



Ft. Collins, Colorado

LIMS Version: 7.527

Page 1 of 1

Friday, September 11, 2020

Karen Waters-Husted
 CH2M HILL Plateau Remediation Company
 825 Jadwin Avenue
 Richland, WA 99352

Re: ALS Workorder: 2008145
 Project Name: 100-N Apatite Barrier, June 20
 Project Number: I20-022

Dear Ms. Waters-Husted:

Two water samples were received from CH2M HILL Plateau Remediation Company, on 8/7/2020. The samples were scheduled for the following analyses:

Gross Alpha/Beta

Metals

Strontium-90

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained from ALS Environmental.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

ALS Environmental
 Katie M. O'Brien
 Project Manager

We certify that this data package is in compliance with the SOW, both technically and for completeness, including a full description of, explanation of, and corrective actions for, any and all deviations, from either the analyses requested or the case narrative requested. Release of the data contained in this hard copy data package has been authorized by the Laboratory Analytical Manager (or designee) and the laboratory's client services representative as verified by their signatures on this report.

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 2008145

Client Name: CH2M HILL Plateau Remediation Company

Client Project Name: 100-N Apatite Barrier, June 20

Client Project Number: I20-022

Client PO Number: BOA 54854

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
B3W952	2008145-1		WATER	05-Aug-20	12:28
B3W955	2008145-2		WATER	05-Aug-20	12:28



ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client Name/ID: **CHPRC** Workorder No: **2008145**
Project Manager: **KMO** Initials: **TM** Date: **8/7/20**

1. Are airbills / shipping documents present and/or removable?	<input type="checkbox"/> Drop Off	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
2. Are custody seals on shipping containers intact?	<input type="checkbox"/> NONE	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO*
3. Are custody seals on sample containers intact?	<input type="checkbox"/> NONE	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO*
4. Is there a COC (chain-of-custody) present?		<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO*
5. Is the COC in agreement with samples received? (IDs, dates, times, # of samples, # of containers, matrix, requested analyses, etc.)		<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO*
6. Are short-hold samples present?		<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
7. Are all samples within holding times for the requested analyses?		<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO*
8. Were all sample containers received intact? (not broken or leaking)		<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO*
9. Is there sufficient sample for the requested analyses?		<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO*
10. Are samples in proper containers for requested analyses? (form 250, Sample Handling Guidelines)		<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO*
11. Are all aqueous samples preserved correctly, if required?	<input type="checkbox"/> N/A	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO*
12. Were unpreserved samples pH checked, if required?	<input checked="" type="checkbox"/> N/A	<input type="checkbox"/> YES	<input type="checkbox"/> NO
13. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, radon) free of bubbles > 6 mm in diameter?	<input checked="" type="checkbox"/> N/A	<input type="checkbox"/> YES	<input type="checkbox"/> NO
14. Were the samples shipped on ice?		<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
15. Were cooler temperatures measured at 0.1 - 6.0°C?	IR gun used: <input type="checkbox"/> #3 <input checked="" type="checkbox"/> #5	<input type="checkbox"/> Rad Only	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO

Cooler #: **1**
 Temperature (°C): **2.4**
 # of custody seals on cooler: **1**
 External mR/hr reading: **10**
 Background mR/hr reading: **11** Were external mR/hr readings ≤ two times background and within DOT acceptance criteria? (If no, see Form 008) N/A YES NO

* Please provide details below for 'NO' responses in gray boxes above - for 2 thru 5 & 7 thru 12, notify PM & continue w/ login.

All client bottle ID's vs ALS lab ID's double-checked by: **TM**

If applicable, was the client contacted? YES N/A Contact Name: _____ Date: _____
 Project Manager Signature / Date: *KMO* **8/11/20**

10-1
2.4

ORIGIN ID:PSCA (509) 531-0450
TROY BACON
CH2M
6267 LATAH ST.

SHIP DATE: 08AUG20
ACTWGT: 87.00 LB
CAD: 107068051/NET4280

RICHLAND, WA 99352
UNITED STATES US

BILL THIRD PARTY

TO **JULIE ELLINGSON**
ALS GLOBAL-FORT COLLINS
225 COMMERCE DR

568-0277098766

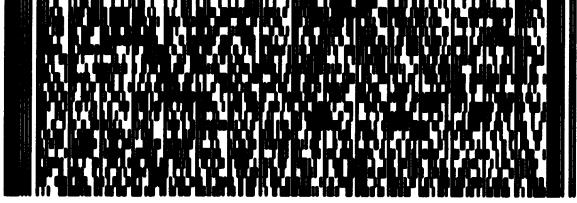
FORT COLLINS CO 80524

(970) 490-1511

REF: 300072/GWS-315

INV:

DEPT:



TRK#
0201

7711 9789 6142

FRI - 07 AUG 10:30A
PRIORITY OVERNIGHT

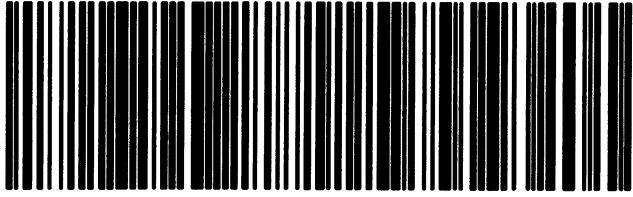
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CO-US

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Gross Alpha/Beta Case Narrative

CH2M HILL Plateau Remediation Company

100-N Apatite Barrier, June 20 – I20-022

Work Order Number: 2008145

1. This sample was prepared according to the current revision of SOP 702.
2. The sample was analyzed for gross alpha and beta activity by gas flow proportional counting according to the current revision of SOP 724. The analysis was completed on 08/20/2020. Gross alpha results are referenced to ^{241}Am . Gross beta results are referenced to $^{90}\text{Sr/Y}$.
3. The matrix spike and matrix spike duplicate of sample 2008182-2 are shared for this work order. The matrix spikes were performed on a CH2M HILL Plateau Remediation Company sample and the results are acceptable. The results can be found in the following report
4. The analysis results for this sample are reported in units of pCi/L. The sample was not filtered prior to analysis.
5. In accordance with project specific instructions, the evaluation threshold for Relative Percent Difference (RPD) has been set at 20%. RPD is defined as:

$$\text{RPD} = \frac{|S - D|}{(S + D)/2} * 100$$

Where: S = sample activity result and D = duplicate activity result. RPD is not evaluated for sample/duplicate pairs where the reported activity is less than 5 times the sample specific MDC, as indicated with an "NC" on the Duplicate Sample Results (RPD) page.

6. The magnitude of the negative gross beta activity for the method blank is greater than the 2 sigma TPU. The analyst's review of the data does not indicate a problem with the instrument data or the subsequent reporting systems. The data quality is not believed to be affected and the results are submitted without qualification. Under typical conditions, where background level sample data is normally distributed and analyzed by paired observations, this event is likely to occur at least 2.5% of the time.
7. No anomalous situations were encountered during the preparation or analysis of this sample. All quality control criteria were met.



The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Pik Yee Yuen
Pik Yee Yuen
Radiochemistry Primary Data Reviewer

8/27/20
Date

Kath M. W.
Radiochemistry Final Data Reviewer

8/30/20
Date

Gross Alpha/Beta by GFPC

PAI 724 Rev 14

Method Blank Results**Lab Name:** ALS -- Fort Collins**Work Order Number:** 2008145**Client Name:** CH2M HILL Plateau Remediation Company**ClientProject ID:** 100-N Apatite Barrier, June 20 I20-022**Lab ID:** AB200818-1MB**Sample Matrix:** WATER**Prep Batch:** AB200818-1**Final Aliquot:** 200 ml**Prep SOP:** PAI 702 Rev 23**QCBatchID:** AB200818-1-1**Result Units:** pCi/l**Date Collected:** 18-Aug-20**Run ID:** AB200818-1A**File Name:** ABC0820G**Date Prepared:** 18-Aug-20**Count Time:** 1000 minutes**Date Analyzed:** 20-Aug-20

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
12587-46-1	GROSS ALPHA	2.06E-01 +/- 4.22E-01	7.06E-01	3.00E+00	NA	U
12587-47-2	GROSS BETA	-7.51E-01 +/- 7.10E-01	1.19E+00	4.00E+00	NA	U

Comments:**Qualifiers/Flags:**

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Sample specific Minimum Detectable Concentration

BDL - Below Detection Limit

M - Requested MDC not met.

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

DL - Decision Level

Data Package ID: AB2008145-1

Gross Alpha/Beta by GFPC

PAI 724 Rev 14

Laboratory Control Sample(s)**Lab Name:** ALS -- Fort Collins**Work Order Number:** 2008145**Client Name:** CH2M HILL Plateau Remediation Company**ClientProject ID:** 100-N Apatite Barrier, June 20 I20-022**Lab ID:** AB200818-1LCS**Sample Matrix:** WATER**Prep Batch:** AB200818-1**Final Aliquot:** 200 ml**Prep SOP:** PAI 702 Rev 23**QCBatchID:** AB200818-1-1**Result Units:** pCi/l**Date Collected:** 18-Aug-20**Run ID:** AB200818-1A**File Name:** ABC0820B**Date Prepared:** 18-Aug-20**Count Time:** 150 minutes**Date Analyzed:** 20-Aug-20

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
12587-46-1	GROSS ALPHA	2.33E+02 +/- 3.82E+01	2.44E+00	2.310E+02	101	72 - 130	
12587-47-2	GROSS BETA	2.14E+02 +/- 3.48E+01	5.73E+00	2.220E+02	96.3	86 - 115	

Comments:**Qualifiers/Flags:**

U - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
Y2 - Chemical Yield outside default limits.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS Recovery within control limits.
M - The requested MDC was not met.
M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty
MDC - Minimum Detectable Concentration

Data Package ID: AB2008145-1

Gross Alpha/Beta by GFPC

PAI 724 Rev 14

Matrix Spike Results

Lab Name: ALS -- Fort Collins
Work Order Number: 2008145
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: 100-N Apatite Barrier, June 20 I20-022

Field ID:	Shared QC
Lab ID:	2008182-2MS

Sample Matrix: WATER
Prep SOP: PAI 702 Rev 23
Date Collected: 06-Aug-20
Date Prepared: 18-Aug-20
Date Analyzed: 20-Aug-20

Prep Batch: AB200818-1
QC Batch ID: AB200818-1-1
Run ID: AB200818-1A
Count Time: 150 minutes
Report Basis: Unfiltered

Final Aliquot: 100 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: ABC0820A

Analysis ReqCode: SMR_ALPHABET

CASNO	Target Nuclide	Matrix Spike	Sample Results	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
12587-46-1	GROSS ALPHA	3.80E+02	7.30E-01	6.20E+00	4.620E+02	82.0	72 - 130	
12587-47-2	GROSS BETA	4.58E+02	8.39E+00	9.86E+00	4.450E+02	101	86 - 115	

Comments:

Qualifiers/Flags:

- U - Result is less than the sample specific MDC.
- Y1 - Chemical Yield in control at 100-110%. Quantitative yield is assumed.
- Y2 - Chemical Yield outside default limits.
- N - Matrix Spike Recovery outside control limits
- P - Matrix Spike Recovery within control limits
- M - The requested MDC was not met.
- M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Abbreviations:

MDC - Sample specific Minimum Detectable Concentration

Data Package ID: AB2008145-1

Gross Alpha/Beta by GFPC

PAI 724 Rev 14

Matrix Spike Results

Lab Name: ALS -- Fort Collins
Work Order Number: 2008145
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: 100-N Apatite Barrier, June 20 I20-022

Field ID:	Shared QC
Lab ID:	2008182-2MSD

Sample Matrix: WATER
Prep SOP: PAI 702 Rev 23
Date Collected: 06-Aug-20
Date Prepared: 18-Aug-20
Date Analyzed: 20-Aug-20

Prep Batch: AB200818-1
QCBatchID: AB200818-1-1
Run ID: AB200818-1A
Count Time: 150 minutes
Report Basis: Unfiltered

Final Aliquot: 100 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: ABC0820A

Analysis ReqCode: SMR_ALPHABET

CASNO	Target Nuclide	Matrix Spike	Sample Results	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
12587-46-1	GROSS ALPHA	4.19E+02	7.30E-01	6.60E+00	4.620E+02	90.4	72 - 130	
12587-47-2	GROSS BETA	4.74E+02	8.39E+00	1.03E+01	4.450E+02	105	86 - 115	

Comments:

Qualifiers/Flags:

- U - Result is less than the sample specific MDC.
- Y1 - Chemical Yield in control at 100-110%. Quantitative yield is assumed.
- Y2 - Chemical Yield outside default limits.
- N - Matrix Spike Recovery outside control limits
- P - Matrix Spike Recovery within control limits
- M - The requested MDC was not met.
- M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Abbreviations:

MDC - Sample specific Minimum Detectable Concentration

Data Package ID: AB2008145-1

Gross Alpha/Beta by GFPC

PAI 724 Rev 14

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 2008145
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: 100-N Apatite Barrier, June 20 I20-022

Field ID:	Shared QC
Lab ID:	2008182-2

Sample Matrix: WATER	Prep Batch: AB200818-1	Final Aliquot: 100 ml
Prep SOP: PAI 702 Rev 23	QCBatchID: AB200818-1-1	Prep Basis: Unfiltered
Date Collected: 06-Aug-20	Run ID: AB200818-1A	Moisture(%): NA
Date Prepared: 18-Aug-20	Count Time: 1000 minutes	Result Units: pCi/l
Date Analyzed: 20-Aug-20	Report Basis: Unfiltered	File Name: ABC0820G

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
12587-46-1	GROSS ALPHA	7.30E-01 +/- 1.07E+00	1.77E+00	3E+00	NA	U
12587-47-2	GROSS BETA	8.39E+00 +/- 1.96E+00	2.15E+00	4E+00	NA	

Comments:

Qualifiers/Flags:

- U - Result is less than the sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
- Y2 - Chemical Yield outside default limits.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
- M - The requested MDC was not met.

Abbreviations:

- TPU - Total Propagated Uncertainty
- MDC - Sample specific Minimum Detectable Concentration
- BDL - Below Detection Limit
- DL - Decision Level

Data Package ID: AB2008145-1

Gross Alpha/Beta by GFPC

PAI 724 Rev 14

Duplicate Sample Results (DER)

Lab Name: ALS -- Fort Collins
Work Order Number: 2008145
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: 100-N Apatite Barrier, June 20 I20-022

Field ID:	Shared QC
Lab ID:	2008182-2MSD

Sample Matrix: WATER
Prep SOP: PAI 702 Rev 23
Date Collected: 06-Aug-20
Date Prepared: 18-Aug-20
Date Analyzed: 20-Aug-20

Prep Batch: AB200818-1
QCBatchID: AB200818-1-1
Run ID: AB200818-1A
Count Time: 150 minutes
Report Basis: Unfiltered

Final Aliquot: 100 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: ABC0820A

CASNO	Analyte	Sample				Duplicate				DER	DER Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
12587-46-1	GROSS ALPHA	3.80E+02 +/-	6.31E+01	6.20E+00		4.19E+02 +/-	6.94E+01	6.60E+00		0.829	3
12587-47-2	GROSS BETA	4.58E+02 +/-	7.42E+01	9.86E+00		4.74E+02 +/-	7.69E+01	1.03E+01		0.309	3

Comments:

Duplicate Qualifiers/Flags:

- U - Result is less than the sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
- Y2 - Chemical Yield outside default limits.
- D - DER is greater than Control Limit of 3
- LT - Result is less than Request MDC, greater than sample specific MDC
- M - Requested MDC not met.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
- L - LCS Recovery below lower control limit.
- H - LCS Recovery above upper control limit.
- P - LCS, Matrix Spike Recovery within control limits.
- N - Matrix Spike Recovery outside control limits

Abbreviations:

- TPU - Total Propagated Uncertainty
- DER - Duplicate Error Ratio
- BDL - Below Detection Limit
- NR - Not Reported

Data Package ID: AB2008145-1

Gross Alpha/Beta by GFPC

PAI 724 Rev 14

Duplicate Sample Results (RPD)

Lab Name: ALS -- Fort Collins
Work Order Number: 2008145
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: 100-N Apatite Barrier, June 20 I20-022

Field ID:	Shared QC
Lab ID:	2008182-2MSD

Sample Matrix: WATER
Prep SOP: PAI 702 Rev 23
Date Collected: 06-Aug-20
Date Prepared: 18-Aug-20
Date Analyzed: 20-Aug-20

Prep Batch: AB200818-1
QCBatchID: AB200818-1-1
Run ID: AB200818-1A
Count Time: 150 minutes
Report Basis: Unfiltered

Final Aliquot: 100 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: ABC0820A

CASNO	Analyte	Sample				Duplicate				RPD	RPD Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
12587-46-1	GROSS ALPHA	3.80E+02 +/-	6.31E+01	6.20E+00		4.19E+02 +/-	6.94E+01	6.60E+00		10.00	20
12587-47-2	GROSS BETA	4.58E+02 +/-	7.42E+01	9.86E+00		4.74E+02 +/-	7.69E+01	1.03E+01		4.00	20

Comments:

Qualifiers/Flags:

- + - Duplicate RPD not within limits.
- U - Result is less than the sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
- Y2 - Chemical Yield outside default limits.
- M - Requested MDC not met.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
- L - LCS Recovery below lower control limit.
- H - LCS Recovery above upper control limit.
- P - LCS, Matrix Spike Recovery within control limits.
- N - Matrix Spike Recovery outside control limits
- NC - Not Calculated for duplicate results less than 5 times MDC

Abbreviations:

- TPU - Total Propagated Uncertainty
- BDL - Below Detection Limit
- NR - Not Reported

Data Package ID: AB2008145-1

Gross Alpha/Beta by GFPC

PAI 724 Rev 14

Duplicate Sample Results (DER)

Lab Name: ALS -- Fort Collins
Work Order Number: 2008145
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: 100-N Apatite Barrier, June 20 I20-022

Field ID:	B3W952
Lab ID:	2008145-1DUP

Sample Matrix: WATER
Prep SOP: PAI 702 Rev 23
Date Collected: 05-Aug-20
Date Prepared: 18-Aug-20
Date Analyzed: 20-Aug-20

Prep Batch: AB200818-1
QCBatchID: AB200818-1-1
Run ID: AB200818-1A
Count Time: 150 minutes
Report Basis: Unfiltered

Final Aliquot: 200 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: ABC0820A

CASNO	Analyte	Sample				Duplicate				DER	DER Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
12587-46-1	GROSS ALPHA	4.38E-01 +/- 1.03E+00		2.31E+00	U	-3.14E-01 +/- 8.94E-01		2.32E+00	U	1.1	3
12587-47-2	GROSS BETA	2.22E+00 +/- 1.46E+00		2.90E+00	U	2.57E+00 +/- 1.54E+00		3.01E+00	U	0.329	3

Comments:

Duplicate Qualifiers/Flags:

- U - Result is less than the sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
- Y2 - Chemical Yield outside default limits.
- D - DER is greater than Control Limit of 3
- LT - Result is less than Request MDC, greater than sample specific MDC
- M - Requested MDC not met.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
- L - LCS Recovery below lower control limit.
- H - LCS Recovery above upper control limit.
- P - LCS, Matrix Spike Recovery within control limits.
- N - Matrix Spike Recovery outside control limits

Abbreviations:

- TPU - Total Propagated Uncertainty
- DER - Duplicate Error Ratio
- BDL - Below Detection Limit
- NR - Not Reported

Data Package ID: AB2008145-1

Gross Alpha/Beta by GFPC

PAI 724 Rev 14

Duplicate Sample Results (RPD)

Lab Name: ALS -- Fort Collins
Work Order Number: 2008145
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: 100-N Apatite Barrier, June 20 I20-022

Field ID:	B3W952
Lab ID:	2008145-1DUP

Sample Matrix: WATER
Prep SOP: PAI 702 Rev 23
Date Collected: 05-Aug-20
Date Prepared: 18-Aug-20
Date Analyzed: 20-Aug-20

Prep Batch: AB200818-1
QCBatchID: AB200818-1-1
Run ID: AB200818-1A
Count Time: 150 minutes
Report Basis: Unfiltered

Final Aliquot: 200 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: ABC0820A

CASNO	Analyte	Sample				Duplicate				RPD	RPD Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
12587-46-1	GROSS ALPHA	4.38E-01 +/- 1.03E+00		2.31E+00	U	-3.14E-01 +/- 8.94E-01		2.32E+00	U	NC	20
12587-47-2	GROSS BETA	2.22E+00 +/- 1.46E+00		2.90E+00	U	2.57E+00 +/- 1.54E+00		3.01E+00	U	NC	20

Comments:

Qualifiers/Flags:

- + - Duplicate RPD not within limits.
- U - Result is less than the sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
- Y2 - Chemical Yield outside default limits.
- M - Requested MDC not met.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
- L - LCS Recovery below lower control limit.
- H - LCS Recovery above upper control limit.
- P - LCS, Matrix Spike Recovery within control limits.
- N - Matrix Spike Recovery outside control limits
- NC - Not Calculated for duplicate results less than 5 times MDC

Abbreviations:

- TPU - Total Propagated Uncertainty
- BDL - Below Detection Limit
- NR - Not Reported

Data Package ID: AB2008145-1

Gross Alpha/Beta by GFPC

PAI 724 Rev 14

Sample Results**Lab Name:** ALS -- Fort Collins**Work Order Number:** 2008145**Client Name:** CH2M HILL Plateau Remediation Company**ClientProject ID:** 100-N Apatite Barrier, June 20 I20-022

Field ID:	B3W952
Lab ID:	2008145-1

Sample Matrix: WATER**Prep SOP:** PAI 702 Rev 23**Date Collected:** 05-Aug-20**Date Prepared:** 18-Aug-20**Date Analyzed:** 20-Aug-20**Prep Batch:** AB200818-1**QCBatchID:** AB200818-1-1**Run ID:** AB200818-1A**Count Time:** 150 minutes**Report Basis:** Unfiltered**Final Aliquot:** 200 ml**Prep Basis:** Unfiltered**Moisture(%):** NA**Result Units:** pCi/l**File Name:** ABC0820A**Analysis ReqCode:** SMR_ALPHABET

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
12587-46-1	GROSS ALPHA	4.38E-01 +/- 1.03E+00	2.31E+00	3E+00	NA	U
12587-47-2	GROSS BETA	2.22E+00 +/- 1.46E+00	2.90E+00	4E+00	NA	U

Comments:**Qualifiers/Flags:**

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Sample specific Minimum Detectable Concentration

BDL - Below Detection Limit

DL - Decision Level

Data Package ID: AB2008145-1

Gross Alpha/Beta by GFPC

PAI 724 Rev 14

Sample Duplicate Results

Lab Name: ALS -- Fort Collins
Work Order Number: 2008145
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: 100-N Apatite Barrier, June 20 I20-022

Field ID:	B3W952
Lab ID:	2008145-1DUP

Sample Matrix: WATER
Prep SOP: PAI 702 Rev 23
Date Collected: 05-Aug-20
Date Prepared: 18-Aug-20
Date Analyzed: 20-Aug-20

Prep Batch: AB200818-1
QCBatchID: AB200818-1-1
Run ID: AB200818-1A
Count Time: 150 minutes
Report Basis: Unfiltered

Final Aliquot: 200 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: ABC0820A

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
12587-46-1	GROSS ALPHA	-3.14E-01 +/- 8.94E-01	2.32E+00	3E+00	NA	U
12587-47-2	GROSS BETA	2.57E+00 +/- 1.54E+00	3.01E+00	4E+00	NA	U

Comments:

Qualifiers/Flags:

- U - Result is less than the sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
- Y2 - Chemical Yield outside default limits.
- M - The requested MDC was not met.
- M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

- D - DER is greater than Control Limit of 3

Abbreviations:

- TPU - Total Propagated Uncertainty
- MDC - Sample specific Minimum Detectable Concentration
- BDL - Below Detection Limit
- DL - Decision Level

Data Package ID: AB2008145-1

Date Printed:

Thursday, August 27, 2020

ALS -- Fort Collins

LIMS Version: 7.010

Page 1 of 1

Prep Batch ID: AB200818-1

Start Date: 08/18/20	End Date: 08/18/20	Concentration Method: NONE	Batch Created By: rgs
Start Time: 6:39	End Time: 6:39	Extract Method: PAI 70223	Date Created: 08/18/20
Prep Analyst: Reilly G. Stockton		Initial Volume Units: ml	Time Created: 6:39
Comments:		Final Volume Units: ml	Validated By: rgs
<div style="border: 1px solid black; height: 30px; width: 100%;"></div>			Date Validated: 08/19/20
			Time Validated: 7:49

QC Batch ID: AB200818-1-1

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
AB200818-1	MB	XXXXXX	WATER	XXXXXX	200	200	NONE	1	2008145
AB200818-1	LCS	XXXXXX	WATER	XXXXXX	200	200	NONE	1	2008145
2008182-2	MS	XXXXXX	WATER	XXXXXX	100	100	NONE	1	2008182
2008182-2	MSD	XXXXXX	WATER	XXXXXX	100	100	NONE	1	2008182
2008145-1	DUP	B3W952	WATER	8/5/2020	200	200	NONE	1	2008145
2008145-1	SMP	B3W952	WATER	8/5/2020	200	200	NONE	1	2008145
2008182-2	SMP	XXXXXX	WATER	XXXXXX	100	100	NONE	1	2008182

QC Types

CAR	Carrier reference sample	DLS	Detection Limit Standard
DUP	Laboratory Duplicate	LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicat	LODV	Limit of Detection Verification
LOQV	Limit of Quantitation Verification	MB	Method Blank
MS	Laboratory Matrix Spike	MSD	Laboratory Matrix Spike Duplicate
REP	Sample replicate	RVS	Reporting Level Verification Standar
SMP	Field Sample	SYS	Sample Yield Spike



Metals

Case Narrative

CH2M HILL Plateau Remediation Company

100-N Apatite Barrier, June 20 – I20-022

Work Order Number: 2008145

1. The samples were prepared and analyzed based on SW-846, 3rd Edition procedures.

For analysis by Trace ICP and ICP-MS, the samples were digested following method 3005A and the current revision of SOP 806.

2. Analysis by Trace ICP followed method 6010D and the current revision of SOP 834.
3. Analysis by ICP-MS followed method 6020B and the current revision of SOP 827.
4. All standards and solutions are NIST traceable and were used within their recommended shelf life.
5. The samples were prepared and analyzed within the established hold time.

All in house quality control procedures were followed, as described below.

6. General quality control procedures.
 - A preparation (method) blank and laboratory control sample were digested and analyzed with the samples in this digestion batch.
 - The preparation (method) blank associated with this digestion batch was below the reporting limit for the requested analytes. Sample results have been compared to the blank results and are flagged as appropriate.
 - All laboratory control sample criteria were met.
 - All initial and continuing calibration blanks were below the reporting limit for the requested analytes.
 - All initial and continuing calibration verifications were within the acceptance criteria for the requested analytes.



- The interference check samples and high standard read-backs associated with Method 6010D were within acceptance criteria.
- The interference check samples associated with Method 6020B were analyzed.

7. Matrix specific quality control procedures.

Sample 2008182-1 was designated as the quality control sample for each analysis. Results for the shared quality control samples are included at the client's request.

Similarity of matrix and therefore relevance of the QC results should not be automatically inferred for any sample other than the native sample selected for QC.

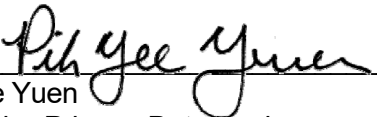
- A matrix spike and matrix spike duplicate were digested and analyzed with each batch. All acceptance criteria for accuracy and precision were met.
- Matrix spike recoveries could not be evaluated for the following analyte:

<u>Analyte</u>	<u>Sample ID</u>
Strontium	2008182-1MS/MSD

The concentration of this analyte in the native sample was greater than four times the concentration of matrix spike added during the digestion. When sample concentration is that much greater than the spike added, spike recoveries may not be accurate. The laboratory control sample indicate that the digestion and analysis were in control.

- A serial dilution was analyzed with each ICP batch. All acceptance criteria were met.
8. It is a standard practice that samples for ICP-MS are analyzed at a dilution. The samples were analyzed at a 5X dilution per client request. The 5X factor can be considered an artifact of the prep and does not indicate a secondary dilution and is therefore not flagged as a dilution.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.



 Pik Yee Yuen
 Inorganics Primary Data Reviewer

9/10/20
 Date



 Kath M. W.
 Inorganics Final Data Reviewer

9/11/20
 Date



Inorganic Data Reporting Qualifiers

The following qualifiers are used as needed by the laboratory when reporting results of inorganic analyses.

- Result qualifier -- A “B” is entered if the reported value was obtained from a reading that was less than the Reporting Limit but greater than or equal to the Method Detection Limit (MDL). If the analyte was analyzed for but not detected a “U” is entered. For samples, negative values are reported as non-detects (“U” flagged). For blanks, if the absolute value of the negative value is above the MDL and below the reporting limit, then the result is “B” flagged.
- QC qualifier -- Specified entries and their meanings are as follows:
 - E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.
 - M - Duplicate injection precision was not met.
 - N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.
 - Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.
 - * - Duplicate analysis (relative percent difference) not within control limits.
 - S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.
 - C - The analyte was detected in both the sample and the associated QC blank, and the sample concentration was $\leq 20X$ the blank concentration.
 - D - Analyte was reported at a secondary dilution factor, typically $DF > 1$ (i.e., the primary preparation required dilution to either bring the analyte within the calibration range or to minimize interference). Required for organics/wetchem if the sample was diluted.

Total Recoverable ICP Metals

Method SW6010D

Sample Results

Lab Name: ALS -- Fort Collins

Work Order Number: 2008145

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: 100-N Apatite Barrier, June 20 I20-022

Field ID:	B3W952
Lab ID:	2008145-1

Sample Matrix: WATER
 % Moisture: N/A
 Date Collected: 05-Aug-20
 Date Extracted: 04-Sep-20
 Date Analyzed: 08-Sep-20
 Prep Method: SW3005 Rev A

Prep Batch: IP200904-1
 QCBatchID: IP200904-1-2
 Run ID: IT200908-1A2
 Cleanup: NONE
 Basis: As Received
 File Name: 200908A.

Analyst: Steve Workman
 Sample Aliquot: 50 ml
 Final Volume: 50 ml
 Result Units: UG/L
 Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Result Qualifier	Reporting Limit	MDL
7440-42-8	BORON	1	9.4	U	50	9.4
7440-70-2	CALCIUM	1	22000		1000	94
7439-89-6	IRON	1	44	U	100	44
7439-95-4	MAGNESIUM	1	4600		750	86
7440-09-7	POTASSIUM	1	1400		1000	330
7440-23-5	SODIUM	1	5200		1000	360
7440-62-2	VANADIUM	1	2.4	B	10	1.7

Data Package ID: IT2008145-1

Dissolved ICP Metals

Method SW6010D

Sample Results

Lab Name: ALS -- Fort Collins

Work Order Number: 2008145

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: 100-N Apatite Barrier, June 20 I20-022

Field ID: B3W955

Lab ID: 2008145-2

Sample Matrix: WATER

% Moisture: N/A

Date Collected: 05-Aug-20

Date Extracted: 04-Sep-20

Date Analyzed: 08-Sep-20

Prep Method: SW3005 Rev A

Prep Batch: IP200904-1

QCBatchID: IP200904-1-2

Run ID: IT200908-1A2

Cleanup: NONE

Basis: As Received

File Name: 200908A.

Analyst: Steve Workman

Sample Aliquot: 50 ml

Final Volume: 50 ml

Result Units: UG/L

Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Result Qualifier	Reporting Limit	MDL
7440-42-8	BORON	1	9.4	U	50	9.4
7440-70-2	CALCIUM	1	21000		1000	94
7439-89-6	IRON	1	44	U	100	44
7439-95-4	MAGNESIUM	1	4500		750	86
7440-09-7	POTASSIUM	1	1400		1000	330
7440-23-5	SODIUM	1	5100		1000	360
7440-62-2	VANADIUM	1	2.6	B	10	1.7

Data Package ID: IT2008145-1

Date Printed: Thursday, September 10, 2020

ALS -- Fort Collins

Page 2 of 2

LIMS Version: 7.010

Total Recoverable ICPMS Metals

Method SW6020B

Sample Results

Lab Name: ALS -- Fort Collins

Work Order Number: 2008145

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: 100-N Apatite Barrier, June 20 I20-022

Field ID: B3W952

Lab ID: 2008145-1

Sample Matrix: WATER

% Moisture: N/A

Date Collected: 05-Aug-20

Date Extracted: 04-Sep-20

Date Analyzed: 09-Sep-20

Prep Method: SW3005 Rev A

Prep Batch: IP200904-1

QC Batch ID: IP200904-1-1

Run ID: IM200909-10A2

Cleanup: NONE

Basis: As Received

File Name: 054SMPL.

Analyst: Jill M. Latelle

Sample Aliquot: 50 ml

Final Volume: 50 ml

Result Units: UG/L

Clean DF: 1

Analysis ReqCode: 6020_METALS_I

CASNO	Target Analyte	Dilution Factor	Result	Result Qualifier	Reporting Limit	MDL
7429-90-5	ALUMINUM	5	26	U	50	26
7440-36-0	ANTIMONY	5	0.12	B	0.5	0.08
7440-38-2	ARSENIC	5	0.26	B	1	0.26
7440-39-3	BARIUM	5	25		2.5	0.95
7440-41-7	BERYLLIUM	5	0.037	U	0.25	0.037
7440-43-9	CADMIUM	5	0.12	U	1	0.12
7440-47-3	CHROMIUM	5	2.4	U	5	2.4
7440-48-4	COBALT	5	0.16	U	2.5	0.16
7440-50-8	COPPER	5	2	U	10	2
7439-92-1	LEAD	5	0.5	U	1	0.5
7439-96-5	MANGANESE	5	2.4	U	5	2.4
7439-98-7	MOLYBDENUM	5	1.4		1	0.23
7440-02-0	NICKEL	5	1.3	U	10	1.3
7782-49-2	SELENIUM	5	1.4	U	5	1.4
7440-22-4	SILVER	5	0.045	U	0.25	0.045
7440-24-6	STRONTIUM	5	85		2.5	0.34
7440-28-0	THALLIUM	5	0.032	U	0.075	0.032
7440-29-1	THORIUM	5	0.05	U	0.1	0.05
7440-31-5	TIN	5	2.6	U	5	2.6
7440-61-1	URANIUM	5	0.22		0.05	0.02
7440-66-6	ZINC	5	24	U	50	24

Data Package ID: IM2008145-1

Date Printed: Thursday, September 10, 2020

ALS -- Fort Collins

Page 1 of 4

LIMS Version: 7.010

Dissolved ICPMS Metals

Method SW6020B

Sample Results

Lab Name: ALS -- Fort Collins

Work Order Number: 2008145

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: 100-N Apatite Barrier, June 20 I20-022

Field ID: B3W955

Lab ID: 2008145-2

Sample Matrix: WATER

% Moisture: N/A

Date Collected: 05-Aug-20

Date Extracted: 04-Sep-20

Date Analyzed: 09-Sep-20

Prep Method: SW3005 Rev A

Prep Batch: IP200904-1

QCBatchID: IP200904-1-1

Run ID: IM200909-10A2

Cleanup: NONE

Basis: As Received

File Name: 055SMPL.

Analyst: Jill M. Latelle

Sample Aliquot: 50 ml

Final Volume: 50 ml

Result Units: UG/L

Clean DF: 1

Analysis ReqCode: 6020_METALS_I

CASNO	Target Analyte	Dilution Factor	Result	Result Qualifier	Reporting Limit	MDL
7429-90-5	ALUMINUM	5	26	U	50	26
7440-36-0	ANTIMONY	5	0.12	B	0.5	0.08
7440-38-2	ARSENIC	5	0.26	U	1	0.26
7440-39-3	BARIUM	5	24		2.5	0.95
7440-41-7	BERYLLIUM	5	0.037	U	0.25	0.037
7440-43-9	CADMIUM	5	0.12	U	1	0.12
7440-47-3	CHROMIUM	5	2.4	U	5	2.4
7440-48-4	COBALT	5	0.16	U	2.5	0.16
7440-50-8	COPPER	5	2	U	10	2
7439-92-1	LEAD	5	0.5	U	1	0.5
7439-96-5	MANGANESE	5	2.4	U	5	2.4
7439-98-7	MOLYBDENUM	5	1.4		1	0.23
7440-02-0	NICKEL	5	1.3	U	10	1.3
7782-49-2	SELENIUM	5	1.4	U	5	1.4
7440-22-4	SILVER	5	0.045	U	0.25	0.045
7440-24-6	STRONTIUM	5	86		2.5	0.34
7440-28-0	THALLIUM	5	0.032	U	0.075	0.032
7440-29-1	THORIUM	5	0.05	U	0.1	0.05
7440-31-5	TIN	5	2.6	U	5	2.6
7440-61-1	URANIUM	5	0.22		0.05	0.02
7440-66-6	ZINC	5	24	U	50	24

Data Package ID: IM2008145-1

ICP Metals

Method SW6010D

Method Blank

Lab Name: ALS -- Fort Collins

Work Order Number: 2008145

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: 100-N Apatite Barrier, June 20 I20-022

Lab ID: IP200904-1MB

Sample Matrix: WATER

% Moisture: N/A

Date Collected: N/A

Date Extracted: 04-Sep-20

Date Analyzed: 08-Sep-20

Prep Batch: IP200904-1

QCBatchID: IP200904-1-2

Run ID: IT200908-1A2

Cleanup: NONE

Basis: N/A

File Name: 200908A.

Sample Aliquot: 50 ml

Final Volume: 50 ml

Result Units: UG/L

Clean DF: 1

CASNO	Target Analyte	DF	Result	Result Qualifier	Reporting Limit	MDL
7440-42-8	BORON	1	9.4	U	50	9.4
7440-70-2	CALCIUM	1	94	U	1000	94
7439-89-6	IRON	1	44	U	100	44
7439-95-4	MAGNESIUM	1	86	U	750	86
7440-09-7	POTASSIUM	1	330	U	1000	330
7440-23-5	SODIUM	1	360	U	1000	360
7440-62-2	VANADIUM	1	1.7	U	10	1.7

Data Package ID: IT2008145-1

ICP Metals

Method SW6010D

Laboratory Control Sample

Lab Name: ALS -- Fort Collins

Work Order Number: 2008145

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: 100-N Apatite Barrier, June 20 I20-022

Lab ID: IP200904-1LCS

Sample Matrix: WATER

% Moisture: N/A

Date Collected: N/A

Date Extracted: 09/04/2020

Date Analyzed: 09/08/2020

Prep Method: SW3005A

Prep Batch: IP200904-1

QCBatchID: IP200904-1-2

Run ID: IT200908-1A2

Cleanup: NONE

Basis: N/A

File Name: 200908A.

Sample Aliquot: 50 ml

Final Volume: 50 ml

Result Units: UG/L

Clean DF: 1

CASNO	Target Analyte	Spike Added	LCS Result	Reporting Limit	Result Qualifier	LCS % Rec.	Control Limits
7440-42-8	BORON	1000	973	50		97	80 - 120%
7440-70-2	CALCIUM	40000	38800	1000		97	80 - 120%
7439-89-6	IRON	1000	1010	100		101	80 - 120%
7439-95-4	MAGNESIUM	40000	40500	750		101	80 - 120%
7440-09-7	POTASSIUM	40000	40000	1000		100	80 - 120%
7440-23-5	SODIUM	41600	40700	1000		98	80 - 120%
7440-62-2	VANADIUM	500	501	10		100	80 - 120%

Data Package ID: IT2008145-1

Date Printed: Thursday, September 10, 2020

ALS -- Fort Collins

Page 1 of 1

LIMS Version: 7.010

ICP Metals

Method SW6010D

Matrix Spike And Matrix Spike Duplicate

Lab Name: ALS -- Fort Collins
Work Order Number: 2008145
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: 100-N Apatite Barrier, June 20 I20-022

Field ID: SHARED QC
LabID: 2008182-1MS

Sample Matrix: WATER	Prep Batch: IP200904-1	Sample Aliquot: 50 ml
% Moisture: N/A	QCBatchID: IP200904-1-2	Final Volume: 50 ml
Date Collected: 06-Aug-20	Run ID: IT200908-1A2	Result Units: UG/L
Date Extracted: 04-Sep-20	Cleanup: NONE	File Name: 200908A.
Date Analyzed: 08-Sep-20	Basis: As Received	
Prep Method: SW3005 Rev A		

CASNO	Target Analyte	Sample Result	Samp Qual	MS Result	MS Qual	Reporting Limit	Spike Added	MS % Rec.	Control Limits
7440-42-8	BORON	9.4	U	993		50	1000	99	80 - 120%
7440-70-2	CALCIUM	130000		171000		1000	40000	98	80 - 120%
7439-89-6	IRON	44	U	987		100	1000	99	80 - 120%
7439-95-4	MAGNESIUM	32000		72500		750	40000	102	80 - 120%
7440-09-7	POTASSIUM	10000		50100		1000	40000	99	80 - 120%
7440-23-5	SODIUM	34000		70900		1000	41600	88	80 - 120%
7440-62-2	VANADIUM	7.2	B	500		10	500	99	80 - 120%

Field ID: SHARED QC
LabID: 2008182-1MSD

Sample Matrix: WATER	Prep Batch: IP200904-1	Sample Aliquot: 50 ml
% Moisture: N/A	QCBatchID: IP200904-1-2	Final Volume: 50 ml
Date Collected: 06-Aug-20	Run ID: IT200908-1A2	Result Units: UG/L
Date Extracted: 04-Sep-20	Cleanup: NONE	File Name: 200908A.
Date Analyzed: 08-Sep-20	Basis: As Received	
Prep Method: SW3005 Rev A		

CASNO	Target Analyte	MSD Result	MSD Qual	Spike Added	MSD % Rec.	Reporting Limit	RPD Limit	RPD
7440-42-8	BORON	995		1000	100	50	20	0
7440-70-2	CALCIUM	170000		40000	97	1000	20	0
7439-89-6	IRON	985		1000	98	100	20	0
7439-95-4	MAGNESIUM	72400		40000	102	750	20	0
7440-09-7	POTASSIUM	50100		40000	99	1000	20	0
7440-23-5	SODIUM	70800		41600	88	1000	20	0
7440-62-2	VANADIUM	500		500	98	10	20	0

Data Package ID: IT2008145-1

Prep Batch ID: IP200904-1

Start Date: 09/04/20	End Date: 09/04/20	Concentration Method: NONE	Batch Created By: jml
Start Time: 9:07	End Time: 18:00	Extract Method: SW3005A	Date Created: 09/04/20
Prep Analyst: Jill M. Latelle		Initial Volume Units: ml	Time Created: 9:07
<u>Comments:</u>		Final Volume Units: ml	Validated By: jml
<div style="border: 1px solid black; height: 30px; width: 100%;"></div>			Date Validated: 09/04/20
			Time Validated: 12:33

QC Batch ID: IP200904-1-2

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
IP200904-1	MB	XXXXXX	WATER	XXXXXX	50	50	NONE	1	2008182
IP200904-1	LCS	XXXXXX	WATER	XXXXXX	50	50	NONE	1	2008182
2008182-1	MS	XXXXXX	WATER	XXXXXX	50	50	NONE	1	2008182
2008182-1	MSD	XXXXXX	WATER	XXXXXX	50	50	NONE	1	2008182
2008145-1	SMP	B3W952	WATER	8/5/2020	50	50	NONE	1	2008145
2008145-2	SMP	B3W955	WATER	8/5/2020	50	50	NONE	1	2008145
2008182-1	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	2008182
2008182-10	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	2008182
2008182-12	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	2008182
2008182-13	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	2008182
2008182-2	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	2008182
2008182-3	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	2008182
2008182-4	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	2008182
2008182-5	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	2008182
2008182-6	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	2008182
2008182-7	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	2008182
2008182-8	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	2008182
2008182-9	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	2008182
2008293-1	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	2008293
2008293-2	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	2008293

Prep Batch ID: IP200904-1

Start Date: 09/04/20	End Date: 09/04/20	Concentration Method: NONE	Batch Created By: jml
Start Time: 9:07	End Time: 18:00	Extract Method: SW3005A	Date Created: 09/04/20
Prep Analyst: Jill M. Latelle		Initial Volume Units: ml	Time Created: 9:07
Comments:		Final Volume Units: ml	Validated By: jml
			Date Validated: 09/04/20
			Time Validated: 12:33

QC Types

CAR	Carrier reference sample		DLS	Detection Limit Standard
DUP	Laboratory Duplicate		LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicat		LODV	Limit of Detection Verification
LOQV	Limit of Quantitation Verification		MB	Method Blank
MS	Laboratory Matrix Spike		MSD	Laboratory Matrix Spike Duplicate
REP	Sample replicate		RVS	Reporting Level Verification Standar
SMP	Field Sample		SYS	Sample Yield Spike

ICPMS Metals

Method SW6020B

Method Blank

Lab Name: ALS -- Fort Collins

Work Order Number: 2008145

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: 100-N Apatite Barrier, June 20 I20-022

Lab ID: IP200904-1MB

Sample Matrix: WATER

% Moisture: N/A

Date Collected: N/A

Date Extracted: 04-Sep-20

Date Analyzed: 09-Sep-20

Prep Batch: IP200904-1

QCBatchID: IP200904-1-1

Run ID: IM200909-10A2

Cleanup: NONE

Basis: N/A

File Name: 052SMPL.

Sample Aliquot: 50 ml

Final Volume: 50 ml

Result Units: UG/L

Clean DF: 1

CASNO	Target Analyte	DF	Result	Result Qualifier	Reporting Limit	MDL
7429-90-5	ALUMINUM	5	26	U	50	26
7440-36-0	ANTIMONY	5	0.08	U	0.5	0.08
7440-38-2	ARSENIC	5	0.26	U	1	0.26
7440-39-3	BARIUM	5	0.95	U	2.5	0.95
7440-41-7	BERYLLIUM	5	0.037	U	0.25	0.037
7440-43-9	CADMIUM	5	0.12	U	1	0.12
7440-47-3	CHROMIUM	5	2.4	U	5	2.4
7440-48-4	COBALT	5	0.16	U	2.5	0.16
7440-50-8	COPPER	5	2	U	10	2
7439-92-1	LEAD	5	0.5	U	1	0.5
7439-96-5	MANGANESE	5	2.4	U	5	2.4
7439-98-7	MOLYBDENUM	5	0.23	U	1	0.23
7440-02-0	NICKEL	5	1.3	U	10	1.3
7782-49-2	SELENIUM	5	1.4	U	5	1.4
7440-22-4	SILVER	5	0.045	U	0.25	0.045
7440-24-6	STRONTIUM	5	0.34	U	2.5	0.34
7440-28-0	THALLIUM	5	0.032	U	0.075	0.032
7440-29-1	THORIUM	5	0.05	U	0.1	0.05
7440-31-5	TIN	5	2.6	U	5	2.6
7440-61-1	URANIUM	5	0.02	U	0.05	0.02
7440-66-6	ZINC	5	24	U	50	24

Data Package ID: IM2008145-1

Date Printed: Thursday, September 10, 2020

ALS -- Fort Collins

Page 1 of 1

LIMS Version: 7.010

ICPMS Metals

Method SW6020B

Laboratory Control Sample

Lab Name: ALS -- Fort Collins

Work Order Number: 2008145

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: 100-N Apatite Barrier, June 20 I20-022

Lab ID: IM200904-1LCS

Sample Matrix: WATER

% Moisture: N/A

Date Collected: N/A

Date Extracted: 09/04/2020

Date Analyzed: 09/09/2020

Prep Method: SW3005A

Prep Batch: IP200904-1

QCBatchID: IP200904-1-1

Run ID: IM200909-10A2

Cleanup: NONE

Basis: N/A

File Name: 053SMPL.

Sample Aliquot: 50 ml

Final Volume: 50 ml

Result Units: UG/L

Clean DF: 1

CASNO	Target Analyte	Spike Added	LCS Result	Reporting Limit	Result Qualifier	LCS % Rec.	Control Limits
7429-90-5	ALUMINUM	5000	4760	50		95	80 - 120%
7440-36-0	ANTIMONY	30	29.6	0.5		99	80 - 120%
7440-38-2	ARSENIC	100	96.3	1		96	80 - 120%
7440-39-3	BARIUM	100	96.5	2.5		96	80 - 120%
7440-41-7	BERYLLIUM	50	55.2	0.25		110	80 - 120%
7440-43-9	CADMIUM	30	31	1		103	80 - 120%
7440-47-3	CHROMIUM	500	433	5		87	80 - 120%
7440-48-4	COBALT	100	93.2	2.5		93	80 - 120%
7440-50-8	COPPER	1000	955	10		95	80 - 120%
7439-92-1	LEAD	50	52.6	1		105	80 - 120%
7439-96-5	MANGANESE	100	89.8	5		90	80 - 120%
7439-98-7	MOLYBDENUM	100	86.5	1		86	80 - 120%
7440-02-0	NICKEL	500	453	10		91	80 - 120%
7782-49-2	SELENIUM	100	98.7	5		99	80 - 120%
7440-22-4	SILVER	10	10	0.25		100	80 - 120%
7440-24-6	STRONTIUM	100	86.3	2.5		86	80 - 120%
7440-28-0	THALLIUM	2	2.06	0.075		103	80 - 120%
7440-29-1	THORIUM	10	10.5	0.1		105	80 - 120%
7440-31-5	TIN	500	502	5		100	80 - 120%
7440-61-1	URANIUM	10	9.96	0.05		100	80 - 120%
7440-66-6	ZINC	2000	1940	50		97	80 - 120%

Data Package ID: IM2008145-1

Date Printed: Thursday, September 10, 2020

ALS -- Fort Collins

Page 1 of 1

LIMS Version: 7.010

ICPMS Metals

Method SW6020B

Matrix Spike And Matrix Spike Duplicate

Lab Name: ALS -- Fort Collins

Work Order Number: 2008145

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: 100-N Apatite Barrier, June 20 I20-022

Field ID: SHARED QC

LabID: 2008182-1MS

Sample Matrix: WATER

% Moisture: N/A

Date Collected: 06-Aug-20

Date Extracted: 04-Sep-20

Date Analyzed: 09-Sep-20

Prep Method: SW3005 Rev A

Prep Batch: IP200904-1

QCBatchID: IP200904-1-1

Run ID: IM200909-10A2

Cleanup: NONE

Basis: As Received

Sample Aliquot: 50 ml

Final Volume: 50 ml

Result Units: UG/L

File Name: 058SMPL.

CASNO	Target Analyte	Sample Result	Samp Qual	MS Result	MS Qual	Reporting Limit	Spike Added	MS % Rec.	Control Limits
7429-90-5	ALUMINUM	26	U	4690		50	5000	94	75 - 125%
7440-36-0	ANTIMONY	0.085	B	29.9		0.5	30	99	75 - 125%
7440-38-2	ARSENIC	1.8		95.7		1	100	94	75 - 125%
7440-39-3	BARIUM	45		140		2.5	100	95	75 - 125%
7440-41-7	BERYLLIUM	0.037	U	55.2		0.25	50	110	75 - 125%
7440-43-9	CADMIUM	0.12	U	30.9		1	30	103	75 - 125%
7440-47-3	CHROMIUM	2.4	U	445		5	500	89	75 - 125%
7440-48-4	COBALT	0.16	U	92.2		2.5	100	92	75 - 125%
7440-50-8	COPPER	2	U	931		10	1000	93	75 - 125%
7439-92-1	LEAD	0.5	U	52.5		1	50	105	75 - 125%
7439-96-5	MANGANESE	4.2	B	95.1		5	100	91	75 - 125%
7439-98-7	MOLYBDENUM	5.7		95.7		1	100	90	75 - 125%
7440-02-0	NICKEL	1.3	U	458		10	500	92	75 - 125%
7782-49-2	SELENIUM	14		113		5	100	99	75 - 125%
7440-22-4	SILVER	0.045	U	10.2		0.25	10	102	75 - 125%
7440-24-6	STRONTIUM	710		796		2.5	100	90	75 - 125%
7440-28-0	THALLIUM	0.032	U	2.08		0.075	2	104	75 - 125%
7440-29-1	THORIUM	0.05	U	10.8		0.1	10	108	75 - 125%
7440-31-5	TIN	2.6	U	525		5	500	105	75 - 125%
7440-61-1	URANIUM	2.1		12.2		0.05	10	101	75 - 125%
7440-66-6	ZINC	24	U	1920		50	2000	96	75 - 125%

Data Package ID: IM2008145-1

ICPMS Metals

Method SW6020B

Matrix Spike And Matrix Spike Duplicate

Lab Name: ALS -- Fort Collins

Work Order Number: 2008145

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: 100-N Apatite Barrier, June 20 I20-022

Field ID: SHARED QC

LabID: 2008182-1MSD

Sample Matrix: WATER

% Moisture: N/A

Date Collected: 06-Aug-20

Date Extracted: 04-Sep-20

Date Analyzed: 09-Sep-20

Prep Method: SW3005 Rev A

Prep Batch: IP200904-1

QCBatchID: IP200904-1-1

Run ID: IM200909-10A2

Cleanup: NONE

Basis: As Received

Sample Aliquot: 50 ml

Final Volume: 50 ml

Result Units: UG/L

File Name: 059SMPL.

CASNO	Target Analyte	MSD Result	MSD Qual	Spike Added	MSD % Rec.	Reporting Limit	RPD Limit	RPD
7429-90-5	ALUMINUM	4690		5000	94	50	20	0
7440-36-0	ANTIMONY	30		30	100	0.5	20	1
7440-38-2	ARSENIC	94		100	92	1	20	2
7440-39-3	BARIUM	142		100	97	2.5	20	1
7440-41-7	BERYLLIUM	54.9		50	110	0.25	20	0
7440-43-9	CADMIUM	30.3		30	101	1	20	2
7440-47-3	CHROMIUM	451		500	90	5	20	1
7440-48-4	COBALT	91.2		100	91	2.5	20	1
7440-50-8	COPPER	920		1000	92	10	20	1
7439-92-1	LEAD	52.3		50	105	1	20	0
7439-96-5	MANGANESE	97.4		100	93	5	20	2
7439-98-7	MOLYBDENUM	97.7		100	92	1	20	2
7440-02-0	NICKEL	468		500	94	10	20	2
7782-49-2	SELENIUM	112		100	98	5	20	1
7440-22-4	SILVER	10.1		10	101	0.25	20	2
7440-24-6	STRONTIUM	808		100	101	2.5	20	1
7440-28-0	THALLIUM	2.05		2	102	0.075	20	2
7440-29-1	THORIUM	10.9		10	109	0.1	20	2
7440-31-5	TIN	523		500	105	5	20	0
7440-61-1	URANIUM	12.3		10	102	0.05	20	0
7440-66-6	ZINC	1890		2000	95	50	20	2

Data Package ID: IM2008145-1

Prep Batch ID: IP200904-1

Start Date: 09/04/20	End Date: 09/04/20	Concentration Method: NONE	Batch Created By: jml
Start Time: 9:07	End Time: 18:00	Extract Method: SW3005A	Date Created: 09/04/20
Prep Analyst: Jill M. Latelle		Initial Volume Units: ml	Time Created: 9:07
<u>Comments:</u>		Final Volume Units: ml	Validated By: jml
<div style="border: 1px solid black; height: 30px; width: 100%;"></div>			Date Validated: 09/04/20
			Time Validated: 12:33

QC Batch ID: IP200904-1-1

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
IP200904-1	MB	XXXXXX	WATER	XXXXXX	50	50	NONE	1	2008182
IM200904-1	LCS	XXXXXX	WATER	XXXXXX	50	50	NONE	1	2008182
2008182-1	MS	XXXXXX	WATER	XXXXXX	50	50	NONE	1	2008182
2008182-1	MSD	XXXXXX	WATER	XXXXXX	50	50	NONE	1	2008182
2008145-1	SMP	B3W952	WATER	8/5/2020	50	50	NONE	1	2008145
2008145-2	SMP	B3W955	WATER	8/5/2020	50	50	NONE	1	2008145
2008182-1	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	2008182
2008182-10	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	2008182
2008182-12	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	2008182
2008182-13	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	2008182
2008182-2	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	2008182
2008182-3	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	2008182
2008182-4	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	2008182
2008182-5	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	2008182
2008182-6	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	2008182
2008182-7	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	2008182
2008182-8	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	2008182
2008182-9	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	2008182
2008293-1	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	2008293
2008293-2	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	2008293

Prep Batch ID: IP200904-1

Start Date: 09/04/20	End Date: 09/04/20	Concentration Method: NONE	Batch Created By: jml
Start Time: 9:07	End Time: 18:00	Extract Method: SW3005A	Date Created: 09/04/20
Prep Analyst: Jill M. Latelle		Initial Volume Units: ml	Time Created: 9:07
Comments:		Final Volume Units: ml	Validated By: jml
<div style="border: 1px solid black; height: 30px; width: 100%;"></div>			Date Validated: 09/04/20
			Time Validated: 12:33

QC Types

CAR	Carrier reference sample		DLS	Detection Limit Standard
DUP	Laboratory Duplicate		LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicat		LODV	Limit of Detection Verification
LOQV	Limit of Quantitation Verification		MB	Method Blank
MS	Laboratory Matrix Spike		MSD	Laboratory Matrix Spike Duplicate
REP	Sample replicate		RVS	Reporting Level Verification Standar
SMP	Field Sample		SYS	Sample Yield Spike



Strontium-90

Case Narrative

CH2M HILL Plateau Remediation Company

100-N Apatite Barrier, June 20 – I20-022

Work Order Number: 2008145

1. This sample was prepared according to the current revision of SOP 707.
2. This sample was analyzed for the presence of ⁹⁰Sr according to the current revision of SOP 724. The analysis was completed on 08/20/2020.
3. Total radio-strontium is reported as ⁹⁰Sr. The presence of other radioisotopes of strontium may cause positive bias in the measured strontium concentration.
4. The analysis results for this sample are reported in units of pCi/L. The sample was not filtered prior to analysis.
5. Sample volume was insufficient to allow preparation of a duplicate. A laboratory control sample duplicate (LCSD) was prepared in lieu of a client sample duplicate.
6. In accordance with project specific instructions, the evaluation threshold for Relative Percent Difference (RPD) has been set at 20%. RPD is defined as:

$$RPD = \frac{|S - D|}{(S + D)/2} * 100$$

Where: S = sample activity result and D = duplicate activity result.

7. No anomalous situations were encountered during the preparation and analysis of this sample. All quality control criteria were met.



The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Pik yee Yuen
Pik Yee Yuen
Radiochemistry Primary Data Reviewer

8/26/20
Date

Kath M. W.
Radiochemistry Final Data Reviewer

8/26/20
Date

Strontium-90 by GFPC

PAI 724 Rev 14

Method Blank Results

Lab Name: ALS -- Fort Collins

Work Order Number: 2008145

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: 100-N Apatite Barrier, June 20 I20-022

Lab ID: SR200813-2MB	Sample Matrix: WATER	Prep Batch: SR200813-2	Final Aliquot: 994 ml
	Prep SOP: PAI 707 Rev 16	QCBatchID: SR200813-2-1	Result Units: pCi/l
	Date Collected: 13-Aug-20	Run ID: SR200813-2A	File Name: SRA0819A
	Date Prepared: 13-Aug-20	Count Time: 240 minutes	
	Date Analyzed: 19-Aug-20		

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10098-97-2	Sr-90	1.02E-01 +/- 2.10E-01	4.37E-01	1.00E+00	NA	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1.030E+03	9.09E+02	ug	88.2	40 - 110 %	

Comments:**Qualifiers/Flags:**

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

M - Requested MDC not met.

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

DL - Decision Level

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Sample specific Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: SR2008145-1

Strontium-90 by GFPC

PAI 724 Rev 14

Laboratory Control Sample(s)**Lab Name:** ALS -- Fort Collins**Work Order Number:** 2008145**Client Name:** CH2M HILL Plateau Remediation Company**ClientProject ID:** 100-N Apatite Barrier, June 20 I20-022**Lab ID:** SR200813-2LCS**Sample Matrix:** WATER**Prep Batch:** SR200813-2**Final Aliquot:** 994 ml**Prep SOP:** PAI 707 Rev 16**QC Batch ID:** SR200813-2-1**Result Units:** pCi/l**Date Collected:** 13-Aug-20**Run ID:** SR200813-2A**File Name:** SRA0820**Date Prepared:** 13-Aug-20**Count Time:** 180 minutes**Date Analyzed:** 20-Aug-20

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
10098-97-2	Sr-90	1.01E+01 +/- 2.44E+00	4.82E-01	1.110E+01	91.2	75 - 125	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1.030E+03	9.16E+02	ug	88.8	40 - 110 %	

Comments:**Qualifiers/Flags:**

U - Result is less than the sample specific MDC.
 Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
 Y2 - Chemical Yield outside default limits.
 L - LCS Recovery below lower control limit.
 H - LCS Recovery above upper control limit.
 P - LCS Recovery within control limits.
 M - The requested MDC was not met.
 M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty
 MDC - Minimum Detectable Concentration

Data Package ID: SR2008145-1

Strontium-90 by GFPC

PAI 724 Rev 14

Laboratory Control Sample(s)**Lab Name:** ALS -- Fort Collins**Work Order Number:** 2008145**Client Name:** CH2M HILL Plateau Remediation Company**ClientProject ID:** 100-N Apatite Barrier, June 20 I20-022**Lab ID:** SR200813-2LCSD**Sample Matrix:** WATER**Prep Batch:** SR200813-2**Final Aliquot:** 994 ml**Prep SOP:** PAI 707 Rev 16**QC Batch ID:** SR200813-2-1**Result Units:** pCi/l**Date Collected:** 13-Aug-20**Run ID:** SR200813-2A**File Name:** SRA0820**Date Prepared:** 13-Aug-20**Count Time:** 180 minutes**Date Analyzed:** 20-Aug-20

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
10098-97-2	Sr-90	1.05E+01 +/- 2.52E+00	4.93E-01	1.110E+01	94.4	75 - 125	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1.030E+03	9.00E+02	ug	87.1	40 - 110 %	

Comments:**Qualifiers/Flags:**

U - Result is less than the sample specific MDC.
 Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
 Y2 - Chemical Yield outside default limits.
 L - LCS Recovery below lower control limit.
 H - LCS Recovery above upper control limit.
 P - LCS Recovery within control limits.
 M - The requested MDC was not met.
 M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty
 MDC - Minimum Detectable Concentration

Data Package ID: SR2008145-1

Strontium-90 by GFPC

PAI 724 Rev 14

Duplicate Sample Results (DER)**Lab Name:** ALS -- Fort Collins**Work Order Number:** 2008145**Client Name:** CH2M HILL Plateau Remediation Company**ClientProject ID:** 100-N Apatite Barrier, June 20 I20-022

Field ID:	
Lab ID:	SR200813-2LCSD

Sample Matrix: WATER**Prep SOP:** PAI 707 Rev 16**Date Collected:** 13-Aug-20**Date Prepared:** 13-Aug-20**Date Analyzed:** 20-Aug-20**Prep Batch:** SR200813-2**QCBatchID:** SR200813-2-1**Run ID:** SR200813-2A**Count Time:** 180 minutes**Final Aliquot:** 994 ml**Prep Basis:** Unfiltered**Moisture(%):** NA**Result Units:** pCi/l**File Name:** SRA0820

CASNO	Analyte	Sample				Duplicate				DER	DER Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10098-97-2	Sr-90	1.01E+01 +/-	2.44E+00	4.82E-01		1.05E+01 +/-	2.52E+00	4.93E-01		0.205	3

Comments:**Duplicate Qualifiers/Flags:**

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

D - DER is greater than Control Limit of 3

LT - Result is less than Request MDC, greater than sample specific MDC

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

Abbreviations:

TPU - Total Propagated Uncertainty

DER - Duplicate Error Ratio

BDL - Below Detection Limit

NR - Not Reported

Data Package ID: SR2008145-1

Strontium-90 by GFPC

PAI 724 Rev 14

Duplicate Sample Results (RPD)**Lab Name:** ALS -- Fort Collins**Work Order Number:** 2008145**Client Name:** CH2M HILL Plateau Remediation Company**ClientProject ID:** 100-N Apatite Barrier, June 20 I20-022

Field ID:	
Lab ID:	SR200813-2LCSD

Sample Matrix: WATER**Prep SOP:** PAI 707 Rev 16**Date Collected:** 13-Aug-20**Date Prepared:** 13-Aug-20**Date Analyzed:** 20-Aug-20**Prep Batch:** SR200813-2**QCBatchID:** SR200813-2-1**Run ID:** SR200813-2A**Count Time:** 180 minutes**Final Aliquot:** 994 ml**Prep Basis:** Unfiltered**Moisture(%):** NA**Result Units:** pCi/l**File Name:** SRA0820

CASNO	Analyte	Sample				Duplicate				RPD	RPD Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10098-97-2	Sr-90	1.01E+01 +/-	2.44E+00	4.82E-01		1.05E+01 +/-	2.52E+00	4.93E-01		3.00	20

Comments:**Qualifiers/Flags:**

+ - Duplicate RPD not within limits.
 U - Result is less than the sample specific MDC.
 Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
 Y2 - Chemical Yield outside default limits.
 M - Requested MDC not met.
 M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
 L - LCS Recovery below lower control limit.
 H - LCS Recovery above upper control limit.
 P - LCS, Matrix Spike Recovery within control limits.
 N - Matrix Spike Recovery outside control limits
 NC - Not Calculated for duplicate results less than 5 times MDC

Abbreviations:

TPU - Total Propagated Uncertainty
 BDL - Below Detection Limit
 NR - Not Reported

Data Package ID: SR2008145-1

Strontium-90 by GFPC

PAI 724 Rev 14

Sample Results**Lab Name:** ALS -- Fort Collins**Work Order Number:** 2008145**Client Name:** CH2M HILL Plateau Remediation Company**ClientProject ID:** 100-N Apatite Barrier, June 20 I20-022

Field ID:	B3W952
Lab ID:	2008145-1

Sample Matrix: WATER**Prep SOP:** PAI 707 Rev 16**Date Collected:** 05-Aug-20**Date Prepared:** 13-Aug-20**Date Analyzed:** 19-Aug-20**Prep Batch:** SR200813-2**QCBatchID:** SR200813-2-1**Run ID:** SR200813-2A**Count Time:** 240 minutes**Report Basis:** Unfiltered**Final Aliquot:** 994 ml**Prep Basis:** Unfiltered**Moisture(%):** NA**Result Units:** pCi/l**File Name:** SRA0819A**Analysis ReqCode:** SMR_SR_RAD_

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10098-97-2	Sr-90	4.22E-02 +/- 1.85E-01	3.93E-01	1E+00	NA	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1.090E+03	1.03E+03	ug	94.5	40 - 110 %	

Comments:**Qualifiers/Flags:**

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Sample specific Minimum Detectable Concentration

BDL - Below Detection Limit

DL - Decision Level

Data Package ID: SR2008145-1

Prep Batch ID: SR200813-2

Start Date: 08/13/20	End Date: 08/13/20	Concentration Method: NONE	Batch Created By: rgs
Start Time: 9:31	End Time: 9:31	Extract Method: PAI 70716	Date Created: 08/13/20
Prep Analyst: Reilly G. Stockton		Initial Volume Units: ml	Time Created: 9:32
Comments:		Final Volume Units: ml	Validated By: rgs
			Date Validated: 08/20/20
			Time Validated: 6:51

QC Batch ID: SR200813-2-1

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
SR200813-2	CAR	XXXXXX	WATER	XXXXXX	1000	1000	NONE	1	2008091
SR200813-2	MB	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	2008091
SR200813-2	LCS	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	2008091
SR200813-2	LCSD	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	2008091
2008091-1	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	2008091
2008091-2	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	2008091
2008091-3	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	2008091
2008093-1	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	2008093
2008095-1	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	2008095
2008141-2	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	2008141
2008141-4	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	2008141
2008142-2	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	2008142
2008144-2	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	2008144
2008145-1	SMP	B3W952	WATER	8/5/2020	1000	994.01	NONE	1	2008145
2008184-1	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	2008184

QC Types

CAR	Carrier reference sample	DLS	Detection Limit Standard
DUP	Laboratory Duplicate	LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicat	LODV	Limit of Detection Verification
LOQV	Limit of Quantitation Verification	MB	Method Blank
MS	Laboratory Matrix Spike	MSD	Laboratory Matrix Spike Duplicate
REP	Sample replicate	RVS	Reporting Level Verification Standar
SMP	Field Sample	SYS	Sample Yield Spike