



Ft. Collins, Colorado

LIMS Version: 6.912

Page 1 of 1

Wednesday, October 09, 2019

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

Re: ALS Workorder: 1909233
Project Name: AEA, September 2019
Project Number: 119-028

Dear Ms. Waters-Husted:

Three water samples were received from CH2M HILL Plateau Remediation Company, on 9/12/2019. The samples were scheduled for the following analyses:

Strontium-90
Tritium

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.

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: 1909233

Client Name: CH2M HILL Plateau Remediation Company

Client Project Name: AEA, September 2019

Client Project Number: I19-028

Client PO Number: BOA 54854

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
B3R4V0	1909233-1		WATER	10-Sep-19	12:09
B3R4V5	1909233-2		WATER	10-Sep-19	7:45
B3R4V6	1909233-3		WATER	10-Sep-19	9:34

CH2M Hill Plateau Remediation Company		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST		C.O.C.# I19-028-006 Page 1 of 1
Collector: Mike Esparza /CHPRC	Contact/Requester: Karen Waters-Husted	Telephone No.: 509-376-4650	Purchase Order/Charge Code: 300071	
SAF No.: I19-028	Sampling Origin: Hanford Site	Logbook No.: HNF-N-506 -- 109/36	Ice Chest No.: GUS-012	Bill of Lading/Air Bill No.: 710210058223
Project Title: AEA, September 2019	Method of Shipment: Commercial Carrier	Priority: 30 Days	Offsite Property No.: 11570	
Shipped To (Lab): ALS Environmental Ft. Collins	SPECIAL INSTRUCTIONS N/A			
Protocol: SURV	POSSIBLE SAMPLE HAZARDS/REMARK ** ** Contains Radioactive Material at concentrations that are not regulated for transportation per 49 CFR / IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1			
Sample No. B3R4V0	Filter: N	Date: SEP 10 2019	Time: 209	No/Type Container: 2x1-L G/P
Sample Analysis: SRISO_SEP_PRECIP_GPC: COMMON		Holding Time: 6 Months	Preservative: HNO3 to pH <2	

Relinquished By		Received By		Matrix *	
Print First and Last Name	Signature	Date/Time	Print First and Last Name	Signature	Date/Time
Mike Esparza /CHPRC	<i>[Signature]</i>	SEP 10 2019	Janelle Zunker /CHPRC	<i>[Signature]</i>	SEP 10 2019
Janelle Zunker /CHPRC	<i>[Signature]</i>	SEP 10 2019	SSU-1	<i>[Signature]</i>	SEP 10 2019
SSU-1	<i>[Signature]</i>	SEP 11 2019	Janelle Zunker /CHPRC	<i>[Signature]</i>	SEP 11 2019
Janelle Zunker /CHPRC	<i>[Signature]</i>	SEP 11 2019	FEDEX	<i>[Signature]</i>	SEP 11 2019
	<i>[Signature]</i>		Taylor Morrison	<i>[Signature]</i>	

FINAL SAMPLE DISPOSITION	Disposal Method (e.g., Return to customer, per lab procedure, used in process):	Disposed By:	Date/Time:
Printed On: 7/20/2019	FSR ID = FSR82657		A-6004-842 (REV 3)

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

C.O.C.# **I19-028-008**
Page 1 of 1

CH2M Hill Plateau Remediation Company

Collector: *Larry Reams* **Contact/Requester:** Karen Waters-Husted
SAF No.: I19-028 **Telephone No.:** 509-376-4650

Project Title: AEA, September 2019 **Sampling Origin:** Hanford Site
Shipped To (Lab): ALS Environmental Ft. Collins **Logbook No.:** HNF-N-506 **Ice Chest No.:** 6255012
Protocol: SURV **Priority:** 30 Days **Method of Shipment:** Commercial Carrier **Bill of Lading/Air Bill No.:** 776810058023
Offsite Property No.: 11570

POSSIBLE SAMPLE HAZARDS/REMARK
** * Contains Radioactive Material at concentrations that are not regulated for transportation per 49 CFR / IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1

SPECIAL INSTRUCTIONS
N/A

Sample No.	Filter	Date	Time	No/Type Container	Sample Analysis	Holding Time	Preservative
B3R4V6	N	SEP 10 2019	0934	2x1-L G/P	SRISO_SEP_PRECIP_GPC: COMMON	6 Months	HNO3 to pH <2
B3R4V6	N	SEP 10 2019	0934	1x250-mL P	TRITIUM_DIST_LSC: COMMON	6 Months	None

Relinquished By		Received By	
Print First and Last Name	Signature	Print First and Last Name	Signature
<i>Larry Reams</i>	<i>Larry Reams</i>	Janelle Zunker CHPRC	<i>Janelle Zunker</i>
Janelle Zunker CHPRC	<i>Janelle Zunker</i>	SSU-1	<i>Janelle Zunker</i>
SSU-1	<i>Janelle Zunker</i>	Janelle Zunker CHPRC	<i>Janelle Zunker</i>
Janelle Zunker CHPRC	<i>Janelle Zunker</i>	FEDEX	<i>Janelle Zunker</i>
	<i>FEDEX</i>	Tyler Moss	<i>Tyler Moss</i>

Disposal Method (e.g., Return to customer, per lab procedure, used in process):

Disposed By:

FINAL SAMPLE DISPOSITION

Printed On 7/20/2019

Disposal Method (e.g., Return to customer, per lab procedure, used in process):

Date/Time:

Matrix *
S = Soil
SE = Sediment
SO = Solid
SL = Sludge
W = Water
O = Oil
A = Air
DS = Drum Solids
DL = Drum Liquids
T = Tissue
WI = Wipe
L = Liquid
V = Vegetation
X = Other



ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: CHPRC

Workorder No: 120233

Project Manager: KMO

Initials: TEM Date: 9/12/19

1. Are airbills / shipping documents present and/or removable?		DROP OFF	<u>YES</u>	NO			
2. Are custody seals on shipping containers intact?		NONE	<u>YES</u>	NO *			
3. Are custody seals on sample containers intact?		NONE	<u>YES</u>	NO *			
4. Is there a COC (chain-of-custody) present?			<u>YES</u>	NO *			
5. Is the COC in agreement with samples received? (IDs, dates, times, # of samples, # of containers, matrix, requested analyses, etc.)			<u>YES</u>	NO *			
6. Are short-hold samples present?			YES	<u>NO</u>			
7. Are all samples within holding times for the requested analyses?			<u>YES</u>	NO *			
8. Were all sample containers received intact? (not broken or leaking)			<u>YES</u>	NO *			
9. Is there sufficient sample for the requested analyses?			<u>YES</u>	NO *			
10. Are all samples in the proper containers for the requested analyses?			<u>YES</u>	NO *			
11. Are all aqueous samples preserved correctly, if required? (excluding volatiles)		N/A	<u>YES</u>	NO *			
12. Are all aqueous non-preserved samples pH 4-9?		N/A	<u>YES</u>	NO *			
13. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, radon) free of bubbles > 6 mm (1/4 inch) diameter? (i.e. size of green pea)		<u>N/A</u>	YES	NO			
14. Were the samples shipped on ice?			<u>YES</u>	NO			
15. Were cooler temperatures measured at 0.1-6.0°C?	IR gun used*:	#1	<u>#3</u>	#4	RAD ONLY	<u>YES</u>	NO
Cooler #:		<u>1</u>	<u>2</u>				
Temperature (°C):		<u>1.6</u>	<u>1.2</u>				
No. of custody seals on cooler:		<u>2</u>	<u>2</u>				
External µR/hr reading:		<u>14</u>	<u>13</u>				
Background µR/hr reading:		<u>13</u>					
Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? <u>YES</u> NO / NA (If no, see Form 008)							

* Please provide details here for NO responses to 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: TEM

If applicable, was the client contacted? YES / NO / NA Contact: _____ Date/Time: _____

Project Manager Signature / Date: [Signature] 9/13/19

1909233

ORIGIN ID: PSCA (509) 531-0450
TROY BACON
CH2M
6287 LATAH ST.
RICHLAND, WA 99352
UNITED STATES US

SHIP DATE: 11SEP19
ACTWGT: 15.00 LB
CAD: 10706605/IN/ET/4160
BILL THIRD PARTY

TO JULIE ELLINGSON
ALS GLOBAL-FORT COLLINS
225 COMMERCE DR

14-2

FORT COLLINS CO 80524
(970) 480-1511
REF: FTR#11982

1.6

PO: DEPT:



#12210062@1uv

TRK# 7762 1670 5639
0201

THU - 12 SEP 10:30A
PRIORITY OVERNIGHT
DSR

XH FTCA

80524
CO-US DEN



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1909233

1909233

ORIGIN ID: PSCA (509) 531-0450
TROY BACON
CH2M
6287 LATI/4H ST.
RICHLAND, WA 99352
UNITED STATES US

SHIP DATE: 11SEP19
ACTWGT: 82.00 LB
CAD: 10705605/UNET/4160
BILL THIRD PARTY

TO JULIE ELLINGSON
ALS GLOBAL-FORT COLLINS
225 COMMERCE DR

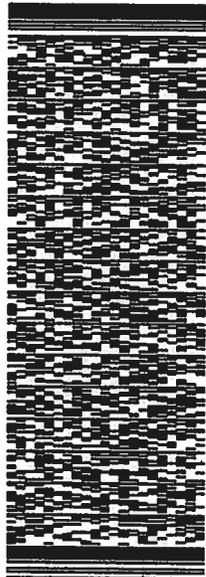
13-2

FORT COLLINS CO 80524
(970) 490-1511
NW
PO

1-2

REF: P7841570

DEPT



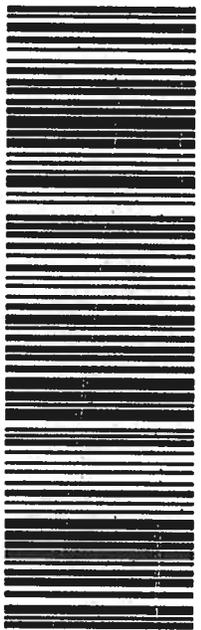
J132819062401uv

TRK# 7762 1005 8223
0201

THU - 12 SEP 10:30A
PRIORITY OVERNIGHT
DSR

XH FTCA

CO-US DEN 80524



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1909233



Strontium-90

Case Narrative

CH2M HILL Plateau Remediation Company

AEA, September 2019 – I19-028

Work Order Number: 1909233

1. The samples were prepared according to the current revision of SOP 707.
2. The samples were analyzed for the presence of ⁹⁰Sr according to the current revision of SOP 724. The analyses were completed on 10/05/2019.
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 these samples are reported in units of pCi/L. The samples were 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 these samples. 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

10/8/19
Date

Kath M. O.
Radiochemistry Final Data Reviewer

10/9/19
Date

Strontium-90 by GFPC

PAI 724 Rev 13

Method Blank Results

Lab Name: ALS -- Fort Collins

Work Order Number: 1909233

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: AEA, September 2019 I19-028

Lab ID: SR191002-1MB	Sample Matrix: WATER	Prep Batch: SR191002-1	Final Aliquot: 994 ml
	Prep SOP: PAI 707 Rev 15	QCBatchID: SR191002-1-1	Result Units: pCi/l
	Date Collected: 02-Oct-19	Run ID: SR191002-1A	File Name: SRC1005C
	Date Prepared: 02-Oct-19	Count Time: 90 minutes	
	Date Analyzed: 05-Oct-19		

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10098-97-2	Sr-90	-8.28E-02 +/- 2.82E-01	6.73E-01	1.00E+00	NA	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1.020E+03	9.22E+02	ug	90.2	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: SR1909233-1

Strontium-90 by GFPC

PAI 724 Rev 13

Laboratory Control Sample(s)**Lab Name:** ALS -- Fort Collins**Work Order Number:** 1909233**Client Name:** CH2M HILL Plateau Remediation Company**ClientProject ID:** AEA, September 2019 I19-028**Lab ID:** SR191002-1LCS**Sample Matrix:** WATER**Prep Batch:** SR191002-1**Final Aliquot:** 994 ml**Prep SOP:** PAI 707 Rev 15**QC Batch ID:** SR191002-1-1**Result Units:** pCi/l**Date Collected:** 02-Oct-19**Run ID:** SR191002-1A**File Name:** SRC1005B**Date Prepared:** 02-Oct-19**Count Time:** 30 minutes**Date Analyzed:** 05-Oct-19

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
10098-97-2	Sr-90	1.19E+01 +/- 3.10E+00	1.15E+00	1.160E+01	103	75 - 125	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1.020E+03	9.51E+02	ug	93.0	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: SR1909233-1

Strontium-90 by GFPC

PAI 724 Rev 13

Laboratory Control Sample(s)**Lab Name:** ALS -- Fort Collins**Work Order Number:** 1909233**Client Name:** CH2M HILL Plateau Remediation Company**ClientProject ID:** AEA, September 2019 I19-028**Lab ID:** SR191002-1LCSD

Sample Matrix: WATER
Prep SOP: PAI 707 Rev 15
Date Collected: 02-Oct-19
Date Prepared: 02-Oct-19
Date Analyzed: 05-Oct-19

Prep Batch: SR191002-1
QCBatchID: SR191002-1-1
Run ID: SR191002-1A
Count Time: 30 minutes

Final Aliquot: 994 ml
Result Units: pCi/l
File Name: SRC1005B

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
10098-97-2	Sr-90	1.08E+01 +/- 2.85E+00	1.13E+00	1.160E+01	93.8	75 - 125	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1.020E+03	9.24E+02	ug	90.4	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: SR1909233-1

Strontium-90 by GFPC

PAI 724 Rev 13

Duplicate Sample Results (DER)

Lab Name: ALS -- Fort Collins
Work Order Number: 1909233
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID:	
Lab ID:	SR191002-1LCSD

Sample Matrix: WATER
Prep SOP: PAI 707 Rev 15
Date Collected: 02-Oct-19
Date Prepared: 02-Oct-19
Date Analyzed: 05-Oct-19

Prep Batch: SR191002-1
QCBatchID: SR191002-1-1
Run ID: SR191002-1A
Count Time: 30 minutes

Final Aliquot: 994 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: SRC1005B

CASNO	Analyte	Sample				Duplicate				DER	DER Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10098-97-2	Sr-90	1.19E+01 +/-	3.10E+00	1.15E+00		1.08E+01 +/-	2.85E+00	1.13E+00		0.515	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: SR1909233-1

Strontium-90 by GFPC

PAI 724 Rev 13

Duplicate Sample Results (RPD)**Lab Name:** ALS -- Fort Collins**Work Order Number:** 1909233**Client Name:** CH2M HILL Plateau Remediation Company**ClientProject ID:** AEA, September 2019 I19-028

Field ID:	
Lab ID:	SR191002-1LCSD

Sample Matrix: WATER**Prep SOP:** PAI 707 Rev 15**Date Collected:** 02-Oct-19**Date Prepared:** 02-Oct-19**Date Analyzed:** 05-Oct-19**Prep Batch:** SR191002-1**QCBatchID:** SR191002-1-1**Run ID:** SR191002-1A**Count Time:** 30 minutes**Final Aliquot:** 994 ml**Prep Basis:** Unfiltered**Moisture(%):** NA**Result Units:** pCi/l**File Name:** SRC1005B

CASNO	Analyte	Sample				Duplicate				RPD	RPD Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10098-97-2	Sr-90	1.19E+01 +/-	3.10E+00	1.15E+00		1.08E+01 +/-	2.85E+00	1.13E+00		10.00	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: SR1909233-1

Strontium-90 by GFPC

PAI 724 Rev 13

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1909233
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID:	B3R4V0
Lab ID:	1909233-1

Sample Matrix: WATER
Prep SOP: PAI 707 Rev 15
Date Collected: 10-Sep-19
Date Prepared: 02-Oct-19
Date Analyzed: 05-Oct-19

Prep Batch: SR191002-1
QCBatchID: SR191002-1-1
Run ID: SR191002-1A
Count Time: 90 minutes
Report Basis: Unfiltered

Final Aliquot: 994 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: SRC1005A

Analysis ReqCode: SRISO_SEP_PR

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10098-97-2	Sr-90	9.72E+02 +/- 2.29E+02	6.96E-01	1E+00	NA	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1.130E+03	9.98E+02	ug	88.7	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: SR1909233-1

Strontium-90 by GFPC

PAI 724 Rev 13

Sample Results**Lab Name:** ALS -- Fort Collins**Work Order Number:** 1909233**Client Name:** CH2M HILL Plateau Remediation Company**ClientProject ID:** AEA, September 2019 I19-028

Field ID:	B3R4V5
Lab ID:	1909233-2

Sample Matrix: WATER**Prep SOP:** PAI 707 Rev 15**Date Collected:** 10-Sep-19**Date Prepared:** 02-Oct-19**Date Analyzed:** 05-Oct-19**Prep Batch:** SR191002-1**QCBatchID:** SR191002-1-1**Run ID:** SR191002-1A**Count Time:** 90 minutes**Report Basis:** Unfiltered**Final Aliquot:** 994 ml**Prep Basis:** Unfiltered**Moisture(%):** NA**Result Units:** pCi/l**File Name:** SRC1005A**Analysis ReqCode:** SRISO_SEP_PR

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10098-97-2	Sr-90	3.75E-02 +/- 3.07E-01	7.09E-01	1E+00	NA	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1.020E+03	9.61E+02	ug	94.0	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: SR1909233-1

Strontium-90 by GFPC

PAI 724 Rev 13

Sample Results**Lab Name:** ALS -- Fort Collins**Work Order Number:** 1909233**Client Name:** CH2M HILL Plateau Remediation Company**ClientProject ID:** AEA, September 2019 I19-028

Field ID:	B3R4V6
Lab ID:	1909233-3

Sample Matrix: WATER**Prep SOP:** PAI 707 Rev 15**Date Collected:** 10-Sep-19**Date Prepared:** 02-Oct-19**Date Analyzed:** 05-Oct-19**Prep Batch:** SR191002-1**QCBatchID:** SR191002-1-1**Run ID:** SR191002-1A**Count Time:** 90 minutes**Report Basis:** Unfiltered**Final Aliquot:** 994 ml**Prep Basis:** Unfiltered**Moisture(%):** NA**Result Units:** pCi/l**File Name:** SRC1005C**Analysis ReqCode:** SRISO_SEP_PR

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10098-97-2	Sr-90	1.37E+03 +/- 3.22E+02	6.64E-01	1E+00	NA	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1.310E+03	1.18E+03	ug	89.7	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: SR1909233-1

Prep Batch ID: SR191002-1

Start Date: 10/02/19	End Date: 10/02/19	Concentration Method: NONE	Batch Created By: jxh
Start Time: 11:12	End Time: 11:12	Extract Method: PAI 70715	Date Created: 10/02/19
Prep Analyst: Jirushaya Hantula		Initial Volume Units: ml	Time Created: 11:13
<u>Comments:</u>		Final Volume Units: ml	Validated By: jxh
<div style="border: 1px solid black; height: 30px; width: 100%;"></div>			Date Validated: 10/04/19
			Time Validated: 13:44

QC Batch ID: SR191002-1-1

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
SR191002-1	CAR	XXXXXX	WATER	XXXXXX	1000	1000	NONE	1	1909172
SR191002-1	MB	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909172
SR191002-1	LCS	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909172
SR191002-1	LCSD	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909216
1909172-13	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909172
1909172-14	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909172
1909172-17	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909172
1909215-6	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909215
1909216-1	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909216
1909216-2	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909216
1909216-3	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909216
1909216-4	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909216
1909216-5	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909216
1909216-6	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909216
1909233-1	SMP	B3R4V0	WATER	9/10/2019	1000	994.01	NONE	1	1909233
1909233-2	SMP	B3R4V5	WATER	9/10/2019	1000	994.01	NONE	1	1909233
1909233-3	SMP	B3R4V6	WATER	9/10/2019	1000	994.01	NONE	1	1909233
1909243-1	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909243
1909243-3	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909243
1909243-4	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909243

Prep Batch ID: SR191002-1

Start Date: 10/02/19	End Date: 10/02/19	Concentration Method: NONE	Batch Created By: jxh
Start Time: 11:12	End Time: 11:12	Extract Method: PAI 70715	Date Created: 10/02/19
Prep Analyst: Jirushaya Hantula		Initial Volume Units: ml	Time Created: 11:13
Comments:		Final Volume Units: ml	Validated By: jxh
			Date Validated: 10/04/19
			Time Validated: 13:44

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	



Tritium Case Narrative

CH2M HILL Plateau Remediation Company

AEA, September 2019 – I19-028

Work Order Number: 1909233

1. The samples were prepared according to the current revision of SOP 700.
2. The samples were analyzed for the presence of tritium according to the current revision of SOP 704. The analyses were completed on 10/01/2019.
3. The duplicate of sample 1909245-9 and the matrix spikes of sample 1909213-3 are shared for this work order. The duplicate and matrix spikes were performed on CH2M HILL Plateau Remediation Company samples and the results are acceptable. The results can be found in the following report.
4. The analysis results for these samples are reported in units of pCi/L. The samples were 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:

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

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

6. No anomalous situations were encountered during the preparation or analysis of these samples. 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

10/8/19
Date

Kath M. W.
Radiochemistry Final Data Reviewer

10/9/19
Date

Tritium by Liquid Scintillation

PAI 704 Rev 12

Method Blank Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1909233
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Lab ID: 3H190926-1MB	Sample Matrix: WATER	Prep Batch: 3H190926-1	Final Aliquot: 10.0 ml
	Prep SOP: PAI 700 Rev 15	QCBatchID: 3H190926-1-2	Result Units: pCi/l
	Date Collected: 26-Sep-19	Run ID: 3H190926-1C	File Name: B60_04_093001
	Date Prepared: 26-Sep-19	Count Time: 90 minutes	
	Date Analyzed: 01-Oct-19		

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10028-17-8	H-3	-5.11E+01 +/- 1.82E+02	3.09E+02	4.00E+02	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: H31909233-1

Tritium by Liquid Scintillation

PAI 704 Rev 12

Laboratory Control Sample(s)

Lab Name: ALS -- Fort Collins
Work Order Number: 1909233
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Lab ID: 3H190926-1LCS	Sample Matrix: WATER	Prep Batch: 3H190926-1	Final Aliquot: 9.84 ml
	Prep SOP: PAI 700 Rev 15	QCBatchID: 3H190926-1-2	Result Units: pCi/l
	Date Collected: 26-Sep-19	Run ID: 3H190926-1C	File Name: B60_04_093001
	Date Prepared: 26-Sep-19	Count Time: 90 minutes	
	Date Analyzed: 01-Oct-19		

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
10028-17-8	H-3	1.60E+04 +/- 2.46E+03	3.13E+02	1.650E+04	96.6	80 - 120	

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: H31909233-1

Tritium by Liquid Scintillation

PAI 704 Rev 12

Matrix Spike Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1909233
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID:	Shared QC
Lab ID:	1909213-3MS

Sample Matrix: WATER
Prep SOP: PAI 700 Rev 15
Date Collected: 10-Sep-19
Date Prepared: 26-Sep-19
Date Analyzed: 30-Sep-19

Prep Batch: 3H190926-1
QCBatchID: 3H190926-1-2
Run ID: 3H190926-1C
Count Time: 90 minutes
Report Basis: Unfiltered

Final Aliquot: 9.84 ml
Prep Basis: Unfiltered
Moisture(%): 100.000
Result Units: pCi/l
File Name: B60_04_093001

Analysis ReqCode: TRITIUM_DIST_L

CASNO	Target Nuclide	Matrix Spike	Sample Results	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
10028-17-8	H-3	1.58E+04	4.38E+02	3.14E+02	1.650E+04	92.7	80 - 120	

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: H31909233-1

Tritium by Liquid Scintillation

PAI 704 Rev 12

Matrix Spike Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1909233
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID:	Shared QC
Lab ID:	1909213-3MSD

Sample Matrix: WATER
Prep SOP: PAI 700 Rev 15
Date Collected: 10-Sep-19
Date Prepared: 26-Sep-19
Date Analyzed: 30-Sep-19

Prep Batch: 3H190926-1
QCBatchID: 3H190926-1-2
Run ID: 3H190926-1C
Count Time: 90 minutes
Report Basis: Unfiltered

Final Aliquot: 9.84 ml
Prep Basis: Unfiltered
Moisture(%): 100.000
Result Units: pCi/l
File Name: B60_04_093001

Analysis ReqCode: TRITIUM_DIST_L

CASNO	Target Nuclide	Matrix Spike	Sample Results	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
10028-17-8	H-3	1.67E+04	4.38E+02	3.14E+02	1.650E+04	98.0	80 - 120	

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: H31909233-1

Tritium by Liquid Scintillation

PAI 704 Rev 12

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1909233
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID:	Shared QC
Lab ID:	1909213-3

Sample Matrix: WATER	Prep Batch: 3H190926-1	Final Aliquot: 10.0 ml
Prep SOP: PAI 700 Rev 15	QCBatchID: 3H190926-1-2	Prep Basis: Unfiltered
Date Collected: 10-Sep-19	Run ID: 3H190926-1C	Moisture(%): 100.000
Date Prepared: 26-Sep-19	Count Time: 90 minutes	Result Units: pCi/l
Date Analyzed: 30-Sep-19	Report Basis: Unfiltered	File Name: B60_04_093001

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10028-17-8	H-3	4.38E+02 +/- 2.07E+02	3.09E+02	4E+02	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: H31909233-1

Tritium by Liquid Scintillation

PAI 704 Rev 12

Duplicate Sample Results (DER)

Lab Name: ALS -- Fort Collins
Work Order Number: 1909233
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID:	Shared QC
Lab ID:	1909213-3MSD

Sample Matrix: WATER
Prep SOP: PAI 700 Rev 15
Date Collected: 10-Sep-19
Date Prepared: 26-Sep-19
Date Analyzed: 30-Sep-19

Prep Batch: 3H190926-1
QCBatchID: 3H190926-1-2
Run ID: 3H190926-1C
Count Time: 90 minutes
Report Basis: Unfiltered

Final Aliquot: 9.84 ml
Prep Basis: Unfiltered
Moisture(%): 100.000
Result Units: pCi/l
File Name: B60_04_093001

CASNO	Analyte	Sample				Duplicate				DER	DER Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10028-17-8	H-3	1.58E+04 +/-	2.44E+03	3.14E+02		1.67E+04 +/-	2.57E+03	3.14E+02		0.249	2.13

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.
- W - DER is greater than Warning Limit of 1.42
- D - DER is greater than Control Limit of 2.13
- 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: H31909233-1

Tritium by Liquid Scintillation

PAI 704 Rev 12

Duplicate Sample Results (RPD)

Lab Name: ALS -- Fort Collins

Work Order Number: 1909233

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: AEA, September 2019 I19-028

Field ID:	Shared QC
Lab ID:	1909213-3MSD

Sample Matrix: WATER

Prep SOP: PAI 700 Rev 15

Date Collected: 10-Sep-19

Date Prepared: 26-Sep-19

Date Analyzed: 30-Sep-19

Prep Batch: 3H190926-1

QCBatchID: 3H190926-1-2

Run ID: 3H190926-1C

Count Time: 90 minutes

Report Basis: Unfiltered

Final Aliquot: 9.84 ml

Prep Basis: Unfiltered

Moisture(%): 100.000

Result Units: pCi/l

File Name: B60_04_093001

CASNO	Analyte	Sample				Duplicate				RPD	RPD Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10028-17-8	H-3	1.58E+04 +/-	2.44E+03	3.14E+02		1.67E+04 +/-	2.57E+03	3.14E+02		5.00	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: H31909233-1

Tritium by Liquid Scintillation

PAI 704 Rev 12

Duplicate Sample Results (DER)

Lab Name: ALS -- Fort Collins

Work Order Number: 1909233

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: AEA, September 2019 I19-028

Field ID:	Shared QC
Lab ID:	1909245-9DUP

Sample Matrix: WATER

Prep SOP: PAI 700 Rev 15

Date Collected: 11-Sep-19

Date Prepared: 26-Sep-19

Date Analyzed: 01-Oct-19

Prep Batch: 3H190926-1

QCBatchID: 3H190926-1-2

Run ID: 3H190926-1C

Count Time: 90 minutes

Report Basis: Unfiltered

Final Aliquot: 10.0 ml

Prep Basis: Unfiltered

Moisture(%): 100.000

Result Units: pCi/l

File Name: B60_04_093001

CASNO	Analyte	Sample				Duplicate				DER	DER Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10028-17-8	H-3	5.92E+02 +/-	2.19E+02	3.09E+02		5.31E+02 +/-	2.14E+02	3.09E+02		0.198	2.13

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.
- W - DER is greater than Warning Limit of 1.42
- D - DER is greater than Control Limit of 2.13
- 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: H31909233-1

Tritium by Liquid Scintillation

PAI 704 Rev 12

Duplicate Sample Results (RPD)

Lab Name: ALS -- Fort Collins

Work Order Number: 1909233

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: AEA, September 2019 I19-028

Field ID:	Shared QC
Lab ID:	1909245-9DUP

Sample Matrix: WATER
 Prep SOP: PAI 700 Rev 15
 Date Collected: 11-Sep-19
 Date Prepared: 26-Sep-19
 Date Analyzed: 01-Oct-19

Prep Batch: 3H190926-1
 QCBatchID: 3H190926-1-2
 Run ID: 3H190926-1C
 Count Time: 90 minutes
 Report Basis: Unfiltered

Final Aliquot: 10.0 ml
 Prep Basis: Unfiltered
 Moisture(%): 100.000
 Result Units: pCi/l
 File Name: B60_04_093001

CASNO	Analyte	Sample				Duplicate				RPD	RPD Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10028-17-8	H-3	5.92E+02 +/-	2.19E+02	3.09E+02		5.31E+02 +/-	2.14E+02	3.09E+02		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: H31909233-1

Tritium by Liquid Scintillation

PAI 704 Rev 12

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1909233
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID:	Shared QC
Lab ID:	1909245-9

Sample Matrix: WATER	Prep Batch: 3H190926-1	Final Aliquot: 10.0 ml
Prep SOP: PAI 700 Rev 15	QCBatchID: 3H190926-1-2	Prep Basis: Unfiltered
Date Collected: 11-Sep-19	Run ID: 3H190926-1C	Moisture(%): 100.000
Date Prepared: 26-Sep-19	Count Time: 90 minutes	Result Units: pCi/l
Date Analyzed: 01-Oct-19	Report Basis: Unfiltered	File Name: B60_04_093001

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10028-17-8	H-3	5.92E+02 +/- 2.19E+02	3.09E+02	4E+02	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: H31909233-1

Tritium by Liquid Scintillation

PAI 704 Rev 12

Sample Duplicate Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1909233
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Field ID: Shared QC</td> </tr> <tr> <td style="padding: 2px;">Lab ID: 1909245-9DUP</td> </tr> </table>	Field ID: Shared QC	Lab ID: 1909245-9DUP	<p>Sample Matrix: WATER Prep SOP: PAI 700 Rev 15 Date Collected: 11-Sep-19 Date Prepared: 26-Sep-19 Date Analyzed: 01-Oct-19</p>	<p>Prep Batch: 3H190926-1 QCBatchID: 3H190926-1-2 Run ID: 3H190926-1C Count Time: 90 minutes Report Basis: Unfiltered</p>	<p>Final Aliquot: 10.0 ml Prep Basis: Unfiltered Moisture(%): 100.000 Result Units: pCi/l File Name: B60_04_093001</p>
Field ID: Shared QC					
Lab ID: 1909245-9DUP					

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10028-17-8	H-3	5.31E+02 +/- 2.14E+02	3.09E+02	4E+02	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.
- M - The requested MDC was not met.
- M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.
- W - DER is greater than Warning Limit of 1.42

- D - DER is greater than Control Limit of 2.13

Abbreviations:

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

Data Package ID: H31909233-1

Date Printed:

Tuesday, October 08, 2019

ALS -- Fort Collins

LIMS Version: 6.912

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Tritium by Liquid Scintillation

PAI 704 Rev 12

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1909233
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID:	B3R4V5
Lab ID:	1909233-2

Sample Matrix: WATER	Prep Batch: 3H190926-1	Final Aliquot: 10.0 ml
Prep SOP: PAI 700 Rev 15	QCBatchID: 3H190926-1-2	Prep Basis: Unfiltered
Date Collected: 10-Sep-19	Run ID: 3H190926-1C	Moisture(%): 100.000
Date Prepared: 26-Sep-19	Count Time: 90 minutes	Result Units: pCi/l
Date Analyzed: 01-Oct-19	Report Basis: Unfiltered	File Name: B60_04_093001

Analysis ReqCode: TRITIUM_DIST_L

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10028-17-8	H-3	7.69E+01 +/- 1.86E+02	3.09E+02	4E+02	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: H31909233-1

Tritium by Liquid Scintillation

PAI 704 Rev 12

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1909233
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID:	B3R4V6
Lab ID:	1909233-3

Sample Matrix: WATER	Prep Batch: 3H190926-1	Final Aliquot: 10.0 ml
Prep SOP: PAI 700 Rev 15	QCBatchID: 3H190926-1-2	Prep Basis: Unfiltered
Date Collected: 10-Sep-19	Run ID: 3H190926-1C	Moisture(%): 100.000
Date Prepared: 26-Sep-19	Count Time: 90 minutes	Result Units: pCi/l
Date Analyzed: 01-Oct-19	Report Basis: Unfiltered	File Name: B60_04_093001

Analysis ReqCode: TRITIUM_DIST_L

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10028-17-8	H-3	7.55E+03 +/- 1.19E+03	3.09E+02	4E+02	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: H31909233-1

Prep Batch ID: 3H190926-1

Start Date: 09/26/19	End Date: 09/26/19	Concentration Method: NONE	Batch Created By: rgs
Start Time: 11:25	End Time: 11:25	Extract Method: PAI 70015	Date Created: 09/26/19
Prep Analyst: Reilly G. Stockton		Initial Volume Units: ml	Time Created: 11:25
Comments:		Final Volume Units: ml	Validated By: rgs
			Date Validated: 09/29/19
			Time Validated: 7:26

QC Batch ID: 3H190926-1-2

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
3H190926-1	MB	XXXXXX	WATER	XXXXXX	30	10	NONE	1	1909213
3H190926-1CB1	MB	XXXXXX	WATER	XXXXXX	30	10	NONE	1	1909213
3H190926-1CB2	MB	XXXXXX	WATER	XXXXXX	30	10	NONE	1	1909213
3H190926-1CB3	MB	XXXXXX	WATER	XXXXXX	30	10	NONE	1	1909213
3H190926-1	LCS	XXXXXX	WATER	XXXXXX	30	9.8361	NONE	1	1909213
1909213-3	MS	XXXXXX	WATER	XXXXXX	30	9.8361	NONE	1	1909213
1909213-3	MSD	XXXXXX	WATER	XXXXXX	30	9.8361	NONE	1	1909213
1909245-9	DUP	XXXXXX	WATER	XXXXXX	30	10	NONE	1	1909245
1909213-3	SMP	XXXXXX	WATER	XXXXXX	30	10	NONE	1	1909213
1909216-1	SMP	XXXXXX	WATER	XXXXXX	30	10	NONE	1	1909216
1909216-6	SMP	XXXXXX	WATER	XXXXXX	30	10	NONE	1	1909216
1909233-2	SMP	B3R4V5	WATER	9/10/2019	30	10	NONE	1	1909233
1909233-3	SMP	B3R4V6	WATER	9/10/2019	30	10	NONE	1	1909233
1909241-1	SMP	XXXXXX	WATER	XXXXXX	30	10	NONE	1	1909241
1909243-2	SMP	XXXXXX	WATER	XXXXXX	30	10	NONE	1	1909243
1909245-9	SMP	XXXXXX	WATER	XXXXXX	30	10	NONE	1	1909245

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