# CHPRC - REVIEW COMMENT RECORD (RCR)

| 1. Date | 2. Review No. |
|---|---|
| 03/10/2011 | |
| 3. Project No. | Page 1 of 1 |

| 5. Document Number(s)/Title(s) | 6. Program/Project/Building Number | 7. Reviewer | 8. Organization/Group | 9. Location/Phone |
|---|---|---|---|---|
| VSR11-003 | | Scot Fitzgerald | Analytical Support Group | 2753/373-7495 |

| 17. Comment Submittal Approval | 10. Agreement With Indicated Comment Disposition(s) | 11. CLOSED |
|---|---|---|
| Date: ____ Organization Manager (optional) (print and sign): ____ | Scot Fitzgerald<br>Reviewer/Point of Contact (print and sign)<br>3/10/2011<br>Date<br>Author/Originator (print and sign) | Scot Fitzgerald<br>Reviewer/Point of Contact (print and sign)<br>3/14/2011<br>Date<br>Author/Originator (print and sign) |

| 12. Item | 13a. Comments | 13b. Basis | 13c. Recommendation | 14. Reviewer Concurrence Required (Y or N) | 15. Disposition (provide justification if **NOT** accepted) | 16. Status |
|---|---|---|---|---|---|---|
| 1 | Pages 31-33 of 120 contain QC data for radiochemistry. Should be VOA QC data in this section/ | | Replace Radchem QC with VOA QC. | Y | Section fixed | |
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| 5. Document Number(s)/Title(s) | 6. Program/Project/Building Number | 7. Reviewer | 8. Organization/Group | 9. Location/Phone |
|---|---|---|---|---|
| VSR11-003, Data Validation Report for CHPRC - Project 100 Area RI/FS, Chemical Validation - Level C | S&GRP Sample Data Groups (SDGs); WSCF103042 and WSCF111251 | JA Edwards | Environmental Quality Assurance (EQA) | 2420 Stevens Rm. 345 376-4324 |

| 17. Comment Submittal Approval | 10. Agreement With Indicated Comment Disposition(s) | 11. CLOSED |
|---|---|---|
| Date: ____ Organization Manager (optional) (print and sign): ____ | JA Edwards (Reviewer/Point of Contact (print and sign)) 03/10/2010 (Date) ____ (Author/Originator (print and sign)) | JA Edwards (Reviewer/Point of Contact (print and sign)) 03/10/2010 (Date) ____ (Author/Originator (print and sign)) |

| 12. Item | 13a. Comments | 13b. Basis | 13c. Recommendation | 14. Reviewer Concurrence Required (Y or N) | 15. Disposition (provide justification if **NOT** accepted) | 16. Status |
|---|---|---|---|---|---|---|
| 1 | There were no issues found in this review | N/A | No additional items found | N | N/A | Closed |

Documents:

GRP-GD-002, Rev. 0, Change 0, *Data Validation for Radiochemical Analyses*, August 2010
GRP-GD-003, Rev. 0, Change 0, *Data Validation for Chemical Analyses*, August 2010
DOE/RL-2009-41, Rev. 0, *Sampling and Analysis Plan for the 100-K Decision Unit Remedial Investigation/Feasibility Study*, October 2009.
LA-523-455, Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry
LA-505-412: Inductively Coupled Plasma-Mass Spectrometry (ICP/MS) for Trace Elements in Water and Solids
LA-265-403: Hexavalent Chromium Anaysis By Spectrophotometer or Discrete Analyzer
LA-533-410: Anion Analysis By Ion Chromatography
LA-220-406: Strontium-89 and 90 in Aqueous Samples by Sr-Spec Separation

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Albuquerque, NM 87123
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# Data Validation Report for CH2M Hill Plateau Remediation Company

## VSR11-003
## Project 100 Area RI/FS

## Chemical & Radiochemical Validation - Level C

**Validation Performed By:** Eyda Hergenreder **Date:** 3-09-2011

**Validation Reviewed By:** Carl Schlosser **Date:** 3-09-2011

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Date: 09 March 2011
To: CH2M Hill (technical representative)
From: Analytical Quality Associates, Inc.
Project: 100 Area RI/FS
Subject: Volatile Organics - Sample Data Group (SDG) WSCF111251

## INTRODUCTION

This memorandum presents the results of data validation for SDG WSCF111251 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 |
|---|---|---|---|---|
| B260H7 | 01/21/11 | Water | C | 8260B |
| B260H8 | 01/21/11 | Water | C | 8260B |

Data validation was conducted in accordance with the CHPRC validation statement of work and the Sampling and Analysis Plan for the 100-K Decision Unit Remedial Investigation/Feasibility Study, DOE/RL-2009-41, 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 requirements for volatile organics are analysis within 14 days of sample collection. Sample preservation requires chilling to 4 degrees Celsius and acid preservation with hydrochloric or sulfuric acid to pH <2.

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 surrogate results, matrix spike sample results, and laboratory control sample results. According to the SAP, the matrix spike sample and laboratory control sample accuracy limits are 80% to 120%. The limits for reported analytes not listed in the SAP are specified by the DV procedure.

**Surrogates**

All surrogate recoveries were acceptable.

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

All MS/MSD recoveries were acceptable with the following exception.

The only 8260B MS/MSD analytes reported were 1,1-dichloroethene, benzene, chlorobenzene, toluene and trichloroethene. Reported analytes not represented in the MS/MSDs were cis-1,3-dichloropropene, trans-1,3-dichloropropene, methyl isobutyl ketone, 2-hexanone, acetone, carbon disulfide, bromodichloromethane and methyl ethyl ketone. All sample results for these non-represented analytes were non-detects and should be qualified as estimates and flagged "UJ."

**Laboratory Control Samples (LCSs)**

All LCS recoveries were acceptable with the following exceptions.

The only 8260B LCS analytes reported were 1,1-dichloroethene, benzene, chlorobenzene, toluene and trichloroethene. Reported analytes not represented in the LCSs were cis-1,3-dichloropropene, trans-1,3-dichloropropene, methyl isobutyl ketone, 2-hexanone, acetone, carbon disulfide, bromodichloromethane and methyl ethyl ketone. All sample results for these

non-represented analytes were non-detects and should be qualified as estimates and flagged "UJ."

- **Precision**

Precision is evaluated by reviewing MS/MSD results, field duplicate sample results, 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 ±20%. The limits for reported analytes not listed in the SAP are specified by the DV procedure.

**MS/MSD Samples**

All MS/MSD relative percent difference values were acceptable.

**Field Duplicate Samples**

No field duplicates were submitted for validation.

**Field Split Samples**

No field splits were submitted for validation.

- **Internal Standards**

Internal standard performance criteria ensure that GC/MS sensitivity and response are stable during each analysis. Internal standards are added to all samples, including QC samples, prior to analysis.

Internal standards 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 were below the CRDLs.

- **Completeness**

SDG WSCF11251 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 estimates were due to non-represented QC data for multiple analytes for all samples. 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-2009-41, Rev. 0, *Sampling and Analysis Plan for the 100-K Decision Unit Remedial Investigation/Feasibility Study*, October 2009.

# 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

| Volatile Organics Data Qualification Summary | | | |
|---|---|---|---|
| SDG: WSC111251 | Reviewer: AQA | Project:<br>100 Area RI/FS | Page 1 of 1 |
| **Analyte(s)** | **Qualifier** | **Samples Affected** | **Reason** |
| cis-1,3-Dichloropropene<br>trans-1,3-Dichloropropene<br>Methyl isobutyl ketone<br>2-Hexanone<br>Acetone<br>Carbon disulfide<br>Bromodichloromethane<br>Methyl ethyl ketone | UJ | B260H7, B260H8 | Non-represented<br>MS/MSD and LCS data |

Comments: None

# Appendix 3

Annotated Laboratory Reports

# WSCF Analytical Results Report

**Attention** Michael Neely
**Department** Organic, Volatiles

**Group #** WSCF111251

**Sample #** 111251001
**SAF#** F10-208
**Sample ID** B260H7

**Matrix** WATER
**Sampled** 01/21/11
**Received** 01/21/11

| Test Performed | CAS # | Method | RQ | Result | TP Err | Units | DF | MDL | PQL | Analyzed |
|---|---|---|---|---|---|---|---|---|---|---|
| **8260 Prep** | | | | | | | | | | **01/26/11** |
| **SW-846 8260B** | | | | | | | | | | |
| 1,1-Dichloroethene | 75-35-4 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Trichloroethene | 79-01-6 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Benzene | 71-43-2 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Toluene | 108-88-3 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Chlorobenzene | 108-90-7 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| 1,1-Dichloroethane | 75-34-3 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Ethylbenzene | 100-41-4 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Styrene | 100-42-5 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| cis-1,3-Dichloropropene UJ | 10061-01-5 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| trans-1,3-Dichloropropene UJ | 10061-02-6 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| 1,2-Dichloroethane | 107-06-2 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Methyl isobutyl ketone UJ | 108-10-1 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Dibromochloromethane | 124-48-1 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Tetrachloroethene | 127-18-4 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Total Xylenes | 1330-20-7 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Total 1,2-Dichloroethene | 540-59-0 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |

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
D - Analyte was reported at a secondary diltution factor.
E - The calibration exceeds the calibration range (GC/MS).
J - Analyte < PQL (or EQL) >= MDL.
N - Presumed evidence based on MS library search(GC/MS only)

T - MS/MSD recovery outside control limits(GC/MS only).
U - Analyzed for but not detected above limiting criteria.
X,Y or Z - See comment detail and/or narrative.
N - MS and/or MSD recovery outside control limits.
PQL is equivalent to Estimated Quantitation Limit (EQL)

# WSCF Analytical Results Report

**Attention** Michael Neely
**Department** Organic, Volatiles

**Group #** WSCF111251

**Sample #** 111251001
**SAF#** F10-208
**Sample ID** B260H7

**Matrix** WATER
**Sampled** 01/21/11
**Received** 01/21/11

| Test Performed | | CAS # | Method | RQ | Result | TP Err | Units | DF | MDL | PQL | Analyzed |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon tetrachloride | | 56-23-5 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| 2-Hexanone | UJ | 591-78-6 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Acetone | UJ | 67-64-1 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Chloroform | | 67-66-3 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| 1,1,1-Trichloroethane | | 71-55-6 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Bromomethane | | 74-83-9 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Chloromethane | | 74-87-3 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Chloroethane | | 75-00-3 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Vinyl chloride | | 75-01-4 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Methylene chloride | | 75-09-2 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Carbon disulfide | UJ | 75-15-0 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Bromoform | | 75-25-2 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Bromodichloromethane | UJ | 75-27-4 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| 1,2-Dichloropropane | | 78-87-5 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Methyl ethyl ketone | UJ | 78-93-3 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| 1,1,2-Trichloroethane | | 79-00-5 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| 1,1,2,2-Tetrachloroethane | | 79-34-5 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| trans-1,2-Dichloroethene | | 156-60-5 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |

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
D - Analyte was reported at a secondary diltution factor.
E - The calibration exceeds the calibration range (GC/MS).
J - Analyte < PQL (or EQL) >= MDL.
N - Presumed evidence based on MS library search(GC/MS only)

T - MS/MSD recovery outside control limits(GC/MS only).
U - Analyzed for but not detected above limiting criteria.
X,Y or Z - See comment detail and/or narrative.
N - MS and/or MSD recovery outside control limits.
PQL is equivalent to Estimated Quantitation Limit (EQL)

# WSCF Analytical Results Report

**Attention** Michael Neely
**Department** Organic, Volatiles

**Group #** WSCF111251

**Sample #** 111251001
**SAF#** F10-208
**Sample ID** B260H7

**Matrix** WATER
**Sampled** 01/21/11
**Received** 01/21/11

| Test Performed | CAS # | Method | RQ | Result | TP Err | Units | DF | MDL | PQL | Analyzed |
|---|---|---|---|---|---|---|---|---|---|---|
| cis-1,2-Dichloroethene | 156-59-2 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |

MDL = Minimum Detection
RQ = Result Qualifier
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B - Analyte was detected in both the BLANK and SAMPLE
D - Analyte was reported at a secondary diltution factor.
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X,Y or Z - See comment detail and/or narrative.
N - MS and/or MSD recovery outside control limits.
PQL is equivalent to Estimated Quantitation Limit (EQL)

# WSCF Analytical Results Report

**Attention** Michael Neely
**Department** Organic, Volatiles

**Group #** WSCF111251

**Sample #** 111251002
**SAF#** F10-208
**Sample ID** B260H8

**Matrix** WATER
**Sampled** 01/21/11
**Received** 01/21/11

| Test Performed | CAS # | Method | RQ | Result | TP Err | Units | DF | MDL | PQL | Analyzed |
|---|---|---|---|---|---|---|---|---|---|---|
| **8260 Prep** | | | | | | | | | | **01/26/11** |
| **SW-846 8260B** | | | | | | | | | | |
| 1,1-Dichloroethene | 75-35-4 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Trichloroethene | 79-01-6 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Benzene | 71-43-2 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Toluene | 108-88-3 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Chlorobenzene | 108-90-7 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| 1,1-Dichloroethane | 75-34-3 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Ethylbenzene | 100-41-4 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Styrene | 100-42-5 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| cis-1,3-Dichloropropene UJ | 10061-01-5 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| trans-1,3-Dichloropropene UJ | 10061-02-6 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| 1,2-Dichloroethane | 107-06-2 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Methyl isobutyl ketone UJ | 108-10-1 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Dibromochloromethane | 124-48-1 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Tetrachloroethene | 127-18-4 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Total Xylenes | 1330-20-7 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Total 1,2-Dichloroethene | 540-59-0 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |

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
D - Analyte was reported at a secondary diltution factor.
E - The calibration exceeds the calibration range (GC/MS).
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T - MS/MSD recovery outside control limits(GC/MS only).
U - Analyzed for but not detected above limiting criteria.
X,Y or Z - See comment detail and/or narrative.
N - MS and/or MSD recovery outside control limits.
PQL is equivalent to Estimated Quantitation Limit (EQL)

# WSCF Analytical Results Report

**Attention** Michael Neely
**Department** Organic, Volatiles

**Group #** WSCF111251

**Sample #** 111251002
**SAF#** F10-208
**Sample ID** B260H8

**Matrix** WATER
**Sampled** 01/21/11
**Received** 01/21/11

| Test Performed | | CAS # | Method | RQ | Result | TP Err | Units | DF | MDL | PQL | Analyzed |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon tetrachloride | | 56-23-5 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| 2-Hexanone | UJ | 591-78-6 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Acetone | UJ | 67-64-1 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Chloroform | | 67-66-3 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| 1,1,1-Trichloroethane | | 71-55-6 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Bromomethane | | 74-83-9 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Chloromethane | | 74-87-3 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Chloroethane | | 75-00-3 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Vinyl chloride | | 75-01-4 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Methylene chloride | | 75-09-2 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Carbon disulfide | UJ | 75-15-0 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Bromoform | | 75-25-2 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Bromodichloromethane | UJ | 75-27-4 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| 1,2-Dichloropropane | | 78-87-5 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| Methyl ethyl ketone | UJ | 78-93-3 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| 1,1,2-Trichloroethane | | 79-00-5 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| 1,1,2,2-Tetrachloroethane | | 79-34-5 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |
| trans-1,2-Dichloroethene | | 156-60-5 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |

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
D - Analyte was reported at a secondary diltution factor.
E - The calibration exceeds the calibration range (GC/MS).
J - Analyte < PQL (or EQL) >= MDL.
N - Presumed evidence based on MS library search(GC/MS only)

T - MS/MSD recovery outside control limits(GC/MS only).
U - Analyzed for but not detected above limiting criteria.
X,Y or Z - See comment detail and/or narrative.
N - MS and/or MSD recovery outside control limits.
PQL is equivalent to Estimated Quantitation Limit (EQL)

# WSCF Analytical Results Report

**Attention** Michael Neely
**Department** Organic, Volatiles

**Group #** WSCF111251

**Sample #** 111251002
**SAF#** F10-208
**Sample ID** B260H8

**Matrix** WATER
**Sampled** 01/21/11
**Received** 01/21/11

| Test Performed | CAS # | Method | RQ | Result | TP Err | Units | DF | MDL | PQL | Analyzed |
|---|---|---|---|---|---|---|---|---|---|---|
| cis-1,2-Dichloroethene | 156-59-2 | LA-523-455 | U | <1 | | ug/L | 1 | 1 | 5 | 01/26/11 |

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
D - Analyte was reported at a secondary diltution factor.
E - The calibration exceeds the calibration range (GC/MS).
J - Analyte < PQL (or EQL) >= MDL.
N - Presumed evidence based on MS library search(GC/MS only)

T - MS/MSD recovery outside control limits(GC/MS only).
U - Analyzed for but not detected above limiting criteria.
X,Y or Z - See comment detail and/or narrative.
N - MS and/or MSD recovery outside control limits.
PQL is equivalent to Estimated Quantitation Limit (EQL)

# Appendix 4

Laboratory Narrative and Chain-of-Custody Documentation

Attachment 2
**Narrative**
WSCF111251

## 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), 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

**Anions** – Hold time requirements for this analysis were met. A Duplicate, Matrix Spike, Matrix Spike Duplicate, Blank and Laboratory Control Sample were analyzed with this delivery group. Analytical Note(s):

- Sulfate – Matrix Spike and/or Matrix Spike Duplicate recoveries are outside established laboratory limits. Affected sample results in this batch were "N" flagged.
    - All other applicable QC controls are within the established limits.

Attachment 2
**Narrative**
WSCF111251

**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. Analytical Note(s):

- Manganese – Exceeded spiking levels by a factor of 4. Spike recoveries and associated RPDs are not valid.
    - All other applicable QC controls are within the established limits.

**Organic Comments**

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

- All 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.

# Sample Receipt

**CH2MHill Plateau Remediation Company** | **CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST** | F10-208-280 | PAGE 1 OF 1

COLLECTOR: Emerson

SAMPLING LOCATION: C7694; 1-023

ICE CHEST NO.: N/A

SHIPPED TO: Waste Sampling & Characterization

COMPANY CONTACT: DYEKMAN, DL

TELEPHONE NO.: 373-2530

PROJECT DESIGNATION: 100 Area Remedial Investigation/Feasibility Analysis - 100-KR-4 Groundwat

FIELD LOGBOOK NO.: ANF-N-583 3/48

ACTUAL SAMPLE DEPTH: ~~128.6'~~ 134' AC 1/21/11

OFFSITE PROPERTY NO.: N/A

PROJECT COORDINATOR: DYEKMAN, DL

SAF NO.: F10-208

COA: 300082ES10

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

PRICE CODE: 7N

AIR QUALITY: ☐

METHOD OF SHIPMENT: GOVERNMENT VEHICLE

Data Turnaround: ~~30~~ 15 Days/~~30~~ 15 Days VS 1/17/11

MATRIX*: A=Air, DL=Drum Liquids, DS=Drum Solids, L=Liquid, O=Oil, S=Soil, SE=Sediment, T=Tissue, 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)

SPECIAL HANDLING AND/OR STORAGE: 111251

| PRESERVATION | HCl or H2SO4 to pH <2/Cool~4C | HNO3 to pH <2 | HNO3 to pH <2 | Cool~4C | HNO3 to pH <2 | None |
|---|---|---|---|---|---|---|
| HOLDING TIME | 14 Days | 6 Months | 28 Days | 48 Hours | 6 Months | 6 Months |
| TYPE OF CONTAINER | aGs | G/P | G | P | G/P | G |
| NO. OF CONTAINER(S) | 3 | 1 | 1 | 1 | 2 | 1 |
| VOLUME | 40mL | 500mL | 500mL | 500mL | 1L | 250mL |
| SAMPLE ANALYSIS | VOA - 8260 (TCL 100 Area RI/FS); ✓ | SEE ITEM (1) IN SPECIAL INSTRUCTIONS | 200.8_HG - ICPMS (100 Area RI/FS); ✓ | IC Anions - 300.0 (100 Area RI/FS); ✓ | Strontium-89,90 - Total Sr; ✓ | Tritium - Ion Ex; ✓ |

| SAMPLE NO. | MATRIX* | SAMPLE DATE | SAMPLE TIME | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| B260H7 | WATER | 1/21/11 | 0830 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

**CHAIN OF POSSESSION / SIGN/ PRINT NAMES**

| RELINQUISHED BY/REMOVED FROM | DATE/TIME | RECEIVED BY/STORED IN | DATE/TIME |
|---|---|---|---|
| Adam Emerson | 1/21/11 1500 | Victor Blas | 1/21/11 1500 |
| 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 |
| RELINQUISHED BY/REMOVED FROM | DATE/TIME | RECEIVED BY/STORED IN | DATE/TIME |
| RELINQUISHED BY/REMOVED FROM | DATE/TIME | RECEIVED BY/STORED IN | DATE/TIME |

**SPECIAL INSTRUCTIONS**

** The laboratory is to report all TICs for Method 8260.☐☐** The CACN for all analytical work at WSCF laboratory is 401697ES20.☐** The 100 Area S&GRP Characterization and Monitoring Sampling and Analysis GKI applies to this SAF.
(1) ICP/MS - 200.8 (100 Area RI/FS); ICP/MS - 200.8 (Add-on) {Uranium};

ORIGINAL

| LABORATORY SECTION | RECEIVED BY | TITLE | DATE/TIME |
|---|---|---|---|
| FINAL SAMPLE DISPOSITION | DISPOSAL METHOD | DISPOSED BY | DATE/TIME |

# Sample Receipt

## Chain of Custody

**CH2MHill Plateau Remediation Company** — **CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST** — F10-208-281 — PAGE 1 OF 1

COLLECTOR: Emerson

SAMPLING LOCATION: C7694; I-024

ICE CHEST NO.: N/A

SHIPPED TO: Waste Sampling & Characterization

COMPANY CONTACT: DYEKMAN, DL

TELEPHONE NO.: 373-2530

PROJECT DESIGNATION: 100 Area Remedial Investigation/Feasibility Analysis - 100-KR-4 Groundwat

FIELD LOGBOOK NO.: HWF-N-583-3/48

ACTUAL SAMPLE DEPTH: 138'

OFFSITE PROPERTY NO.: N/A

PROJECT COORDINATOR: DYEKMAN, DL

SAF NO.: F10-208

COA: 300082ES10

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

PRICE CODE: 7N

AIR QUALITY: ☐

METHOD OF SHIPMENT: GOVERNMENT VEHICLE

Data Turnaround: ~~15~~, ~~30~~ Days/~~30~~ Days 15 15 1/17/11

MATRIX*: A=Air; DL=Drum Liquids; DS=Drum Solids; L=Liquid; O=Oil; S=Soil; SE=Sediment; T=Tissue; 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)

**SPECIAL HANDLING AND/OR STORAGE**

| PRESERVATION | HCl or H2SO4 to pH <2/Cool~4C | HNO3 to pH <2 | HNO3 to pH <2 | Cool~4C | HNO3 to pH <2 | None |
|---|---|---|---|---|---|---|
| HOLDING TIME | 14 Days | 6 Months | 28 Days | 48 Hours | 6 Months | 6 Months |
| TYPE OF CONTAINER | aGs | G/P | G | P | G/P | G |
| NO. OF CONTAINER(S) | 3 | 1 | 1 | 1 | 2 | 1 |
| VOLUME | 40mL | 500mL | 500mL | 500mL | 1L | 250mL |
| SAMPLE ANALYSIS | VOA - 8260 (TCL 100 Area RI/FS); | SEE ITEM (1) IN SPECIAL INSTRUCTIONS | 200.8_HG - ICPMS (100 Area RI/FS); | IC Anions - 300.0 (100 Area RI/FS); | Strontium-89,90 -- Total Sr; | Tritium - Ion Ex; |

| SAMPLE NO. | MATRIX* | SAMPLE DATE | SAMPLE TIME | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| B260H8 2 | WATER | 1/21/11 | 1410 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

| CHAIN OF POSSESSION | | SIGN/ PRINT NAMES | |
|---|---|---|---|
| RELINQUISHED BY/REMOVED FROM: Adam Emerson | DATE/TIME: 1/21/11 1500 | RECEIVED BY/STORED IN: Victor Jim | DATE/TIME: 1/21/11 1500 |
| 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 |
| RELINQUISHED BY/REMOVED FROM | DATE/TIME | RECEIVED BY/STORED IN | DATE/TIME |
| RELINQUISHED BY/REMOVED FROM | DATE/TIME | RECEIVED BY/STORED IN | DATE/TIME |

**SPECIAL INSTRUCTIONS**

** The laboratory is to report all TICs for Method 8260.☐☐** The CACN for all analytical work at WSCF laboratory is 401697ES20.☐** The 100 Area S&GRP Characterization and Monitoring Sampling and Analysis GKI applies to this SAF.
(1) ICP/MS - 200.8 (100 Area RI/FS); ICP/MS - 200.8 (Add-on) {Uranium};

| LABORATORY SECTION | RECEIVED BY | TITLE | DATE/TIME |
|---|---|---|---|
| FINAL SAMPLE DISPOSITION | DISPOSAL METHOD | DISPOSED BY | DATE/TIME |

# Appendix 5

Data Validation Supporting Documentation

## Appendix A - Chemical Data Validation Checklist

| VALIDATION LEVEL: | A | B | (C) | D | E |
|---|---|---|---|---|---|
| PROJECT: 100 Area RI/FS | | | DATA PACKAGE: VSR11-003 | | |
| VALIDATOR: Eyda Hergenreder | | LAB: WSCF | | DATE: 03-09-2011 | |
| | | | SDG: WSCF111251 | | |
| ANALYSES PERFORMED | | | | | |
| SW-846 8260 X | | SW-846 8260 (TCLP) | SW-846 8270 | | SW-846 8270 (TCLP) |
| | | | | | |
| SAMPLES/MATRIX Water samples<br>SDG WSCF111251: B260H7, B260H8 | | | | | |

### 1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE

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

Comments: None

**2. INSTRUMENT TUNING AND CALIBRATION (Levels D and E)**

GC/MS tuning/performance check acceptable? ..... Yes No N/A

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

Continuing calibrations 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)**

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

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

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

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

Comments: None

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

Surrogates/system monitoring compounds analyzed? ..... Yes No N/A

Surrogate/system monitoring compound recoveries acceptable? ..... Yes No N/A

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

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

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? (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:

Lack of MS/MSD and LCS data for cis-1,3-dichloropropene, trans-1,2-dichloropropene, 4-methyl-2-pentanone, 2-hexanone, acetone carbon disulfide, bromodichloromethane and methyl ethyl ketone.

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

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

MS/MSD RPD values 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. SYSTEM PERFORMANCE (Levels D and E)**

Internal standards analyzed? ..... Yes No N/A

Internal standard areas acceptable? ..... Yes No N/A

Internal standard retention times 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

**8. COMPOUND IDENTIFICATION, QUANTITATION, AND DETECTION LIMITS (all levels)**

Compound identification acceptable? (Levels D, E) ..... Yes No N/A

Compound quantitation acceptable? (Levels D, E) ..... Yes No N/A

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

Laboratory properly identified and coded all TIC? (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

**9. SAMPLE CLEANUP (Levels D and E)**

GPC cleanup performed? ..... Yes No N/A

GPC check performed?..... Yes No N/A

GPC check recoveries acceptable?..... Yes No N/A

GPC calibration performed?..... Yes No N/A

GPC calibration check performed? ..... Yes No N/A

GPC calibration check retention times acceptable? ..... Yes No N/A

Check/calibration materials traceable? ..... Yes No N/A

Check/calibration materials Expired?..... Yes No N/A

Analytical batch QC given similar cleanup?..... Yes No N/A

Transcription/Calculation Errors?..... Yes No N/A

Comments:

Comments (attach additional sheets as necessary): None

# Appendix 6

Additional Documentation Requested By Client

## Quality Control Report

**Attention** Michael Neely
**Department** Organic, Volatiles

**Group #** WSCF111251

**QC Batch** 175114
**Associated Samples** 111251001, 111251002

**Test** SW-846 8260B Volatiles, separate prep

| Analyte | CAS # | Original Found | QC Found | Units | % Recov | Limits | RPD | RPD Limit | RQ | Analyzed |
|---|---|---|---|---|---|---|---|---|---|---|
| **BLANK** | | | **QC Sample #47426** | | | | | | | |
| 1,1-Dichloroethene | 75-35-4 | | <1 | ug/L | | | | | U | 01/26/11 |
| Trichloroethene | 79-01-6 | | <1 | ug/L | | | | | U | 01/26/11 |
| Benzene | 71-43-2 | | <1 | ug/L | | | | | U | 01/26/11 |
| Toluene | 108-88-3 | | <1 | ug/L | | | | | U | 01/26/11 |
| Chlorobenzene | 108-90-7 | | <1 | ug/L | | | | | U | 01/26/11 |
| 1,1-Dichloroethane | 75-34-3 | | <1 | ug/L | | | | | U | 01/26/11 |
| Ethylbenzene | 100-41-4 | | <1 | ug/L | | | | | U | 01/26/11 |
| Styrene | 100-42-5 | | <1 | ug/L | | | | | U | 01/26/11 |
| cis-1,3-Dichloropropene | 10061-01-5 | | <1 | ug/L | | | | | U | 01/26/11 |
| trans-1,3-Dichloropropene | 10061-02-6 | | <1 | ug/L | | | | | U | 01/26/11 |
| 1,2-Dichloroethane | 107-06-2 | | <1 | ug/L | | | | | U | 01/26/11 |
| Methyl isobutyl ketone | 108-10-1 | | <1 | ug/L | | | | | U | 01/26/11 |
| Dibromochloromethane | 124-48-1 | | <1 | ug/L | | | | | U | 01/26/11 |
| Tetrachloroethene | 127-18-4 | | <1 | ug/L | | | | | U | 01/26/11 |
| Total Xylenes | 1330-20-7 | | <1 | ug/L | | | | | U | 01/26/11 |
| Total 1,2-Dichloroethene | 540-59-0 | | <1 | ug/L | | | | | U | 01/26/11 |
| Carbon tetrachloride | 56-23-5 | | <1 | ug/L | | | | | U | 01/26/11 |

## Quality Control Report

**Attention** Michael Neely
**Department** Organic, Volatiles

**Group #** WSCF111251

| Analyte | CAS # | Original Found | QC Found | Units | % Recov | Limits | RPD | RPD Limit | RQ | Analyzed |
|---|---|---|---|---|---|---|---|---|---|---|
| 2-Hexanone | 591-78-6 | | <1 | ug/L | | | | | U | 01/26/11 |
| Acetone | 67-64-1 | | <1 | ug/L | | | | | U | 01/26/11 |
| Chloroform | 67-66-3 | | <1 | ug/L | | | | | U | 01/26/11 |
| 1,1,1-Trichloroethane | 71-55-6 | | <1 | ug/L | | | | | U | 01/26/11 |
| Bromomethane | 74-83-9 | | <1 | ug/L | | | | | U | 01/26/11 |
| Chloromethane | 74-87-3 | | <1 | ug/L | | | | | U | 01/26/11 |
| Chloroethane | 75-00-3 | | <1 | ug/L | | | | | U | 01/26/11 |
| Vinyl chloride | 75-01-4 | | <1 | ug/L | | | | | U | 01/26/11 |
| Methylene chloride | 75-09-2 | | <1 | ug/L | | | | | U | 01/26/11 |
| Carbon disulfide | 75-15-0 | | <1 | ug/L | | | | | U | 01/26/11 |
| Bromoform | 75-25-2 | | <1 | ug/L | | | | | U | 01/26/11 |
| Bromodichloromethane | 75-27-4 | | <1 | ug/L | | | | | U | 01/26/11 |
| 1,2-Dichloropropane | 78-87-5 | | <1 | ug/L | | | | | U | 01/26/11 |
| Methyl ethyl ketone | 78-93-3 | | <1 | ug/L | | | | | U | 01/26/11 |
| 1,1,2-Trichloroethane | 79-00-5 | | <1 | ug/L | | | | | U | 01/26/11 |
| 1,1,2,2-Tetrachloroethane | 79-34-5 | | <1 | ug/L | | | | | U | 01/26/11 |
| trans-1,2-Dichloroethene | 156-60-5 | | <1 | ug/L | | | | | U | 01/26/11 |
| cis-1,2-Dichloroethene | 156-59-2 | | <1 | ug/L | | | | | U | 01/26/11 |
| **LCS** | | | **QC Sample #47427** | | | | | | | |
| 1,1-Dichloroethene | 75-35-4 | | 24 | ug/L | 95 | 75 - 125 | | | | 01/26/11 |
| Trichloroethene | 79-01-6 | | 20 | ug/L | 80.3 | 75 - 125 | | | | 01/26/11 |
| Benzene | 71-43-2 | | 23 | ug/L | 90.1 | 75 - 125 | | | | 01/26/11 |

## Quality Control Report

**Attention** Michael Neely
**Department** Organic, Volatiles

**Group #** WSCF111251

| Analyte | CAS # | Original Found | QC Found | Units | % Recov | Limits | RPD | RPD Limit | RQ | Analyzed |
|---|---|---|---|---|---|---|---|---|---|---|
| Toluene | 108-88-3 | | 21 | ug/L | 82.6 | 75 - 125 | | | | 01/26/11 |
| Chlorobenzene | 108-90-7 | | 22 | ug/L | 86.5 | 75 - 125 | | | | 01/26/11 |
| **MS** | | | **QC Sample #47428** | | | | | | | |
| | | | **Original 111247001** | | | | | | | |
| 1,1-Dichloroethene | 75-35-4 | | 28 | ug/L | 112.2 | 75 - 125 | | | | 01/26/11 |
| Trichloroethene | 79-01-6 | | 22 | ug/L | 90 | 75 - 125 | | | | 01/26/11 |
| Benzene | 71-43-2 | | 25 | ug/L | 98.9 | 75 - 125 | | | | 01/26/11 |
| Toluene | 108-88-3 | | 24 | ug/L | 95.2 | 75 - 125 | | | | 01/26/11 |
| Chlorobenzene | 108-90-7 | | 24 | ug/L | 96.2 | 75 - 125 | | | | 01/26/11 |
| **MSD** | | | **QC Sample #47429** | | | | | | | |
| | | | **Original 111247001** | | | | | **Paired** | **47428** | |
| 1,1-Dichloroethene | 75-35-4 | | 27 | ug/L | 109.4 | 75 - 125 | 2.50 | 20 | | 01/26/11 |
| Trichloroethene | 79-01-6 | | 22 | ug/L | 86.2 | 75 - 125 | 4.30 | 20 | | 01/26/11 |
| Benzene | 71-43-2 | | 24 | ug/L | 97.6 | 75 - 125 | 1.30 | 20 | | 01/26/11 |
| Toluene | 108-88-3 | | 23 | ug/L | 90.5 | 75 - 125 | 5.10 | 20 | | 01/26/11 |
| Chlorobenzene | 108-90-7 | | 24 | ug/L | 95 | 75 - 125 | 1.30 | 20 | | 01/26/11 |

## Quality Control Report

**Attention** Michael Neely
**Department** Organic, Volatiles

**Group #** WSCF111251

**QC Batch** 175114
**Associated Samples** 111251001, 111251002

**Test** SW-846 8260B Volatiles, separate prep

| Analyte | CAS # | Original Found | QC Found | Units | % Recov | Limits | RPD | RPD Limit | RQ | Analyzed |
|---|---|---|---|---|---|---|---|---|---|---|
| **SAMPLE** | | | **Sample #111251001** | | | | | | | |
| 1,2-Dichloroethane-d4 | 17060-07-0 | | | | 98.3 | 75 - 125 | | | | 01/26/11 |
| Toluene-d8 | 2037-26-5 | | | | 91.6 | 75 - 125 | | | | 01/26/11 |
| 4-Bromofluorobenzene | 460-00-4 | | | | 91.7 | 75 - 125 | | | | 01/26/11 |
| **SAMPLE** | | | **Sample #111251002** | | | | | | | |
| 1,2-Dichloroethane-d4 | 17060-07-0 | | | | 101.3 | 75 - 125 | | | | 01/26/11 |
| Toluene-d8 | 2037-26-5 | | | | 92.8 | 75 - 125 | | | | 01/26/11 |
| 4-Bromofluorobenzene | 460-00-4 | | | | 89.4 | 75 - 125 | | | | 01/26/11 |
| **BLANK** | | | **QC Sample #47426** | | | | | | | |
| 1,2-Dichloroethane-d4 | 17060-07-0 | | | | 97 | 75 - 125 | | | | 01/26/11 |
| Toluene-d8 | 2037-26-5 | | | | 90 | 75 - 125 | | | | 01/26/11 |
| 4-Bromofluorobenzene | 460-00-4 | | | | 91.6 | 75 - 125 | | | | 01/26/11 |
| **LCS** | | | **QC Sample #47427** | | | | | | | |
| 1,2-Dichloroethane-d4 | 17060-07-0 | | | | 97.4 | 75 - 125 | | | | 01/26/11 |
| Toluene-d8 | 2037-26-5 | | | | 90.3 | 75 - 125 | | | | 01/26/11 |

## Quality Control Report

**Attention** Michael Neely
**Department** Organic, Volatiles

**Group #** WSCF111251

| Analyte | CAS # | Original Found | QC Found | Units | % Recov | Limits | RPD | RPD Limit | RQ | Analyzed |
|---|---|---|---|---|---|---|---|---|---|---|
| 4-Bromofluorobenzene | 460-00-4 | | | | 92 | 75 - 125 | | | | 01/26/11 |
| **MS** | | | **QC Sample #47428** | | | | | | | |
| | | | **Original** | **111247001** | | | | | | |
| 1,2-Dichloroethane-d4 | 17060-07-0 | | | | 100.5 | 75 - 125 | | | | 01/26/11 |
| Toluene-d8 | 2037-26-5 | | | | 92.2 | 75 - 125 | | | | 01/26/11 |
| 4-Bromofluorobenzene | 460-00-4 | | | | 89.9 | 75 - 125 | | | | 01/26/11 |
| **MSD** | | | **QC Sample #47429** | | | | | | | |
| | | | **Original** | **111247001** | | | | | **Paired** | **47428** |
| 1,2-Dichloroethane-d4 | 17060-07-0 | | | | 98.4 | 75 - 125 | 2.10 | 20 | | 01/26/11 |
| Toluene-d8 | 2037-26-5 | | | | 90.4 | 75 - 125 | 2.00 | 20 | | 01/26/11 |
| 4-Bromofluorobenzene | 460-00-4 | | | | 89.9 | 75 - 125 | 0.00 | 20 | | 01/26/11 |

Date: 09 March 2011
To: CH2M Hill (technical representative)
From: Analytical Quality Associates, Inc.
Project: 100 Area RI/FS
Subject: Inorganics - Sample Data Group (SDG) WSCF111251

## INTRODUCTION

This memorandum presents the results of data validation for SDG WSCF111251 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 |
|---|---|---|---|---|
| B260H7 | 01/21/11 | Water | C | 200.8 |
| B260H8 | 01/21/11 | Water | 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-K Decision Unit Remedial Investigation/Feasibility Study, DOE/RL-2009-41, 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 acid preservation with nitric acid to pH <2.

The samples were analyzed within the prescribed holding times 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, 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 for ICP analytes are 80% to 120%. For Hg, the matrix spike sample accuracy limits are 80% to 120%, and the laboratory control sample accuracy limits are ones specified by the DV procedure. 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.

**Laboratory Control Samples (LCSs)**

All LCS recoveries were acceptable.

**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 ±20%. The limits for reported analytes not listed in the SAP are 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.

- **ICP-MS Internal Standards**

The analysis of ICP-MS internal standards is used to determine the existences and magnitude of instrument drift and physical interferences. The criteria for evaluation of internal standard results apply to all samples (including QC) analyzed during the analytical run, beginning with the calibration.

ICP-MS internal standards 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 were below the CRDLs.

- **Completeness**

SDG WSCF111251 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

None found.

## REFERENCES

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

DOE/RL-2009-41, Rev. 0, *Sampling and Analysis Plan for the 100-K Decision Unit Remedial Investigation/Feasibility Study*, October 2009.

# 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: WSCF111251 | Reviewer: AQA | Project:<br>100 Area RI/FS | Page 1 of 1 |
| **Analyte(s)** | **Qualifier** | **Samples Affected** | **Reason** |
| Metals | None | N/A | N/A |

Comments: None

# Appendix 3

Annotated Laboratory Reports

# WSCF Analytical Results Report

**Attention** Michael Neely
**Department** Inorganic

**Group #** WSCF111251

**Sample #** 111251001
**SAF#** F10-208
**Sample ID** B260H7

**Matrix** WATER
**Sampled** 01/21/11
**Received** 01/21/11

| Test Performed | CAS # | Method | RQ | Result | TP Err | Units | DF | MDL | PQL | Analyzed |
|---|---|---|---|---|---|---|---|---|---|---|
| **Anions by IC** | | | | | | | | | | **01/22/11** |
| **Anions by IC** | | | | | | | | | | |
| Fluoride | 16984-48-8 | LA-533-410 | BD | 0.224 | | ug/mL | 2 | 0.088 | 0.40 | 01/22/11 |
| Chloride | 16887-00-6 | LA-533-410 | D | 8.02 | | ug/mL | 2 | 0.084 | 0.80 | 01/22/11 |
| Nitrite-N | NO2-N | LA-533-410 | UD | <0.036 | | ug/mL | 2 | 0.036 | 0.20 | 01/22/11 |
| Bromide | 24959-67-9 | LA-533-410 | UD | <0.11 | | ug/mL | 2 | 0.11 | 1.0 | 01/22/11 |
| Nitrate-N | NO3-N | LA-533-410 | D | 2.07 | | ug/mL | 2 | 0.019 | 0.20 | 01/22/11 |
| Phosphate-P | PO4-P | LA-533-410 | UD | <0.14 | | ug/mL | 2 | 0.14 | 0.80 | 01/22/11 |
| Sulfate | 14808-79-8 | LA-533-410 | DN | 46.4 | | ug/mL | 2 | 0.17 | 2.0 | 01/22/11 |
| **ICPMS Prep** | | | | | | | | | | **02/01/11** |
| **ICP-MS** | | | | | | | | | | |
| Aluminum | 7429-90-5 | LA-505-412 | UD | <10 | | ug/L | 2 | 10 | 200 | 02/02/11 |
| Manganese | 7439-96-5 | LA-505-412 | D | 126 | | ug/L | 2 | 0.20 | 2.0 | 02/02/11 |
| Nickel | 7440-02-0 | LA-505-412 | BD | 0.992 | | ug/L | 2 | 0.40 | 4.0 | 02/02/11 |
| Silver | 7440-22-4 | LA-505-412 | UD | <0.20 | | ug/L | 2 | 0.20 | 2.0 | 02/02/11 |
| Antimony | 7440-36-0 | LA-505-412 | UD | <0.60 | | ug/L | 2 | 0.60 | 6.0 | 02/02/11 |
| Barium | 7440-39-3 | LA-505-412 | D | 32.5 | | ug/L | 2 | 0.40 | 4.0 | 02/02/11 |
| Beryllium | 7440-41-7 | LA-505-412 | UD | <0.10 | | ug/L | 2 | 0.10 | 1.0 | 02/02/11 |
| Cadmium | 7440-43-9 | LA-505-412 | UD | <0.20 | | ug/L | 2 | 0.20 | 2.0 | 02/02/11 |

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 diltution 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

**Attention** Michael Neely
**Department** Inorganic

**Group #** WSCF111251

**Sample #** 111251001
**SAF#** F10-208
**Sample ID** B260H7

**Matrix** WATER
**Sampled** 01/21/11
**Received** 01/21/11

| Test Performed | CAS # | Method | RQ | Result | TP Err | Units | DF | MDL | PQL | Analyzed |
|---|---|---|---|---|---|---|---|---|---|---|
| Chromium | 7440-47-3 | LA-505-412 | BD | 3.94 | | ug/L | 2 | 1.0 | 10 | 02/02/11 |
| Cobalt | 7440-48-4 | LA-505-412 | BD | 0.358 | | ug/L | 2 | 0.10 | 0.50 | 02/02/11 |
| Copper | 7440-50-8 | LA-505-412 | BD | 0.220 | | ug/L | 2 | 0.20 | 2.0 | 02/02/11 |
| Vanadium | 7440-62-2 | LA-505-412 | D | 10.3 | | ug/L | 2 | 0.40 | 4.0 | 02/02/11 |
| Zinc | 7440-66-6 | LA-505-412 | D | 13.3 | | ug/L | 2 | 1.6 | 10 | 02/02/11 |
| Lead | 7439-92-1 | LA-505-412 | UD | <0.20 | | ug/L | 2 | 0.20 | 2.0 | 02/02/11 |
| Mercury | 7439-97-6 | LA-505-412 | UD | <0.10 | | ug/L | 2 | 0.10 | 0.40 | 02/02/11 |
| Thallium | 7440-28-0 | LA-505-412 | UD | <0.10 | | ug/L | 2 | 0.10 | 1.0 | 02/02/11 |
| Uranium | 7440-61-1 | LA-505-412 | D | 2.52 | | ug/L | 2 | 0.10 | 0.40 | 02/02/11 |
| Arsenic | 7440-38-2 | LA-505-412 | BD | 2.79 | | ug/L | 2 | 0.80 | 8.0 | 02/02/11 |
| Selenium | 7782-49-2 | LA-505-412 | BD | 1.47 | | ug/L | 2 | 0.60 | 6.0 | 02/02/11 |

MDL = Minimum Detection
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DF = Dilution Factor
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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

**Attention** Michael Neely
**Department** Inorganic

**Group #** WSCF111251

**Sample #** 111251002
**SAF#** F10-208
**Sample ID** B260H8

**Matrix** WATER
**Sampled** 01/21/11
**Received** 01/21/11

| Test Performed | CAS # | Method | RQ | Result | TP Err | Units | DF | MDL | PQL | Analyzed |
|---|---|---|---|---|---|---|---|---|---|---|
| **Anions by IC** | | | | | | | | | | **01/22/11** |
| **Anions by IC** | | | | | | | | | | |
| Fluoride | 16984-48-8 | LA-533-410 | BD | 0.190 | | ug/mL | 2 | 0.088 | 0.40 | 01/22/11 |
| Chloride | 16887-00-6 | LA-533-410 | D | 7.49 | | ug/mL | 2 | 0.084 | 0.80 | 01/22/11 |
| Nitrite-N | NO2-N | LA-533-410 | UD | <0.036 | | ug/mL | 2 | 0.036 | 0.20 | 01/22/11 |
| Bromide | 24959-67-9 | LA-533-410 | UD | <0.11 | | ug/mL | 2 | 0.11 | 1.0 | 01/22/11 |
| Nitrate-N | NO3-N | LA-533-410 | D | 1.94 | | ug/mL | 2 | 0.019 | 0.20 | 01/22/11 |
| Phosphate-P | PO4-P | LA-533-410 | UD | <0.14 | | ug/mL | 2 | 0.14 | 0.80 | 01/22/11 |
| Sulfate | 14808-79-8 | LA-533-410 | DN | 44.2 | | ug/mL | 2 | 0.17 | 2.0 | 01/22/11 |
| **ICPMS Prep** | | | | | | | | | | **02/01/11** |
| **ICP-MS** | | | | | | | | | | |
| Aluminum | 7429-90-5 | LA-505-412 | BD | 10.5 | | ug/L | 2 | 10 | 200 | 02/02/11 |
| Manganese | 7439-96-5 | LA-505-412 | D | 82.5 | | ug/L | 2 | 0.20 | 2.0 | 02/02/11 |
| Nickel | 7440-02-0 | LA-505-412 | BD | 0.984 | | ug/L | 2 | 0.40 | 4.0 | 02/02/11 |
| Silver | 7440-22-4 | LA-505-412 | UD | <0.20 | | ug/L | 2 | 0.20 | 2.0 | 02/02/11 |
| Antimony | 7440-36-0 | LA-505-412 | UD | <0.60 | | ug/L | 2 | 0.60 | 6.0 | 02/02/11 |
| Barium | 7440-39-3 | LA-505-412 | D | 31.0 | | ug/L | 2 | 0.40 | 4.0 | 02/02/11 |
| Beryllium | 7440-41-7 | LA-505-412 | UD | <0.10 | | ug/L | 2 | 0.10 | 1.0 | 02/02/11 |
| Cadmium | 7440-43-9 | LA-505-412 | UD | <0.20 | | ug/L | 2 | 0.20 | 2.0 | 02/02/11 |

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 diltution 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

**Attention** Michael Neely
**Department** Inorganic

**Group #** WSCF111251

**Sample #** 111251002
**SAF#** F10-208
**Sample ID** B260H8

**Matrix** WATER
**Sampled** 01/21/11
**Received** 01/21/11

| Test Performed | CAS # | Method | RQ | Result | TP Err | Units | DF | MDL | PQL | Analyzed |
|---|---|---|---|---|---|---|---|---|---|---|
| Chromium | 7440-47-3 | LA-505-412 | BD | 4.99 | | ug/L | 2 | 1.0 | 10 | 02/02/11 |
| Cobalt | 7440-48-4 | LA-505-412 | D | 0.806 | | ug/L | 2 | 0.10 | 0.50 | 02/02/11 |
| Copper | 7440-50-8 | LA-505-412 | BD | 0.313 | | ug/L | 2 | 0.20 | 2.0 | 02/02/11 |
| Vanadium | 7440-62-2 | LA-505-412 | D | 11.7 | | ug/L | 2 | 0.40 | 4.0 | 02/02/11 |
| Zinc | 7440-66-6 | LA-505-412 | D | 10.2 | | ug/L | 2 | 1.6 | 10 | 02/02/11 |
| Lead | 7439-92-1 | LA-505-412 | UD | <0.20 | | ug/L | 2 | 0.20 | 2.0 | 02/02/11 |
| Mercury | 7439-97-6 | LA-505-412 | UD | <0.10 | | ug/L | 2 | 0.10 | 0.40 | 02/02/11 |
| Thallium | 7440-28-0 | LA-505-412 | UD | <0.10 | | ug/L | 2 | 0.10 | 1.0 | 02/02/11 |
| Uranium | 7440-61-1 | LA-505-412 | D | 2.85 | | ug/L | 2 | 0.10 | 0.40 | 02/02/11 |
| Arsenic | 7440-38-2 | LA-505-412 | BD | 3.13 | | ug/L | 2 | 0.80 | 8.0 | 02/02/11 |
| Selenium | 7782-49-2 | LA-505-412 | BD | 1.93 | | ug/L | 2 | 0.60 | 6.0 | 02/02/11 |

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 diltution 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

Attachment 2
**Narrative**
WSCF111251

## 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), 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

**Anions** – Hold time requirements for this analysis were met. A Duplicate, Matrix Spike, Matrix Spike Duplicate, Blank and Laboratory Control Sample were analyzed with this delivery group. Analytical Note(s):

- Sulfate – Matrix Spike and/or Matrix Spike Duplicate recoveries are outside established laboratory limits. Affected sample results in this batch were "N" flagged.
    - All other applicable QC controls are within the established limits.

Attachment 2
**Narrative**
WSCF111251

**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. Analytical Note(s):

- Manganese – Exceeded spiking levels by a factor of 4. Spike recoveries and associated RPDs are not valid.
    - All other applicable QC controls are within the established limits.

**Organic Comments**

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

- All 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.

**CH2MHill Plateau Remediation Company**

**CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST**

F10-208-280

PAGE 1 OF 1

COLLECTOR: Emerson

SAMPLING LOCATION: C7694; 1-023

ICE CHEST NO.: N/A

SHIPPED TO: Waste Sampling & Characterization

COMPANY CONTACT: DYEKMAN, DL

TELEPHONE NO.: 373-2530

PROJECT DESIGNATION: 100 Area Remedial Investigation/Feasibility Analysis - 100-KR-4 Groundwat

FIELD LOGBOOK NO.: ANF-N-583 3/48

ACTUAL SAMPLE DEPTH: ~~128.6'~~ 134' AC 1/21/11

OFFSITE PROPERTY NO.: N/A

PROJECT COORDINATOR: DYEKMAN, DL

SAF NO.: F10-208

COA: 300082ES10

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

PRICE CODE: 7N

AIR QUALITY: ☐

METHOD OF SHIPMENT: GOVERNMENT VEHICLE

Data Turnaround: ~~30~~ 15 Days/~~30~~ 15 Days VS 1/17/11

MATRIX*: A=Air, DL=Drum Liquids, DS=Drum Solids, L=Liquid, O=Oil, S=Soil, SE=Sediment, T=Tissue, 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)

111251

SPECIAL HANDLING AND/OR STORAGE

| PRESERVATION | HCl or H2SO4 to pH <2/Cool~4C | HNO3 to pH <2 | HNO3 to pH <2 | Cool~4C | HNO3 to pH <2 | None |
|---|---|---|---|---|---|---|
| HOLDING TIME | 14 Days | 6 Months | 28 Days | 48 Hours | 6 Months | 6 Months |
| TYPE OF CONTAINER | aGs | G/P | G | P | G/P | G |
| NO. OF CONTAINER(S) | 3 | 1 | 1 | 1 | 2 | 1 |
| VOLUME | 40mL | 500mL | 500mL | 500mL | 1L | 250mL |
| SAMPLE ANALYSIS | VOA - 8260 (TCL 100 Area RI/FS); ✓ | SEE ITEM (1) IN SPECIAL INSTRUCTIONS | 200.8_HG - ICPMS (100 Area RI/FS); ✓ | IC Anions - 300.0 (100 Area RI/FS); ✓ | Strontium-89,90 - Total Sr; ✓ | Tritium - Ion Ex; ✓ |

| SAMPLE NO. | MATRIX* | SAMPLE DATE | SAMPLE TIME | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| B260H7 | WATER | 1/21/11 | 0830 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

| CHAIN OF POSSESSION | | SIGN/ PRINT NAMES | |
|---|---|---|---|
| RELINQUISHED BY/REMOVED FROM: Adam Emerson | DATE/TIME: 1/21/11 1500 | RECEIVED BY/STORED IN: Victor | DATE/TIME: 1/21/11 1500 |
| 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 |
| RELINQUISHED BY/REMOVED FROM | DATE/TIME | RECEIVED BY/STORED IN | DATE/TIME |
| RELINQUISHED BY/REMOVED FROM | DATE/TIME | RECEIVED BY/STORED IN | DATE/TIME |

SPECIAL INSTRUCTIONS

** The laboratory is to report all TICs for Method 8260.☐☐** The CACN for all analytical work at WSCF laboratory is 401697ES20.☐** The 100 Area S&GRP Characterization and Monitoring Sampling and Analysis GKI applies to this SAF.
(1) ICP/MS - 200.8 (100 Area RI/FS); ICP/MS - 200.8 (Add-on) {Uranium};

ORIGINAL

| LABORATORY SECTION | RECEIVED BY | TITLE | DATE/TIME |
|---|---|---|---|
| FINAL SAMPLE DISPOSITION | DISPOSAL METHOD | DISPOSED BY | DATE/TIME |

# Sample Receipt

## Chain of Custody

**CH2MHill Plateau Remediation Company** — **CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST** — F10-208-281 — PAGE 1 OF 1

COLLECTOR: Emerson

SAMPLING LOCATION: C7694; I-024

ICE CHEST NO.: N/A

SHIPPED TO: Waste Sampling & Characterization

COMPANY CONTACT: DYEKMAN, DL

TELEPHONE NO.: 373-2530

PROJECT DESIGNATION: 100 Area Remedial Investigation/Feasibility Analysis - 100-KR-4 Groundwat

FIELD LOGBOOK NO.: HWF-N-583-3/48

ACTUAL SAMPLE DEPTH: 138'

OFFSITE PROPERTY NO.: N/A

PROJECT COORDINATOR: DYEKMAN, DL

SAF NO.: F10-208

COA: 300082ES10

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

PRICE CODE: 7N

AIR QUALITY: ☐

METHOD OF SHIPMENT: GOVERNMENT VEHICLE

Data Turnaround: ~~30~~ Days/~~30~~ Days 15 15 1/17/11

MATRIX*: A=Air; DL=Drum Liquids; DS=Drum Solids; L=Liquid; O=Oil; S=Soil; SE=Sediment; T=Tissue; 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)

**SPECIAL HANDLING AND/OR STORAGE**

| PRESERVATION | HCl or H2SO4 to pH <2/Cool~4C | HNO3 to pH <2 | HNO3 to pH <2 | Cool~4C | HNO3 to pH <2 | None |
|---|---|---|---|---|---|---|
| HOLDING TIME | 14 Days | 6 Months | 28 Days | 48 Hours | 6 Months | 6 Months |
| TYPE OF CONTAINER | aGs | G/P | G | P | G/P | G |
| NO. OF CONTAINER(S) | 3 | 1 | 1 | 1 | 2 | 1 |
| VOLUME | 40mL | 500mL | 500mL | 500mL | 1L | 250mL |
| SAMPLE ANALYSIS | VOA - 8260 (TCL 100 Area RI/FS); | SEE ITEM (1) IN SPECIAL INSTRUCTIONS | 200.8_HG - ICPMS (100 Area RI/FS); | IC Anions - 300.0 (100 Area RI/FS); | Strontium-89,90 -- Total Sr; | Tritium - Ion Ex; |

| SAMPLE NO. | MATRIX* | SAMPLE DATE | SAMPLE TIME | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| B260H8 2 | WATER | 1/21/11 | 1410 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

| CHAIN OF POSSESSION | | SIGN/ PRINT NAMES | |
|---|---|---|---|
| RELINQUISHED BY/REMOVED FROM: Adam Emerson | DATE/TIME: 1/21/11 1500 | RECEIVED BY/STORED IN: Victor Jim | DATE/TIME: 1/21/11 1500 |
| 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 |
| RELINQUISHED BY/REMOVED FROM | DATE/TIME | RECEIVED BY/STORED IN | DATE/TIME |
| RELINQUISHED BY/REMOVED FROM | DATE/TIME | RECEIVED BY/STORED IN | DATE/TIME |

**SPECIAL INSTRUCTIONS**

** The laboratory is to report all TICs for Method 8260.☐☐** The CACN for all analytical work at WSCF laboratory is 401697ES20.☐** The 100 Area S&GRP Characterization and Monitoring Sampling and Analysis GKI applies to this SAF.
(1) ICP/MS - 200.8 (100 Area RI/FS); ICP/MS - 200.8 (Add-on) {Uranium};

| LABORATORY SECTION | RECEIVED BY | TITLE | DATE/TIME |
|---|---|---|---|
| FINAL SAMPLE DISPOSITION | DISPOSAL METHOD | DISPOSED BY | DATE/TIME |

# Appendix 5

Data Validation Supporting Documentation

| VALIDATION LEVEL: | A | B | C | D | E |
|---|---|---|---|---|---|
| PROJECT: 100 Area RI/FS | | | DATA PACKAGE: VSR11-003 | | |
| VALIDATOR: Eyda Hergenreder | | LAB: WSCF | | DATE: 03-09-2011 | |
| | | | SDG: WSCF111251 | | |
| ANALYSES PERFORMED | | | | | |
| SW-846/ICP | SW-846/GFAA | SW-846/Hg | | EPA 200.8 X | |
| | | | | | |
| SAMPLES/MATRIX Water samples<br>SDG WSCF111251: B260H7, B260H8 | | | | | |

## 1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE

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

Comments: None

**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: None

**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: None

**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. 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

**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

**Attention** Michael Neely
**Department** Inorganic

**Group #** WSCF111251

**QC Batch** 175547
**Associated Samples** 111251001, 111251002

**Test** ICP-2008 MS All possible metal

| Analyte | CAS # | Original Found | QC Found | Units | % Recov | Limits | RPD | RPD Limit | RQ | Analyzed |
|---|---|---|---|---|---|---|---|---|---|---|
| **BLANK** | | | **QC Sample #47945** | | | | | | | |
| Aluminum | 7429-90-5 | | <5.0 | ug/L | | | | | U | 02/02/11 |
| Manganese | 7439-96-5 | | <0.10 | ug/L | | | | | U | 02/02/11 |
| Nickel | 7440-02-0 | | <0.20 | ug/L | | | | | U | 02/02/11 |
| Silver | 7440-22-4 | | <0.10 | ug/L | | | | | U | 02/02/11 |
| Antimony | 7440-36-0 | | <0.30 | ug/L | | | | | U | 02/02/11 |
| Barium | 7440-39-3 | | <0.20 | ug/L | | | | | U | 02/02/11 |
| Beryllium | 7440-41-7 | | <0.10 | ug/L | | | | | U | 02/02/11 |
| Cadmium | 7440-43-9 | | <0.10 | ug/L | | | | | U | 02/02/11 |
| Chromium | 7440-47-3 | | <0.50 | ug/L | | | | | U | 02/02/11 |
| Cobalt | 7440-48-4 | | <0.050 | ug/L | | | | | U | 02/02/11 |
| Copper | 7440-50-8 | | <0.10 | ug/L | | | | | U | 02/02/11 |
| Vanadium | 7440-62-2 | | <0.20 | ug/L | | | | | U | 02/02/11 |
| Zinc | 7440-66-6 | | <0.80 | ug/L | | | | | U | 02/02/11 |
| Lead | 7439-92-1 | | <0.10 | ug/L | | | | | U | 02/02/11 |
| Mercury | 7439-97-6 | | <0.050 | ug/L | | | | | U | 02/02/11 |
| Thallium | 7440-28-0 | | <0.050 | ug/L | | | | | U | 02/02/11 |
| Uranium | 7440-61-1 | | <0.050 | ug/L | | | | | U | 02/02/11 |
| Arsenic | 7440-38-2 | | <0.40 | ug/L | | | | | U | 02/02/11 |
| Selenium | 7782-49-2 | | <0.30 | ug/L | | | | | U | 02/02/11 |

## Quality Control Report

**Attention** Michael Neely
**Department** Inorganic

**Group #** WSCF111251

| Analyte | CAS # | Original Found | QC Found | Units | % Recov | Limits | RPD | RPD Limit | RQ | Analyzed |
|---|---|---|---|---|---|---|---|---|---|---|
| **LCS** | | | **QC Sample #47946** | | | | | | | |
| Aluminum | 7429-90-5 | | 407 | ug/L | 101.8 | 85 - 115 | | | | 02/02/11 |
| Manganese | 7439-96-5 | | 40.6 | ug/L | 101.6 | 85 - 115 | | | | 02/02/11 |
| Nickel | 7440-02-0 | | 40.4 | ug/L | 101.1 | 85 - 115 | | | | 02/02/11 |
| Silver | 7440-22-4 | | 42.6 | ug/L | 106.6 | 85 - 115 | | | | 02/02/11 |
| Antimony | 7440-36-0 | | 40.1 | ug/L | 100.2 | 85 - 115 | | | | 02/02/11 |
| Barium | 7440-39-3 | | 41.8 | ug/L | 104.5 | 85 - 115 | | | | 02/02/11 |
| Beryllium | 7440-41-7 | | 41.2 | ug/L | 103.1 | 85 - 115 | | | | 02/02/11 |
| Cadmium | 7440-43-9 | | 40.4 | ug/L | 101 | 85 - 115 | | | | 02/02/11 |
| Chromium | 7440-47-3 | | 41.4 | ug/L | 103.6 | 85 - 115 | | | | 02/02/11 |
| Cobalt | 7440-48-4 | | 41.4 | ug/L | 103.6 | 85 - 115 | | | | 02/02/11 |
| Copper | 7440-50-8 | | 40.7 | ug/L | 101.8 | 85 - 115 | | | | 02/02/11 |
| Vanadium | 7440-62-2 | | 40.8 | ug/L | 101.9 | 85 - 115 | | | | 02/02/11 |
| Zinc | 7440-66-6 | | 38.6 | ug/L | 96.4 | 85 - 115 | | | | 02/02/11 |
| Lead | 7439-92-1 | | 42.0 | ug/L | 105.1 | 85 - 115 | | | | 02/02/11 |
| Mercury | 7439-97-6 | | 1.99 | ug/L | 99.5 | 85 - 115 | | | | 02/02/11 |
| Thallium | 7440-28-0 | | 41.6 | ug/L | 103.9 | 85 - 115 | | | | 02/02/11 |
| Uranium | 7440-61-1 | | 41.5 | ug/L | 103.7 | 85 - 115 | | | | 02/02/11 |
| Arsenic | 7440-38-2 | | 40.2 | ug/L | 100.5 | 85 - 115 | | | | 02/02/11 |
| Selenium | 7782-49-2 | | 39.0 | ug/L | 97.6 | 85 - 115 | | | | 02/02/11 |
| **MS** | | | **QC Sample #47947** | | | | | | | |
| | | | **Original 111154001** | | | | | | | |
| Aluminum | 7429-90-5 | | 391 | ug/L | 97.8 | 70 - 130 | | | | 02/02/11 |
| Manganese | 7439-96-5 | | 35.0 | ug/L | 87.5 | 70 - 130 | | | X | 02/02/11 |

## Quality Control Report

**Attention** Michael Neely
**Department** Inorganic

**Group #** WSCF111251

| Analyte | CAS # | Original Found | QC Found | Units | % Recov | Limits | RPD | RPD Limit | | RQ | Analyzed |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Nickel | 7440-02-0 | | 37.9 | ug/L | 94.7 | 70 - 130 | | | | | 02/02/11 |
| Silver | 7440-22-4 | | 40.8 | ug/L | 102.1 | 70 - 130 | | | | | 02/02/11 |
| Antimony | 7440-36-0 | | 41.8 | ug/L | 104.6 | 70 - 130 | | | | | 02/02/11 |
| Barium | 7440-39-3 | | 42.8 | ug/L | 107 | 70 - 130 | | | | | 02/02/11 |
| Beryllium | 7440-41-7 | | 40.0 | ug/L | 100 | 70 - 130 | | | | | 02/02/11 |
| Cadmium | 7440-43-9 | | 40.2 | ug/L | 100.4 | 70 - 130 | | | | | 02/02/11 |
| Chromium | 7440-47-3 | | 40.7 | ug/L | 101.7 | 70 - 130 | | | | | 02/02/11 |
| Cobalt | 7440-48-4 | | 38.8 | ug/L | 97.1 | 70 - 130 | | | | | 02/02/11 |
| Copper | 7440-50-8 | | 36.7 | ug/L | 91.8 | 70 - 130 | | | | | 02/02/11 |
| Vanadium | 7440-62-2 | | 40.8 | ug/L | 102 | 70 - 130 | | | | | 02/02/11 |
| Zinc | 7440-66-6 | | 35.8 | ug/L | 89.5 | 70 - 130 | | | | | 02/02/11 |
| Lead | 7439-92-1 | | 42.8 | ug/L | 107 | 70 - 130 | | | | | 02/02/11 |
| Mercury | 7439-97-6 | | 2.17 | ug/L | 108.6 | 70 - 130 | | | | | 02/02/11 |
| Thallium | 7440-28-0 | | 43.2 | ug/L | 107.9 | 70 - 130 | | | | | 02/02/11 |
| Uranium | 7440-61-1 | | 44.8 | ug/L | 112 | 70 - 130 | | | | | 02/02/11 |
| Arsenic | 7440-38-2 | | 42.9 | ug/L | 107.2 | 70 - 130 | | | | | 02/02/11 |
| Selenium | 7782-49-2 | | 40.4 | ug/L | 101 | 70 - 130 | | | | | 02/02/11 |
| **MSD** | | | **QC Sample #47948** | | | | | | | | |
| | | | **Original 111154001** | | | | | | **Paired** | **47947** | |
| Aluminum | 7429-90-5 | | 398 | ug/L | 99.5 | 70 - 130 | 1.70 | 20 | | | 02/02/11 |
| Manganese | 7439-96-5 | | 53.0 | ug/L | 132.5 | 70 - 130 | 40.90 | 20 | * | X | 02/02/11 |
| Nickel | 7440-02-0 | | 38.8 | ug/L | 97 | 70 - 130 | 2.40 | 20 | | | 02/02/11 |
| Silver | 7440-22-4 | | 40.5 | ug/L | 101.2 | 70 - 130 | 0.90 | 20 | | | 02/02/11 |
| Antimony | 7440-36-0 | | 41.7 | ug/L | 104.3 | 70 - 130 | 0.30 | 20 | | | 02/02/11 |
| Barium | 7440-39-3 | | 41.9 | ug/L | 104.7 | 70 - 130 | 2.20 | 20 | | | 02/02/11 |

## Quality Control Report

**Attention** Michael Neely
**Department** Inorganic

**Group #** WSCF111251

| Analyte | CAS # | Original Found | QC Found | Units | % Recov | Limits | RPD | RPD Limit | RQ | Analyzed |
|---|---|---|---|---|---|---|---|---|---|---|
| Beryllium | 7440-41-7 | | 40.6 | ug/L | 101.4 | 70 - 130 | 1.40 | 20 | | 02/02/11 |
| Cadmium | 7440-43-9 | | 39.7 | ug/L | 99.2 | 70 - 130 | 1.20 | 20 | | 02/02/11 |
| Chromium | 7440-47-3 | | 41.1 | ug/L | 102.8 | 70 - 130 | 1.10 | 20 | | 02/02/11 |
| Cobalt | 7440-48-4 | | 39.9 | ug/L | 99.8 | 70 - 130 | 2.70 | 20 | | 02/02/11 |
| Copper | 7440-50-8 | | 37.5 | ug/L | 93.9 | 70 - 130 | 2.30 | 20 | | 02/02/11 |
| Vanadium | 7440-62-2 | | 41.8 | ug/L | 104.6 | 70 - 130 | 2.50 | 20 | | 02/02/11 |
| Zinc | 7440-66-6 | | 37.7 | ug/L | 94.3 | 70 - 130 | 5.20 | 20 | | 02/02/11 |
| Lead | 7439-92-1 | | 43.2 | ug/L | 108 | 70 - 130 | 0.90 | 20 | | 02/02/11 |
| Mercury | 7439-97-6 | | 2.14 | ug/L | 107 | 70 - 130 | 1.50 | 20 | | 02/02/11 |
| Thallium | 7440-28-0 | | 43.7 | ug/L | 109.2 | 70 - 130 | 1.20 | 20 | | 02/02/11 |
| Uranium | 7440-61-1 | | 45.6 | ug/L | 114 | 70 - 130 | 1.80 | 20 | | 02/02/11 |
| Arsenic | 7440-38-2 | | 42.2 | ug/L | 105.4 | 70 - 130 | 1.70 | 20 | | 02/02/11 |
| Selenium | 7782-49-2 | | 38.8 | ug/L | 97.1 | 70 - 130 | 3.90 | 20 | | 02/02/11 |

Date: 09 March 2011
To: CH2M Hill (technical representative)
From: Analytical Quality Associates, Inc.
Project: 100 Area RI/FS
Subject: General Chemistry - Sample Data Groups (SDGs) WSCF103042 and WSCF111251

## INTRODUCTION

This memorandum presents the results of data validation for SDGs WSCF103042 and WSCF111251 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 |
|---|---|---|---|---|
| B25YR8 | 11/17/10 | Water | C | 7196A (Cr VI) |
| B27736 | 11/17/10 | Water | C | 7196A (Cr VI) |
| B260H7 | 01/21/11 | Water | C | 300.0 |
| B260H8 | 01/21/11 | Water | C | 300.0 |

Data validation was conducted in accordance with the CHPRC validation statement of work and the Sampling and Analysis Plan for the 100-K Decision Unit Remedial Investigation/Feasibility Study, DOE/RL-2009-41, 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 requirements are 24 hours for chromium(VI) and 48 hours for all anions. Sample preservation requires chilling to 4 degrees Celsius.

The samples were analyzed within the prescribed holding times 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 and laboratory control sample accuracy limits are 80% to 120% for all anions. For chromium (VI), the matrix spike sample accuracy limits are 80% to 120% and the laboratory control sample accuracy 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 exceptions.

For SDG WSCF111251, the MS and MSD recoveries for sulfate were below the lower acceptance limit. The sulfate results for samples B260H7 and B260H8 were detects and should be qualified as estimates and flagged "J."

**Laboratory Control Samples (LCSs)**

All LCS recoveries were acceptable.

- **Precision**

Precision is evaluated by reviewing MS/MSD results, 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 ±20%. The RPD limits for reported analytes not listed in the SAP are specified by the DV procedure.

**MS/MSD Samples**

All MS/MSD RPD values were acceptable.

**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 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 CRDLs.

- **Completeness**

SDGs WSCF103042 and WSCF111251 were 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 the sulfate results for samples B260H7 and B260H8 as estimates were due to an MS/MSD infraction.

**REFERENCES**

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

DOE/RL-2009-41, Rev. 0, *Sampling and Analysis Plan for the 100-K Decision Unit Remedial Investigation/Feasibility Study*, October 2009.

# 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 | | | |
|---|---|---|---|
| SDGs: WSCF103042, WSCF111251 | Reviewer: AQA | Project: 100 Area RI/FS | Page 1 of 1 |
| **Analyte(s)** | **Qualifier** | **Samples Affected** | **Reason** |
| Sulfate | J | B260H7, B260H8 | Low MS/MSD recoveries |

Comments: None

# Appendix 3

Annotated Laboratory Reports

# WSCF Analytical Results Report

**Attention** Michael Neely
**Department** Inorganic

**Group #** WSCF103042

**Sample #** 103042001
**SAF#** F10-208
**Sample ID** B25YR8

**Matrix** WATER
**Sampled** 11/17/10
**Received** 11/17/10

| Test Performed | CAS # | Method | RQ | Result | TP Err | Units | DF | MDL | PQL | Analyzed |
|---|---|---|---|---|---|---|---|---|---|---|
| **Cr(VI)** | | | | | | | | | | **11/17/10** |
| **Cr(VI)** | | | | | | | | | | |
| Hexavalent chromium | 18540-29-9 | LA-265-403 | U | <0.0020 | | mg/L | 1 | 0.0020 | 0.0050 | 11/17/10 |

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 diltution 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

**Attention** Michael Neely
**Department** Inorganic

**Group #** WSCF103042

**Sample #** 103042002
**SAF#** F10-208
**Sample ID** B27736

**Matrix** WATER
**Sampled** 11/17/10
**Received** 11/17/10

| Test Performed | CAS # | Method | RQ | Result | TP Err | Units | DF | MDL | PQL | Analyzed |
|---|---|---|---|---|---|---|---|---|---|---|
| **Cr(VI)** | | | | | | | | | | **11/17/10** |
| **Cr(VI)** | | | | | | | | | | |
| Hexavalent chromium | 18540-29-9 | LA-265-403 | U | <0.0020 | | mg/L | 1 | 0.0020 | 0.0050 | 11/17/10 |

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 diltution 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

**Attention** Michael Neely
**Department** Inorganic

**Group #** WSCF111251

**Sample #** 111251001
**SAF#** F10-208
**Sample ID** B260H7

**Matrix** WATER
**Sampled** 01/21/11
**Received** 01/21/11

| Test Performed | | CAS # | Method | RQ | Result | TP Err | Units | DF | MDL | PQL | Analyzed |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Anions by IC** | | | | | | | | | | | **01/22/11** |
| **Anions by IC** | | | | | | | | | | | |
| Fluoride | | 16984-48-8 | LA-533-410 | BD | 0.224 | | ug/mL | 2 | 0.088 | 0.40 | 01/22/11 |
| Chloride | | 16887-00-6 | LA-533-410 | D | 8.02 | | ug/mL | 2 | 0.084 | 0.80 | 01/22/11 |
| Nitrite-N | | NO2-N | LA-533-410 | UD | <0.036 | | ug/mL | 2 | 0.036 | 0.20 | 01/22/11 |
| Bromide | | 24959-67-9 | LA-533-410 | UD | <0.11 | | ug/mL | 2 | 0.11 | 1.0 | 01/22/11 |
| Nitrate-N | | NO3-N | LA-533-410 | D | 2.07 | | ug/mL | 2 | 0.019 | 0.20 | 01/22/11 |
| Phosphate-P | | PO4-P | LA-533-410 | UD | <0.14 | | ug/mL | 2 | 0.14 | 0.80 | 01/22/11 |
| Sulfate | J | 14808-79-8 | LA-533-410 | DN | 46.4 | | ug/mL | 2 | 0.17 | 2.0 | 01/22/11 |
| **ICPMS Prep** | | | | | | | | | | | **02/01/11** |
| **ICP-MS** | | | | | | | | | | | |
| Aluminum | | 7429-90-5 | LA-505-412 | UD | <10 | | ug/L | 2 | 10 | 200 | 02/02/11 |
| Manganese | | 7439-96-5 | LA-505-412 | D | 126 | | ug/L | 2 | 0.20 | 2.0 | 02/02/11 |
| Nickel | | 7440-02-0 | LA-505-412 | BD | 0.992 | | ug/L | 2 | 0.40 | 4.0 | 02/02/11 |
| Silver | | 7440-22-4 | LA-505-412 | UD | <0.20 | | ug/L | 2 | 0.20 | 2.0 | 02/02/11 |
| Antimony | | 7440-36-0 | LA-505-412 | UD | <0.60 | | ug/L | 2 | 0.60 | 6.0 | 02/02/11 |
| Barium | | 7440-39-3 | LA-505-412 | D | 32.5 | | ug/L | 2 | 0.40 | 4.0 | 02/02/11 |
| Beryllium | | 7440-41-7 | LA-505-412 | UD | <0.10 | | ug/L | 2 | 0.10 | 1.0 | 02/02/11 |
| Cadmium | | 7440-43-9 | LA-505-412 | UD | <0.20 | | ug/L | 2 | 0.20 | 2.0 | 02/02/11 |

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 diltution 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

**Attention** Michael Neely
**Department** Inorganic

**Group #** WSCF111251

**Sample #** 111251002
**SAF#** F10-208
**Sample ID** B260H8

**Matrix** WATER
**Sampled** 01/21/11
**Received** 01/21/11

| Test Performed | | CAS # | Method | RQ | Result | TP Err | Units | DF | MDL | PQL | Analyzed |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Anions by IC** | | | | | | | | | | | **01/22/11** |
| **Anions by IC** | | | | | | | | | | | |
| Fluoride | | 16984-48-8 | LA-533-410 | BD | 0.190 | | ug/mL | 2 | 0.088 | 0.40 | 01/22/11 |
| Chloride | | 16887-00-6 | LA-533-410 | D | 7.49 | | ug/mL | 2 | 0.084 | 0.80 | 01/22/11 |
| Nitrite-N | | NO2-N | LA-533-410 | UD | <0.036 | | ug/mL | 2 | 0.036 | 0.20 | 01/22/11 |
| Bromide | | 24959-67-9 | LA-533-410 | UD | <0.11 | | ug/mL | 2 | 0.11 | 1.0 | 01/22/11 |
| Nitrate-N | | NO3-N | LA-533-410 | D | 1.94 | | ug/mL | 2 | 0.019 | 0.20 | 01/22/11 |
| Phosphate-P | | PO4-P | LA-533-410 | UD | <0.14 | | ug/mL | 2 | 0.14 | 0.80 | 01/22/11 |
| Sulfate | J | 14808-79-8 | LA-533-410 | DN | 44.2 | | ug/mL | 2 | 0.17 | 2.0 | 01/22/11 |
| **ICPMS Prep** | | | | | | | | | | | **02/01/11** |
| **ICP-MS** | | | | | | | | | | | |
| Aluminum | | 7429-90-5 | LA-505-412 | BD | 10.5 | | ug/L | 2 | 10 | 200 | 02/02/11 |
| Manganese | | 7439-96-5 | LA-505-412 | D | 82.5 | | ug/L | 2 | 0.20 | 2.0 | 02/02/11 |
| Nickel | | 7440-02-0 | LA-505-412 | BD | 0.984 | | ug/L | 2 | 0.40 | 4.0 | 02/02/11 |
| Silver | | 7440-22-4 | LA-505-412 | UD | <0.20 | | ug/L | 2 | 0.20 | 2.0 | 02/02/11 |
| Antimony | | 7440-36-0 | LA-505-412 | UD | <0.60 | | ug/L | 2 | 0.60 | 6.0 | 02/02/11 |
| Barium | | 7440-39-3 | LA-505-412 | D | 31.0 | | ug/L | 2 | 0.40 | 4.0 | 02/02/11 |
| Beryllium | | 7440-41-7 | LA-505-412 | UD | <0.10 | | ug/L | 2 | 0.10 | 1.0 | 02/02/11 |
| Cadmium | | 7440-43-9 | LA-505-412 | UD | <0.20 | | ug/L | 2 | 0.20 | 2.0 | 02/02/11 |

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 diltution 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

Attachment 2
**Narrative**
WSCF103042

**Introduction**

Two (2) S&GRP samples were received at the WSCF Laboratory on November 17, 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**

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

- Batch QC 170034 analyzed on sample# B25YR8 (103042001)

All QC controls are within the established limits.

## Narrative

Attachment 2
**Narrative**
WSCF103042

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 | | | F10-208-236 | PAGE 1 OF 1 |
|---|---|---|---|---|---|
| COLLECTOR: D. WEBB | COMPANY CONTACT: DYEKMAN, DL | TELEPHONE NO.: 373-2530 | PROJECT COORDINATOR: DYEKMAN, DL | PRICE CODE: 1A | DATA TURNAROUND: 24 Hours / 15 Days |
| SAMPLING LOCATION: C7693; T-028 | PROJECT DESIGNATION: 100 Area Remedial Investigation/Feasibility Analysis - 100-KR-4 Groundwat | | SAF NO.: F10-208 | AIR QUALITY: ☐ | |
| ICE CHEST NO.: N/A | FIELD LOGBOOK NO.: HNF-N-583-3/4 | ACTUAL SAMPLE DEPTH: 148.2 | COA: 300082ES10 | METHOD OF SHIPMENT: GOVERNMENT VEHICLE | |
| SHIPPED TO: Waste Sampling & Characterization | OFFSITE PROPERTY NO.: N/A | | BILL OF LADING/AIR BILL NO.: N/A | | |

MATRIX*: A=Air, DL=Drum Liquids, DS=Drum Solids, L=Liquid, O=Oil, S=Soil, SE=Sediment, T=Tissue, 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)

103042

SPECIAL HANDLING AND/OR STORAGE

| PRESERVATION | Cool<4C |
|---|---|
| HOLDING TIME | 24 Hours |
| TYPE OF CONTAINER | aG |
| NO. OF CONTAINER(S) | 1 |
| VOLUME | 500ml |
| SAMPLE ANALYSIS | Chromium Hex (7196) |

| SAMPLE NO. | | MATRIX* | SAMPLE DATE | SAMPLE TIME | |
|---|---|---|---|---|---|
| B25YR8 | 1 | WATER | 11-17-10 | 1320 | X |

| CHAIN OF POSSESSION | | SIGN/ PRINT NAMES | |
|---|---|---|---|
| RELINQUISHED BY/REMOVED FROM: D. WEBB | DATE/TIME: 11-17-10 / 1530 | RECEIVED BY/STORED IN: Victor Sing | DATE/TIME: 11-17-10 / 1530 |
| 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 |
| RELINQUISHED BY/REMOVED FROM | DATE/TIME | RECEIVED BY/STORED IN | DATE/TIME |
| RELINQUISHED BY/REMOVED FROM | DATE/TIME | RECEIVED BY/STORED IN | DATE/TIME |

SPECIAL INSTRUCTIONS

** The CACN for all analytical work at WSCF laboratory is 401697ES20.☐** The 100 Area S&GRP Characterization and Monitoring Sampling and Analysis GKI applies to this SAF.

ORIGINAL

| LABORATORY SECTION | RECEIVED BY | TITLE | DATE/TIME |
|---|---|---|---|
| FINAL SAMPLE DISPOSITION | DISPOSAL METHOD | DISPOSED BY | DATE/TIME |

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Page 2 of 3

ChemWare

# Sample Receipt

## Chain of Custody

**CH2MHill Plateau Remediation Company** — **CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST** — F10-208-590 — PAGE 1 OF 1

| | | | |
|---|---|---|---|
| COLLECTOR: D. WEBB | COMPANY CONTACT: DYEKMAN, DL | TELEPHONE NO.: 373-2530 | PROJECT COORDINATOR: DYEKMAN, DL |
| PRICE CODE: 1A | DATA TURNAROUND: 24 Hours / 15 Days | SAMPLING LOCATION: C7592 (199-K-192), I-041 | PROJECT DESIGNATION: 100 Area Remedial Investigation/Feasibility Analysis - 100-KR-4 Groundwat |
| SAF NO.: F10-208 | AIR QUALITY: ☐ | ICE CHEST NO.: N/A | FIELD LOGBOOK NO.: HNF-N-583-3/3 |
| ACTUAL SAMPLE DEPTH: 182.0' | COA: 300082ES10 | METHOD OF SHIPMENT: GOVERNMENT VEHICLE | SHIPPED TO: Waste Sampling & Characterization |
| OFFSITE PROPERTY NO.: N/A | BILL OF LADING/AIR BILL NO.: N/A | | |

MATRIX*: A=Air, DL=Drum Liquids, DS=Drum Solids, L=Liquid, O=Oil, S=Soil, SE=Sediment, T=Tissue, 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)

**SPECIAL HANDLING AND/OR STORAGE**

| | |
|---|---|
| PRESERVATION | Cool-4C |
| HOLDING TIME | 14 Hours |
| TYPE OF CONTAINER | aG |
| NO. OF CONTAINER(S) | 1 |
| VOLUME | 500mL |
| SAMPLE ANALYSIS | Chromium Hex - 7196 |

| SAMPLE NO. | MATRIX* | SAMPLE DATE | SAMPLE TIME | |
|---|---|---|---|---|
| B27736 | 2 WATER | 11-17-10 | 1445 | X |

**CHAIN OF POSSESSION** — **SIGN/ PRINT NAMES**

| RELINQUISHED BY/REMOVED FROM | DATE/TIME | RECEIVED BY/STORED IN | DATE/TIME |
|---|---|---|---|
| D. WEBB / [signature] | 11-17-10 / 1530 | [signature] | 11-17-10 / 1530 |
| 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 |
| RELINQUISHED BY/REMOVED FROM | DATE/TIME | RECEIVED BY/STORED IN | DATE/TIME |
| RELINQUISHED BY/REMOVED FROM | DATE/TIME | RECEIVED BY/STORED IN | DATE/TIME |

**SPECIAL INSTRUCTIONS**

** The CACN for all analytical work at WSCF laboratory is 401697ES20.☐** The 100 Area S&GRP Characterization and Monitoring Sampling and Analysis GKI applies to this SAF.

ORIGINAL

| | | | |
|---|---|---|---|
| LABORATORY SECTION | RECEIVED BY | TITLE | DATE/TIME |
| FINAL SAMPLE DISPOSITION | DISPOSAL METHOD | DISPOSED BY | DATE/TIME |

A 6003 618(01/06)

Wednesday, November 17, 2010 8:11:21 PM
Page 3 of 3

ChemWare

Attachment 2
**Narrative**
WSCF111251

## 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), 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

**Anions** – Hold time requirements for this analysis were met. A Duplicate, Matrix Spike, Matrix Spike Duplicate, Blank and Laboratory Control Sample were analyzed with this delivery group. Analytical Note(s):

- Sulfate – Matrix Spike and/or Matrix Spike Duplicate recoveries are outside established laboratory limits. Affected sample results in this batch were "N" flagged.
    - All other applicable QC controls are within the established limits.

Attachment 2
**Narrative**
WSCF111251

**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. Analytical Note(s):

- Manganese – Exceeded spiking levels by a factor of 4. Spike recoveries and associated RPDs are not valid.
    - All other applicable QC controls are within the established limits.

**Organic Comments**

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

- All 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.

**CH2MHill Plateau Remediation Company**

**CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST**

F10-208-280

PAGE 1 OF 1

COLLECTOR: Emerson

SAMPLING LOCATION: C7694; 1-023

ICE CHEST NO.: N/A

SHIPPED TO: Waste Sampling & Characterization

COMPANY CONTACT: DYEKMAN, DL

TELEPHONE NO.: 373-2530

PROJECT DESIGNATION: 100 Area Remedial Investigation/Feasibility Analysis - 100-KR-4 Groundwat

FIELD LOGBOOK NO.: ANF-N-583 3/48

ACTUAL SAMPLE DEPTH: ~~128.6'~~ 134' AC 1/21/11

OFFSITE PROPERTY NO.: N/A

PROJECT COORDINATOR: DYEKMAN, DL

SAF NO.: F10-208

COA: 300082ES10

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

PRICE CODE: 7N

AIR QUALITY: ☐

METHOD OF SHIPMENT: GOVERNMENT VEHICLE

Data Turnaround: ~~15~~ ~~30~~ Days/~~30~~ Days 15 VS 1/27/11

MATRIX*: A=Air, DL=Drum Liquids, DS=Drum Solids, L=Liquid, O=Oil, S=Soil, SE=Sediment, T=Tissue, 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)

SPECIAL HANDLING AND/OR STORAGE: 111251

| PRESERVATION | HCl or H2SO4 to pH <2/Cool~4C | HNO3 to pH <2 | HNO3 to pH <2 | Cool~4C | HNO3 to pH <2 | None |
|---|---|---|---|---|---|---|
| HOLDING TIME | 14 Days | 6 Months | 28 Days | 48 Hours | 6 Months | 6 Months |
| TYPE OF CONTAINER | aGs | G/P | G | P | G/P | G |
| NO. OF CONTAINER(S) | 3 | 1 | 1 | 1 | 2 | 1 |
| VOLUME | 40mL | 500mL | 500mL | 500mL | 1L | 250mL |
| SAMPLE ANALYSIS | VOA - 8260 (TCL 100 Area RI/FS); ✓ | SEE ITEM (1) IN SPECIAL INSTRUCTIONS | 200.8_HG - ICPMS (100 Area RI/FS); ✓ | IC Anions - 300.0 (100 Area RI/FS); ✓ | Strontium-89,90 - Total Sr; ✓ | Tritium - Ion Ex; ✓ |

| SAMPLE NO. | MATRIX* | SAMPLE DATE | SAMPLE TIME | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| B260H7 | WATER | 1/21/11 | 0830 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

**CHAIN OF POSSESSION / SIGN/ PRINT NAMES**

| RELINQUISHED BY/REMOVED FROM | DATE/TIME | RECEIVED BY/STORED IN | DATE/TIME |
|---|---|---|---|
| Adam Emerson | 1/21/11 1500 | Victor Blas | 1/21/11 1500 |
| 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 |
| RELINQUISHED BY/REMOVED FROM | DATE/TIME | RECEIVED BY/STORED IN | DATE/TIME |
| RELINQUISHED BY/REMOVED FROM | DATE/TIME | RECEIVED BY/STORED IN | DATE/TIME |

**SPECIAL INSTRUCTIONS**

** The laboratory is to report all TICs for Method 8260.☐☐** The CACN for all analytical work at WSCF laboratory is 401697ES20.☐** The 100 Area S&GRP Characterization and Monitoring Sampling and Analysis GKI applies to this SAF.
(1) ICP/MS - 200.8 (100 Area RI/FS); ICP/MS - 200.8 (Add-on) {Uranium};

ORIGINAL

| LABORATORY SECTION | RECEIVED BY | TITLE | DATE/TIME |
|---|---|---|---|
| FINAL SAMPLE DISPOSITION | DISPOSAL METHOD | DISPOSED BY | DATE/TIME |

**CH2MHill Plateau Remediation Company** — **CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST** — F10-208-281 — PAGE 1 OF 1

COLLECTOR: Emerson

SAMPLING LOCATION: C7694; I-024

ICE CHEST NO.: N/A

SHIPPED TO: Waste Sampling & Characterization

COMPANY CONTACT: DYEKMAN, DL

TELEPHONE NO.: 373-2530

PROJECT DESIGNATION: 100 Area Remedial Investigation/Feasibility Analysis - 100-KR-4 Groundwat

FIELD LOGBOOK NO.: HWF-N-583-3/48

ACTUAL SAMPLE DEPTH: 138'

OFFSITE PROPERTY NO.: N/A

PROJECT COORDINATOR: DYEKMAN, DL

SAF NO.: F10-208

COA: 300082ES10

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

PRICE CODE: 7N

AIR QUALITY: ☐

METHOD OF SHIPMENT: GOVERNMENT VEHICLE

Data Turnaround: ~~15~~, ~~30~~ Days/~~30~~ Days 15 15 1/17/11

MATRIX*: A=Air; DL=Drum Liquids; DS=Drum Solids; L=Liquid; O=Oil; S=Soil; SE=Sediment; T=Tissue; 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)

**SPECIAL HANDLING AND/OR STORAGE**

| PRESERVATION | HCl or H2SO4 to pH <2/Cool~4C | HNO3 to pH <2 | HNO3 to pH <2 | Cool~4C | HNO3 to pH <2 | None |
|---|---|---|---|---|---|---|
| HOLDING TIME | 14 Days | 6 Months | 28 Days | 48 Hours | 6 Months | 6 Months |
| TYPE OF CONTAINER | aGs | G/P | G | P | G/P | G |
| NO. OF CONTAINER(S) | 3 | 1 | 1 | 1 | 2 | 1 |
| VOLUME | 40mL | 500mL | 500mL | 500mL | 1L | 250mL |
| SAMPLE ANALYSIS | VOA - 8260 (TCL 100 Area RI/FS); | SEE ITEM (1) IN SPECIAL INSTRUCTIONS | 200.8_HG - ICPMS (100 Area RI/FS); | IC Anions - 300.0 (100 Area RI/FS); | Strontium-89,90 -- Total Sr; | Tritium - Ion Ex; |

| SAMPLE NO. | MATRIX* | SAMPLE DATE | SAMPLE TIME | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| B260H8 2 | WATER | 1/21/11 | 1410 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

| CHAIN OF POSSESSION | | SIGN/ PRINT NAMES | |
|---|---|---|---|
| RELINQUISHED BY/REMOVED FROM: Adam Emerson | DATE/TIME: 1/21/11 1500 | RECEIVED BY/STORED IN: Victor Blm | DATE/TIME: 1/21/11 1500 |
| 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 |
| RELINQUISHED BY/REMOVED FROM | DATE/TIME | RECEIVED BY/STORED IN | DATE/TIME |
| RELINQUISHED BY/REMOVED FROM | DATE/TIME | RECEIVED BY/STORED IN | DATE/TIME |

**SPECIAL INSTRUCTIONS**

** The laboratory is to report all TICs for Method 8260.☐☐** The CACN for all analytical work at WSCF laboratory is 401697ES20.☐** The 100 Area S&GRP Characterization and Monitoring Sampling and Analysis GKI applies to this SAF.
(1) ICP/MS - 200.8 (100 Area RI/FS); ICP/MS - 200.8 (Add-on) {Uranium};

| LABORATORY SECTION | RECEIVED BY | TITLE | DATE/TIME |
|---|---|---|---|
| FINAL SAMPLE DISPOSITION | DISPOSAL METHOD | DISPOSED BY | DATE/TIME |

# Appendix 5

Data Validation Supporting Documentation

| VALIDATION LEVEL: | A | B | (C) | D | E |
|---|---|---|---|---|---|
| PROJECT: 100 Area RI/FS | | | DATA PACKAGE: VSR11-003 | | |
| VALIDATOR: Eyda Hergenreder | | LAB: WSCF | | DATE: 03-09-2011 | |
| | | | SDG: WSCF103042, WSCF111251 | | |
| ANALYSES PERFORMED | | | | | |
| Anions/IC X | TOC | TOX | TPH-418.1 | Oil and Grease | Alkalinity |
| Ammonia | BOD/COD | Chloride | Chromium-VI X | pH | $NO_3/NO_2$ |
| Sulfate | TDS | TKN | Phosphate | Cyanide | |
| | | | | | |

SAMPLES/MATRIX Water samples

SDG WSCF103042: B25YR8, B27736

SDG WSCF111251: B260H7, B260H8

## 1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE

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

Comments: None

**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

**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:
SDG WSCF111251: Sulfate MS/MSD %R =59%/63%

**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

**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 #** WSCF103042

**QC Batch** 170034
**Associated Samples** 103042001, 103042002

**Test** Hexavalent chromium Discrete Analyzer

| Analyte | CAS # | Original Found | QC Found | Units | % Recov | Limits | RPD | RPD Limit | RQ | Analyzed |
|---|---|---|---|---|---|---|---|---|---|---|
| **BLANK** | | | **QC Sample #42242** | | | | | | | |
| Hexavalent chromium | 18540-29-9 | | <0.0020 | mg/L | | | | | U | 11/17/10 |
| **LCS** | | | **QC Sample #42244** | | | | | | | |
| Hexavalent chromium | 18540-29-9 | | 0.0510 | mg/L | 102 | 90 - 110 | | | | 11/17/10 |
| **DUP** | | | **QC Sample #42245** | | | | | | | |
| | | | **Original 103042001** | | | | | | | |
| Hexavalent chromium | 18540-29-9 | <0.0020 | <0.0020 | mg/L | | | -7.40 | 20 | U | 11/17/10 |
| **MS** | | | **QC Sample #42246** | | | | | | | |
| | | | **Original 103042001** | | | | | | | |
| Hexavalent chromium | 18540-29-9 | <0.0020 | 0.0371 | mg/L | 92.8 | 85 - 115 | | | | 11/17/10 |

## Quality Control Report

**Attention** Michael Neely
**Department** Inorganic

**Group #** WSCF111251

**QC Batch** 174899
**Associated Samples** 111251001, 111251002

**Test** Anions by Ion Chromatography (Water)

| Analyte | CAS # | Original Found | QC Found | Units | % Recov | Limits | RPD | RPD Limit | RQ | Analyzed |
|---|---|---|---|---|---|---|---|---|---|---|
| **BLANK** | | | **QC Sample #47122** | | | | | | | |
| Fluoride | 16984-48-8 | | <0.044 | ug/mL | | | | | U | 01/22/11 |
| Chloride | 16887-00-6 | | <0.042 | ug/mL | | | | | U | 01/22/11 |
| Nitrite-N | NO2-N | | <0.018 | ug/mL | | | | | U | 01/22/11 |
| Bromide | 24959-67-9 | | <0.054 | ug/mL | | | | | U | 01/22/11 |
| Nitrate-N | NO3-N | | <9.7E-3 | ug/mL | | | | | U | 01/22/11 |
| Phosphate-P | PO4-P | | <0.072 | ug/mL | | | | | U | 01/22/11 |
| Sulfate | 14808-79-8 | | <0.083 | ug/mL | | | | | U | 01/22/11 |
| **LCS** | | | **QC Sample #47123** | | | | | | | |
| Fluoride | 16984-48-8 | | 0.979 | ug/mL | 98.8 | 90 - 110 | | | | 01/22/11 |
| Chloride | 16887-00-6 | | 1.94 | ug/mL | 98.1 | 90 - 110 | | | | 01/22/11 |
| Nitrite-N | NO2-N | | 0.967 | ug/mL | 98.8 | 90 - 110 | | | | 01/22/11 |
| Bromide | 24959-67-9 | | 3.93 | ug/mL | 100.1 | 90 - 110 | | | | 01/22/11 |
| Nitrate-N | NO3-N | | 0.903 | ug/mL | 102 | 90 - 110 | | | | 01/22/11 |
| Phosphate-P | PO4-P | | 1.94 | ug/mL | 101.6 | 90 - 110 | | | | 01/22/11 |
| Sulfate | 14808-79-8 | | 3.94 | ug/mL | 100.4 | 90 - 110 | | | | 01/22/11 |
| **DUP** | | | **QC Sample #47124** | | | | | | | |
| | | | **Original** | **111251001** | | | | | | |
| Fluoride | 16984-48-8 | 0.224 | 0.213 | ug/mL | | | 5.00 | 20 | BD | 01/22/11 |

## Quality Control Report

**Attention** Michael Neely
**Department** Inorganic

**Group #** WSCF111251

| Analyte | CAS # | Original Found | QC Found | Units | % Recov | Limits | RPD | RPD Limit | RQ | Analyzed |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 16887-00-6 | 8.02 | 8.00 | ug/mL | | | 0.20 | 20 | D | 01/22/11 |
| Nitrite-N | NO2-N | <0.036 | <0.036 | ug/mL | | | 0.00 | 20 | UD | 01/22/11 |
| Bromide | 24959-67-9 | <0.11 | <0.11 | ug/mL | | | 0.00 | 20 | UD | 01/22/11 |
| Nitrate-N | NO3-N | 2.07 | 1.95 | ug/mL | | | 6.00 | 20 | D | 01/22/11 |
| Phosphate-P | PO4-P | <0.14 | <0.14 | ug/mL | | | 0.00 | 20 | UD | 01/22/11 |
| Sulfate | 14808-79-8 | 46.4 | 44.9 | ug/mL | | | 3.30 | 20 | D | 01/22/11 |
| **MS** | | | **QC Sample #47125** | | | | | | | |
| | | | **Original 111251001** | | | | | | | |
| Fluoride | 16984-48-8 | 0.224 | 0.915 | ug/mL | 91.5 | 80 - 120 | | | D | 01/22/11 |
| Chloride | 16887-00-6 | 8.02 | 1.96 | ug/mL | 98 | 80 - 120 | | | D | 01/22/11 |
| Nitrite-N | NO2-N | <0.036 | 0.907 | ug/mL | 91.8 | 80 - 120 | | | D | 01/22/11 |
| Bromide | 24959-67-9 | <0.11 | 3.91 | ug/mL | 98.8 | 80 - 120 | | | D | 01/22/11 |
| Nitrate-N | NO3-N | 2.07 | 0.762 | ug/mL | 85.3 | 80 - 120 | | | D | 01/22/11 |
| Phosphate-P | PO4-P | <0.14 | 1.87 | ug/mL | 97.1 | 80 - 120 | | | D | 01/22/11 |
| Sulfate | 14808-79-8 | 46.4 | 2.35 | ug/mL | 59.4 | 80 - 120 | | | DN | 01/22/11 |
| **MSD** | | | **QC Sample #47126** | | | | | | | |
| | | | **Original 111251001** | | | | | **Paired** | **47125** | |
| Fluoride | 16984-48-8 | 0.224 | 0.946 | ug/mL | 94.6 | 80 - 120 | 3.30 | 20 | D | 01/22/11 |
| Chloride | 16887-00-6 | 8.02 | 1.88 | ug/mL | 94 | 80 - 120 | 4.20 | 20 | D | 01/22/11 |
| Nitrite-N | NO2-N | <0.036 | 0.921 | ug/mL | 93.2 | 80 - 120 | 1.50 | 20 | D | 01/22/11 |
| Bromide | 24959-67-9 | <0.11 | 3.88 | ug/mL | 98 | 80 - 120 | 0.80 | 20 | D | 01/22/11 |
| Nitrate-N | NO3-N | 2.07 | 0.769 | ug/mL | 86 | 80 - 120 | 0.80 | 20 | D | 01/22/11 |
| Phosphate-P | PO4-P | <0.14 | 1.83 | ug/mL | 94.9 | 80 - 120 | 2.30 | 20 | D | 01/22/11 |
| Sulfate | 14808-79-8 | 46.4 | 2.49 | ug/mL | 63 | 80 - 120 | 5.90 | 20 | DN | 01/22/11 |

Date: 09 March 2011
To: CH2M Hill (technical representative)
From: Analytical Quality Associates, Inc.
Project: 100 Area RI/FS
Subject: Radiochemical - Sample Data Group (SDG) WSCF111251

## INTRODUCTION

This memorandum presents the results of data validation for SDG WSCF111251 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 |
|---|---|---|---|---|
| B260H7 | 01/21/11 | Water | C | H-3, Sr-89/90 |
| B260H8 | 01/21/11 | Water | C | H-3, 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-K Decision Unit Remedial Investigation/Feasibility Study, DOE/RL-2009-41, 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. Sample preservation for water samples for Sr-89/90 requires acid preservation with nitric acid to pH <2.

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, 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 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 tritium MS recovery was acceptable. MS analysis is not required for Sr-89/90.

**Laboratory Control Samples (LCSs)**

All LCS recoveries were acceptable.

**Carrier/Tracer Recovery Factors**

All carrier/tracer recovery factors were acceptable.

- **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 ±30%. 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 were below the CRDLs.

- **Completeness**

SDGs WSCF111251 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**

None found.

**REFERENCES**

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

DOE/RL-2009-41, Rev. 0, *Sampling and Analysis Plan for the 100-K Decision Unit Remedial Investigation/Feasibility Study*, October 2009.

# 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: WSCF111251 | Reviewer: AQA | Project:<br>100 Area RI/FS | Page 1 of 1 |
| **Analyte(s)** | **Qualifier** | **Samples Affected** | **Reason** |
| Radiochemical | None | N/A | N/A |

Comments: None

# Appendix 3

Annotated Laboratory Reports

# WSCF Analytical Results Report

**Attention** Michael Neely
**Department** Radiochemistry

**Group #** WSCF111251

**Sample #** 111251001
**SAF#** F10-208
**Sample ID** B260H7

**Matrix** WATER
**Sampled** 01/21/11
**Received** 01/21/11

| Test Performed | CAS # | Method | RQ | Result | TP Err | Units | DF | MDL | PQL | Analyzed |
|---|---|---|---|---|---|---|---|---|---|---|
| **H3 EICHROM** | | | | | | | | | | **01/24/11** |
| **TRI-CARB LSC** | | | | | | | | | | |
| Tritium | 10028-17-8 | LA-508-421 | | 1100 | 370 | pCi/L | 1 | 400 | | 02/08/11 |
| **SR-89/90** | | | | | | | | | | **01/28/11** |
| **SR-89/90** | | | | | | | | | | |
| Strontium-89/90 | SR-RAD | LA-220-406 | U | -5.0 | 2.4 | pCi/L | 1 | 1.3 | | 02/03/11 |

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

**Attention** Michael Neely
**Department** Radiochemistry

**Group #** WSCF111251

**Sample #** 111251002
**SAF#** F10-208
**Sample ID** B260H8

**Matrix** WATER
**Sampled** 01/21/11
**Received** 01/21/11

| Test Performed | CAS # | Method | RQ | Result | TP Err | Units | DF | MDL | PQL | Analyzed |
|---|---|---|---|---|---|---|---|---|---|---|
| **H3 EICHROM** | | | | | | | | | | **01/24/11** |
| **TRI-CARB LSC** | | | | | | | | | | |
| Tritium | 10028-17-8 | LA-508-421 | U | 200 | 240 | pCi/L | 1 | 400 | | 02/08/11 |
| **SR-89/90** | | | | | | | | | | **01/28/11** |
| **SR-89/90** | | | | | | | | | | |
| Strontium-89/90 | SR-RAD | LA-220-406 | U | -1.6 | 2.4 | pCi/L | 1 | 1.5 | | 02/03/11 |

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

Attachment 2
**Narrative**
WSCF111251

## 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), 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

**Anions** – Hold time requirements for this analysis were met. A Duplicate, Matrix Spike, Matrix Spike Duplicate, Blank and Laboratory Control Sample were analyzed with this delivery group. Analytical Note(s):

- Sulfate – Matrix Spike and/or Matrix Spike Duplicate recoveries are outside established laboratory limits. Affected sample results in this batch were "N" flagged.
    - All other applicable QC controls are within the established limits.

Attachment 2
**Narrative**
WSCF111251

**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. Analytical Note(s):

- Manganese – Exceeded spiking levels by a factor of 4. Spike recoveries and associated RPDs are not valid.
    - All other applicable QC controls are within the established limits.

**Organic Comments**

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

- All 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.

**CH2MHill Plateau Remediation Company**

**CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST**

F10-208-280

PAGE 1 OF 1

COLLECTOR: Emerson

SAMPLING LOCATION: C7694; 1-023

ICE CHEST NO.: N/A

SHIPPED TO: Waste Sampling & Characterization

COMPANY CONTACT: DYEKMAN, DL

TELEPHONE NO.: 373-2530

PROJECT DESIGNATION: 100 Area Remedial Investigation/Feasibility Analysis - 100-KR-4 Groundwat

FIELD LOGBOOK NO.: ANF-N-583 3/48

ACTUAL SAMPLE DEPTH: ~~128.6'~~ 134' AC 1/21/11

OFFSITE PROPERTY NO.: N/A

PROJECT COORDINATOR: DYEKMAN, DL

SAF NO.: F10-208

COA: 300082ES10

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

PRICE CODE: 7N

AIR QUALITY: ☐

METHOD OF SHIPMENT: GOVERNMENT VEHICLE

Data Turnaround: ~~15~~ ~~30~~ Days/~~30~~ Days 15 VS 1/17/11

MATRIX*: A=Air, DL=Drum Liquids, DS=Drum Solids, L=Liquid, O=Oil, S=Soil, SE=Sediment, T=Tissue, 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)

111251

SPECIAL HANDLING AND/OR STORAGE

| PRESERVATION | HCl or H2SO4 to pH <2/Cool~4C | HNO3 to pH <2 | HNO3 to pH <2 | Cool~4C | HNO3 to pH <2 | None |
|---|---|---|---|---|---|---|
| HOLDING TIME | 14 Days | 6 Months | 28 Days | 48 Hours | 6 Months | 6 Months |
| TYPE OF CONTAINER | aGs | G/P | G | P | G/P | G |
| NO. OF CONTAINER(S) | 3 | 1 | 1 | 1 | 2 | 1 |
| VOLUME | 40mL | 500mL | 500mL | 500mL | 1L | 250mL |
| SAMPLE ANALYSIS | VOA - 8260 (TCL 100 Area RI/FS); ✓ | SEE ITEM (1) IN SPECIAL INSTRUCTIONS | 200.8_HG - ICPMS (100 Area RI/FS); ✓ | IC Anions - 300.0 (100 Area RI/FS); ✓ | Strontium-89,90 - Total Sr; ✓ | Tritium - Ion Ex; ✓ |

| SAMPLE NO. | MATRIX* | SAMPLE DATE | SAMPLE TIME | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| B260H7 | WATER | 1/21/11 | 0830 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

| CHAIN OF POSSESSION | | SIGN/ PRINT NAMES | |
|---|---|---|---|
| RELINQUISHED BY/REMOVED FROM: Adam Emerson | DATE/TIME: 1/21/11 1500 | RECEIVED BY/STORED IN: Victor | DATE/TIME: 1/21/11 1500 |
| 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 |
| RELINQUISHED BY/REMOVED FROM | DATE/TIME | RECEIVED BY/STORED IN | DATE/TIME |
| RELINQUISHED BY/REMOVED FROM | DATE/TIME | RECEIVED BY/STORED IN | DATE/TIME |

SPECIAL INSTRUCTIONS

** The laboratory is to report all TICs for Method 8260.☐☐** The CACN for all analytical work at WSCF laboratory is 401697ES20.☐** The 100 Area S&GRP Characterization and Monitoring Sampling and Analysis GKI applies to this SAF.
(1) ICP/MS - 200.8 (100 Area RI/FS); ICP/MS - 200.8 (Add-on) {Uranium};

ORIGINAL

| LABORATORY SECTION | RECEIVED BY | TITLE | DATE/TIME |
|---|---|---|---|
| FINAL SAMPLE DISPOSITION | DISPOSAL METHOD | DISPOSED BY | DATE/TIME |

**CH2MHill Plateau Remediation Company** — **CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST** — F10-208-281 — PAGE 1 OF 1

COLLECTOR: Emerson
SAMPLING LOCATION: C7694; I-024
ICE CHEST NO.: N/A
SHIPPED TO: Waste Sampling & Characterization

COMPANY CONTACT: DYEKMAN, DL
TELEPHONE NO.: 373-2530
PROJECT DESIGNATION: 100 Area Remedial Investigation/Feasibility Analysis - 100-KR-4 Groundwat
FIELD LOGBOOK NO.: HWF-N-583-3/48
ACTUAL SAMPLE DEPTH: 138'
OFFSITE PROPERTY NO.: N/A

PROJECT COORDINATOR: DYEKMAN, DL
SAF NO.: F10-208
COA: 300082ES10
BILL OF LADING/AIR BILL NO.: N/A

PRICE CODE: 7N
AIR QUALITY: ☐
METHOD OF SHIPMENT: GOVERNMENT VEHICLE

Data Turnaround: 15 ~~30~~ Days/~~30~~ Days 15 15 1/17/11

MATRIX*: A=Air; DL=Drum Liquids; DS=Drum Solids; L=Liquid; O=Oil; S=Soil; SE=Sediment; T=Tissue; 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)

**SPECIAL HANDLING AND/OR STORAGE**

| | | | | | | |
|---|---|---|---|---|---|---|
| PRESERVATION | HCl or H2SO4 to pH <2/Cool~4C | HNO3 to pH <2 | HNO3 to pH <2 | Cool~4C | HNO3 to pH <2 | None |
| HOLDING TIME | 14 Days | 6 Months | 28 Days | 48 Hours | 6 Months | 6 Months |
| TYPE OF CONTAINER | aGs | G/P | G | P | G/P | G |
| NO. OF CONTAINER(S) | 3 | 1 | 1 | 1 | 2 | 1 |
| VOLUME | 40mL | 500mL | 500mL | 500mL | 1L | 250mL |
| SAMPLE ANALYSIS | VOA - 8260 (TCL 100 Area RI/FS); | SEE ITEM (1) IN SPECIAL INSTRUCTIONS | 200.8_HG - ICPMS (100 Area RI/FS); | IC Anions - 300.0 (100 Area RI/FS); | Strontium-89,90 -- Total Sr; | Tritium - Ion Ex; |

| SAMPLE NO. | MATRIX* | SAMPLE DATE | SAMPLE TIME | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| B260H8 2 | WATER | 1/21/11 | 1410 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

| CHAIN OF POSSESSION | | SIGN/ PRINT NAMES | |
|---|---|---|---|
| RELINQUISHED BY/REMOVED FROM: Adam Emerson | DATE/TIME: 1/21/11 1500 | RECEIVED BY/STORED IN: Victor Dim | DATE/TIME: 1/21/11 1500 |
| 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 |
| RELINQUISHED BY/REMOVED FROM | DATE/TIME | RECEIVED BY/STORED IN | DATE/TIME |
| RELINQUISHED BY/REMOVED FROM | DATE/TIME | RECEIVED BY/STORED IN | DATE/TIME |

**SPECIAL INSTRUCTIONS**
** The laboratory is to report all TICs for Method 8260.☐☐** The CACN for all analytical work at WSCF laboratory is 401697ES20.☐** The 100 Area S&GRP Characterization and Monitoring Sampling and Analysis GKI applies to this SAF.
(1) ICP/MS - 200.8 (100 Area RI/FS); ICP/MS - 200.8 (Add-on) {Uranium};

| | | | |
|---|---|---|---|
| LABORATORY SECTION | RECEIVED BY | TITLE | DATE/TIME |
| FINAL SAMPLE DISPOSITION | DISPOSAL METHOD | DISPOSED BY | DATE/TIME |

# Appendix 5

Data Validation Supporting Documentation

## Appendix B - Radiochemical Data Validation Checklist

RADIOCHEMICAL DATA VALIDATION CHECKLIST

| VALIDATION LEVEL: | A | B | (C) | D | E |
|---|---|---|---|---|---|
| PROJECT: 100 Area RI/FS | | | DATA PACKAGE: VSR11-003 | | |
| VALIDATOR: Eyda Hergenreder | | LAB: WSCF | | DATE: 03-09-2011 | |
| | | | SDG: WSCF111251 | | |
| ANALYSES PERFORMED | | | | | |
| Gross Alpha/Beta | Strontium-90 X | Technetium-99 | Alpha Spectroscopy | Gamma Spectroscopy | |
| Total Uranium | Radium-22 | Tritium X | C-14 | I-129 | |
| SAMPLES/MATRIX Water samples<br>SDG WSCF111251: B260H7, B260H8 | | | | | |

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

Comments:

3. Continuing Calibration (Levels D, E)..... ☒ N/A

Calibration checked within required frequency? ..... Yes No N/A

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

Calibration check standards traceable? ..... Yes No N/A

Calibration check standards expired? ..... Yes No N/A

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

Comments:

4. Background Counts (Levels D, E) ..... ☒ N/A

Background Counts checked within required frequency? ..... Yes No N/A

Background Counts acceptable? ..... Yes No N/A

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

Comments:

5. Blanks (Levels B, C, D, E) ☐ N/A

Method blank analyzed within required frequency? Yes No N/A

Method blank results acceptable? Yes No N/A

Analytes detected in method blank? Yes No N/A

Field blank(s) analyzed? Yes No N/A

Field blank results acceptable? Yes No N/A

Analytes detected in field blank(s)? Yes No N/A

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

Comments: None

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

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

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

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: None

# Appendix 6

Additional Documentation Requested By Client

## Quality Control Report

**Attention** Michael Neely
**Department** Radiochemistry

**Group #** WSCF111251

**QC Batch** 174955
**Associated Samples** 111251001, 111251002

**Test** Tritium by LSC

| Analyte | CAS # | Original Found | QC Found | Units | % Recov | Limits | RPD | RPD Limit | RQ | Analyzed |
|---|---|---|---|---|---|---|---|---|---|---|
| **BLANK** | | | **QC Sample #47263** | | | | | | | |
| Tritium | 10028-17-8 | | 170 | pCi/L | | | | | U | 02/08/11 |
| **LCS** | | | **QC Sample #47264** | | | | | | | |
| Tritium | 10028-17-8 | | 3700 | pCi/L | 117.4 | 80 - 120 | | | | 02/08/11 |
| **DUP** | | | **QC Sample #47265** | | | | | | | |
| | | | **Original 111225009** | | | | | | | |
| Tritium | 10028-17-8 | | 1400 | pCi/L | | | 15.40 | 20 | | 02/08/11 |
| **MS** | | | **QC Sample #47266** | | | | | | | |
| | | | **Original 111225009** | | | | | | | |
| Tritium | 10028-17-8 | | 20000 | pCi/L | 97.1 | 75 - 125 | | | | 02/08/11 |

## Quality Control Report

**Attention** Michael Neely
**Department** Radiochemistry

**Group #** WSCF111251

**QC Batch** 175001
**Associated Samples** 111251001, 111251002

**Test** Strontium 89/90 (GPC/GEA)

| Analyte | CAS # | Original Found | QC Found | Units | % Recov | Limits | RPD | RPD Limit | | RQ | Analyzed |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **BLANK** | | | **QC Sample #47300** | | | | | | | | |
| Strontium-89/90 | SR-RAD | | -3.3 | pCi/L | | | | | | U | 02/03/11 |
| **LCS** | | | **QC Sample #47301** | | | | | | | | |
| Strontium-89/90 | SR-RAD | | 93 | pCi/L | 99.7 | 80 - 120 | | | | | 02/03/11 |
| **DUP** | | | **QC Sample #47302** | | | | | | | | |
| | | | **Original 111235001** | | | | | | | | |
| Strontium-89/90 | SR-RAD | | -3.4 | pCi/L | | | -89.40 | 20 | * | U | 02/03/11 |

## Quality Control Report

**Attention** Michael Neely
**Department** Radiochemistry

**Group #** WSCF111251

**QC Batch** 175001
**Associated Samples** 111251001, 111251002

**Test** Strontium 89/90 (GPC/GEA)

| Analyte | CAS # | Original Found | QC Found | Units | % Recov | Limits | RPD | RPD Limit | RQ | Analyzed |
|---|---|---|---|---|---|---|---|---|---|---|
| **SAMPLE** | | | **Sample #111251001** | | | | | | | |
| Strontium-85 | 13967-73-2 | | | | 96.2 | 25 - 105 | | | | 02/03/11 |
| **SAMPLE** | | | **Sample #111251002** | | | | | | | |
| Strontium-85 | 13967-73-2 | | | | 86.5 | 25 - 105 | | | | 02/03/11 |
| **BLANK** | | | **QC Sample #47300** | | | | | | | |
| Strontium-85 | 13967-73-2 | | | | 94.3 | 25 - 105 | | | | 02/03/11 |
| **LCS** | | | **QC Sample #47301** | | | | | | | |
| Strontium-85 | 13967-73-2 | | | | 88.1 | 25 - 105 | | | | 02/03/11 |
| **DUP** | | | **QC Sample #47302** | | | | | | | |
| | | | **Original 111235001** | | | | | | | |
| Strontium-85 | 13967-73-2 | | | | 88.9 | 25 - 105 | 4.30 | | | 02/03/11 |