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Data Validation Report for CH2M Hill Plateau Remediation Company

VSR11-028
Project 100 Area RI/FS

Chemical & Radiochemical Validation - Level C

Validation Performed By: Carl Schroeder Date: 2-24-2011

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Date: 24 February 2011
 To: CH2M Hill (technical representative)
 From: Analytical Quality Associates, Inc.
 Project: 100 Area RI/FS
 Subject: Inorganics - Sample Data Group (SDG) WSCF102846

INTRODUCTION

This memorandum presents the results of data validation for SDG WSCF102846 prepared by WSCF Analytical Laboratories. A list of samples validated along with the analytical methods is provided in the following table.

Sample ID	Sample Date	Media	Validation Level	Analytical Methods
B26J55	11/05/2010	Soil	C	200.8
B26J56	11/05/2010	Soil	C	200.8

Data validation was conducted in accordance with the CHPRC validation statement of work and the Sampling and Analysis Plan for the 100-BC-1, 100-BC-2, and 100-BC-5 Operable Units Remedial Investigation/Feasibility Study, DOE/RL-2009-44, Rev. 0 (SAP). Appendices 1 through 6 provide the following information as indicated below:

- Appendix 1. Glossary of Data Reporting Qualifiers
- Appendix 2. Summary of Data Qualification
- Appendix 3. Annotated Laboratory Reports
- Appendix 4. Laboratory Narrative and Chain-of-Custody Documentation
- Appendix 5. Data Validation Supporting Documentation
- Appendix 6. Additional Documentation Requested By Client

DATA QUALITY OBJECTIVES

- **Holding Times and Sample Preservation**

Holding times are calculated from Chain-of-Custody forms to determine the validity of the results. The holding time requirement for ICP metals are analysis within 180 days of sample collection, and the holding time requirement for mercury is analysis within 28 days of sample collection. Sample preservation requires chilling to 4 degrees Celsius.

The samples were analyzed within the prescribed holding time and properly preserved.

- **Blanks**

The blank data results are reviewed to assess the extent of contamination introduced through sampling, sample preparation, and analysis.

Laboratory Blanks

All laboratory blank results were acceptable with the following exceptions. The Be and V laboratory blank results were > the method detection limits (MDLs) but < the reporting limits (RLs). The Be results for samples B26J55 and B26J56 were detects < the RLs and should be qualified as non-detects at the RLs (0.61 and 0.58 mg/kg, respectively) and flagged “U.” The V results for samples B26J55 and B26J56 were well above the RLs and should not be qualified.

Trip Blanks

No trip blanks were submitted for validation.

Field Blanks

No field blanks were submitted for validation.

Equipment Blanks

No equipment blanks were submitted for validation.

- **Accuracy**

Accuracy is evaluated by reviewing matrix spike sample results, laboratory control sample results, and ICP-AES interference check sample results. According to the SAP, the matrix spike sample and laboratory control sample accuracy limits are 70% to 130%. The limits for reported analytes not listed in the SAP are specified by the DV procedure. The interference check sample limits are ones specified by the DV procedure.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Samples

All MS/MSD recoveries were acceptable with the following exception. The MSD recovery for Mn was > the upper acceptance limit. The Mn results for samples B26J55 and B26J56 were detects and should be qualified as estimates and flagged “J+.”

Laboratory Control Samples (LCSs)

All LCS recoveries were acceptable with the following exception. The LCS recovery for Sb was > the upper acceptance limit. The Sb results for samples B26J55 and B26J56 were non-detects and should not be qualified.

ICP-AES Interference Check Samples (ICSs)

ICS data was not included in the data package. Sample results should not be qualified based on this.

- **Precision**

Precision is evaluated by reviewing MS/MSD results, field duplicate sample results, field split sample results, and ICP serial dilution results. These QC results provide information on the laboratory reproducibility and whether sampling activities are adequate to acquire consistent sample results. According to the SAP, the relative percent difference (RPD) limits are $\pm 30\%$. The limits for reported analytes not listed in the SAP are specified by the DV procedure. When duplicate RPDs exceed the limits and have associated results $< 5X$ the SAP required detection limits (or $< 5X$ the laboratory reporting limits for analytes not listed in the SAP) with differences $< 2X$ the required detection limits no precision infraction occurred. The serial dilution limits are ones specified by the DV procedure.

MS/MSD Samples

All MS/MSD RPD values were acceptable.

Field Duplicate Samples

No field duplicates were submitted for validation.

Field Split Samples

No field splits were submitted for validation.

ICP Serial Dilution Samples

ICS serial dilution data was not included in the data package. Sample results should not be qualified based on this.

- **Detection Limits**

Reported MDLs are compared against the contractually required detection limits (CRDLs) to ensure that laboratory detection limits meet the required criteria.

All reported sample MDLs with associated non-detected sample results were below the CRDLs.

- **Completeness**

SDG WSCF102846 was submitted for validation and verified for completeness. Completeness is based on the percentage of data determined to be valid (i.e., not rejected). The completion percentage was 100%.

MAJOR DEFICIENCIES

None found.

MINOR DEFICIENCIES

Minor deficiencies leading to qualification of sample results as non-detects or estimates were due to a laboratory blank infraction for Be and a MSD recovery infraction for Mn. See the table in Appendix 2 for a listing of all affected sample results.

REFERENCES

GRP-GD-003, Rev. 0, Change 0, *Data Validation for Chemical Analyses*, August 2010.

DOE/RL-2009-44, Rev. 0, *Sampling and Analysis Plan for the 100-BC-1, 100-BC-2, and 100-BC-5 Operable Units Remedial Investigation/Feasibility Study*, March 2010

Appendix 1

Glossary of Data Reporting Qualifiers

Qualifiers that may be applied by data validators in compliance with the CHPRC statement of work are as follows:

- **U** — The constituent was analyzed for, but was not detected. The data should be considered usable for decision-making purposes.
- **UJ** — The constituent was analyzed for and was not detected. Due to a quality control deficiency identified during data validation the value reported may not accurately reflect the RL. The data should be considered usable for decision-making purposes.
- **J** — Indicates the constituent was analyzed for and detected. The associated value is estimated due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.
- **J+** — Indicates the constituent was analyzed for and detected. The associated value is estimated with a suspected positive bias due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.
- **J-** — Indicates the constituent was analyzed for and detected. The associated value is estimated with a suspected negative bias due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.
- **N** — The analysis indicates the presence of an analyte that has been tentatively identified.
- **NJ** — The analysis indicates the presence of an analyte that has been tentatively identified and the associated numerical value represents its approximate concentration.
- **NJ+** — The analysis indicates the presence of an analyte that has been tentatively identified. The associated value is estimated with a suspected positive bias due to a quality control deficiency identified during data validation.
- **NJ-** — The analysis indicates the presence of an analyte that has been tentatively identified. The associated value is estimated with a suspected negative bias due to a quality control deficiency identified during data validation.
- **UR** — Indicates the constituent was analyzed for and not detected; however, due to an identified quality control deficiency the data should be considered unusable for decision-making purposes.
- **R** — Indicates the constituent was analyzed for and detected; however, due to an identified quality control deficiency the data should be considered unusable for decision-making purposes.

Appendix 2
Summary of Data Qualification

Inorganic Data Qualification Summary			
SDG: WSCF102846	Reviewer: AQA	Project: 100 Area RI/FS	Page 1 of 1
Analyte(s)	Qualifier	Samples Affected	Reason
Be	0.61U	B26J55	Laboratory blank contamination
Be	0.58U	B26J56	Laboratory blank contamination
Mn	J+	B26J55, B26J56	High MSD recovery

Comments: None

Appendix 3

Annotated Laboratory Reports

WSCF Analytical Results Report

Group # WSCF102846

Attention Michael Neely
 Department Inorganic

Sample # 102846001 Matrix SOIL
 SAF# F10-225 Sampled 11/05/10
 Sample ID B26J55 Received 11/05/10

Test Performed	CAS #	Method	RQ	Result	TP Err	Units	DF	MDL	PQL	Analyzed
Cr(VI) Prep										11/11/10
Cr(VI)										11/11/10
Hexavalent Chromium	18540-29-9	LA-265-403	UN	<0.12		ug/g	1	0.12	0.61	11/11/10
ICPMS Prep										
ICP-MS										
Aluminum	7429-90-5	LA-505-412		5310		mg/kg	1	6.1	120	11/10/10
Manganese	J+ 7439-96-5	LA-505-412	N	166		mg/kg	1	0.12	1.2	11/10/10
Nickel	7440-02-0	LA-505-412		12.4		mg/kg	1	0.25	2.5	11/10/10
Silver	7440-22-4	LA-505-412	U	<0.12		mg/kg	1	0.12	1.2	11/10/10
Antimony	7440-36-0	LA-505-412	U	<0.37		mg/kg	1	0.37	3.7	11/10/10
Barium	7440-39-3	LA-505-412		48.6		mg/kg	1	0.25	2.5	11/10/10
Beryllium	7440-41-7	LA-505-412	BC	0.142		mg/kg	1	0.12	0.61	11/10/10
Cadmium	7440-43-9	LA-505-412	U	<0.12		mg/kg	1	0.12	1.2	11/10/10
Chromium	7440-47-3	LA-505-412		12.0		mg/kg	1	0.61	6.1	11/10/10
Cobalt	7440-48-4	LA-505-412		5.71		mg/kg	1	0.12	0.61	11/10/10
Copper	7440-50-8	LA-505-412		8.45		mg/kg	1	0.12	1.2	11/10/10
Vanadium	7440-62-2	LA-505-412		24.7		mg/kg	1	0.25	2.5	11/10/10
Zinc	7440-66-6	LA-505-412		27.6		mg/kg	1	0.98	6.1	11/10/10
Lead	7439-92-1	LA-505-412		2.89		mg/kg	1	0.12	1.2	11/10/10

MDL = Minimum Detection B - Analyte < the PQL (or EQL) but >= the IDL/MDL (Inorganic)
 RQ = Result Qualifier C - Analyte was found in the Associated Blank. (Inorganic)
 TP Err = Total Propagated D - Analyte was reported at a secondary dilution factor.
 DF = Dilution Factor E - Analyte is an estimate, see comment section.
 + - Indicates more than nine qualifier 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)

WSCF Analytical Results Report

Attention Michael Neely **Group #** WSCF102846
Department Inorganic

Sample #	102846001	Matrix	SOIL
SAF#	F10-225	Sampled	11/05/10
Sample ID	B26J55	Received	11/05/10

Test Performed	CAS #	Method	RQ	Result	TP Err	Units	DF	MDL	PQL	Analyzed
Mercury	7439-97-6	LA-505-412	U	<0.061		mg/kg	1	0.061	0.25	11/10/10
Thallium	7440-28-0	LA-505-412	U	<0.12		mg/kg	1	0.12	0.61	11/10/10
Arsenic	7440-38-2	LA-505-412	B	1.01		mg/kg	1	0.49	4.9	11/10/10
Selenium	7782-49-2	LA-505-412	B	0.592		mg/kg	1	0.37	3.7	11/10/10

MDL = Minimum Detection B - Analyte < the PQL (or EQL) but >= the IDL/MDL (Inorganic)
RQ = Result Qualifier C - Analyte was found in the Associated Blank. (Inorganic)
TP Err = Total Propagated D - Analyte was reported at a secondary dilution factor.
DF = Dilution Factor E - Analyte is an estimate, see comment section.
+ - Indicates more than nine qualifier 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)

WSCF Analytical Results Report

Group # WSCF102846

Attention Michael Neely
 Department Inorganic

Sample # 102846002 Matrix SOIL
 SAF# F10-225 Sampled 11/05/10
 Sample ID B26J56 Received 11/05/10

Test Performed	CAS #	Method	RQ	Result	TP Err	Units	DF	MDL	PQL	Analyzed
Cr(VI) Prep										11/11/10
Cr(VI)										11/11/10
Hexavalent chromium	18540-29-9	LA-265-403	UN	<0.12		ug/g	1	0.12	0.61	11/11/10
ICPMS Prep										
ICP-MS										
Aluminum	7429-90-5	LA-505-412		4120		mg/kg	1	5.8	120	11/10/10
Manganese	J+ 7439-96-5	LA-505-412	N	134		mg/kg	1	0.12	1.2	11/10/10
Nickel	7440-02-0	LA-505-412		10.3		mg/kg	1	0.23	2.3	11/10/10
Silver	7440-22-4	LA-505-412	U	<0.12		mg/kg	1	0.12	1.2	11/10/10
Antimony	7440-36-0	LA-505-412	U	<0.35		mg/kg	1	0.35	3.5	11/10/10
Barium	7440-39-3	LA-505-412		29.6		mg/kg	1	0.23	2.3	11/10/10
Beryllium	7440-41-7	LA-505-412	BC	0.345		mg/kg	1	0.12	0.58	11/10/10
Cadmium	7440-43-9	LA-505-412	B	0.198		mg/kg	1	0.12	1.2	11/10/10
Chromium	7440-47-3	LA-505-412		12.0		mg/kg	1	0.58	5.8	11/10/10
Cobalt	7440-48-4	LA-505-412		5.12		mg/kg	1	0.12	0.58	11/10/10
Copper	7440-50-8	LA-505-412		5.83		mg/kg	1	0.12	1.2	11/10/10
Vanadium	7440-62-2	LA-505-412		20.8		mg/kg	1	0.23	2.3	11/10/10
Zinc	7440-66-6	LA-505-412		22.7		mg/kg	1	0.92	5.8	11/10/10
Lead	7439-92-1	LA-505-412		2.07		mg/kg	1	0.12	1.2	11/10/10

MDL = Minimum Detection B - Analyte < the PQL (or EQL) but >= the IDL/MDL (Inorganic)
 RQ = Result Qualifier C - Analyte was found in the Associated Blank. (Inorganic)
 TP Err = Total Propagated D - Analyte was reported at a secondary dilution factor.
 DF = Dilution Factor E - Analyte is an estimate, see comment section.
 + - Indicates more than nine qualifier 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)

WSCF Analytical Results Report

Group # WSCF102846

Attention Michael Neely
Department Inorganic

Sample # 102846002
SAF# F10-225
Sample ID B26J56
Matrix SOIL
Sampled 11/05/10
Received 11/05/10

Test Performed	CAS #	Method	RQ	Result	TP Err	Units	DF	MDL	PQL	Analyzed
Mercury	7439-97-6	LA-505-412	U	<0.058		mg/kg	1	0.058	0.23	11/10/10
Thallium	7440-28-0	LA-505-412	U	<0.12		mg/kg	1	0.12	0.58	11/10/10
Arsenic	7440-38-2	LA-505-412	B	0.648		mg/kg	1	0.46	4.6	11/10/10
Selenium	7782-49-2	LA-505-412	U	<0.35		mg/kg	1	0.35	3.5	11/10/10

MDL = Minimum Detection
RQ = Result Qualifier
TP Err = Total Propagated
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)

Appendix 4

Laboratory Narrative and Chain-of-Custody Documentation

Introduction

Two (2) S&GRP samples were received at the WSCF Laboratory on November 5, 2010. 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), Modification No. 2 to Agreement 36587, Release 3, "FH 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, D, U and J) 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.
- **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.
- **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.

Analytical Methodology for Requested Analyses

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

Inorganic Comments

ICP-MS 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.

Batch QC 169673 analyzed on sample# B28P43 (102784009)

- Manganese – Matrix Spike Duplicate recovery exceeded established laboratory limits. Affected sample results in this batch were N flagged.

Narrative

Attachment 2
Narrative
WSCF102846

- Beryllium and Vanadium were detected in the Blank. Affected sample results in this batch were "C" Flagged.
- Aluminum – exceeded spiking levels by a factor of 4. Spike recoveries and associated RPDs are not valid.

All other QC controls are within the established limits.

Hexavalent Chromium – The hold time requirement for this analysis was met. A Duplicate, Matrix Spike, Blank, Laboratory Control Sample, Post Spike and Insoluble Matrix Spike were analyzed with this delivery group. Analytical Note(s):

Batch QC 169809 analyzed on sample# B267D7 (102816001)

- Percent Recoveries for the Matrix Spike and Post Spike fell outside established laboratory control limits. All affected samples were "N" flagged.
- The Duplicate is flagged for RPD recovery outside established laboratory control limits. RPD is calculated on measured values and is not applicable for a result qualified with a "U".

All other QC controls are within the established limits.

Radiochemistry Comments

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

Gamma Energy Analysis:

Batch QC 169636 analyzed on sample# B29B72 (102841001)

- Potassium-40 and Radium-226 activity was detected in the blank. These two isotopes represent NORM (Naturally Occurring Radioactive Material); therefore, no flags were issued.
- Duplicate Relative Percent Difference(s) (RPD) did not meet the established laboratory limits. Duplicate Relative Percent Difference (RPD) does not apply to results less than 5X the minimum detectable activity. No flags issued.

All other QC controls are within the established limits.

Strontium-89/90:

Batch QC 169743 analyzed on sample# B28754 (102846001)

All QC controls are within the established limits.

Attachment 2
Narrative
WSCF102846

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.

CH2MHill Plateau Remediation Company

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

F10-225-013 PAGE 1 OF 1

COLLECTOR: **DAILEY**

COMPANY CONTACT: DYEKMAN, DL

TELEPHONE NO.: 375-1688

PROJECT COORDINATOR: DYEKMAN, DL

PRICE CODE: BN

DATA TURNAROUND: 45 Days / 45 Days

SAMPLING LOCATION: C7784 (199-B2-16); Bottom of Aquifer

PROJECT DESIGNATION: 100 Area Remedial Investigation/Feasibility Analysis - 100-BC Soils

SAF NO.: F10-225

ICE CHEST NO.: N/A

FIELD LOGBOOK NO.: HNF-N-588-3/72

ACTUAL SAMPLE DEPTH: 148.1'

COA: 300078ES10

METHOD OF SHIPMENT: GOVERNMENT VEHICLE

SHIPPED TO: Waste Sampling & Characterization

OFFSITE PROPERTY NO.: N/A

BILL OF LADING/AIR BILL NO.: N/A

MATRIX*	POSSIBLE SAMPLE HAZARDS/ REMARKS	PRESERVATION	Cock-4C	Cock-4C	None	None
A=Air DL=Drum L=Liquid DS=Drum S=Solids L=Liquid O=Oil S=Soil SE=Settlement T=Tree V=Vegetation W=Water WI=Wipe X=Other	Contains Radioactive Material at concentrations that may or may not be regulated for transportation per 49 CFR / IATA Dangerous Goods Regulations but are not releasable per DOE Order 5400.5 (1990/1993)		10 Days	5 Months	6 Months	6 Months
		HOLDING TIME	G/P	G/P	Square Bottle - Poly	G/P
		TYPE OF CONTAINER	1	1	1	1
		NO. OF CONTAINER(S)	60ml	250ul	300u	60ul
		VOLUME	Chromium Hex - 7150	U/245 - 200A 100 Area R4952	Gamma Spectrometry 100 Area R1751	Structure: B/N - Total Sr
		SAMPLE ANALYSIS				

SPECIAL HANDLING AND/OR STORAGE: 102846

SAMPLE NO.	MATRIX*	SAMPLE DATE	SAMPLE TIME				
B26J55	SOIL	11-5-10	1300	✓	✓	✓	✓

CHAIN OF POSSESSION

SIGN/ PRINT NAMES

SPECIAL INSTRUCTIONS

RELINQUISHED BY/REMOVED FROM: *JR BAILEY* DATE/TIME: 11-5-10 1535

RECEIVED BY/STORED IN: *JA FRAZIER* DATE/TIME: 11-5-10 1535

RELINQUISHED BY/REMOVED FROM: _____ DATE/TIME: _____

RECEIVED BY/STORED IN: _____ DATE/TIME: _____

RELINQUISHED BY/REMOVED FROM: _____ DATE/TIME: _____

RECEIVED BY/STORED IN: _____ DATE/TIME: _____

RELINQUISHED BY/REMOVED FROM: _____ DATE/TIME: _____

RECEIVED BY/STORED IN: _____ DATE/TIME: _____

RELINQUISHED BY/REMOVED FROM: _____ DATE/TIME: _____

RECEIVED BY/STORED IN: _____ DATE/TIME: _____

LABORATORY SECTION: _____ RECEIVED BY: _____ TITLE: _____ DATE/TIME: _____

FINAL SAMPLE DISPOSITION: _____ DISPOSAL METHOD: _____ DISPOSED BY: _____ DATE/TIME: _____

ORIGINAL

Friday, November 05, 2010 7:44:58 PM
Page 2 of 3



Appendix 5

Data Validation Supporting Documentation

Data Validation for Chemical Analyses

Published Date: 08/16/10

Effective Date: 08/16/10

VALIDATION LEVEL:	A	B	<input checked="" type="radio"/> C	D	E
PROJECT: 100 Area RI/FS			DATA PACKAGE: VSR11-028		
VALIDATOR: Carl Schloesslin		LAB: WSCF		DATE: 2-24-2011	
			SDG: WSCF102846		
ANALYSES PERFORMED					
SW-846/ICP	SW-846/GFAA	SW-846/Hg		EPA 200.8 X	
SAMPLES/MATRIX Soil samples B26J55, B26J56					

1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE

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

Comments: None

Data Validation for Chemical Analyses

Published Date: 08/16/10

Effective Date: 08/16/10

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

Initial calibrations performed on all instruments?	Yes	No	N/A
Initial calibrations acceptable?	Yes	No	N/A
ICP interference checks acceptable?	Yes	No	N/A
ICV and CCV checks performed on all instruments?	Yes	No	N/A
ICV and CCV checks acceptable?	Yes	No	N/A
Standards traceable?	Yes	No	N/A
Standards expired?	Yes	No	N/A
Calculation check acceptable?	Yes	No	N/A

Comments:

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

ICB and CCB checks performed for all applicable analyses? (Levels D, E)	Yes	No	N/A
ICB and CCB results acceptable? (Levels D, E)	Yes	No	N/A
Laboratory blanks analyzed?	Yes	No	N/A
Laboratory blank results acceptable?	Yes	No	N/A
Field blanks analyzed? (Levels C, D, E)	Yes	No	N/A
Field blank results acceptable? (Levels C, D, E)	Yes	No	N/A
Transcription/calculation errors? (Levels D, E)	Yes	No	N/A

Comments:

MB Detects: Be 0.13 mg/kg, V 0.28 mg/kg

Data Validation for Chemical Analyses

Published Date: 08/16/10

Effective Date: 08/16/10

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

MS/MSD samples analyzed? Yes No N/A

MS/MSD results acceptable? Yes No N/A

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

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

LCS/BSS samples analyzed? Yes No N/A

LCS/BSS results acceptable? Yes No N/A

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

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

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

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

Performance audit sample results acceptable? Yes No N/A

Comments:

Sb LCS %R = 135%

Mn MSD %R = 135%

Data Validation for Chemical Analyses

Published Date: 08/16/10

Effective Date: 08/16/10

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

- Duplicate RPD values acceptable?..... Yes No N/A
- Duplicate results acceptable?..... Yes No N/A
- MS/MSD standards NIST traceable? (Levels D, E)..... Yes No N/A
- MS/MSD standards expired? (Levels D, E)..... Yes No N/A
- Field duplicate RPD values acceptable?..... Yes No N/A
- Field split RPD values acceptable?..... Yes No N/A
- Transcription/calculation errors? (Levels D, E)..... Yes No N/A

Comments: None

Data Validation for Chemical Analyses

Published Date: 08/16/10

Effective Date: 08/16/10

6. ICP QUALITY CONTROL (Levels D and E)

ICP serial dilution samples analyzed?	Yes	No	N/A
ICP serial dilution %D values acceptable?	Yes	No	N/A
ICP post digestion spike required?	Yes	No	N/A
ICP post digestion spike values acceptable?.....	Yes	No	N/A
Standards traceable?	Yes	No	N/A
Standards expired?	Yes	No	N/A
Transcription/calculation errors?.....	Yes	No	N/A

Comments:

7. HOLDING TIMES (all levels)

Samples properly preserved?	Yes	No	N/A
Sample holding times acceptable?	Yes	No	N/A

Comments: None

Data Validation for Chemical Analyses

Published Date: 08/16/10

Effective Date: 08/16/10

8. RESULT QUANTITATION AND DETECTION LIMITS (all levels)

- Results reported for all requested analyses?..... Yes No N/A
- Results supported in the raw data? (Levels D, E) Yes No N/A
- Samples properly prepared? (Levels D, E) Yes No N/A
- Detection limits meet RDL?..... Yes No N/A
- Transcription/calculation errors? (Levels D, E) Yes No N/A

Comments: None

Appendix 6

Additional Documentation Requested By Client

Quality Control Report

Group # WSCF102846

Attention Michael Neely
Department Inorganic

QC Batch	169673	Test	ICP-2008 MS All possible metal
Associated Samples	102846001, 102846002		

Analyte	CAS #	Original Found	QC Found	Units	% Recov	Limits	RPD	RPD Limit	RQ	Analyzed
BLANK										
QC Sample #41351										
Aluminum	7429-90-5	<5.0	<5.0	ug/L					U	11/10/10
Manganese	7439-96-5	<0.10	<0.10	ug/L					U	11/10/10
Nickel	7440-02-0	<0.20	<0.20	ug/L					U	11/10/10
Silver	7440-22-4	<0.10	<0.10	ug/L					U	11/10/10
Antimony	7440-36-0	<0.30	<0.30	ug/L					U	11/10/10
Barium	7440-39-3	<0.20	<0.20	ug/L					U	11/10/10
Beryllium	7440-41-7	0.129	0.129	ug/L					B	11/10/10
Cadmium	7440-43-9	<0.10	<0.10	ug/L					U	11/10/10
Chromium	7440-47-3	<0.50	<0.50	ug/L					U	11/10/10
Cobalt	7440-48-4	<0.050	<0.050	ug/L					U	11/10/10
Copper	7440-50-8	<0.10	<0.10	ug/L					U	11/10/10
Vanadium	7440-62-2	0.281	0.281	ug/L					B	11/10/10
Zinc	7440-66-6	<0.80	<0.80	ug/L					U	11/10/10
Lead	7439-92-1	<0.10	<0.10	ug/L					U	11/10/10
Mercury	7439-97-6	<0.050	<0.050	ug/L					U	11/10/10
Thallium	7440-28-0	<0.050	<0.050	ug/L					U	11/10/10
Arsenic	7440-38-2	<0.40	<0.40	ug/L					U	11/10/10
Selenium	7782-49-2	<0.30	<0.30	ug/L					U	11/10/10

Quality Control Report

Group # WSCF102846

Attention Michael Neely
 Department Inorganic

Analyte	CAS #	Original Found	QC Found	Units	% Recov	Limits	RPD	RPD Limit	RQ	Analyzed
LCS										
Aluminum	7429-90-5	7260	7260	mg/kg	87.2	49 - 124				11/10/10
Manganese	7439-96-5	520	520	mg/kg	113.8	75 - 121				11/10/10
Nickel	7440-02-0	64.6	64.6	mg/kg	115.3	74 - 122				11/10/10
Silver	7440-22-4	127	127	mg/kg	124.6	83 - 127				11/10/10
Antimony	7440-36-0	123	123	mg/kg	135.1	62 - 205				11/10/10
Barium	7440-39-3	374	374	mg/kg	116.2	78 - 118				11/10/10
Beryllium	7440-41-7	100	100	mg/kg	111.1	77 - 120				11/10/10
Cadmium	7440-43-9	84.4	84.4	mg/kg	125.9	76 - 129				11/10/10
Chromium	7440-47-3	81.0	81.0	mg/kg	110.3	68 - 119				11/10/10
Cobalt	7440-48-4	88.1	88.1	mg/kg	119.6	77 - 122				11/10/10
Copper	7440-50-8	77.9	77.9	mg/kg	112.8	67 - 120				11/10/10
Vanadium	7440-62-2	90.8	90.8	mg/kg	108.5	67 - 122				11/10/10
Zinc	7440-66-6	206	206	mg/kg	115.7	73 - 131				11/10/10
Lead	7439-92-1	157	157	mg/kg	119.9	79 - 124				11/10/10
Mercury	7439-97-6	9.78	9.78	mg/kg	116.9	69 - 124				11/10/10
Thallium	7440-28-0	160	160	mg/kg	119.3	52 - 137				11/10/10
Arsenic	7440-38-2	160	160	mg/kg	120.2	79 - 125				11/10/10
Selenium	7782-49-2	191	191	mg/kg	117.9	82 - 133				11/10/10
MS										
QC Sample #41353										
Original 102784009										
Aluminum	7429-90-5	1850	1850	mg/kg	186.3	70 - 130			X	11/10/10
Manganese	7439-96-5	124	124	mg/kg	125.2	70 - 130				11/10/10
Nickel	7440-02-0	111	111	mg/kg	111.4	70 - 130				11/10/10

Quality Control Report

Group # WSCF102846

Attention Michael Neely
 Department Inorganic

Analyte	CAS #	Original Found	QC Found	Units	% RecovLimits	RPD	RPD Limit	RQ	Analyzed
Chromium	7440-47-3	113		mg/kg	113.6	70 - 130	0.20		11/10/10
Cobalt	7440-48-4	111		mg/kg	111.6	70 - 130	0.10		11/10/10
Copper	7440-50-8	111		mg/kg	111.5	70 - 130	0.80		11/10/10
Vanadium	7440-62-2	115		mg/kg	115.8	70 - 130	3.90		11/10/10
Zinc	7440-66-6	114		mg/kg	115.1	70 - 130	2.00		11/10/10
Lead	7439-92-1	115		mg/kg	115.5	70 - 130	1.50		11/10/10
Mercury	7439-97-6	2.40		mg/kg	121	70 - 130	3.40		11/10/10
Thallium	7440-28-0	114		mg/kg	114.9	70 - 130	2.60		11/10/10
Arsenic	7440-38-2	115		mg/kg	115.7	70 - 130	2.30		11/10/10
Selenium	7782-49-2	114		mg/kg	114.8	70 - 130	2.80		11/10/10

Date: 24 February 2011
 To: CH2M Hill (technical representative)
 From: Analytical Quality Associates, Inc.
 Project: 100 Area RI/FS
 Subject: General Chemistry - Sample Data Group (SDG) WSCF102846

INTRODUCTION

This memorandum presents the results of data validation for SDG WSCF102846 prepared by WSCF Analytical Laboratories. A list of samples validated along with the analytical methods is provided in the following table.

Sample ID	Sample Date	Media	Validation Level	Analytical Methods
B26J55	11/05/2010	Soil	C	7196A
B26J56	11/05/2010	Soil	C	7196A

Data validation was conducted in accordance with the CHPRC validation statement of work and the Sampling and Analysis Plan for the 100-BC-1, 100-BC-2, and 100-BC-5 Operable Units Remedial Investigation/Feasibility Study, DOE/RL-2009-44, Rev. 0 (SAP). Appendices 1 through 6 provide the following information as indicated below:

- Appendix 1. Glossary of Data Reporting Qualifiers
- Appendix 2. Summary of Data Qualification
- Appendix 3. Annotated Laboratory Reports
- Appendix 4. Laboratory Narrative and Chain-of-Custody Documentation
- Appendix 5. Data Validation Supporting Documentation
- Appendix 6. Additional Documentation Requested By Client

DATA QUALITY OBJECTIVES

- **Holding Times and Sample Preservation**

Holding times are calculated from Chain-of-Custody forms to determine the validity of the results. The holding time requirement for hexavalent chromium is analysis within 30 days of sample collection. Sample preservation requires chilling to 4 degrees Celsius.

The samples were analyzed within the prescribed holding time and properly preserved.

- **Blanks**

The blank data results are reviewed to assess the extent of contamination introduced through sampling, sample preparation, and analysis.

Laboratory Blanks

All laboratory blank results were acceptable.

Trip Blanks

No trip blanks were submitted for validation.

Field Blanks

No field blanks were submitted for validation.

Equipment Blanks

No equipment blanks were submitted for validation.

- **Accuracy**

Accuracy is evaluated by reviewing matrix spike sample results and laboratory control sample results. According to the SAP, the matrix spike sample accuracy limits are 70% to 130% and the laboratory control sample accuracy limits are ones specified by the DV procedure.

Matrix Spike (MS) Samples

The MS and post spike recoveries for hexavalent chromium were < the lower acceptance limit. The hexavalent chromium results for samples B26J55 and B26J56 were non-detects and should be qualified as estimates and flagged "UJ."

Laboratory Control Samples (LCSs)

The LCS recovery was acceptable.

- **Precision**

Precision is evaluated by reviewing laboratory duplicate sample results, field duplicate sample results, and field split sample results. These QC results provide information on the laboratory reproducibility and whether sampling activities are adequate to acquire consistent sample results. According to the SAP, the relative percent difference (RPD) limits are $\pm 30\%$. When duplicate RPDs exceed the limits and have associated results <5X the SAP required detection limits (or <5X the laboratory reporting limits for analytes not listed in the SAP) with differences <2X the required detection limits no precision infraction occurred.

Laboratory Duplicate Samples

The laboratory duplicate result was acceptable.

Field Duplicate Samples

No field duplicates were submitted for validation.

Field Split Samples

No field splits were submitted for validation.

- **Detection Limits**

Reported MDLs are compared against the contractually required detection limits (CRDLs) to ensure that laboratory detection limits meet the required criteria.

All reported sample MDLs were below the CRDL.

- **Completeness**

SDG WSCF102846 was submitted for validation and verified for completeness. Completeness is based on the percentage of data determined to be valid (i.e., not rejected). The completion percentage was 100%.

MAJOR DEFICIENCIES

None found.

MINOR DEFICIENCIES

Minor deficiencies leading to qualification of hexavalent chromium results for samples B26J55 and B26J56 as estimates were due to MS and post spike recovery infractions.

REFERENCES

GRP-GD-003, Rev. 0, Change 0, *Data Validation for Chemical Analyses*, August 2010.

DOE/RL-2009-44, Rev. 0, *Sampling and Analysis Plan for the 100-BC-1, 100-BC-2, and 100-BC-5 Operable Units Remedial Investigation/Feasibility Study*, March 2010

Appendix 1

Glossary of Data Reporting Qualifiers

Qualifiers that may be applied by data validators in compliance with the CHPRC statement of work are as follows:

- **U** — The constituent was analyzed for, but was not detected. The data should be considered usable for decision-making purposes.
- **UJ** — The constituent was analyzed for and was not detected. Due to a quality control deficiency identified during data validation the value reported may not accurately reflect the RL. The data should be considered usable for decision-making purposes.
- **J** — Indicates the constituent was analyzed for and detected. The associated value is estimated due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.
- **J+** — Indicates the constituent was analyzed for and detected. The associated value is estimated with a suspected positive bias due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.
- **J-** — Indicates the constituent was analyzed for and detected. The associated value is estimated with a suspected negative bias due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.
- **N** — The analysis indicates the presence of an analyte that has been tentatively identified.
- **NJ** — The analysis indicates the presence of an analyte that has been tentatively identified and the associated numerical value represents its approximate concentration.
- **NJ+** — The analysis indicates the presence of an analyte that has been tentatively identified. The associated value is estimated with a suspected positive bias due to a quality control deficiency identified during data validation.
- **NJ-** — The analysis indicates the presence of an analyte that has been tentatively identified. The associated value is estimated with a suspected negative bias due to a quality control deficiency identified during data validation.
- **UR** — Indicates the constituent was analyzed for and not detected; however, due to an identified quality control deficiency the data should be considered unusable for decision-making purposes.
- **R** — Indicates the constituent was analyzed for and detected; however, due to an identified quality control deficiency the data should be considered unusable for decision-making purposes.

Appendix 2
Summary of Data Qualification

General Chemistry Data Qualification Summary			
SDG: WSCF102846	Reviewer: AQA	Project: 100 Area RI/FS	Page 1 of 1
Analyte(s)	Qualifier	Samples Affected	Reason
Hexavalent chromium	UJ	B26J55, B26J56	Low MS and post spike recoveries

Comments: None

Appendix 3

Annotated Laboratory Reports

WSCF Analytical Results Report

Group # WSCF102846

Attention Michael Neely
 Department Inorganic

Sample # 102846001 Matrix SOIL
 SAF# F10-225 Sampled 11/05/10
 Sample ID B26J55 Received 11/05/10

Test Performed	CAS #	Method	RQ	Result	TP Err	Units	DF	MDL	PQL	Analyzed
Cr(VI) Prep										11/11/10
Cr(VI)										
Hexavalent chromium	18540-29-9	LA-265-403	UN	<0.12	UJ	ug/g	1	0.12	0.61	11/11/10
ICPMS Prep										
ICP-MS										
Aluminum	7429-90-5	LA-505-412		5310		mg/kg	1	6.1	120	11/10/10
Manganese	7439-96-5	LA-505-412	N	166	LS	mg/kg	1	0.12	1.2	11/10/10
Nickel	7440-02-0	LA-505-412		12.4	2-24-2011	mg/kg	1	0.25	2.5	11/10/10
Silver	7440-22-4	LA-505-412	U	<0.12		mg/kg	1	0.12	1.2	11/10/10
Antimony	7440-36-0	LA-505-412	U	<0.37		mg/kg	1	0.37	3.7	11/10/10
Barium	7440-39-3	LA-505-412		48.6		mg/kg	1	0.25	2.5	11/10/10
Beryllium	7440-41-7	LA-505-412	BC	0.142		mg/kg	1	0.12	0.61	11/10/10
Cadmium	7440-43-9	LA-505-412	U	<0.12		mg/kg	1	0.12	1.2	11/10/10
Chromium	7440-47-3	LA-505-412		12.0		mg/kg	1	0.61	6.1	11/10/10
Cobalt	7440-48-4	LA-505-412		5.71		mg/kg	1	0.12	0.61	11/10/10
Copper	7440-50-8	LA-505-412		8.45		mg/kg	1	0.12	1.2	11/10/10
Vanadium	7440-62-2	LA-505-412		24.7		mg/kg	1	0.25	2.5	11/10/10
Zinc	7440-66-6	LA-505-412		27.6		mg/kg	1	0.98	6.1	11/10/10
Lead	7439-92-1	LA-505-412		2.89		mg/kg	1	0.12	1.2	11/10/10

MDL = Minimum Detection
 RQ = Result Qualifier
 TP Err = Total Propagated
 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)

WSCF Analytical Results Report

Group # WSCF102846

Attention Michael Neely
 Department Inorganic

Sample # 102846002 Matrix SOIL
 SAF# F10-225 Sampled 11/05/10
 Sample ID B26J56 Received 11/05/10

Test Performed	CAS #	Method	RQ	Result	TP Err	Units	DF	MDL	PQL	Analyzed
Cr(VI) Prep										11/11/10
Cr(VI)										
Hexavalent chromium	18540-29-9	LA-265-403	UN	<0.12	UJ	ug/g	1	0.12	0.61	11/11/10
ICPMS Prep										11/09/10
ICP-MS										
Aluminum	7429-90-5	LA-505-412		4120		mg/kg	1	5.8	120	11/10/10
Manganese	7439-96-5	LA-505-412	N	134	LS	mg/kg	1	0.12	1.2	11/10/10
Nickel	7440-02-0	LA-505-412		10.3	2-24-2011	mg/kg	1	0.23	2.3	11/10/10
Silver	7440-22-4	LA-505-412	U	<0.12		mg/kg	1	0.12	1.2	11/10/10
Antimony	7440-36-0	LA-505-412	U	<0.35		mg/kg	1	0.35	3.5	11/10/10
Barium	7440-39-3	LA-505-412		29.6		mg/kg	1	0.23	2.3	11/10/10
Beryllium	7440-41-7	LA-505-412	BC	0.345		mg/kg	1	0.12	0.58	11/10/10
Cadmium	7440-43-9	LA-505-412	B	0.198		mg/kg	1	0.12	1.2	11/10/10
Chromium	7440-47-3	LA-505-412		12.0		mg/kg	1	0.58	5.8	11/10/10
Cobalt	7440-48-4	LA-505-412		5.12		mg/kg	1	0.12	0.58	11/10/10
Copper	7440-50-8	LA-505-412		5.83		mg/kg	1	0.12	1.2	11/10/10
Vanadium	7440-62-2	LA-505-412		20.8		mg/kg	1	0.23	2.3	11/10/10
Zinc	7440-66-6	LA-505-412		22.7		mg/kg	1	0.92	5.8	11/10/10
Lead	7439-92-1	LA-505-412		2.07		mg/kg	1	0.12	1.2	11/10/10

MDL = Minimum Detection
 RQ = Result Qualifier
 TP Err = Total Propagated
 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)

Appendix 4

Laboratory Narrative and Chain-of-Custody Documentation

Introduction

Two (2) S&GRP samples were received at the WSCF Laboratory on November 5, 2010. 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), Modification No. 2 to Agreement 36587, Release 3, "FH 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, D, U and J) 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.
- **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.
- **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.

Analytical Methodology for Requested Analyses

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

Inorganic Comments

ICP-MS 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.

Batch QC 169673 analyzed on sample# B28P43 (102784009)

- Manganese – Matrix Spike Duplicate recovery exceeded established laboratory limits. Affected sample results in this batch were N flagged.

Narrative

Attachment 2
Narrative
WSCF102846

- Beryllium and Vanadium were detected in the Blank. Affected sample results in this batch were "C" Flagged.
- Aluminum – exceeded spiking levels by a factor of 4. Spike recoveries and associated RPDs are not valid.

All other QC controls are within the established limits.

Hexavalent Chromium – The hold time requirement for this analysis was met. A Duplicate, Matrix Spike, Blank, Laboratory Control Sample, Post Spike and Insoluble Matrix Spike were analyzed with this delivery group. Analytical Note(s):

Batch QC 169809 analyzed on sample# B267D7 (102816001)

- Percent Recoveries for the Matrix Spike and Post Spike fell outside established laboratory control limits. All affected samples were "N" flagged.
- The Duplicate is flagged for RPD recovery outside established laboratory control limits. RPD is calculated on measured values and is not applicable for a result qualified with a "U".

All other QC controls are within the established limits.

Radiochemistry Comments

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

Gamma Energy Analysis:

Batch QC 169636 analyzed on sample# B29B72 (102841001)

- Potassium-40 and Radium-226 activity was detected in the blank. These two isotopes represent NORM (Naturally Occurring Radioactive Material); therefore, no flags were issued.
- Duplicate Relative Percent Difference(s) (RPD) did not meet the established laboratory limits. Duplicate Relative Percent Difference (RPD) does not apply to results less than 5X the minimum detectable activity. No flags issued.

All other QC controls are within the established limits.

Strontium-89/90:

Batch QC 169743 analyzed on sample# B28754 (102846001)

All QC controls are within the established limits.

Attachment 2
Narrative
WSCF102846

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.

Appendix 5

Data Validation Supporting Documentation

Data Validation for Chemical Analyses

Published Date: 08/16/10

Effective Date: 08/16/10

VALIDATION LEVEL:	A	B	<input checked="" type="radio"/> C	D	E
PROJECT: 100 Area RI/FS			DATA PACKAGE: VSR11-028		
VALIDATOR: Carl Schloesslin		LAB: WSCF		DATE: 2-24-2011	
			SDG: WSCF102846		
ANALYSES PERFORMED					
Anions/IC	TOC	TOX	TPH-418.1	Oil and Grease	Alkalinity
Ammonia	BOD/COD	Chloride	Chromium-VI <input checked="" type="checkbox"/>	pH	NO ₃ /NO ₂
Sulfate	TDS	TKN	Phosphate	Cyanide	
SAMPLES/MATRIX Soil samples B26J55, B26J56					

1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE

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

Comments: None

Data Validation for Chemical Analyses

Published Date: 08/16/10

Effective Date: 08/16/10

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

Initial calibrations performed on all instruments?	Yes	No	N/A
Initial calibrations acceptable?	Yes	No	N/A
ICV and CCV checks performed on all instruments?	Yes	No	N/A
ICV and CCV checks acceptable?	Yes	No	N/A
Standards traceable?	Yes	No	N/A
Standards expired?	Yes	No	N/A
Calculation check acceptable?	Yes	No	N/A

Comments:

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

ICB and CCB checks performed for all applicable analyses? (Levels D, E)	Yes	No	N/A
ICB and CCB results acceptable? (Levels D, E)	Yes	No	N/A
Laboratory blanks analyzed?	Yes	No	N/A
Laboratory blank results acceptable?	Yes	No	N/A
Field blanks analyzed? (Levels C, D, E)	Yes	No	N/A
Field blank results acceptable? (Levels C, D, E)	Yes	No	N/A
Transcription/calculation errors? (Levels D, E)	Yes	No	N/A

Comments: None

Data Validation for Chemical Analyses

Published Date: 08/16/10

Effective Date: 08/16/10

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

- Spike samples analyzed? Yes No N/A
- Spike recoveries acceptable? Yes No N/A
- Spike standards NIST traceable? (Levels D, E) Yes No N/A
- Spike standards expired? (Levels D, E) Yes No N/A
- LCS/BSS samples analyzed? Yes No N/A
- LCS/BSS results acceptable? Yes No N/A
- Standards traceable? (Levels D, E) Yes No N/A
- Standards expired? (Levels D, E) Yes No N/A
- Transcription/calculation errors? (Levels D, E) Yes No N/A
- Performance audit sample(s) analyzed? Yes No N/A
- Performance audit sample results acceptable? Yes No N/A

Comments:

Cr(VI) MS %R = 57%, PS %R = 67%

Data Validation for Chemical Analyses

Published Date: 08/16/10

Effective Date: 08/16/10

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

- Duplicate RPD values acceptable?..... Yes No N/A
- Duplicate results acceptable?..... Yes No N/A
- MS/MSD standards NIST traceable? (Levels D, E)..... Yes No N/A
- MS/MSD standards expired? (Levels D, E)..... Yes No N/A
- Field duplicate RPD values acceptable?..... Yes No N/A
- Field split RPD values acceptable?..... Yes No N/A
- Transcription/calculation errors? (Levels D, E)..... Yes No N/A

Comments: None

6. HOLDING TIMES (all levels)

- Samples properly preserved?..... Yes No N/A
- Sample holding times acceptable?..... Yes No N/A

Comments: None

Data Validation for Chemical Analyses

Published Date: 08/16/10

Effective Date: 08/16/10

7. RESULT QUANTITATION AND DETECTION LIMITS (all levels)

Results reported for all requested analyses?..... Yes No N/A
Results supported in the raw data? (Levels D, E) Yes No N/A
Samples properly prepared? (Levels D, E) Yes No N/A
Detection limits meet RDL?..... Yes No N/A
Transcription/calculation errors? (Levels D, E) Yes No N/A

Comments: None

Appendix 6

Additional Documentation Requested By Client

Quality Control Report

Attention Michael Neely
Department Inorganic
Group # WSCF102846

QC Batch 169809
Test Hexavalent chromium
Associated Samples 102846001, 102846002

Analyte	CAS #	Original Found	QC Found	Units	% Recov	Limits	RPD	RPD Limit	RQ	Analyzed
BLANK										
Hexavalent chromium	18540-29-9	<0.10	<0.10	ug/g					U	11/11/10
LCS										
Hexavalent chromium	18540-29-9	4.04	4.04	ug/g	101.2	80 - 120				11/11/10
DUP										
Hexavalent chromium	18540-29-9	<0.10	<0.10	ug/g			78.70	20	* UJ	11/11/10
MS										
Hexavalent chromium	18540-29-9	2.30	2.30	ug/g	57.4	75 - 125			N	11/11/10
PSTSPK										
Hexavalent chromium	18540-29-9	0.0357	0.0357	ug/g	67.1	85 - 115			UN	11/11/10
IMS										
Hexavalent chromium	18540-29-9	302	302	ug/g	82.3	75 - 125			D	11/11/10

Date: 24 February 2011
 To: CH2M Hill (technical representative)
 From: Analytical Quality Associates, Inc.
 Project: 100 Area RI/FS
 Subject: Radiochemical - Sample Data Group (SDG) WSCF102846

INTRODUCTION

This memorandum presents the results of data validation for SDG WSCF102846 prepared by WSCF Analytical Laboratories. A list of samples validated along with the analytical methods is provided in the following table.

Sample ID	Sample Date	Media	Validation Level	Analytical Methods
B26J55	11/05/2010	Soil	C	Gamma, Sr-89/90
B26J56	11/05/2010	Soil	C	Gamma, Sr-89/90

Data validation was conducted in accordance with the CHPRC validation statement of work and the Sampling and Analysis Plan for the 100-BC-1, 100-BC-2, and 100-BC-5 Operable Units Remedial Investigation/Feasibility Study, DOE/RL-2009-44, Rev. 0 (SAP). Appendices 1 through 6 provide the following information as indicated below:

- Appendix 1. Glossary of Data Reporting Qualifiers
- Appendix 2. Summary of Data Qualification
- Appendix 3. Annotated Laboratory Reports
- Appendix 4. Laboratory Narrative and Chain-of-Custody Documentation
- Appendix 5. Data Validation Supporting Documentation
- Appendix 6. Additional Documentation Requested By Client

DATA QUALITY OBJECTIVES

- **Holding Times and Sample Preservation**

Holding times are calculated from Chain-of-Custody forms to determine the validity of the results. The maximum holding time for radiochemical analysis is 180 days. There are no specific preservation requirements for soil samples.

The samples were analyzed within the prescribed holding time.

- **Blanks**

The blank data results are reviewed to assess the extent of contamination introduced through sampling, sample preparation, and analysis.

Laboratory Blanks

All laboratory blank results were acceptable with the following exceptions. The K-40 and Ra-226 laboratory blank results were > the minimum detectable concentrations (MDCs). The K-40 and Ra-226 results for samples B26J55 and B26J56 were detects >5X the blank results and should not be qualified for the blank infractions.

Trip Blanks

No trip blanks were submitted for validation.

Field Blanks

No field blanks were submitted for validation.

Equipment Blanks

No equipment blanks were submitted for validation.

- **Accuracy**

Accuracy is evaluated by reviewing matrix spike sample results, laboratory control sample results, and chemical recovery factors. Chemical recovery factors are determined through use of a carrier or tracer and provide assessment of the chemical separation process that is affected by the laboratory procedure, sample matrix, and/or interference. Chemical recovery factors are used to correct sample concentration, uncertainty, and MDC results. According to the SAP, the laboratory control sample accuracy limits are 70% to 130%.

Matrix Spike (MS) Samples

MS analyses are not required for the methods performed.

Laboratory Control Samples (LCSs)

All LCS recoveries were acceptable.

Carrier/Tracer Recovery Factors

All carrier/tracer recovery factors were acceptable.

Other

The WSCF Ra-226 results for all samples were reported from Pb-214 and/or Bi-214 gamma lines. These radon daughters were not in secular equilibrium with Ra-226. In addition, the Pb-214 and Bi-214 results may have been greatly biased due to inaccurate detector background subtraction due to fluctuating concentrations of Rn-222. Per client request, all WSCF Ra-226

results should be qualified as unusable and flagged “UR” for non-detects and “R” for detects. See the table in Appendix 2 for a listing of the all affected sample results.

- **Precision**

Precision is evaluated by reviewing laboratory duplicate, field duplicate, and field split sample results. These QC results provide information on the laboratory reproducibility and whether sampling activities are adequate to acquire consistent sample results. According to the SAP, the relative percent difference (RPD) limits are $\pm 30\%$. The RPD limits for reported analytes not listed in the SAP are specified by the DV procedure. When duplicate RPDs exceed the limits and have associated results $< 5X$ the MDCs the precision limits are ones specified by the DV procedure.

Laboratory Duplicate Samples

All laboratory duplicate results were acceptable.

Field Duplicate Samples

No field duplicates were submitted for validation.

Field Split Samples

No field splits were submitted for validation.

- **Detection Limits**

Reported MDCs are compared against the contractually required detection limits (CRDLs) to ensure that laboratory detection limits meet the required criteria.

All reported sample MDCs with associated non-detected sample results were below the CRDLs with the following exception. The Eu-155 MDC for sample B26J55 was slightly $>$ the CRDL.

- **Completeness**

SDG WSCF102846 was submitted for validation and verified for completeness. Completeness is based on the percentage of data determined to be valid (i.e., not rejected). The completion percentage for Ra-226 was 0%. The completion percentage for all remaining gamma analytes was 100%. The completion percentage of all other radiochemical analyses was 100%.

MAJOR DEFICIENCIES

Major deficiencies leading to qualification of all Ra-226 results as unusable were due to severe analytical limitations for this particular analyte. See the table in Appendix 2 for a listing of all affected sample results.

MINOR DEFICIENCIES

None found.

REFERENCES

GRP-GD-002, Rev. 0, Change 0, *Data Validation for Radiochemical Analyses*, August 2010.

DOE/RL-2009-44, Rev. 0, *Sampling and Analysis Plan for the 100-BC-1, 100-BC-2, and 100-BC-5 Operable Units Remedial Investigation/Feasibility Study*, March 2010

Appendix 1

Glossary of Data Reporting Qualifiers

Qualifiers that may be applied by data validators in compliance with the CHPRC statement of work are as follows:

- **U** — The constituent was analyzed for and was not detected. The data should be considered usable for decision-making purposes.
- **UJ** — The constituent was analyzed for and was not detected. Due to a quality control deficiency identified during data validation the value reported may not accurately reflect the MDC. The data should be considered usable for decision-making purposes.
- **J** — Indicates the constituent was analyzed for and detected. The associated value is estimated due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.
- **J+** — Indicates the constituent was analyzed for and detected. The associated value is estimated with a suspected positive bias due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.
- **J-** — Indicates the constituent was analyzed for and detected. The associated value is estimated with a suspected negative bias due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.
- **UR** — Indicates the constituent was analyzed for and not detected; however, due to an identified quality control deficiency the data should be considered unusable for decision-making purposes.
- **R** — Indicates the constituent was analyzed for and detected; however, due to an identified quality control deficiency the data should be considered unusable for decision-making purposes.

Appendix 2
Summary of Data Qualification

Radiochemical Data Qualification Summary			
SDG: WSCF102846	Reviewer: AQA	Project: 100 Area RI/FS	Page 1 of 1
Analyte(s)	Qualifier	Samples Affected	Reason
Ra-226	R	B26J55, B26J56	Severe analytical limitations

Comments: None

Appendix 3

Annotated Laboratory Reports

WSCF Analytical Results Report

Group # WSCF102846

Attention Michael Neely
Department Radiochemistry

Sample # 102846001
SAF# F10-225
Sample ID B26J55

Matrix SOIL
Sampled 11/05/10
Received 11/05/10

Test Performed	CAS #	Method	RQ	Result	TP Err	Units	DF	MDL	PQL	Analyzed
GEA Prep										
GEA										
Antimony-125	14234-35-6	LA-508-481	U	3.8E-3	.027	pCi/g	1	0.055		11/09/10
Cesium-134	13967-70-9	LA-508-481	U	0.034	.013	pCi/g	1	0.037		11/09/10
Cesium-137	10045-97-3	LA-508-481	U	-0.018	.0095	pCi/g	1	0.018		11/09/10
Cobalt-60	10198-40-0	LA-508-481	U	-3.9E-3	.0094	pCi/g	1	0.020		11/09/10
Europium-152	14683-23-9	LA-508-481	U	-0.048	.031	pCi/g	1	0.058		11/09/10
Europium-154	15585-10-1	LA-508-481	U	-6.7E-3	.029	pCi/g	1	0.062		11/09/10
Europium-155	14391-16-3	LA-508-481	U	0.11	.058	pCi/g	1	0.12		11/09/10
Potassium-40	13966-00-2	LA-508-481		18	1.8	pCi/g	1	0.15		11/09/10
Radium-226	13982-63-3	LA-508-481		0.55	.074	pCi/g	1	0.038		11/09/10
Ruthenium-106	13967-48-1	LA-508-481	U	0.092	.076	pCi/g	1	0.17		11/09/10
Beryllium-7	13966-02-4	LA-508-481	U	0.034	.078	pCi/g	1	0.16		11/09/10
SR-89/90										
SR-89/90										
Strontium-89/90	SR-RAD	LA-220-406	U	-0.98	.6	pCi/g	1	0.45		11/19/10

LS
2-24-2011

MDL = Minimum Detection
 RQ = Result Qualifier
 TP Err = Total Propagated
 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.

WSCF Analytical Results Report

Group # WSCF102846

Attention Michael Neely
Department Radiochemistry

Sample # 102846002
SAF# F10-225
Sample ID B26J56

Matrix SOIL
Sampled 11/05/10
Received 11/05/10

Test Performed	CAS #	Method	RQ	Result	TP Err	Units	DF	MDL	PQL	Analyzed
GEA Prep										
GEA										
Antimony-125	14234-35-6	LA-508-481	U	0.013	.022	pCi/g	1	0.045		11/09/10
Cesium-134	13967-70-9	LA-508-481	U	0.026	.011	pCi/g	1	0.036		11/09/10
Cesium-137	10045-97-3	LA-508-481	U	-2.6E-4	.0091	pCi/g	1	0.017		11/09/10
Cobalt-60	10198-40-0	LA-508-481	U	-2.6E-3	.0081	pCi/g	1	0.017		11/09/10
Europium-152	14683-23-9	LA-508-481	U	-5.2E-4	.029	pCi/g	1	0.049		11/09/10
Europium-154	15585-10-1	LA-508-481	U	9.8E-3	.026	pCi/g	1	0.055		11/09/10
Europium-155	14391-16-3	LA-508-481	U	0.027	.035	pCi/g	1	0.073		11/09/10
Potassium-40	13966-00-2	LA-508-481		14	1.4	pCi/g	1	0.13		11/09/10
Radium-226	R 13982-63-3	LA-508-481		0.66	.08	pCi/g	1	0.029		11/09/10
Ruthenium-106	13967-48-1	LA-508-481	U	-0.023	.063	pCi/g	1	0.13		11/09/10
Beryllium-7	13966-02-4	LA-508-481	U	-0.044	.064	pCi/g	1	0.13		11/09/10
SR-89/90										
SR-89/90										
Strontium-89/90	SR-RAD	LA-220-406	U	-0.62	.54	pCi/g	1	0.45		11/19/10

LS
 2-24-2011

MDL = Minimum Detection
 RQ = Result Qualifier
 TP Err = Total Propagated
 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.

Appendix 4

Laboratory Narrative and Chain-of-Custody Documentation

Introduction

Two (2) S&GRP samples were received at the WSCF Laboratory on November 5, 2010. 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), Modification No. 2 to Agreement 36587, Release 3, "FH 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, D, U and J) 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.
- **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.
- **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.

Analytical Methodology for Requested Analyses

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

Inorganic Comments

ICP-MS 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.

Batch QC 169673 analyzed on sample# B28P43 (102784009)

- Manganese – Matrix Spike Duplicate recovery exceeded established laboratory limits. Affected sample results in this batch were N flagged.

Narrative

Attachment 2
Narrative
WSCF102846

- Beryllium and Vanadium were detected in the Blank. Affected sample results in this batch were "C" Flagged.
- Aluminum – exceeded spiking levels by a factor of 4. Spike recoveries and associated RPDs are not valid.

All other QC controls are within the established limits.

Hexavalent Chromium – The hold time requirement for this analysis was met. A Duplicate, Matrix Spike, Blank, Laboratory Control Sample, Post Spike and Insoluble Matrix Spike were analyzed with this delivery group. Analytical Note(s):

Batch QC 169809 analyzed on sample# B267D7 (102816001)

- Percent Recoveries for the Matrix Spike and Post Spike fell outside established laboratory control limits. All affected samples were "N" flagged.
- The Duplicate is flagged for RPD recovery outside established laboratory control limits. RPD is calculated on measured values and is not applicable for a result qualified with a "U".

All other QC controls are within the established limits.

Radiochemistry Comments

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

Gamma Energy Analysis:

Batch QC 169636 analyzed on sample# B29B72 (102841001)

- Potassium-40 and Radium-226 activity was detected in the blank. These two isotopes represent NORM (Naturally Occurring Radioactive Material); therefore, no flags were issued.
- Duplicate Relative Percent Difference(s) (RPD) did not meet the established laboratory limits. Duplicate Relative Percent Difference (RPD) does not apply to results less than 5X the minimum detectable activity. No flags issued.

All other QC controls are within the established limits.

Strontium-89/90:

Batch QC 169743 analyzed on sample# B28754 (102846001)

All QC controls are within the established limits.

Attachment 2
Narrative
WSCF102846

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.

CH2MHill Plateau Remediation Company

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

F10-225-013 PAGE 1 OF 1

COLLECTOR DALLIN	COMPANY CONTACT DYEKMAN, DL	TELEPHONE NO. 375-1688	PROJECT COORDINATOR DYEKMAN, DL	PRICE CODE BN	DATA TURNAROUND 45 Days / 45 Days
SAMPLING LOCATION C7784 (199-B2-16); Bottom of Aquifer	PROJECT DESIGNATION 100 Area Remedial Investigation/Feasibility Analysis - 100-BC Soils	FIELD LOGBOOK NO. HNF-N-588-3/72	ACTUAL SAMPLE DEPTH 148.1'	SAF NO. F10-225	AIR QUALITY <input type="checkbox"/>
ICE CHEST NO. N/A	OFFSITE PROPERTY NO. N/A	COA 300078ES10	BILL OF LADING/AIR BILL NO. N/A	METHOD OF SHIPMENT GOVERNMENT VEHICLE	
SHIPPED TO Waste Sampling & Characterization	PRESERVATION	Cool+4C	Cool+4C	None	None
MATRIX* A=Air DL=Drum L=Liquid DS=Drum S=Soil L=Liquid O=Oil S=Soil SE=Settlement T=Tree V=Vegetation W=Water WI=Wipe X=Other	POSSIBLE SAMPLE HAZARDS/ REMARKS Contains Radioactive Material at concentrations that may or may not be regulated for transportation per 49 CFR / IATA Dangerous Goods Regulations but are not releasable per DOE Order 5400.5 (1990/1993)	HOLDING TIME	10 Days	5 Months	6 Months
	SPECIAL HANDLING AND/OR STORAGE 102846	TYPE OF CONTAINER	G/P	G/P	Square Bottle - Poly
		NO. OF CONTAINER(S)	1	1	1
		VOLUME	60ml	250uL	300u
		SAMPLE ANALYSIS	Chromium Hex - 7150	U/235 - 200A 100 Area RPP52	Gamma Spectrometry 100 Area RPP51

SAMPLE NO.	MATRIX*	SAMPLE DATE	SAMPLE TIME				
B26J55	1 SOIL	11-5-10	1300	✓	✓	✓	✓

CHAIN OF POSSESSION		SIGN/ PRINT NAMES		SPECIAL INSTRUCTIONS	
RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME	** The 100 Area S&GRP Characterization and Monitoring Sampling and Analysis GKI applies to this SAF. <input type="checkbox"/> <input type="checkbox"/> ** Physical Properties laboratory: Conduct the hydraulic conductivity test (ASTM 5084 or 2434) as appropriate to the sample matrix.	
J. BAILEY	11-5-10 1535	JA FRAZIER	11-5-10 1535		
RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME		
RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME		
RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME		
RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME		
LABORATORY SECTION	RECEIVED BY	TITLE	DATE/TIME		
FINAL SAMPLE DISPOSITION	DISPOSAL METHOD	DISPOSED BY	DATE/TIME		

Friday, November 05, 2010 7:44:58 PM
Page 2 of 3



Appendix 5

Data Validation Supporting Documentation

Data Validation for Radiochemical Analyses

Published Date: 08/16/10

Effective Date: 08/16/10

Appendix B - Radiochemical Data Validation Checklist

RADIOCHEMICAL DATA VALIDATION CHECKLIST

VALIDATION LEVEL:	A	B	C	D	E
PROJECT: 100 Area RI/FS			DATA PACKAGE: VSR11-028		
VALIDATOR: Carl Schloesslin		LAB: WSCF		DATE: 2-24-2011	
			SDG: WSCF102846		
ANALYSES PERFORMED					
Gross Alpha/Beta	Strontium-90 X	Technetium-99	Alpha Spectroscopy	Gamma Spectroscopy X	
Total Uranium	Radium-22	Tritium	C-14	I-129	
SAMPLES/MATRIX Soil samples B26J55, B26J56					

1. Completeness N/A
 Technical verification forms present? Yes No N/A
 Comments: None

2. Initial Calibration (Levels D, E) N/A
 Instruments/detectors calibrated? Yes No N/A
 Initial calibration acceptable? Yes No N/A
 Standards NIST traceable? Yes No N/A
 Standards Expired? Yes No N/A
 Calculation check acceptable? Yes No N/A

Data Validation for Radiochemical Analyses

Published Date: 08/16/10

Effective Date: 08/16/10

Comments:

- 3. Continuing Calibration (Levels D, E)..... N/A
- Calibration checked within required frequency? Yes No N/A
- Calibration check acceptable? Yes No N/A
- Calibration check standards traceable? Yes No N/A
- Calibration check standards expired? Yes No N/A
- Calculation check acceptable? Yes No N/A

Comments:

- 4. Background Counts (Levels D, E) N/A
- Background Counts checked within required frequency? Yes No N/A
- Background Counts acceptable? Yes No N/A
- Calculation check acceptable? Yes No N/A

Comments:

Data Validation for Radiochemical Analyses

Published Date: 08/16/10

Effective Date: 08/16/10

- 5. Blanks (Levels B, C, D, E)..... N/A
- Method blank analyzed within required frequency?..... Yes No N/A
- Method blank results acceptable?..... Yes No N/A
- Analytes detected in method blank?..... Yes No N/A
- Field blank(s) analyzed?..... Yes No N/A
- Field blank results acceptable?..... Yes No N/A
- Analytes detected in field blank(s)?..... Yes No N/A
- Transcription/Calculation Errors? (Levels D, E)..... Yes No N/A

Comments:

MB Detects: K-40 0.16 pCi/g, Ra-226 0.032 pCi/g

- 6. Laboratory Control Samples or Blank Spike Samples (Levels C, D, E)..... N/A
- LCS /BSS analyzed within required frequency?..... Yes No N/A
- LCS/BSS recoveries acceptable?..... Yes No N/A
- LCS/BSS traceable? (Levels D,E)..... Yes No N/A
- LCS/BSS expired? (Levels D,E)..... Yes No N/A
- LCS/BSS levels correct? (Levels D,E)..... Yes No N/A
- Transcription/Calculation Errors? (Levels D, E)..... Yes No N/A

Comments: None

Data Validation for Radiochemical Analyses

Published Date: 08/16/10

Effective Date: 08/16/10

7. Chemical Carrier Recovery (Levels C, D, E) N/A

Chemical carrier added? Yes No N/A

Chemical recovery acceptable? Yes No N/A

Chemical carrier traceable? (Levels D, E) Yes No N/A

Chemical carrier expired? (Levels D, E) Yes No N/A

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

Comments: None

8. Tracer Recovery (Levels C, D, E) N/A

Tracer added? Yes No N/A

Tracer recovery acceptable? Yes No N/A

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

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

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

Comments: None

Data Validation for Radiochemical Analyses

Published Date: 08/16/10

Effective Date: 08/16/10

9. Matrix Spikes (Levels C, D, E)..... N/A

Matrix spike analyzed?..... Yes No N/A

Spike recoveries acceptable? Yes No N/A

Spike source traceable? (Levels D, E) Yes No N/A

Spike source expired? Levels D, E) Yes No N/A

Transcription/Calculation Errors? (Levels D, E)..... Yes No N/A

Comments: None

10. Duplicates (Levels C, D, E) N/A

Duplicates Analyzed at required frequency? Yes No N/A

RPD Values Acceptable? Yes No N/A

Transcription/Calculation Errors? (Levels D, E)..... Yes No N/A

Comments: None

Data Validation for Radiochemical Analyses

Published Date: 08/16/10

Effective Date: 08/16/10

- 11. Field QC Samples (Levels C, D E) N/A
- Field duplicate sample(s) analyzed? Yes No N/A
- Field duplicate RPD values acceptable? Yes No N/A
- Field split sample(s) analyzed? Yes No N/A
- Field split RPD values acceptable? Yes No N/A
- Performance audit sample(s) analyzed? Yes No N/A
- Performance audit sample results acceptable? Yes No N/A

Comments: None

12. Holding Times (All levels)

Are sample holding times acceptable? Yes No N/A

Comments: None

13. Results and Detection Limits (All Levels) N/A

- Results reported for all required sample analyses? Yes No N/A
- Results supported in raw data?(Levels D, E) Yes No N/A
- Results Acceptable? (Levels D, E) Yes No N/A
- Transcription/Calculation errors? (Levels D, E) Yes No N/A
- MDA's meet required detection limits? Yes No N/A
- Transcription/calculation errors? (Levels D, E) Yes No N/A

Comments:

MDCs > CRDLs for associated non-detect sample results

Eu-155 CRDL = 0.1 pCi/g, B26J55 MDC = 0.12 pCi/g

Appendix 6

Additional Documentation Requested By Client

Quality Control Report

Group # WSCF102846

Attention Michael Neely
 Department Radiochemistry

QC Batch 169636 Test Gamma Energy Analysis-general
 Associated Samples 102846001, 102846002

Analyte	CAS #	Original Found	QC Found	Units	% Recov	Limits	RPD	RPD Limit	RQ	Analyzed
IBLANK										
QC Sample #41229										
Antimony-125	14234-35-6		6.7E-3	pCi/g					U	11/11/10
Cesium-134	13967-70-9		7.3E-3	pCi/g					U	11/11/10
Cesium-137	10045-97-3		-3.9E-3	pCi/g					U	11/11/10
Cobalt-60	10198-40-0		-5.6E-4	pCi/g					U	11/11/10
Europium-152	14683-23-9		5.2E-3	pCi/g					U	11/11/10
Europium-154	15585-10-1		-0.012	pCi/g					U	11/11/10
Europium-155	14391-16-3		8.5E-3	pCi/g					U	11/11/10
Potassium-40	13966-00-2		0.16	pCi/g					U	11/11/10
Radium-226	13982-63-3		0.032	pCi/g					X	11/11/10
Ruthenium-106	13967-48-1		-2.4E-3	pCi/g					X	11/11/10
Beryllium-7	13966-02-4		-5.5E-3	pCi/g					U	11/11/10
LCS										
QC Sample #41230										
Cesium-137	10045-97-3		6400	pCi/sample	106.4	80 - 120				11/11/10
Cobalt-60	10198-40-0		10000	pCi/sample	102.7	80 - 120				11/11/10
DUP										
QC Sample #41231										
Original 102841001										
Antimony-125	14234-35-6		0.033	pCi/g			428.60	-30 - 30	*	U
Cesium-134	13967-70-9		0.024	pCi/g			13.30	-30 - 30		U

Quality Control Report

Group # WSCF102846

Attention Michael Neely
 Department Radiochemistry

Analyte	CAS #	Original Found	QC Found	Units	% RecovLimits	RPD	RPD Limit	RQ	Analyzed
Cesium-137	10045-97-3	-6.3E-3	-6.3E-3	pCi/g		-96.50	-30 - 30	* U	11/09/10
Cobalt-60	10198-40-0	4.5E-3	4.5E-3	pCi/g		925.00	-30 - 30	* U	11/09/10
Europium-152	14683-23-9	-0.036	-0.036	pCi/g		-44.10	-30 - 30	* U	11/09/10
Europium-154	15585-10-1	7.3E-3	7.3E-3	pCi/g		62.90	-30 - 30	* U	11/09/10
Europium-155	14391-16-3	0.037	0.037	pCi/g		123.10	-30 - 30	* U	11/09/10
Potassium-40	13966-00-2	12	12	pCi/g		0.00	-30 - 30		11/09/10
Radium-226	13982-63-3	0.51	0.51	pCi/g		29.20	-30 - 30		11/09/10
Ruthenium-106	13967-48-1	0.049	0.049	pCi/g		175.50	-30 - 30	* U	11/09/10
Beryllium-7	13966-02-4	0.029	0.029	pCi/g		24.20	-30 - 30	U	11/09/10

Quality Control Report

Group # WSCF102846

Attention Department Michael Neely
Radiochemistry

QC Batch	169743	Test	Strontium 89/90 (GPC/GEA)
Associated Samples	102846001, 102846002		

Analyte	CAS #	Original Found	QC Found	Units	% Recov	Limits	RPD	RPD Limit	RQ	Analyzed
DUP										
Strontium-89/90	SR-RAD	-0.98	-1.0	pCi/g			-6.10	-30 - 30	U	11/19/10
BLANK										
Strontium-89/90	SR-RAD	-0.71		pCi/g					U	11/19/10
LCS										
Strontium-89/90	SR-RAD	29		pCi/g	104.3	80 - 120				11/19/10
SAMPLE										
Strontium-85	13967-73-2				93.2	25 - 105				11/19/10
SAMPLE										
Strontium-85	13967-73-2				92.4	25 - 105				11/19/10
DUP										
Strontium-85	13967-73-2				91.2	25 - 105	3.60			11/19/10
BLANK										
Strontium-85	13967-73-2				87.6	25 - 105				11/19/10

Quality Control Report

Group # WSCF102846

Attention Michael Neely
Department Radiochemistry

Analyte	CAS #	Original Found	QC Found	Units	% RecovLimits	RPD	RPD Limit	RQ	Analyzed
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LCS QC Sample #41499

Strontium-85	13967-73-2				82.7	25 - 105			11/19/10
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