

JANUARY 10, 2014

WSCF Laboratory

PO Box 650 S3-30
Richland, WA 99352



January 10, 2014

Scot Fitzgerald
CH2M-HILL PRC
PO Box 1600
Richland, WA 99352

Dear Scot Fitzgerald,

FINAL RESULT FOR SAMPLE DELIVERY GROUP WSCF131593

Reference: (1) SOW, Mod 2, #36587, Release 3
(2) MSC-SD-CD-QAPP-017, current version, Waste Sampling & Characterization Facility Quality Assurance Program Plan

This letter contains the following information for sample delivery group WSCF131593

- * Cover Sheet (Attachment 1)
- * Narrative (Attachment 2)
- * Analytical Results (Attachment 3)
- * Sample Receipt Information (Attachment 4)

Very truly yours,

Electronically signed by Joseph Hale

For Lab Manager, Dan T. Smith

WSCF Analytical Lab

(509) 373-4804

Attachments 4

CC: w/Attachments

File/LB

ATTACHMENT 1

COVER SHEET

Consisting of 2 pages
Including cover page

WSCF SAF Number Cross Reference

Group # WSCF131593
Data Deliverable Date 01/10/14

SAF #	Sample ID	Sample #	Matrix	Sampled	Received
F13-051	B2RW95	131593001	WATER	12/26/13	12/26/13
F13-051	B2RW96	131593002	WATER	12/26/13	12/26/13

ATTACHMENT 2

NARRATIVE

Consisting of 3 pages
Including cover page

Introduction

Samples were received at the WSCF laboratory as referenced on the WSCF SAF Number Cross Reference table included in the final report. The samples were analyzed for the analytes indicated on the attached copy of the chain of custody (COC) form in accordance with the *Statement of Work (SOW)*, to Contract 39818, Revision 4, "WSCF ANALYTICAL SERVICES FOR GROUNDWATER."

The narrative (Attachment 2) will address sample characteristics, analyses requested and general information in performance of the analytical methods. A Data Summary Report (Attachment 3) includes analytical results, a comment report detailing method abnormalities, tentatively identified peaks if applicable, method references, and Laboratory QC information as applicable. Copies of the chain of custody and sample receipt documentation are included as Attachment 4.

It should be noted that the attached chain of custody was not stamped "ICED" by the WSCF Laboratory Sample Custodian during sample receiving. However, based on procedure LO-090-403 form "NOTICE OF IMPROPER SAMPLE SUBMITTAL" was not submitted and was not stamped "NOT ICED". No anomaly was noted during sample receipt.

The following generic data qualifiers (i.e., B, C, D, J and U) may be applicable to this report, as appropriate.

- **B** – Sample results with a concentration greater than the MDL but less than the PQL are B flagged (applies to inorganic and wet chemical analyses), as appropriate.
- **C** – Analyte was detected in the blank and was evaluated. Affected sample results in the batch were C flagged (applies to inorganic and wet chemical analyses).
- **D** – Sample results are D flagged if dilution(s) were required, as appropriate.
- **J** – Sample results with a concentration greater than the MDL but less than the PQL are J flagged (applies to organic analyses), as appropriate.
- **B (organic analyses)** – Analyte was detected in the blank and was evaluated. Affected sample results in the batch were B flagged.
- **U** – Analyzed for but not detected above limiting criteria. Relative Percent Difference (RPD) values associated with an analyte qualified with a "U" are not applicable.
- **o** – LCS recovery outside established laboratory acceptance limits.

Analytical Methodology for Requested Analyses

Refer to *WSCF Method References Report* for a complete listing of approved analytical methods.

Inorganic Comments

ICP-AES Metals – The hold time requirements for this analysis were met. A Matrix Spike, Matrix Spike Duplicate, Blank and Laboratory Control Sample were analyzed with this delivery group. Analytical Note(s):

- Potassium and Sodium were detected in the Blank and evaluated.
- All other applicable QC controls are within the established limits.

Radiochemistry Comments

Rad Chem – The hold time requirement for this analysis was met. A Duplicate, Matrix Spike (Matrix Spikes apply only to Tritium), Blank and Laboratory Control Sample were analyzed with this delivery group. Analytical Note(s):

Tracers are used to determine chemical yield. RPD is monitored in sample duplicate and is not required for tracer recovery per SOW.

Strontium-89/90:

- All applicable QC controls are within the established limits.

Tritium:

- All applicable QC controls are within the established limits.

We certify that this data package is in compliance with the SOW, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this data package has been authorized by the Analytical Laboratory Manager (or designee) and the Client Services representative as verified by electronic signatures shown on the WSCF ANALYTICAL RESULTS REPORT.

JANUARY 10, 2014

ATTACHMENT 3

ANALYTICAL RESULTS

Consisting of 13 pages
Including cover page

JANUARY 10, 2014

WSCF ANALYTICAL RESULTS REPORT

For

CH2M Hill Plateau Remediation

PO Box 1600
Richland, WA 99352

Attention: Scot Fitzgerald

Contract # MOA-FH-CHPRC-2008
Group # WSCF131593
Report Date January 10, 2014

Analytical: Electronically signed by Joseph Hale

Client Services: Electronically signed by Heather Medley

Solid samples results that have a 'Percent Solid' test are reported on a "dry weight basis", except results of TCLP, Percent Solid, and Total Activity. If no 'Percent Solid' test is reported then the results are reported on an "as received" basis.

This information is intended for the use of the addressee only. If the reader of this report is not the intended recipient or is not authorized by the recipient to receive the report, you are hereby notified that any dissemination, distribution or copying of this report is strictly prohibited. If you have received this report in error, please notify WSCF Laboratory immediately by telephone at (509) 373-7005. Information designation of this report is the responsibility of the customer.

Batch QC List

Attention Scot Fitzgerald
 Department Inorganic

Group # WSCF131593

QC Batch	Analytical Batch	S#	Type	Sample #	Client Sample#	Original	Test
225428	225521	5	BLANK	103093	BLANK		ICP-6010 - All possible metals
225428	225521	7	LCS	103095	LCS		ICP-6010 - All possible metals
225428	225521	9	MS	103096	B2TH14(131504002MS)	131504002	ICP-6010 - All possible metals
225428	225521	10	MSD	103097	B2TH14(131504002MSD)	131504002	ICP-6010 - All possible metals
225428	225521	31	SAMPLE	131593001	B2RW95		ICP-6010 - All possible metals

Batch QC List

Attention Scot Fitzgerald
Department Radiochemistry

Group # WSCF131593

QC Batch	Analytical Batch	S#	Type	Sample #	Client Sample#	Original	Test
225427	225502	1	BLANK	103090	BLANK		Strontium 89/90 (GPC/GEA)
225427	225502	2	LCS	103091	LCS		Strontium 89/90 (GPC/GEA)
225427	225502	3	DUP	103092	B2RYN4(131583002DUP)	131583002	Strontium 89/90 (GPC/GEA)
225427	225502	6	SAMPLE	131593002	B2RW96		Strontium 89/90 (GPC/GEA)
225433	225599	1	BLANK	103101	BLANK		Tritium by LSC
225433	225599	2	LCS	103102	LCS		Tritium by LSC
225433	225599	4	DUP	103103	B2RW93(131576002DUP)	131576002	Tritium by LSC
225433	225599	5	MSPK	103104	B2RW93(131576002MSP)		Tritium by LSC
225433	225599	8	SAMPLE	131593002	B2RW96		Tritium by LSC

Method Reference

Attention Scot Fitzgerald
Department Inorganic

Group # WSCF131593

The results provided in this report were generated using the following WSCF Laboratory procedures. For your convenience, this table provides a listing of the regulatory, industry methods or HEIS methods that are referenced by each of these WSCF procedures. Please note that the most recent version of the regulatory or industry method is listed here even though WSCF procedure may reference an older version of the method. Also, a reference to a regulatory or industry method here does not necessarily indicate a verbatim implementation of that method.

LA-505-411	Elemental Analysis by ICP Atomic Emission Spectroscopy (ICP AES)		
	EPA SW-846	6010C	Inductively Coupled Plasma-Atomic Emmission Spectrometry
	HEIS	6010_METALS_ICP	Inductively Coupled Plasma-Atomic Emmission Spectrometry

Note: A complete list of WSCF analytical procedures and reference regulatory or industry methods is available online at <http://www7.rl.gov/rapidweb/AS-DOL/index.cfm>

Method Reference

Attention Scot Fitzgerald
Department Radiochemistry

Group # WSCF131593

The results provided in this report were generated using the following WSCF Laboratory procedures. For your convenience, this table provides a listing of the regulatory, industry methods or HEIS methods that are referenced by each of these WSCF procedures. Please note that the most recent version of the regulatory or industry method is listed here even though WSCF procedure may reference an older version of the method. Also, a reference to a regulatory or industry method here does not necessarily indicate a verbatim implementation of that method.

LA-218-413	Tritium By Ion Removal Using Eichrom Resin Columns (Prep)		
	N/A	PREP METHOD	
LA-220-406	Strontium-89 and 90 in Aqueous Samples by SR-SPEC Separation		
	HEIS	SRTOT_SEP_PRECIP_GPC	Strontium 89/90, by Sr-Spec Sep.
LA-508-421	Operation of the Tri-Carb Model 2500TR Liquid Scintillation Analyzer		
	HEIS	ALPHA_LSC	A/B Liquid Scintillation
	HEIS	BETA_LSC	A/B Liquid Scintillation
	HEIS	TC99_3MDSK_LSC	TC99 by Liquid Scintillation
	HEIS	TRITIUM_EIE_LSC	Tritium, by Eichrome ion exchange, LSC

Note: A complete list of WSCF analytical procedures and reference regulatory or industry methods is available online at <http://www7.rl.gov/rapidweb/AS-DOL/index.cfm>

Attention Scot Fitzgerald
 Department Inorganic

Group # WSCF131593

Sample # 131593001
 SAF# F13-051
 Sample ID B2RW95

Matrix WATER
 Sampled 12/26/13
 Received 12/26/13

Test Performed	CAS #	Method	RQ	Result	TP Err	Units	DF	MDL	PQL	Analyzed
ICPAES Prep (W)										12/31/13
ICP-6010 - All possible metals										
Iron	7439-89-6	LA-505-411	U	<40		ug/L	1	40	50	01/07/14
Magnesium	7439-95-4	LA-505-411		10100		ug/L	1	60	750	01/07/14
Manganese	7439-96-5	LA-505-411		204		ug/L	1	4.0	5.0	01/07/14
Potassium	7440-09-7	LA-505-411	C	6650		ug/L	1	250	4000	01/07/14
Sodium	7440-23-5	LA-505-411		12100		ug/L	1	100	500	01/07/14
Chromium	7440-47-3	LA-505-411	U	<5.0		ug/L	1	5.0	10	01/07/14
Cobalt	7440-48-4	LA-505-411	U	<4.0		ug/L	1	4.0	20	01/07/14
Calcium	7440-70-2	LA-505-411		40700		ug/L	1	50	1000	01/07/14

MDL = Minimum Detection Limit
 RQ = Result Qualifier
 TP Err = Total Propagated Error
 DF = Dilution Factor
 + - Indicates more than nine qualifier

B - Analyte < the PQL(or EQL)but >= the IDL/MDL(Inorganic)
 C - Analyte was found in the Associated Blank. (Inorganic)
 D - Analyte was reported at a secondary dilution factor.
 E - Analyte is an estimate, see comment section.
 N - MS and/or MSD recovery outside control limits.

U - Analyzed for but not detected above limiting criteria.
 X,Y or Z - See comment detail and/or narrative.
 PQL is equivalent to Estimated Quantitation Limit (EQL)
 o - LCS recovery outside established laboratory acceptance limits.
 o - LCS recovery outside established laboratory acceptance limits.

Attention Scot Fitzgerald
 Department Radiochemistry

Group # WSCF131593

Sample # 131593002
 SAF# F13-051
 Sample ID B2RW96

Matrix WATER
 Sampled 12/26/13
 Received 12/26/13

Test Performed	CAS #	Method	RQ	Result	TP Err	Units	DF	MDL	PQL	Analyzed
Strontium 89/90 WATER/LIQUID PREP										12/30/13
Strontium 89/90 (GPC/GEA)										
Strontium-89_90	SR-RAD	LA-220-406	U	1.2	.88	pCi/L	1	1.3		01/03/14
Tritium by LSC EICHROM WA/LIQ PREP										12/31/13
Tritium by LSC										
Tritium	10028-17-8	LA-508-421		8900	1800	pCi/L	1	270		01/01/14

MDL = Minimum Detection Limit
 RQ = Result Qualifier
 TP Err = Total Propagated Error
 DF = Dilution Factor
 + - Indicates more than nine qualifier

B - Analyte was detected in both the BLANK and SAMPLE
 U - Analyzed for but not detected above limiting criteria.
 N - Spike Recovery is Outside Control Limits.
 X,Y or Z - See comment detail and/or narrative.
 PQL is equivalent to Estimated Quantitation Limit (EQL)

o - LCS recovery outside established laboratory acceptance limits.

Quality Control Report

Attention Scot Fitzgerald
Department Radiochemistry

Group # WSCF131593

Analytical Batch 225502 (QC Batch: 225427)
Associated Samples 131593002

Test Strontium 89/90 (GPC/GEA)

Analyte	CAS #	Original Found	QC Found	Units	% Recov	Limits	RPD	RPD Limit	RQ	Analyzed
BLANK										
			QC Sample #103090							
Strontium-89_90	SR-RAD		-0.18	pCi/L					U	01/03/14
LCS										
			QC Sample #103091							
Strontium-89_90	SR-RAD		86	pCi/L	93.2	80 - 120				01/03/14
DUP										
			QC Sample #103092							
			Original 131583002							
Strontium-89_90	SR-RAD		1.0	pCi/L			10.30	20	U	01/03/14

* - QC result out of range

n/a - Not Applicable

Quality Control Report

Attention Scot Fitzgerald
Department Inorganic

Group # WSCF131593

Analytical Batch 225521 (QC Batch: 225428)
Associated Samples 131593001

Test ICP-6010 - All possible metals

Analyte	CAS #	Original Found	QC Found	Units	% Recov	Limits	RPD	RPD Limit	RQ	Analyzed
BLANK		QC Sample #103093								
Iron	7439-89-6	<40		ug/L					U	01/07/14
Magnesium	7439-95-4	<60		ug/L					U	01/07/14
Manganese	7439-96-5	<4.0		ug/L					U	01/07/14
Potassium	7440-09-7	497		ug/L					B	01/07/14
Sodium	7440-23-5	194		ug/L					B	01/07/14
Chromium	7440-47-3	<5.0		ug/L					U	01/07/14
Cobalt	7440-48-4	<4.0		ug/L					U	01/07/14
Calcium	7440-70-2	<50		ug/L					U	01/07/14
LCS		QC Sample #103095								
Iron	7439-89-6	995		ug/L	99.5	80 - 120				01/07/14
Magnesium	7439-95-4	9970		ug/L	99.7	80 - 120				01/07/14
Manganese	7439-96-5	1010		ug/L	100.7	80 - 120				01/07/14
Potassium	7440-09-7	10600		ug/L	106	80 - 120				01/07/14
Sodium	7440-23-5	10300		ug/L	102.8	80 - 120				01/07/14
Chromium	7440-47-3	991		ug/L	99.1	80 - 120				01/07/14
Cobalt	7440-48-4	966		ug/L	96.6	80 - 120				01/07/14

* - QC result out of range

n/a - Not Applicable

Quality Control Report

Attention Scot Fitzgerald
 Department Inorganic

Group # WSCF131593

Analyte	CAS #	Original Found	QC Found	Units	% Recov	Limits	RPD	RPD Limit	RQ	Analyzed
Calcium	7440-70-2		20300	ug/L	101.6	80 - 120				01/07/14
MS			QC Sample #103096							
			Original 131504002							
Iron	7439-89-6		1000	ug/L	100.5	75 - 125				01/07/14
Magnesium	7439-95-4		10300	ug/L	103.4	75 - 125				01/07/14
Manganese	7439-96-5		1020	ug/L	102.2	75 - 125				01/07/14
Potassium	7440-09-7		10300	ug/L	103.4	75 - 125				01/07/14
Sodium	7440-23-5		10400	ug/L	104.2	75 - 125				01/07/14
Chromium	7440-47-3		1010	ug/L	101.3	75 - 125				01/07/14
Cobalt	7440-48-4		999	ug/L	99.9	75 - 125				01/07/14
Calcium	7440-70-2		21200	ug/L	106	75 - 125				01/07/14
MSD			QC Sample #103097							
			Original 131504002						Paired 103096	
Iron	7439-89-6		995	ug/L	99.5	75 - 125	1.00	20		01/07/14
Magnesium	7439-95-4		10200	ug/L	102.3	75 - 125	0.70	20		01/07/14
Manganese	7439-96-5		1010	ug/L	100.7	75 - 125	1.50	20		01/07/14
Potassium	7440-09-7		10300	ug/L	102.6	75 - 125	0.40	20		01/07/14
Sodium	7440-23-5		10300	ug/L	103	75 - 125	0.80	20		01/07/14
Chromium	7440-47-3		995	ug/L	99.5	75 - 125	1.80	20		01/07/14
Cobalt	7440-48-4		978	ug/L	97.8	75 - 125	2.10	20		01/07/14
Calcium	7440-70-2		20800	ug/L	103.8	75 - 125	1.10	20		01/07/14

* - QC result out of range

n/a - Not Applicable

Quality Control Report

Attention Scot Fitzgerald
Department Radiochemistry

Group # WSCF131593

Analytical Batch 225599 (QC Batch: 225433)
Associated Samples 131593002

Test Tritium by LSC

Analyte	CAS #	Original Found	QC Found	Units	% Recov	Limits	RPD	RPD Limit	RQ	Analyzed
BLANK										
			QC Sample #103101							
Tritium LCS	10028-17-8		47	pCi/L					U	01/01/14
			QC Sample #103102							
Tritium DUP	10028-17-8		3300	pCi/L	100.2	80 - 120				01/01/14
			QC Sample #103103							
			Original 131576002							
Tritium MSPK	10028-17-8		2400	pCi/L			8.10	20		01/01/14
			QC Sample #103104							
Tritium	10028-17-8		22000	pCi/L	94.2	75 - 125				01/01/14

* - QC result out of range

n/a - Not Applicable

Quality Control Report

Attention Scot Fitzgerald
Department Radiochemistry

Group # WSCF131593

Analytical Batch 225502 (QC Batch: 225427)
Associated Samples 131593002

Test Strontium 89/90 (GPC/GEA)

Analyte	CAS #	Original Found	QC Found	Units	% Recov	Limits	RPD	RPD Limit	RQ	Analyzed
BLANK										
			QC Sample #103090							
Strontium Nitrate	10042-76-9			mg	57.9	25 - 105				01/03/14
LCS			QC Sample #103091							
Strontium Nitrate	10042-76-9			mg	73.6	25 - 105				01/03/14
DUP			QC Sample #103092							
			Original 131583002							
Strontium Nitrate	10042-76-9			mg	71.1	25 - 105	n/a			01/03/14
SAMPLE			Sample #131593002							
Strontium Nitrate	10042-76-9			mg	69.4	25 - 105				01/03/14

* - QC result out of range

n/a - Not Applicable

ATTACHMENT4

SAMPLE RECEIPT

Consisting of 4 pages
Including cover page

Waste Sampling and Characterization Facility
P.O. Box 650 S3-30, Richland WA 99352
Phone: (509) 373-7005/FAX: (509) 372-0456

ACKNOWLEDGEMENT OF SAMPLES RECEIVED

WSCF Laboratory

PO Box 650 S3-30
 Richland, WA 99352

ATTN: Scot Fitzgerald

Customer Code: CHPRC
CA CN: 404401
Work Order #: 131593
Customer Work ID: F13-051-196
Due Date: 01/10/2014

The following samples were received from you on 12/26/2013 1:40:00 PM. They have been scheduled for the tests listed below each sample. If this information is incorrect, please contact WSCF Client Services. Thank you for using Waste Sampling and Characterization Facility.

Sample #	Sample ID	Matrix	Collected	Received
131593001	B2RW95	WATER	12/26/2013 12:41	12/26/2013 13:40
Procedure		Compound List		
ICP-6010 - All possible metals		Fe, Mg, Mn, Na, Cr, Co, Ca		
Sample #	Sample ID	Matrix	Collected	Received
131593002	B2RW96	WATER	12/26/2013 12:41	12/26/2013 13:40
Procedure		Compound List		
Strontium 89/90 (GPC/GEA)		SR89/90		
Tritium by LSC		H3		

Chain of Custody

CH2MHill Plateau Remediation Company		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST	
COLLECTOR <i>Bretherton Kavan</i>	COMPANY CONTACT TODAK, D	TELEPHONE NO. 376-6427	PROJECT COORDINATOR TODAK, D
SAMPLING LOCATION CB931, 1-008	PROJECT DESIGNATION Sampling and Analysis of New Wells in 100-9C Area - Water	FIELD LOGBOOK NO. HNF-N-50728/5-	SAF NO. H12-051
ICE CHEST NO.	ACTUAL SAMPLE DEPTH 160.3	COA 303220E510	METHOD OF SHIPMENT GOVERNMENT VEHICLE ORIGINAL
SHIPPED TO Waste Sampling & Characterization	OPPOSITE PROPERTY NO. N/A	BILL OF LADING/AIR BILL NO. N/A	PRICE CODE 7C
			AIR QUALITY <input type="checkbox"/>
			DATA TURNAROUND 15 Days / 15

MATRIX*	POSSIBLE SAMPLE HAZARDS/ REMARKS **Contains Radicative Material at concentrations that may or may not be regulated for transportation per 49 CFR/141A Dangerous Goods Regulations but are not releasable per DOT Order 459 1.**	PRESERVATION H2O3 to pH <2	HOLDING TIME 6 Months	TYPE OF CONTAINER G/F	NO. OF CONTAINER(S) 1	VOLUME 1L	SAMPLE ANALYSIS SR/OT SEP PR ECD GPC COMMON	SAMPLE DATE 12-26-13	SAMPLE TIME 12:41	DATE/TIME
H2RW96	WATER									

Filter

CHAIN OF POSSESSION		SIGN/ PRINT NAMES		SPECIAL INSTRUCTIONS	
REINQUISHED BY/REMOVED FROM <i>Elvira</i>	DATE/TIME 12-26-13 13:40	RECEIVED BY/STORDED IN <i>CHAS</i>	DATE/TIME 12-26-13 13:40	** The CACN for WSCF Analytical is 404401.□** The 100 Area S&GRP Characterization and Monitoring Sampling and Analysis GKI applies to this SAF. TRVL-13-105	
REINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORDED IN	DATE/TIME	TRVL-13-105	
REINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORDED IN	DATE/TIME		
REINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORDED IN	DATE/TIME		
REINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORDED IN	DATE/TIME		
LABORATORY SECTION	RECEIVED BY	TITLE	DATE/TIME	DISPOSED BY	DATE/TIME
FINAL SAMPLE DISPOSITION	DISPOSAL METHOD				