Authorization Form RC-204 (Soil)																																			
J00986	B2C6V1	J	J	J	J			J						J					J	J			J			J		J							J
K3512	B2C7C2													J																					
K3519	B2C709													J	J			J				J		J			J	J						J	J
	B2C712													J	J			J				J		J			J	J						J	J
K3540	B2C717	J	J		J			J	J	J			J	J							J							J							
	B2C719	J	J		J			J	J	J			J	J							J							J							
	B2C726	J	J		J			J	J	J			J	J							J							J							
K3545	B2C720													J																					
K3553	B2C7C5													J														J							
K3555	B2C715																																		
	B2C716																																		
	B2C722																																		
K3563	B2C723																			J															
	B2C724																			J															
K3570	B2CKL5													J													J								
K3571	B2C731				J															J			J		J										
	B2C732				J															J			J		J										
K3581	B2C7D3													J														J							
	B2C7F3													J														J							
	B2C7D1													J														J							
	B2C7D5													J														J							
	B2C7C4													J														J							
	B2C7C9													J														J							
	B2C7C7													J														J							
K3587	B2CKL9	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

Table 15. 100-N Review Qualifiers for Semivolatile Organic Analysis - Part 1. (2 Pages)

Sample Delivery Group	Sample Number	1,2-Dichlorobenzene	1,3-Dichlorobenzene	1,4-Dichlorobenzene	1,2,4-Trichlorobenzene	2-Chloronaphthalene	2-Chlorophenol	2-Methylnaphthalene	2-Methylphenol	2-Nitroaniline	2-Nitrophenol	2,4-Dichlorophenol	2,4-Dimethylphenol	2,4-Dinitrophenol	2,4-Dinitrotoluene	2,4,5-Trichlorophenol	2,4,6-Trichlorophenol	2,6-Dinitrotoluene	3-Nitroaniline	3,3'-Dichlorobenzidine	3- and/or 4-Methylphenol	4-Bromophenyl Phenyl Ether	4-Chloroaniline	4-Chlorophenyl Phenyl Ether	4-Chloro-3-methylphenol	4-Nitroaniline	4-Nitrophenol	4,6-Dinitro-2-methylphenol	Acenaphthalene	Acenaphthylene	Anthracene	Benzo[a]anthracene	Benzo[a]pyrene	Benzo[b]fluoranthene	Benzo[g,h,i]perylene
K3597	B2C7F1													J																					
	B2C7F0													J																					
	B2C7D4													J																					
	B2C7D6													J																					
	B2C7D7													J																					
	B2C7D9													J																					
K3598	B2CKM0													J																					
	B2CKM1													J																					
	B2CKN1													J																					
	B2CKL6													J																					
	B2CKL7													J																					
	B2CKL8													J																					
K3607	B2CKM5													J													J								
K3614	B2CKM2													J													J	J						J	
	B2CKM3													J													J	J						J	
	B2CKM4													J													J	J						J	
K3619	B2C7F2										J			J																					
K3628	B2C7F9																																		
K3644	B2CKM6		J	J	J			J												J			J											
	B2CKN6		J	J	J			J												J			J											
K3655	B2CKM7	J	J										J	J																					
	B2CKM9	J	J										J	J																					
	B2CKN7	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.

Table 16. 100-N Review Qualifiers for Semivolatile Organic Analysis - Part 2. (2 Pages)

Sample Delivery Group	Sample Number	Benzo[k]fluoranthene	Bis(2-chloroethoxy)methane	Bis(2-chloroethyl)ether	Bis(2-chloroisopropyl)ether	Bis(2-ethylhexyl)phthalate	Butyl Benzyl Phthalate	Carbazole	Chrysene	Dibenz[a,h]anthracene	Dibenzofuran	Diethyl Phthalate	Dimethyl Phthalate	Di-n-butyl Phthalate	Di-n-octyl Phthalate	Fluoranthene	Fluorene	Hexachlorobenzene	Hexachlorobutadiene	Hexachlorocyclopentadiene	Hexachloroethane	Indeno[1,2,3-cd]pyrene	Isophorone	Naphthalene	Nitrobenzene	N-Nitroso-di-n-propylamine	N-Nitrosodimethylamine	N-Nitrosodiphenylamine	Pentachlorophenol	Phenanthrene	Phenol	Pyrene	Tributyl phosphate	SVOA Holding Time Missed
Sample Authorization Form RC-204 (Soil)																																		
J00986	B2C6V1			J	J					J										J	J	J					J							
K3512	B2C7C2																			J														
K3519	B2C709		J	J			J																					J	J	J				
	B2C712		J	J			J																					J	J	J				
K3540	B2C717									J									J			J				J		J	J					
	B2C719									J									J			J				J		J	J					
	B2C726									J									J			J				J		J	J					
K3545	B2C720																												J					
K3553	B2C7C5																			J									J					
K3555	B2C715				J																						J				J			
	B2C716				J																						J				J			
	B2C722				J																						J				J			
K3563	B2C723																																	
	B2C724																																	
K3570	B2CKL5																																	
K3571	B2C731									J									J															
	B2C732									J									J															
K3581	B2C7D3																												J					
	B2C7F3																												J					
	B2C7D1																												J					
	B2C7D5																												J					
	B2C7C4																												J					
	B2C7C9																												J					
	B2C7C7																												J					
K3587	B2CKL9	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
K3597	B2C7F1																																	
	B2C7F0																																	
	B2C7D4																																	
	B2C7D6																																	
	B2C7D7																																	
	B2C7D9																																	

Table 16. 100-N Review Qualifiers for Semivolatile Organic Analysis - Part 2. (2 Pages)

Sample Delivery Group	Sample Number	Benzo[k]fluoranthene	Bis(2-chloroethoxy)methane	Bis(2-chloroethyl)ether	Bis(2-chloroisopropyl)ether	Bis(2-ethylhexyl)phthalate	Butyl Benzyl Phthalate	Carbazole	Chrysene	Dibenz[a,h]anthracene	Dibenzofuran	Diethyl Phthalate	Dimethyl Phthalate	Di-n-butyl Phthalate	Di-n-octyl Phthalate	Fluoranthene	Fluorene	Hexachlorobenzene	Hexachlorobutadiene	Hexachlorocyclopentadiene	Hexachloroethane	Indeno[1,2,3-cd]pyrene	Isophorone	Naphthalene	Nitrobenzene	N-Nitroso-di-n-propylamine	N-Nitrosodimethylamine	N-Nitrosodiphenylamine	Pentachlorophenol	Phenanthrene	Phenol	Pyrene	Tributyl phosphate	SVOA Holding Time Missed
K3598	B2CKM0																			J														
	B2CKM1																			J														
	B2CKN1																			J														
	B2CKL6																			J														
	B2CKL7																			J														
	B2CKL8																			J														
K3607	B2CKM5																												J					
K3614	B2CKM2																																	
	B2CKM3																																	
	B2CKM4																																	
K3619	B2C7F2																			J									J					
K3628	B2C7F9																			J														
K3644	B2CKM6																		J	J	J		J				J							
	B2CKN6																		J	J	J		J				J							
K3655	B2CKM7																			J														
	B2CKM9																			J														
	B2CKN7																			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.

Table 17. 100-N Review Qualifiers for Special Extraction Analysis.

Sample Delivery Group	Sample Number	Arsenic	Barium	Cadmium	Chromium	Lead	Selenium	Silver	Cr-VI
Sample Authorization Form RC-204 (Soil)									
K3273	B2C484				J				
K3279	B2C477								J
	B2C478				J	J			J
	B2C479								J
	B2C483		J						J
K3313	B2CL47					J			
K3323	B2CL48	J	J	J	J	J	J	J	J
	B2CL49	J	J	J	J	J	J	J	J
K3331	B2CL56	J	J	J	J	J	J	J	
K3468	B2C4M5		J		J				J
	B2C4M6		J						J
	B2C4M7		J		J				J
	B2C4M8		J						J
	B2C4M9		J						J
K3564	B2C734				J				
K3629	B2C7H8				J				
	B2D286				J				
K3657	B2D285				J				
K3677	B2C1W9		J		J				
	B2C3X9		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.

4.0 REFERENCES

DOE/RL-2009-42, 2011, *Sampling and Analysis Plan for the 100-NR-1 and 100-NR-2 Operable Units Remedial Investigation/Feasibility Study*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

EPA/240/B-06/002, 2006, *Data Quality Assessment: A Reviewer's Guide*, U.S. Environmental Protection Agency, Office of Environmental Information, Washington, D.C.

EPA/240/B-06/003, 2006, *Data Quality Assessment: Statistical Methods for Practitioners,* U.S. Environmental Protection Agency, Office of Environmental Information, 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-N REMEDIAL INVESTIGATION RELATIVE PERCENT DIFFERENCE CALCULATIONS

Acrobat 8.0

CALCULATION COVER SHEET

Project Title: 100-N Area Remedial Investigation **Job No. 14655**

Area: 100-N Area

Discipline: Environmental *Calculation No: 0100N-CA-V0115

Subject: 100-N Area 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 = 12 Total = 13	P. L. Benjamin	H. M. Sulloway		J. M. Capron	11/22/11

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 PB | Date 11/21/2011 | Calc. No. 0100N-CA-V0115 | Rev. No. 0
Project 100-N Area Remedial Investigation | Job No. 14655 | Checked H. M. Sulloway HMS | Date 11/21/11
Subject 100-N Area Remedial Investigation Relative Percent Difference (RPD) Calculation | Sheet No. 1 of 12

Summary

PURPOSE:

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

TABLE OF CONTENTS:

GIVEN/REFERENCES:

1) DOE-RL, 2010, *Sampling and Analysis Plan for the 100-NR-1 and 100-NR-2 Operable Units Remedial Investigation/Feasibility Study*, DOE/RL-2009-42, 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-N Area SAP lists laboratory performance standards as estimated quantitation limits (EQLs) for soil/aquifer sediment samples from sampling targets in ~~Tablets 2-3, 2-4, and 2-5~~ Tables 2-3 through 2-6 HMS 11/21/11 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** 11/21/2011 **Calc. No.** 0100N-CA-V0115 **Rev. No.** 0
Project 100-N Area Remedial Investigation **Job No.** 14655 **Checked** H. M. Sulloway HMS **Date** 11/21/11
Subject 100-N Area Remedial Investigation Relative Percent Difference (RPD) Calculation **Sheet No.** 2 of 12

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** 11/21/2011 **Calc. No.** 0100N-CA-V0115 **Rev. No.** 0
Project 100-N Area Remedial Investigation **Job No.** 14655 **Checked** H. M Sulloway HMS **Date** 11/21/11
Subject 100-N Area Remedial Investigation Relative Percent Difference (RPD) Calculation **Sheet No.** 3 of 12

Summary (continued)

Relative Percent Difference Results and QA/QC Analysis

Analyte	C8185, Soil, Interval 5	C8186, Soil, Interval 11	C8187, Soil, Interval 3	C8188, Soil, Interval 7	C8188, Soil, Interval 8	C8188, Soil, Interval 13	C8189, Soil, Interval 11	C8190, Soil, Interval 6	C8191, Soil, Interval 6
	Duplicate Analysis	Duplicate Analysis	Duplicate Analysis	Split Analysis	Duplicate Analysis	Split Analysis	Duplicate Analysis	Duplicate Analysis	Duplicate Analysis
Cobalt-60	--	--	--	--	--	--	--	24.7%	--
Potassium-40	6.9%	3.6%	0.9%	107.5%	1.4%	--	0.5%	2.4%	6.1%
Total beta radiostrontium	--	0.6%	22.9%	34.3%	15.3%	--	19.4%	16.3%	--
Aluminum	5.8%	4.4%	2.9%	--	0.8%	8.3%	11.0%	0.0%	11.2%
Barium	27.4%	40.6%	10.8%	--	5.0%	17.2%	10.5%	28.9%	1.2%
Calcium	31.3%	4.0%	1.4%	--	0.9%	23.3%	20.7%	3.5%	17.8%
Chromium	1.8%	19.2%	20.4%	--	3.7%	1.4%	14.6%	3.5%	15.0%
Copper	15.5%	3.6%	7.5%	--	4.2%	3.7%	23.0%	2.9%	16.5%
Iron	10.0%	5.3%	0.7%	--	2.0%	17.6%	11.7%	9.6%	0.8%
Lead	--	4.1%	9.9%	--	0.3%	5.6%	3.3%	--	--
Magnesium	3.7%	0.5%	90.8%	--	11.5%	10.8%	17.0%	21.4%	13.0%
Manganese	0.0%	7.0%	8.1%	--	2.7%	15.0%	11.5%	7.0%	13.8%
Phosphorus	--	--	--	--	5.5%	--	23.4%	1.7%	--
Silicon	3.5%	4.0%	7.1%	--	11.8%	156.5%	10.9%	14.5%	8.4%
Sodium	--		8.7%	--	--	25.5%	3.1%	3.0%	24.4%
Strontium	3.4%	86.0%	2.3%	--	2.4%	25.4%	16.4%	7.7%	29.2%
Vanadium	7.3%	12.2%	0.6%	--	11.2%	24.2%	11.1%	7.8%	3.4%
Zinc	8.8%	98.0%	8.6%	--	2.7%	13.9%	5.0%	0.9%	26.3%
Nitrate	--	--	--	--	13.7%	--	--	--	--
Sulfate	3.6%	--	--	--	--	--	--	--	--
Fluoranthene	109.5%	--	--	--	--	--	--	--	--
Phenanthrene	113.6%	--	--	--	--	--	--	--	--
Total petroleum hydrocarbons - diesel range	114.0%	--	--	--	--	--	--	--	--

-- = RPD analysis not required

CALCULATION SHEET

Washington Closure Hanford

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

Date 11/21/2011
Job No. 14855

Calc. No. 0100N-CA-V0115
Checked H. M. Sullaway

Rev. No. 0
Date 11/21/12
Sheet No. 4 of 12

1 **Duplicate Analysis - C8185 Interval 5 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
C8185; I-005	B2C1X3	4/13/11	13.5		1.588	0.390		0.126	0.719		0.326	0.940		0.512
C8185; I-005 DUP	B2C1X8	4/13/11	12.6		1.07	0.511		0.156	0.907		0.301	0.599		0.543

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)	No-Stop (acceptable)	No-Stop (acceptable)
	RPD	6.9%			
	Difference > 2 TDL?	Not applicable	No - acceptable	No - acceptable	No - acceptable

Sampling Area	HEIS Number	Sample Date	Aluminum			Arsenic			Barium			Beryllium			Cadmium			Calcium			Chromium			Cobalt			Copper			Iron			Lead			Lithium		
			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	mg/kg	Q	PQL	mg/kg	Q	PQL
C8185; I-005	B2C216	4/13/11	4010		5.42	0.893	B	1.08	43.1		0.54	0.134	B	0.22	0.069	B	0.22	1910		108	6.15		0.22	3.36		2.17	6.55		1.08	8210		21.7	2.88		0.54	5.57		2.71
C8185; I-005 DUP	B2C219	4/13/11	4250		4.23	1.08		0.85	32.7		0.42	0.124	B	0.17	0.055	B	0.17	2620		84.6	8.30		0.17	3.36		1.69	7.85		0.85	9070		16.9	2.08		0.42	5.37		2.11

Analysis:

	TDL	5	1	0.5	0.2	0.2	100	0.2	2	1	5	0.5	2.5
Duplicate Analysis	Both > PQL?	Yes (continue)	No-Stop (acceptable)	Yes (continue)	No-Stop (acceptable)	No-Stop (acceptable)	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)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)
	RPD	5.8%		27.4%			31.3%	1.8%		15.5%	10.0%		
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable	No - acceptable	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable

Sampling Area	HEIS Number	Sample Date	Magnesium			Manganese			Molybdenum			Nickel			Phosphorus			Potassium			Silicon			Sodium			Strontium			Vanadium			Zinc			Chloride		
			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	mg/kg	Q	PQL	mg/kg	Q	PQL
C8185; I-005	B2C216	4/13/11	2210		81.4	159		5.42	0.544	B	2.17	8.10		4.34	264		54.2	627		434	562		2.17	203		54.2	14.3		1.08	17.2		2.71	16.6		10.8	3.9	B	5.4
C8185; I-005 DUP	B2C219	4/13/11	2130		63.4	159		4.23	0.491	B	1.69	7.93		3.38	541		42.3	628		338	562		1.69	254		42.3	14.8		0.85	18.5		2.11	15.2		8.46	4.2	B	5.4

Analysis:

	TDL	75	5	2	4	100	400	2	50	1	2.5	1	2
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	No-Stop (acceptable)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)
	Both >5xTDL?	Yes (calc RPD)	Yes (calc RPD)		No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)	
	RPD	3.7%	0.0%					3.5%		3.4%	7.3%	8.8%	
	Difference > 2 TDL?	Not applicable	Not applicable	No - acceptable	No - acceptable	Yes - assess further	No - acceptable	Not applicable	No - acceptable	Not applicable	Not applicable	Not applicable	No - acceptable

Sampling Area	Sample Number	Sample Date	Sulfate			Acenaphthene			Acenaphthylene			Anthracene			Chrysene			Fluoranthene			Fluorene			Naphthalene			Phenanthrene			Pyrene			Total petroleum hydrocarbons - diesel range			Total petroleum hydrocarbons - gasoline range		
			ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
C8185; I-005	B2C216	4/13/11	51.2		5.4	70.4	D	7.17	35.8	D	7.17	104	D	7.17	3.05	JD	7.17	845	D	7.17	73.8	D	7.17	3.30	JD	7.17	358	D	7.17	64.1	D	7.17	*752000*	D	*36000*	*1310*		*957*
C8185; I-005 DUP	B2C219	4/13/11	53.1		5.4	229	D	18.0	91.0	D	18.0	353	D	18.0	16.4	JD	18.0	2890	D	18.0	255	D	18.0	12.9	JD	18.0	1300	D	18.0	206	D	18.0	206000		3570	1600		868

Analysis:

	TDL	5	100	100	50	100	50	30	100	50	50	8000	5000
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)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)		Yes (calc RPD)	No-Stop (acceptable)		Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)
	RPD	3.8%					109.5%					113.6%	114.0%
	Difference > 2 TDL?	Not applicable	No - acceptable	No - acceptable	Yes - assess further	No - acceptable	Not applicable	Yes - assess further	No - acceptable	Not applicable	Yes - assess further	Not applicable	No - acceptable

Sampling Area	Sample Number	Sample Date	Acetone		
			ug/kg	Q	PQL
C8185; I-005	B2C200	4/13/11	19.2		10.3
C8185; I-005 DUP	B2C203	4/13/11	8.87	J	11.3

Analysis:

	TDL	20
Duplicate Analysis	Both > PQL?	No-Stop (acceptable)
	Both >5xTDL?	
	RPD	
	Difference > 2 TDL?	No - acceptable

CALCULATION SHEET

Washington Closure Hanford

Originator P. L. Benjamin PB — Date 11/21/2011 — Calc. No. 0100N-CA-V0115 — Rev. No. 0

Project 100-N Remedial Investigation — Job No. 14655 — Checked H. M. Sullaway — Date 11/22/11

Subject 100-N Remedial Investigation Relative Percent Difference (RPD) Calculations — Sheet No. 5 of 12

1 **Duplicate Analysis - C8186 Interval 11 Soil Samples**

Sampling Area	Sample Number	Sample Date	Cobalt-60 pCi/g	Q	MDA	Potassium-40 pCi/g	Q	MDA	Radium-226 pCi/g	Q	MDA	Thorium-228 pCi/g	Q	MDA	Total beta radiostrontium pCi/g	Q	MDA
C8186; I-011	B2C3N5	9/1/11	0.183		0.057	13.7		0.322	0.331		0.118	0.443		0.160	358		0.388
C8186; I-011 DUP	B2C3N6	9/1/11	0.203		0.070	14.2		1.04	0.314		0.175	0.545		0.199	356		0.309

Analysis:

		Cobalt-60	Potassium-40	Radium-226	Thorium-228	Total beta radiostrontium
	TDL	0.05	0.5	0.1	1	1
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)
	RPD		3.6%			0.6%
	Difference > 2 TDL?	No - acceptable	Not applicable	No - acceptable	No - acceptable	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	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	Iron mg/kg	Q	PQL
C8186; I-011	B2C3V9	9/1/11	6970		4.53	1.91		0.91	120		0.45	0.220		0.18	0.786	B	1.81	0.108	B	0.18	2710		90.8	18.8		0.18	4.28		1.81	14.1		0.91	12600		18.1
C8186; I-011 DUP	B2C3W0	9/1/11	6670		5.06	1.76		1.01	79.5		0.51	0.222		0.20	0.773	B	2.02	0.111	B	0.20	2820		101	15.5		0.20	4.55		2.02	13.6		1.01	13500		20.2

Analysis:

		Aluminum	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron
	TDL	5	1	0.5	0.2	2	0.2	100	0.2	2	1	5
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)	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)	Yes (calc RPD)
	RPD	4.4%		40.6%				4.0%	19.2%		3.6%	5.3%
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable	No - acceptable	No - acceptable	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable

Sampling Area	HEIS Number	Sample Date	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	Sodium mg/kg	Q	PQL	Strontium mg/kg	Q	PQL
C8186; I-011	B2C3V9	9/1/11	2.75		0.45	8.95		2.26	3680		67.9	247		4.53	2.17		1.81	13.1		3.62	389		45.3	956		362	389		1.81	196		45.3	50.4		0.91
C8186; I-011 DUP	B2C3W0	9/1/11	2.64		0.51	9.68		2.53	3660		75.8	285		5.06	1.03	B	2.02	12.4		4.05	511		50.6	996		405	405		2.02	203		50.6	20.1		1.01

Analysis:

		Lead	Lithium	Magnesium	Manganese	Molybdenum	Nickel	Phosphorus	Potassium	Silicon	Sodium	Strontium
	TDL	0.5	2.5	75	5	2	4	100	400	2	50	1
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)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)		No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)
	RPD	4.1%		0.5%	7.0%					4.0%		86.0%
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	Not applicable	No - acceptable	Not applicable

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	Nitrogen in Nitrite and Nitrate mg/kg	Q	PQL	Sulfate mg/kg	Q	PQL	Acenaphthene µg/kg	Q	PQL
C8186; I-011	B2C3V9	9/1/11	1.46	B	9.06	32.2		2.28	97.0		9.06	2.6	B	5.1	0.28	B	0.51	4.9	B	5.1	34.5		3.37
C8186; I-011 DUP	B2C3W0	9/1/11	1.31	B	10.1	30.4		2.53	33.2		10.1	1.2	B	5.1	0.24	B	0.51	7.1		5.1	11.2		3.39

Analysis:

		Tin	Vanadium	Zinc	Chloride	Nitrogen in Nitrite and Nitrate	Sulfate	Acenaphthene
	TDL	10	2.5	1	2	0.75	5	100
Duplicate Analysis	Both > PQL?	No-Stop (acceptable)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (continue)
	Both >5xTDL?		Yes (calc RPD)	Yes (calc RPD)				No-Stop (acceptable)
	RPD		12.2%	96.0%				
	Difference > 2 TDL?	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable	No - acceptable	No - acceptable

Sampling Area	Sample Number	Sample Date	Acetone µg/kg	Q	PQL	Methylene chloride µg/kg	Q	PQL
C8186; I-011	B2C3R7	9/1/11	11.7		10.9	4.81	BJ	5.43
C8186; I-011 DUP	B2C3R8	9/1/11	11.9		11.3	4.60	BJ	5.67

Analysis:

		Acetone	Methylene chloride
	TDL	20	5
Duplicate Analysis	Both > PQL?	Yes (continue)	No-Stop (acceptable)
	Both >5xTDL?	No-Stop (acceptable)	
	RPD		
	Difference > 2 TDL?	No - acceptable	No - acceptable

CALCULATION SHEET

Washington Closure Hanford

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

Date 11/21/2011
Job No. 14655

Calc. No. 0100N-CA-V0115
Checked H. M. Sullaway

Rev. No. 0
Date 11/21/11
Sheet No. 8 of 12

Duplicate Analysis - C8187 Interval 3 Soil Samples

Sampling Area	Sample Number	Sample Date	Potassium-40			Radium-226			Radium-228			Total beta radiostrontium			Tritium		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
C8187; I-003	B2C403	3/18/11	11.4		0.733	0.491		0.134	0.805		0.247	9.82		0.268	90.0		3.41
C8187; I-003 DUP	B2C438	3/18/11	11.3		0.663	0.357		0.127	0.864		0.304	7.80		0.238	11.1		3.11

Analysis:

	TDL	0.5	0.1	0.2	1	10
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)
	RPD	0.9%			22.9%	
	Difference > 2 TDL?	Not applicable	No - acceptable	No - acceptable	Not applicable	Yes - assess further

Sampling Area	HEIS Number	Sample Date	Aluminum			Arsenic			Barium			Beryllium			Cadmium			Calcium			Chromium			Cobalt			Copper			Iron		
			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
C8187; I-003	B2C469	3/18/11	7050		4.97	2.22		0.99	96.6		0.50	0.206		0.20	0.075	B	0.20	2840		99.4	26.9		0.20	5.25		1.99	12.4		0.99	14200		19.9
C8187; I-003 DUP	B2C470	3/18/11	6850		4.84	2.37		0.97	86.7		0.48	0.202		0.19	0.084	B	0.19	2800		96.8	33.0		0.19	8.64		1.94	11.5		0.97	14100		19.4

Analysis:

	TDL	5	1	0.5	0.2	0.2	100	0.2	2	1	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?	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)		Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)
	RPD	2.9%		10.8%			1.4%	20.4%		7.5%	0.7%
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable	No - acceptable	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable

Sampling Area	HEIS Number	Sample Date	Lead			Lithium			Magnesium			Manganese			Molybdenum			Nickel			Phosphorus			Potassium			Silicon			Sodium		
			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
C8187; I-003	B2C469	3/18/11	3.06		0.50	11.2		2.49	3270		74.6	249		4.97	0.787	B	1.99	18.1		3.98	512		49.7	1360		398	899		1.99	301		49.7
C8187; I-003 DUP	B2C470	3/18/11	2.77		0.48	8.66		2.42	8710		72.8	270		4.84	0.420	B	1.94	67.5		3.87	453		48.4	941		387	837		1.94	276		48.4

Analysis:

	TDL	0.5	2.5	75	5	2	4	100	400	2	50
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?	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)		No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)
	RPD	9.9%		90.8%	8.1%					7.1%	8.7%
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	Yes - assess further	No - acceptable	No - acceptable	Not applicable	Not applicable

Sampling Area	Sample Number	Sample Date	Strontium			Tin			Vanadium			Zinc		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
C8187; I-003	B2C469	3/18/11	17.5		0.99	1.81	B	9.94	33.0		2.49	31.5		9.94
C8187; I-003 DUP	B2C470	3/18/11	17.9		0.97	1.42	B	9.66	32.8		2.42	28.9		9.66

Analysis:

	TDL	1	10	2.5	1
Duplicate Analysis	Both > PQL?	Yes (continue)	No-Stop (acceptable)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)		Yes (calc RPD)	Yes (calc RPD)
	RPD	2.3%		0.6%	8.6%
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	Not applicable

CALCULATION SHEET

Washington Closure Hanford

Originator P. L. Benjamin PB **Date** 11/21/2011 **Calc. No.** 0100N-CA-V0115 **Rev. No.** 0

Project 100-N Remedial Investigation **Job No.** 14655 **Checked** H. Sulloway HMS **Date** 11/21/11

Subject 100-N Remedial Investigation Relative Percent Difference (RPD) Calculations **Sheet No.** 7 of 12

1 **Split Analysis - C8188 Interval 7 Soil Samples**

2	Sampling	Sample	Sample	Potassium-40			Radium-226			Radium-228			Total beta radiostrontium			Tritium		
3	Area	Number	Date	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
4	C8188; I-007	B2C6V0	8/2/11	11.4		0.632	0.396		0.117	0.587		0.312	152		1.22	3.56		2.33
5	C8188; I-007 SPLIT	B2C6X9	8/2/11	37.9		1.22	4.83		0.212	1.53		0.505	215		0.194	4.01		0.0239

6 **Analysis:**

7	TDL		0.5	0.1	0.2	1	10
8	Split Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
9		Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)
10		RPD	*107.5%*			*34.3%*	
11		Difference > 2 TDL?	Not applicable	Yes - assess further	Yes - assess further	Not applicable	No - acceptable

CALCULATION SHEET

Washington Closure Hanford
Originator P. L. Benjamin PB
Project 100-N Remedial Investigation
Subject 100-N Remedial Investigation Relative Percent Difference (RPD) Calculations

Date 11/21/2011
Job No. 14655

Calc. No. 0100N-CA-V0115
Checked H. M. Sullaway

Rev. No. 0
Date 11/22/11
Sheet No. 8 of 12

1 **Duplicate Analysis - C8188 Interval 8 Soil Samples**

Sampling Area	Sample Number	Sample Date	Cobalt-60 pCi/g	Q	MDA	Potassium-40 pCi/g	Q	MDA	Radium-226 pCi/g	Q	MDA	Radium-228 pCi/g	Q	MDA	Thorium-228 pCi/g	Q	MDA	Thorium-232 pCi/g	Q	MDA	Total beta radiostrontium pCi/g	Q	MDA	Tritium pCi/g	Q	MDA	Uranium-233/234 pCi/g	Q	MDA	Uranium-238 pCi/g	Q	MDA
C8188; I-008	B2C6V2	8/3/11	0.164		0.039	14.7		0.338	0.466		0.068	0.694		0.160	0.566		0.056	0.694		0.160	183		0.430	8.06		2.60	0.461		0.230	0.421		0.230
C8188; I-008 DUP	B2C6W4	8/3/11	0.160		0.043	14.5		0.359	0.468		0.074	0.570		0.176	0.722		0.073	0.570		0.176	157		0.403	4.84		3.14	0.460		0.185	0.484		0.185

6 **Analysis:**

	TDL	Cobalt-60	Potassium-40	Radium-226	Radium-228	Thorium-228	Thorium-232	Total beta radiostrontium	Tritium	Uranium-233/234	Uranium-238
		0.05	0.5	0.1	0.2	1	1	1	10	1	1
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)
	RPD		1.4%					15.3%			
	Difference > 2 TDL?	No - acceptable	Not applicable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	Not applicable	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	Copper mg/kg	Q	PQL	Iron mg/kg	Q	PQL
C8188; I-008	B2C717	8/3/11	6430		4.18	2.31		0.84	50.3		0.42	0.241		0.17	0.950	B	1.67	0.149	B	0.17	10700		83.6	13.9		0.17	5.00		1.67	11.6		0.84	15000		16.7
C8188; I-008 DUP	B2C726	8/3/11	6380		4.26	2.53		0.85	52.9		0.43	0.242		0.17	0.821	B	1.70	0.158	B	0.17	10600		85.2	13.4		0.17	4.67		1.70	12.1		0.85	15300		17.0

17 **Analysis:**

	TDL	Aluminum	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron
		5	1	0.5	0.2	2	0.2	100	0.2	2	1	5
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)	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)	Yes (calc RPD)
	RPD	0.8%		5.0%				0.9%	3.7%		4.2%	2.0%
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable	No - acceptable	No - acceptable	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable

Sampling Area	HEIS Number	Sample Date	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	Sodium mg/kg	Q	PQL	Strontium mg/kg	Q	PQL
C8188; I-008	B2C717	8/3/11	3.30		0.42	7.59		2.09	4320		62.7	261		4.18	0.711	B	1.67	12.5		3.34	580		41.8	717		334	248		1.67	171		41.8	33.3		0.84
C8188; I-008 DUP	B2C726	8/3/11	3.29		0.43	7.33		2.13	3850		63.9	254		4.26	0.877	B	1.70	10.4		3.41	549		42.6	694		341	279		1.70	173		42.6	32.6		0.85

28 **Analysis:**

	TDL	Lead	Lithium	Magnesium	Manganese	Molybdenum	Nickel	Phosphorus	Potassium	Silicon	Sodium	Strontium
		0.5	2.5	75	5	2	4	100	400	2	50	1
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)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)		No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)
	RPD	0.3%		11.5%	2.7%			5.5%		11.8%		2.4%
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable	Not applicable	No - acceptable	Not applicable	No - acceptable	Not applicable

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	Nitrate mg/kg	Q	PQL	Nitrogen in Nitrite and Nitrate mg/kg	Q	PQL	Sulfate mg/kg	Q	PQL	Acenaphthene µg/kg	Q	PQL
C8188; I-008	B2C717	8/3/11	1.06	B	8.36	38.0		2.09	32.7		8.36	2.5	B	5.3	17.9		5.3	3.99		0.53	11.8		5.3	67.9		3.59
C8188; I-008 DUP	B2C726	8/3/11	1.01	B	8.52	42.5		2.13	33.6		8.52	2.5	B	5.3	15.6		5.3	3.33		0.53	10.3		5.3	12.1		3.49

39 **Analysis:**

	TDL	Tin	Vanadium	Zinc	Chloride	Nitrate	Nitrogen in Nitrite and Nitrate	Sulfate	Acenaphthene
		10	2.5	1	2	2.5	0.75	5	100
Duplicate Analysis	Both > PQL?	No-Stop (acceptable)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	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)
	RPD		11.2%	2.7%		13.7%			
	Difference > 2 TDL?	No - acceptable	Not applicable	Not applicable	No - acceptable	Not applicable	No - acceptable	No - acceptable	No - acceptable

Sampling Area	Sample Number	Sample Date	Acetone µg/kg	Q	PQL	Methylene chloride µg/kg	Q	PQL
C8188; I-008	B2C6Y0	8/3/11	9.16	J	10.5	2.85	BJ	5.23
C8188; I-008 DUP	B2C702	8/3/11	5.59	J	11.3	3.21	BJ	5.67

50 **Analysis:**

	TDL	Acetone	Methylene chloride
		20	5
Duplicate Analysis	Both > PQL?	No-Stop (acceptable)	No-Stop (acceptable)
	Both >5xTDL?		
	RPD		
	Difference > 2 TDL?	No - acceptable	No - acceptable

CALCULATION SHEET

Washington Closure Hanford

Originator P. L. Benjamin PB — **Date** 11/21/2011 — **Calc. No.** 0100N-CA-V0115 — **Rev. No.** 0

Project 100-N Remedial Investigation — **Job No.** 14655 — **Checked** H. Sulloway HWS — **Date** 11/23/11

Subject 100-N Remedial Investigation Relative Percent Difference (RPD) Calculations — **Sheet No.** 9 of 12

Split Analysis - C8188 Interval 13 Soil Samples

Sampling Area	Sample Number	Sample Date	Aluminum mg/kg	Q	PQL	Arsenic mg/kg	Q	PQL	Barium 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
C8188; I-013	B2C724	8/8/11	7190		4.64	1.85		0.93	83.6		0.46	0.121	B	0.19	3450		92.8	14.3		0.19	4.70		1.86	13.4		0.93
C8188; I-013 SPLIT	B2C6V1	8/8/11	7810		29.4	1.1	B	0.67	99.3		0.53	0.14	B	0.11	4360		26.0	14.5		0.65	8.9	B	2.0	13.9		1.5

Analysis:

	TDL		5			1			0.5			0.2			100			0.2			2			1		
Split Analysis	Both > PQL?		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)						Yes (calc RPD)			Yes (calc RPD)			No-Stop (acceptable)			Yes (calc RPD)		
	RPD		8.3%						17.2%						23.3%			1.4%						3.7%		
	Difference > 2 TDL?		Not applicable			No - acceptable			Not applicable			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	Nickel mg/kg	Q	PQL	Phosphorus mg/kg	Q	PQL	Potassium mg/kg	Q	PQL
C8188; I-013	B2C724	8/8/11	14500		18.6	3.31		0.46	8.80		2.32	3420		69.6	247		4.64	9.38		3.71	450		46.4	1040		371
C8188; I-013 SPLIT	B2C6V1	8/8/11	17300		6.2	3.5		0.36	8.3	B	1.4	3810		17.5	287		0.32	10.3		0.47	540		1.4	961	B	709

Analysis:

	TDL		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)		
	Both >5xTDL?		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		17.6%			5.6%						10.8%			15.0%											
	Difference > 2 TDL?		Not applicable			Not applicable			No - acceptable			Not applicable			Not applicable			No - acceptable			No - acceptable			No - acceptable		

Sampling Area	HEIS Number	Sample Date	Silicon mg/kg	Q	PQL	Sodium mg/kg	Q	PQL	Strontium mg/kg	Q	PQL	Vanadium mg/kg	Q	PQL	Zinc mg/kg	Q	PQL	Chloride mg/kg	Q	PQL	Nitrogen in Nitrite and Nitrate mg/kg	Q	PQL	Sulfate mg/kg	Q	PQL
C8188; I-013	B2C724	8/8/11	584		1.86	445		46.4	24.1		0.93	36.3		2.32	32.1		9.28	3.80	B	5.30	2.31		0.530	19.2		5.30
C8188; I-013 SPLIT	B2C6V1	8/8/11	4780	C	52.6	575		99.1	31.1		0.53	46.3		2.7	36.9		4.2	3.0		0.21	2.0	C	0.049	9.4		0.53

Analysis:

	TDL		2			50			1			2.5			1			2			0.75			5		
Split 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)			Yes (calc RPD)			Yes (calc RPD)			Yes (calc RPD)			Yes (calc RPD)						No-Stop (acceptable)			No-Stop (acceptable)		
	RPD		156.5%			25.5%			25.4%			24.2%			13.9%											
	Difference > 2 TDL?		Not applicable			Not applicable			Not applicable			Not applicable			Not applicable			No - acceptable			No - acceptable			No - acceptable		

Sampling Area	Sample Number	Sample Date	Bis(2-ethylhexyl) phthalate µg/kg	Q	PQL
C8188; I-013	B2C724	8/8/11	125	J	343
C8188; I-013 SPLIT	B2C6V1	8/8/11	110	J	48

Analysis:

	TDL	330
Split Analysis	Both > PQL?	No-Stop (acceptable)
	Both >5xTDL?	
	RPD	
	Difference > 2 TDL?	No - acceptable

CALCULATION SHEET

Washington Closure Hanford
Originator P. L. Benjamin PB
Project 100-N Remedial Investigation
Subject 100-N Remedial Investigation Relative Percent Difference (RPD) Calculations

Date 11/21/2011
Job No. 14655

Calc. No. 0100N-CA-V0115
Checked H. M. Sullaway HMS

Rev. No. 0
Date 11/21/12
Sheet No. 10 of 12

1 **Duplicate Analysis - C8189 Interval 11 Soil Samples**

	Sampling Area	Sample Number	Sample Date	Cobalt-60			Potassium-40			Radium-226			Radium-228			Thorium-228			Thorium-232			Total beta radiostrontium		
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
4	C8189; I-011	B2C767	8/16/11	0.169		0.067	8.74		0.647	0.345		0.128	0.456		0.329	0.524		0.150	0.456		0.329	38.7		0.316
5	C8189; I-011 DUP	B2C777	8/18/11	0.123		0.071	8.78		0.786	0.284		0.131	0.410		0.372	0.599		0.124	0.410		0.372	47.0		0.302

6 **Analysis:**

		TDL	0.05	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)
9		Both >5xTDL?	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)
10		RPD		0.5%					19.4%
11		Difference > 2 TDL?	No - acceptable	Not applicable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	Not applicable

	Sampling Area	HEIS Number	Sample Date	Aluminum			Arsenic			Barium			Beryllium			Boron			Cadmium			Calcium			Chromium			Cobalt			Copper		
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	C8189; I-011	B2C7D3	8/16/11	5420		3.94	2.17		0.79	63.9		0.39	0.179		0.16	1.29	B	1.58	0.108	B	0.16	8530		78.9	9.16		0.16	4.93		1.58	10.8		0.79
16	C8189; I-011 DUP	B2C7F3	8/16/11	6050		4.09	2.04		0.82	71.0		0.41	0.185		0.16	0.687	B	1.63	0.105	B	0.16	10500		81.7	10.6		0.16	5.81		1.63	13.6		0.82

17 **Analysis:**

		TDL	5	1	0.5	0.2	2	0.2	100	0.2	2	1
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)	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	11.0%		10.5%				20.7%	14.6%		23.0%
22		Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable	No - acceptable	No - acceptable	Not applicable	Not applicable	No - acceptable	Not applicable

	Sampling Area	HEIS Number	Sample Date	Iron			Lead			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	mg/kg	Q	PQL	mg/kg	Q	PQL
26	C8189; I-011	B2C7D3	8/16/11	18100		15.8	2.94		0.39	7.08		1.97	3130		59.2	329		3.94	0.781	B	1.58	8.62		3.16	563		39.4	839		316	182		1.58
27	C8189; I-011 DUP	B2C7F3	8/16/11	18100		16.3	3.04		0.41	6.90		2.04	3710		61.3	369		4.09	0.608	B	1.63	8.95		3.27	712		40.9	773		327	203		1.63

28 **Analysis:**

		TDL	5	0.5	2.5	75	5	2	4	100	400	2
30	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)
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)	Yes (calc RPD)
32		RPD	11.7%	3.3%		17.0%	11.5%			23.4%		10.9%
33		Difference > 2 TDL?	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable	Not applicable	No - acceptable	Not applicable

	Sampling Area	Sample Number	Sample Date	Sodium			Strontium			Tin			Vanadium			Zinc			Chloride			Nitrate			Nitrogen in Nitrite and Nitrate			Sulfate		
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	mg/kg	Q	PQL
37	C8189; I-011	B2C7D3	8/16/11	253		39.4	22.4		0.79	0.887	B	7.89	47.0		1.97	35.4		7.89	1.4	B	5.0	11.5		5.0	2.86		0.50	6.6		5.0
38	C8189; I-011 DUP	B2C7F3	8/16/11	261		40.9	26.4		0.82	0.991	B	8.17	52.5		2.04	37.2		8.17	1.1	B	5.1	13.4		5.1	3.27		0.51	5.9		5.1

39 **Analysis:**

		TDL	50	1	10	2.5	1	2	2.5	0.75	5
41	Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	No-Stop (acceptable)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	Yes (continue)	Yes (continue)	Yes (continue)
42		Both >5xTDL?	Yes (calc RPD)	Yes (calc RPD)		Yes (calc RPD)	Yes (calc RPD)		No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)
43		RPD	3.1%	16.4%		11.1%	5.0%				
44		Difference > 2 TDL?	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable	No - acceptable	No - acceptable

	Sampling Area	Sample Number	Sample Date	Methylene chloride		
47				µg/kg	Q	PQL
48	C8189; I-011	B2C795	8/16/11	4.12	BJ	5.38
49	C8189; I-011 DUP	B2C7B5	8/16/11	2.99	BJ	5.60

50 **Analysis:**

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

CALCULATION SHEET

Washington Closure Hanford
Originator P. L. Benjamin PB
Project 100-N Remedial Investigation
Subject 100-N Remedial Investigation Relative Percent Difference (RPD) Calculations

Date 11/21/2011
Job No. 14855

Calc. No. 0100N-CA-V0115
Checked H. M. Sullaway HMS

Rev. No. 0
Date 11/21/11
Sheet No. 11 of 12

1 **Duplicate Analysis - C8190 Interval 6 Soil Samples**

2 Sampling Area	Sample Number	Sample Date	Cobalt-60 pCi/g	Q	MDA	Potassium-40 pCi/g	Q	MDA	Radium-226 pCi/g	Q	MDA	Radium-228 pCi/g	Q	MDA	Thorium-228 pCi/g	Q	MDA	Thorium-232 pCi/g	Q	MDA	Total beta radiostrontium pCi/g	Q	MDA	Uranium-233/234 pCi/g	Q	MDA	Uranium-238 pCi/g	Q	MDA
4 C8190; I-006	B2C7P8	8/22/11	0.259		0.068	8.06		0.417	0.294		0.112	0.525		0.230	0.360		0.078	0.525		0.230	55.1		0.245	0.655		0.239	0.437		0.239
5 C8190; I-006 DUP	B2C803	8/22/11	0.332		0.069	7.87		0.612	0.268		0.122	0.410		0.238	0.492		0.086	0.410		0.238	46.8		0.266	0.338		0.235	0.369		0.235
6 **Analysis:**																													
7 TDL			0.05			0.5			0.1			0.2			1			1			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)		
9 Duplicate Analysis: Both >5xTDL?			Yes (calc RPD)			Yes (calc RPD)			No-Stop (acceptable)			No-Stop (acceptable)			No-Stop (acceptable)			No-Stop (acceptable)			Yes (calc RPD)			No-Stop (acceptable)			No-Stop (acceptable)		
10 Duplicate Analysis: RPD			24.7%			2.4%															16.3%								
11 Duplicate Analysis: Difference > 2 TDL?			Not applicable			Not applicable			No - acceptable			No - acceptable			No - acceptable			No - acceptable			Not applicable			No - acceptable			No - acceptable		

13 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	Iron mg/kg	Q	PQL
15 C8190; I-006	B2CKM1	8/22/11	3590		3.59	1.09		0.72	40.5		0.36	0.164		0.14	0.155		0.14	4710		71.7	4.11		0.14	8.44		1.43	13.5		0.72	23900		14.3
16 C8190; I-006 DUP	B2CKN1	8/22/11	3590		3.40	1.12		0.68	54.2		0.34	0.171		0.14	0.148		0.14	4550		67.9	3.97		0.14	7.90		1.36	13.9		0.68	21700		13.6
17 **Anaiysis:**																															
18 TDL			5			1			0.5			0.2			0.2			100			0.2			2			1			5		
19 Duplicate Analysis: Both > PQL?			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)		
20 Duplicate Analysis: Both >5xTDL?			Yes (calc RPD)			No-Stop (acceptable)			Yes (calc RPD)			No-Stop (acceptable)			No-Stop (acceptable)			Yes (calc RPD)			Yes (calc RPD)			No-Stop (acceptable)			Yes (calc RPD)			Yes (calc RPD)		
21 Duplicate Analysis: RPD			0.0%						28.9%									3.5%			3.5%						2.9%			9.6%		
22 Duplicate Analysis: Difference > 2 TDL?			Not applicable			No - acceptable			Not applicable			No - acceptable			No - acceptable			Not applicable			Not applicable			No - acceptable			Not applicable			Not applicable		

24 Sampling Area	HEIS Number	Sample Date	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	Sodium mg/kg	Q	PQL
26 C8190; I-006	B2CKM1	8/22/11	1.37		0.36	2.34		1.79	3460		53.8	266		3.59	0.975	B	1.43	5.93		2.87	1160		35.9	354		287	259		1.43	359		35.9
27 C8190; I-006 DUP	B2CKN1	8/22/11	1.38		0.34	2.29		1.70	2790		51.0	248		3.40	1.31	B	1.36	5.78		2.72	1140		34.0	381		272	224		1.36	370		34.0
28 **Analysis:**																															
29 TDL			0.5			2.5			75			5			2			4			100			400			2			50		
30 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)		
31 Duplicate Analysis: Both >5xTDL?			No-Stop (acceptable)			No-Stop (acceptable)			Yes (calc RPD)			Yes (calc RPD)						No-Stop (acceptable)			Yes (calc RPD)			No-Stop (acceptable)			Yes (calc RPD)			Yes (calc RPD)		
32 Duplicate Analysis: RPD									21.4%			7.0%									1.7%						14.5%			3.0%		
33 Duplicate Analysis: Difference > 2 TDL?			No - acceptable			No - acceptable			Not applicable			Not applicable			No - acceptable			No - acceptable			Not applicable			No - acceptable			Not applicable			Not applicable		

35 Sampling Area	Sample Number	Sample Date	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	Nitrate mg/kg	Q	PQL	Nitrogen in Nitrite and Nitrate mg/kg	Q	PQL	Sulfate mg/kg	Q	PQL	Total petroleum hydrocarbons - diesel µg/kg	Q	PQL
37 C8190; I-006	B2CKM1	8/22/11	17.6		0.72	1.32	B	7.17	71.7		1.79	46.1		7.17	3.7	B	5.1	10.3		5.1	2.46		0.51	15.2		5.1	1030	J	3360
38 C8190; I-006 DUP	B2CKN1	8/22/11	19.0		0.66	1.19	B	6.79	66.3		1.70	46.5		6.79	4.7	B	4.9	12.6		4.9	3.03		0.49	19.0		4.9	883	J	3310
39 **Analysis:**																													
40 TDL			1			10			2.5			1			2			2.5			0.75			5			5000		
41 Duplicate Analysis: Both > PQL?			Yes (continue)			No-Stop (acceptable)			Yes (continue)			Yes (continue)			No-Stop (acceptable)			Yes (continue)			Yes (continue)			Yes (continue)			No-Stop (acceptable)		
42 Duplicate Analysis: Both >5xTDL?			Yes (calc RPD)						Yes (calc RPD)			Yes (calc RPD)						No-Stop (acceptable)			No-Stop (acceptable)			No-Stop (acceptable)					
43 Duplicate Analysis: RPD			7.7%						7.8%			0.9%																	
44 Duplicate Analysis: Difference > 2 TDL?			Not applicable			No - acceptable			Not applicable			Not applicable			No - acceptable			No - acceptable			No - acceptable			No - acceptable			No - acceptable		

46 Sampling Area	Sample Number	Sample Date	Acetone µg/kg	Q	PQL	Methylene chloride µg/kg	Q	PQL	Xylenes (total) µg/kg	Q	PQL
48 C8190; I-006	B2CB66	8/22/11	5.06	J	12.2	14.0	B	6.09	3.37	J	5.08
49 C8190; I-006 DUP	B2CB76	8/22/11	5.38	J	12.2	13.6	B	6.09	3.31	J	5.08
50 **Analysis:**											
51 TDL			20			5			10		
52 Duplicate Analysis: Both > PQL?			No-Stop (acceptable)			Yes (continue)			No-Stop (acceptable)		
53 Duplicate Analysis: Both >5xTDL?						No-Stop (acceptable)					
54 Duplicate Analysis: RPD											
55 Duplicate Analysis: Difference > 2 TDL?			No - acceptable			No - acceptable			No - acceptable		

CALCULATION SHEET

Washington Closure Hanford

Originator P. L. Benjamin PB — Date 11/21/2011 — Calc. No. 0100N-CA-V0115 — Rev. No. 0

Project 100-N Remedial Investigation — Job No. 14655 — Checked H. M. Sullaway HMS — Date 11/21/11

Subject 100-N Remedial Investigation Relative Percent Difference (RPD) Calculations — Sheet No. 12 of 12

Duplicate Analysis - C8191 Interval 6 Soil Samples

Sampling Area	Sample Number	Sample Date	Potassium-40			Radium-226			Radium-228			Thorium-228			Thorium-232			Tritium		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
C8191; I-006	B2C4J9	7/6/11	12.8		0.814	0.445		0.140	0.687		0.264	0.832		0.120	0.687		0.264	5.80		5.16
C8191; I-006 DUP	B2C4K0	7/6/11	13.6		0.604	0.518		0.130	0.703		0.259	0.892		0.097	0.703		0.259	8.52		4.67

Analysis:

	TDL	Potassium-40	Radium-226	Radium-228	Thorium-228	Thorium-232	Tritium
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)
	RPD	6.1%					
	Difference > 2 TDL?	Not applicable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	No - acceptable
	TDL	0.5	0.1	0.2	1	1	10

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
C8191; I-006	B2C4L5	7/6/11	5910		3.97	1.62		0.80	60.6		0.40	0.165		0.16	0.725	B	1.59	0.076	B	0.16	5590		79.5	15.4		0.16	3.09		1.59
C8191; I-006 DUP	B2C4L6	7/6/11	6610		4.11	1.89		0.82	59.9		0.41	0.206		0.16	0.878	B	1.64	0.076	B	0.16	6680		82.2	17.9		0.16	3.31		1.64

Analysis:

	TDL	Aluminum	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt
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	11.2%		1.2%				17.8%	15.0%	
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable	No - acceptable	No - acceptable	Not applicable	Not applicable	No - acceptable
	TDL	5	1	0.5	0.2	2	0.2	100	0.2	2

Sampling Area	HEIS Number	Sample Date	Copper			Iron			Lead			Lithium			Magnesium			Manganese			Molybdenum			Nickel			Phosphorus		
			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
C8191; I-006	B2C4L5	7/6/11	8.73		0.80	11800		15.9	2.4		0.40	12.3		1.99	4110		59.6	240		3.97	1.14	B	1.59	10.7		3.18	464		39.7
C8191; I-006 DUP	B2C4L6	7/6/11	10.3		0.82	11900		16.4	2.8		0.41	8.78		2.05	3610		61.6	209		4.11	2.13		1.64	9.73		3.29	318		41.1

Analysis:

	TDL	Copper	Iron	Lead	Lithium	Magnesium	Manganese	Molybdenum	Nickel	Phosphorus
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)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)		No-Stop (acceptable)	No-Stop (acceptable)
	RPD	16.5%	0.8%			13.0%	13.8%			
	Difference > 2 TDL?	Not applicable	Not applicable	No - acceptable	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable	No - acceptable
	TDL	1	5	0.5	2.5	75	5	2	4	100

Sampling Area	HEIS Number	Sample Date	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
C8191; I-006	B2C4L5	7/6/11	1700		318	413		1.59	277		39.7	20.2		0.80	1.11	B	7.95	26.1		1.99	34.9		7.95
C8191; I-006 DUP	B2C4L6	7/6/11	1160		329	449		1.64	354		41.1	27.1		0.82	1.02	B	8.22	27.0		2.05	28.8		8.22

Analysis:

	TDL	Potassium	Silicon	Sodium	Strontium	Tin	Vanadium	Zinc
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		8.4%	24.4%	29.2%		3.4%	26.3%
	Difference > 2 TDL?	No - acceptable	Not applicable	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable
	TDL	400	2	50	1	10	2.5	1

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