Ft. Collins, Colorado

LIMS Version: 6.912

Thursday, October 03, 2019

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

Re: ALS Workorder: 1909120
Project Name: AEA, September 2019
Project Number: I19-028

Dear Ms. Waters-Husted:

Six water samples were received from CH2M HILL Plateau Remediation Company, on 9/7/2019. The samples were scheduled for the following analyses:

Iodine-129 by GFPC
Strontium-90
Technetium-99
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. OBrien
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.

ADDRESS 225 Commerce Drive, Fort Collins, Colorado, USA 80524 | PHONE +1 970 490 1511 | FAX +1 970 490 1522
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ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 1909120
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
B3R4C6	1909120-1		WATER	06-Sep-19	8:41
B3R502	1909120-2		WATER	06-Sep-19	8:19
B3R4Y6	1909120-3		WATER	06-Sep-19	10:25
B3R4C8	1909120-4		WATER	06-Sep-19	8:09
B3R4C7	1909120-5		WATER	06-Sep-19	7:00
B3R4Y8	1909120-6		WATER	06-Sep-19	9:20

CH2MHill Plateau Remediation Company	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST 1909120	C.O.C. # I19-028-044 Page 1 of 1

Collector:	Chris Fulton /CHPRC	**Contact/Requester:**	Karen Waters-Husted	**Telephone No.:**	509-376-4650
SAF No.:	I19-028	**Sampling Origin:**	Hanford Site	**Purchase Order/Charge Code:**	300071
Project Title:	AEA, September 2019	**Logbook No.:**	HNF-N-506 10T/34	**Ice Chest No.:**	GWS-725
Shipped To (Lab):	ALS Environmental Ft. Collins	**Method of Shipment**	Commercial Carrier	**Bill of Lading/Air Bill No.:**	7761 7602 1466
Protocol:	SURV	**Priority:**	30 Days	**Offsite Property No.:**	11545

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
B3R4C6	N	W	SEP 0 6 2019	0840	1x500-mL G/P	TC99_SEP_LSC: COMMON	6 Months	HNO3 to pH <2

Relinquished By			Received By		
Print First and Last Name	*Signature*	*Date/Time*	*Print First and Last Name*	*Signature*	*Date/Time*
Chris Fulton /CHPRC		0850 SEP 0 6 2019	Lesly Wall /CHPRC	Lesly Wall 0850	SEP 0 6 2019
Lesly Wall /CHPRC	Lesly Wall	1400 SEP 0 6 2019	FEDEX	FEDEX	
	FEDEX		EMILY LYONS	Emily Lyons	09.07.19 1005

Matrix *

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

FINAL SAMPLE DISPOSITION	Disposal Method (e.g., Return to customer, per lab procedure, used in process):	Disposed By:	Date/Time:

ALS1909120 Oct. 03, 2019 Rev. 0 3 of 62

CH2MHill Plateau Remediation Company	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST 1909120	C.O.C. # I19-028-029 Page 1 of 1

Collector: Dan Klug CHPRC	**Contact/Requester:** Karen Waters-Husted	**Telephone No.:** 509-376-4650
SAF No.: I19-028	**Sampling Origin:** Hanford Site	**Purchase Order/Charge Code:** 300071
Project Title: AEA, September 2019	**Logbook No.:** HNF-N-506-110-52	**Ice Chest No.:** GWS-725
Shipped To (Lab): ALS Environmental Ft. Collins	**Method of Shipment** Commercial Carrier	**Bill of Lading/Air Bill No.:** 7761760214 66
Protocol: SURV	**Priority:** 30 Days	**Offsite Property No.:** 11545

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
B3R502 2	N	W	9-6-19	0819	2x1-L G/P	SRISO_SEP_PRECIP_GPC: COMMON	6 Months	HNO3 to pH <2

Relinquished By			Received By		
Print First and Last Name	*Signature*	*Date/Time*	*Print First and Last Name*	*Signature*	*Date/Time*
Dan Klug CHPRC	[signature]	SEP 06 2019 1040	Jeff Lucas /CHPRC	[signature]	SEP 06 2019 1040
Jeff Lucas /CHPRC	[signature]	SEP 06 2019 1400	FEDEX	FEDEX	
	FEDEX		EMILY LYONS	Emily Lyons	09-07-19 1005

Matrix *

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

FINAL SAMPLE DISPOSITION	Disposal Method (e.g., Return to customer, per lab procedure, used in process):	Disposed By:	Date/Time:

ALS1909120 Oct. 03, 2019 Rev. 0 4 of 62

CH2MHill Plateau Remediation Company	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST 1909120	C.O.C. # I19-028-027 Page 1 of 1

Collector:	Dan Klug CHPRC	**Contact/Requester:**	Karen Waters-Husted	**Telephone No.:**	509-376-4650
SAF No.:	I19-028	**Sampling Origin:**	Hanford Site	**Purchase Order/Charge Code:**	300071
Project Title:	AEA, September 2019	**Logbook No.:**	HNF-N-506-110-52	**Ice Chest No.:**	GWS-725
Shipped To (Lab):	ALS Environmental Ft. Collins	**Method of Shipment**	Commercial Carrier	**Bill of Lading/Air Bill No.:**	7761 7602 1466
Protocol:	SURV	**Priority:**	30 Days	**Offsite Property No.:**	12545

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
B3R4Y6 3	N	W	9-6-19	1025	1x250-mL P	TRITIUM_DIST_LSC: COMMON	6 Months	None

Relinquished By			Received By		
Print First and Last Name	*Signature*	*Date/Time*	*Print First and Last Name*	*Signature*	*Date/Time*
Dan Klug CHPRC	D. Klug	SEP 06 2019 1036	Jeff Lucas /CHPRC FEDEX		SEP 06 2019 1630
Jeff Lucas /CHPRC		SEP 06 2019 1400			
	FEDEX		EMILY LYONS	Emily Lyons	09-07-19 1005

Matrix *

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

FINAL SAMPLE DISPOSITION	Disposal Method (e.g., Return to customer, per lab procedure, used in process):	Disposed By:	Date/Time:

ALS1909120 Oct. 03, 2019 Rev. 0 5 of 62

CH2MHill Plateau Remediation Company	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST 1909120	C.O.C. # I19-028-046 Page 1 of 1

Collector: Chris Fulton /CHPRC	**Contact/Requester:** Karen Waters-Husted	**Telephone No.:** 509-376-4650
SAF No.: I19-028	**Sampling Origin:** Hanford Site	**Purchase Order/Charge Code:** 300071
Project Title: AEA, September 2019	**Logbook No.:** HNF-N-506 109/34	**Ice Chest No.:** GWS-725
Shipped To (Lab): ALS Environmental Ft. Collins	**Method of Shipment** Commercial Carrier	**Bill of Lading/Air Bill No.:** 7176 1760 2 1466
Protocol: SURV	**Priority:** 30 Days	**Offsite Property No.:** 11545

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
B3R4C8 4	N	W	SEP 0 6 2019	0809	1x4-L G/P	I129LL_SEP_LEPS_GS_LL: COMMON	6 Months	None
B3R4C8 ↓	N	W	SEP 0 6 2019	0809	1x500-mL G/P	TC99_SEP_LSC: COMMON	6 Months	HNO3 to pH <2

Relinquished By			Received By		
Print First and Last Name	Signature	Date/Time	Print First and Last Name	Signature	Date/Time
Chris Fulton /CHPRC		0850 SEP 0 6 2019	Lesly Wall /CHPRC	Lesly Wall 0850	SEP 0 6 2019
Lesly Wall /CHPRC	Lesly Wall	1400 SEP 0 6 2019	FEDEX	FEDEX	
	FEDEX		EMILY LYONS	Emily Lyons 09.07.19	1005

Matrix *

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

FINAL SAMPLE DISPOSITION	Disposal Method (e.g., Return to customer, per lab procedure, used in process):	Disposed By:	Date/Time:

ALS1909120 Oct. 03, 2019 Rev. 0 6 of 62

CH2MHill Plateau Remediation Company	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST 1909120	C.O.C. # I19-028-045 Page 1 of 1

Collector: Chris Fulton /CHPRC	**Contact/Requester:** Karen Waters-Husted	**Telephone No.:** 509-376-4650
SAF No.: I19-028	**Sampling Origin:** Hanford Site	**Purchase Order/Charge Code:** 300071
Project Title: AEA, September 2019	**Logbook No.:** HNF-N-506 109/34	**Ice Chest No.:** 6605-1735
Shipped To (Lab): ALS Environmental Ft. Collins	**Method of Shipment** Commercial Carrier	**Bill of Lading/Air Bill No.:** 7761 7602 1466
Protocol: SURV	**Priority:** 30 Days	**Offsite Property No.:** 11545

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
B3R4C7 5	N	W	SEP 0 6 2019	0700	1x4-L G/P	I129LL_SEP_LEPS_GS_LL: COMMON	6 Months	None
B3R4C7 ↓	N	W	SEP 0 6 2019	0700	1x500-mL G/P	TC99_SEP_LSC: COMMON	6 Months	HNO3 to pH <2

Relinquished By			Received By		
Print First and Last Name	*Signature*	*Date/Time*	*Print First and Last Name*	*Signature*	*Date/Time*
Chris Fulton /CHPRC	0850	SEP 0 6 2019	Lesly Wall /CHPRC	Lesly Wall 0850	SEP 0 6 2019
Lesly Wall /CHPRC	Lesly Wall 1400	SEP 0 6 2019	FEDEX	FEDEX	
	FEDEX		EMILY LYONS	Emily Lyons 09.07.19 1005	

Matrix *

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

FINAL SAMPLE DISPOSITION	Disposal Method (e.g., Return to customer, per lab procedure, used in process):	Disposed By:	Date/Time:

CH2MHill Plateau Remediation Company	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST 1909120	C.O.C. # I19-028-028 Page 1 of 1

Collector:	~~Dan Klug~~ CHPRC	**Contact/Requester:**	Karen Waters-Husted	**Telephone No.:**	509-376-4650
SAF No.:	I19-028	**Sampling Origin:**	Hanford Site	**Purchase Order/Charge Code:**	300071
Project Title:	AEA, September 2019	**Logbook No.:**	HNF-N-506 -110-52	**Ice Chest No.:**	GWS-725
Shipped To (Lab):	ALS Environmental Ft. Collins	**Method of Shipment**	Commercial Carrier	**Bill of Lading/Air Bill No.:**	7761 7602 1466
Protocol:	SURV	**Priority:**	30 Days	**Offsite Property No.:**	11545

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
B3R4Y8 6	N	W	9-6-19	0920	2x1-L G/P	SRISO_SEP_PRECIP_GPC: COMMON	6 Months	HNO3 to pH <2

Relinquished By			Received By		
Print First and Last Name	*Signature*	*Date/Time*	*Print First and Last Name*	*Signature*	*Date/Time*
Dan Klug CHPRC	D. Klug	SEP 0 6 2019 1015	Jeff Lucas /CHPRC	[signature]	SEP 0 6 2019 1010
Jeff Lucas /CHPRC	[signature] SEP 0 6 2019	1400	FEDEX	FEDEX	
	FEDEX		EMILY LYONS	Emily Lyons 09-07-19	1005

Matrix *

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

FINAL SAMPLE DISPOSITION	Disposal Method (e.g., Return to customer, per lab procedure, used in process):	Disposed By:	Date/Time:

ALS1909120 Oct. 03, 2019 Rev. 0

ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: CHPRC Workorder No: 1909120
Project Manager: KMO Initials: Em Date: 09.07.19

1.	Are airbills / shipping documents present and/or removable?	DROP OFF	YES	NO
2.	Are custody seals on **shipping** containers intact?	NONE	YES	NO *
3.	Are custody seals on **sample** containers intact?	NONE	YES	NO *
4.	Is there a COC (chain-of-custody) present?		YES	NO *
5.	Is the COC in agreement with samples received? (IDs, dates, times, # of samples, # of containers, matrix, requested analyses, etc.)		YES	NO *
6.	Are short-hold samples present?		YES	NO
7.	Are all samples within holding times for the requested analyses?		YES	NO *
8.	Were all sample containers received intact? (not broken or leaking)		YES	NO *
9.	Is there sufficient sample for the requested analyses?		YES	NO *
10.	Are all samples in the proper containers for the requested analyses?		YES	NO *
11.	Are all aqueous samples preserved correctly, if required? (excluding volatiles)	N/A	YES	NO *
12.	Are all aqueous non-preserved samples pH 4-9?	N/A	YES	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)	N/A	YES	NO
14.	Were the samples shipped on ice?		YES	NO
15.	Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: #1 #3 #4	RAD ONLY	YES	NO

Cooler #: 11545
Temperature (°C): 2.5
No. of custody seals on cooler: 2

DOT Survey/ Acceptance Information
External µR/hr reading: 11
Background µR/hr reading: 13

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? **YES / 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: Em

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

Project Manager Signature / Date: 9/9/19

Form 201r27.xls
(02/11/2019)

*IR Gun #1, VWR SN 170560549
*IR Gun #3, VWR SN 170647571
*IR Gun #4, Oakton, SN 2372220101-0002

Page 1 of ___

1909120

11545

ORIGIN ID:PSCA (509) 531-0450
TROY BACON
CH2M
6267 LATAH ST.
RICHLAND, WA 99352
UNITED STATES US

SHIP DATE: 06SEP19
ACTWGT: 65.00 LB
CAD: 107068051/NET4160

BILL THIRD PARTY

TO JULIE ELLINGSON
ALS GLOBAL-FORT COLLINS
225 COMMERCE DR
FORT COLLINS CO 80524
(970) 490-1511
INV:
PO:
REF: PTR#11545
DEPT:

11.2

2.5

567J1/9D04/05A2

FedEx Express

J1B2010062401mm

SATURDAY 12:00P
PRIORITY OVERNIGHT
DSR
80524
CO-US DEN

TRK# 0201 7761 7602 1466

XO FTCA

After printing this label:
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Iodine-129

Case Narrative

CH2M HILL Plateau Remediation Company

AEA, September 2019 – I19-028

Work Order Number: 1909120

1. The samples were prepared according to the current revision of SOP 753.

2. The samples were analyzed for the presence of ^{129}I according to the current revision of SOP 724. The analyses were completed on 09/23/2019.

3. The analysis results for these sample are reported in units of pCi/L. The samples were not filtered prior to analysis.

4. 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 is less than 5 times the sample specific MDC, as indicated with an "NC" on the Duplicate Sample Results (RPD) page.

5. No anomalous situations were noted 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 — 10/3/19

Pik Yee Yuen
Radiochemistry Primary Data Reviewer

Date

10/3/19

Radiochemistry Final Data Reviewer

Date

Iodine-129 by GFPC

PAI 724 Rev 13

Method Blank Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1909120
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Lab ID: I190921-1MB

Sample Matrix: WATER
Prep SOP: PAI 753 Rev 6
Date Collected: 21-Sep-19
Date Prepared: 21-Sep-19
Date Analyzed: 23-Sep-19

Prep Batch: I190921-1
QCBatchID: I190921-1-1
Run ID: I190921-1A
Count Time: 1000 minutes

Final Aliquot: 1700 ml
Result Units: pCi/l
File Name: IOC0923A

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
15046-84-1	I-129	1.13E-01 +/- 5.15E-01	8.51E-01	1.00E+00	NA	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
IODATE	2.840E+01	2.64E+01	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.

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: *I1909120-1*

Iodine-129 by GFPC

PAI 724 Rev 13

Laboratory Control Sample(s)

Lab Name: ALS -- Fort Collins
Work Order Number: 1909120
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Lab ID: I190921-1LCS

Sample Matrix: WATER
Prep SOP: PAI 753 Rev 6
Date Collected: 21-Sep-19
Date Prepared: 21-Sep-19
Date Analyzed: 23-Sep-19

Prep Batch: I190921-1
QCBatchID: I190921-1-1
Run ID: I190921-1A
Count Time: 30 minutes

Final Aliquot: 1700 ml
Result Units: pCi/l
File Name: IOC0923

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
15046-84-1	I-129	5.70E+01 +/- 2.35E+01	5.01E+00	5.300E+01	107	69 - 171	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
IODATE	2.840E+01	2.60E+01	ug	91.6	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: *I1909120-1*

Iodine-129 by GFPC

PAI 724 Rev 13

Duplicate Sample Results (DER)

Lab Name: **ALS -- Fort Collins**
Work Order Number: 1909120
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID: B3R4C8
Lab ID: 1909120-4DUP

Sample Matrix: WATER
Prep SOP: PAI 753 Rev 6
Date Collected: 06-Sep-19
Date Prepared: 21-Sep-19
Date Analyzed: 23-Sep-19

Prep Batch: I190921-1
QCBatchID: I190921-1-1
Run ID: I190921-1A
Count Time: 1000 minutes
Report Basis: Unfiltered

Final Aliquot: 1700 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: IOC0923A

CASNO	Analyte	Sample			Duplicate			DER	DER Lim
		Result +/- 2 s TPU	MDC	Flags	Result +/- 2 s TPU	MDC	Flags		
15046-84-1	I-129	1.05E-01 +/- 5.20E-01	8.60E-01	U	1.81E-01 +/- 4.55E-01	7.43E-01	U	0.11	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: *I1909120-1*

Iodine-129 by GFPC

PAI 724 Rev 13

Duplicate Sample Results (RPD)

Lab Name: **ALS -- Fort Collins**
Work Order Number: 1909120
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID: B3R4C8
Lab ID: 1909120-4DUP

Sample Matrix: WATER
Prep SOP: PAI 753 Rev 6
Date Collected: 06-Sep-19
Date Prepared: 21-Sep-19
Date Analyzed: 23-Sep-19

Prep Batch: I190921-1
QCBatchID: I190921-1-1
Run ID: I190921-1A
Count Time: 1000 minutes
Report Basis: Unfiltered

Final Aliquot: 1700 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: IOC0923A

CASNO	Analyte	Sample			Duplicate			RPD	RPD Lim
		Result +/- 2 s TPU	MDC	Flags	Result +/- 2 s TPU	MDC	Flags		
15046-84-1	I-129	1.05E-01 +/- 5.20E-01	8.60E-01	U	1.81E-01 +/- 4.55E-01	7.43E-01	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: *I1909120-1*

Iodine-129 by GFPC

PAI 724 Rev 13

Sample Results

Lab Name: **ALS -- Fort Collins**
Work Order Number: 1909120
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID: B3R4C8
Lab ID: 1909120-4

Analysis ReqCode: **I129_LL_SEP_G**

Sample Matrix: WATER
Prep SOP: PAI 753 Rev 6
Date Collected: 06-Sep-19
Date Prepared: 21-Sep-19
Date Analyzed: 23-Sep-19

Prep Batch: I190921-1
QCBatchID: I190921-1-1
Run ID: I190921-1A
Count Time: 1000 minutes
Report Basis: Unfiltered

Final Aliquot: 1700 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: IOC0923A

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
15046-84-1	I-129	1.05E-01 +/- 5.20E-01	8.60E-01	1E+00	NA	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
IODATE	2.840E+01	2.46E+01	ug	86.7	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: *I1909120-1*

Iodine-129 by GFPC

PAI 724 Rev 13

Sample Duplicate Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1909120
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID: B3R4C8
Lab ID: 1909120-4DUP

Sample Matrix: WATER
Prep SOP: PAI 753 Rev 6
Date Collected: 06-Sep-19
Date Prepared: 21-Sep-19
Date Analyzed: 23-Sep-19

Prep Batch: I190921-1
QCBatchID: I190921-1-1
Run ID: I190921-1A
Count Time: 1000 minutes
Report Basis: Unfiltered

Final Aliquot: 1700 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: IOC0923A

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
15046-84-1	I-129	1.81E-01 +/- 4.55E-01	7.43E-01	1E+00	NA	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
IODATE	2.840E+01	2.62E+01	ug	92.3	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 - 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: *I1909120-1*

Iodine-129 by GFPC

PAI 724 Rev 13

Sample Results

Lab Name: **ALS -- Fort Collins**
Work Order Number: 1909120
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID: B3R4C7
Lab ID: 1909120-5

Analysis ReqCode: **I129_LL_SEP_G**

Sample Matrix: WATER
Prep SOP: PAI 753 Rev 6
Date Collected: 06-Sep-19
Date Prepared: 21-Sep-19
Date Analyzed: 23-Sep-19

Prep Batch: I190921-1
QCBatchID: I190921-1-1
Run ID: I190921-1A
Count Time: 1000 minutes
Report Basis: Unfiltered

Final Aliquot: 1700 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: IOC0923A

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
15046-84-1	I-129	4.15E-01 +/- 4.68E-01	7.18E-01	1E+00	NA	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
IODATE	2.840E+01	2.69E+01	ug	94.8	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.

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: *I1909120-1*

Prep Batch ID: I190921-1

Start Date: 09/21/19
Start Time: 10:53
Prep Analyst: Tambrae Elhart

End Date: 09/21/19
End Time: 10:53

Concentration Method: NONE
Extract Method: PAI 7536
Initial Volume Units: ml
Final Volume Units: ml

Batch Created By: tde
Date Created: 09/21/19
Time Created: 10:53
Validated By: tde
Date Validated: 09/22/19
Time Validated: 9:37

Comments:

Due to low MDC's, increased aliquots were taken.

QC Batch ID: I190921-1-1

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
I190921-1	MB	XXXXXX	WATER	XXXXXX	1700	1700	NONE	1	1908707
I190921-1FB1	MB	XXXXXX	WATER	XXXXXX	1700	1700	NONE	1	1908707
I190921-1FB2	MB	XXXXXX	WATER	XXXXXX	1700	1700	NONE	1	1908707
I190921-1FB3	MB	XXXXXX	WATER	XXXXXX	1700	1700	NONE	1	1908707
I190921-1	LCS	XXXXXX	WATER	XXXXXX	1700	1700	NONE	1	1908707
1909120-4	DUP	B3R4C8	WATER	9/6/2019	1700	1700	NONE	1	1909120
1908707-2	SMP	XXXXXX	WATER	XXXXXX	1700	1700	NONE	1	1908707
1909120-4	SMP	B3R4C8	WATER	9/6/2019	1700	1700	NONE	1	1909120
1909120-5	SMP	B3R4C7	WATER	9/6/2019	1700	1700	NONE	1	1909120

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

AEA, September 2019 – I19-028

Work Order Number: 1909120

1. The samples were prepared according to the current revision of SOP 707.

2. The samples were analyzed for the presence of ^{90}Sr according to the current revision of SOP 724. The analyses were completed on 09/29/2019.

3. Total radio-strontium is reported as ^{90}Sr. 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:

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

   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 — 10/3/19

Pik Yee Yuen
Radiochemistry Primary Data Reviewer

Date

10/3/19

Radiochemistry Final Data Reviewer

Date

Strontium-90 by GFPC

PAI 724 Rev 13

Method Blank Results

Lab Name: **ALS -- Fort Collins**
Work Order Number: 1909120
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Lab ID: SR190925-1MB

Sample Matrix: WATER
Prep SOP: PAI 707 Rev 15
Date Collected: 25-Sep-19
Date Prepared: 25-Sep-19
Date Analyzed: 29-Sep-19

Prep Batch: SR190925-1
QCBatchID: SR190925-1-1
Run ID: SR190925-1A
Count Time: 75 minutes

Final Aliquot: 994 ml
Result Units: pCi/l
File Name: SRC0929

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10098-97-2	Sr-90	2.31E-01 +/- 3.24E-01	7.09E-01	1.00E+00	NA	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1.020E+03	9.54E+02	ug	93.2	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.

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: *SR1909120-1*

Strontium-90 by GFPC

PAI 724 Rev 13

Laboratory Control Sample(s)

Lab Name: ALS -- Fort Collins
Work Order Number: 1909120
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Lab ID: SR190925-1LCS

Sample Matrix: WATER
Prep SOP: PAI 707 Rev 15
Date Collected: 25-Sep-19
Date Prepared: 25-Sep-19
Date Analyzed: 29-Sep-19

Prep Batch: SR190925-1
QCBatchID: SR190925-1-1
Run ID: SR190925-1A
Count Time: 75 minutes

Final Aliquot: 994 ml
Result Units: pCi/l
File Name: SRC0929

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
10098-97-2	Sr-90	1.09E+01 +/- 2.68E+00	6.99E-01	1.160E+01	94.2	75 - 125	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1.020E+03	9.02E+02	ug	88.1	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: *SR1909120-1*

Strontium-90 by GFPC

PAI 724 Rev 13

Laboratory Control Sample(s)

Lab Name: ALS -- Fort Collins
Work Order Number: 1909120
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Lab ID: SR190925-1LCSD

Sample Matrix: WATER
Prep SOP: PAI 707 Rev 15
Date Collected: 25-Sep-19
Date Prepared: 25-Sep-19
Date Analyzed: 29-Sep-19

Prep Batch: SR190925-1
QCBatchID: SR190925-1-1
Run ID: SR190925-1A
Count Time: 75 minutes

Final Aliquot: 994 ml
Result Units: pCi/l
File Name: SRC0929

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
10098-97-2	Sr-90	1.13E+01 +/- 2.78E+00	7.32E-01	1.160E+01	97.7	75 - 125	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1.020E+03	8.94E+02	ug	87.4	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: *SR1909120-1*

Strontium-90 by GFPC

PAI 724 Rev 13

Duplicate Sample Results (DER)

Lab Name: **ALS -- Fort Collins**
Work Order Number: 1909120
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID:
Lab ID: SR190925-1LCSD

Sample Matrix: WATER
Prep SOP: PAI 707 Rev 15
Date Collected: 25-Sep-19
Date Prepared: 25-Sep-19
Date Analyzed: 29-Sep-19

Prep Batch: SR190925-1
QCBatchID: SR190925-1-1
Run ID: SR190925-1A
Count Time: 75 minutes

Final Aliquot: 994 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: SRC0929

CASNO	Analyte	Sample				Duplicate				DER	DER Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10098-97-2	Sr-90	1.09E+01	+/- 2.68E+00	6.99E-01		1.13E+01	+/- 2.78E+00	7.32E-01		0.207	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: *SR1909120-1*

Strontium-90 by GFPC

PAI 724 Rev 13

Duplicate Sample Results (RPD)

Lab Name: **ALS -- Fort Collins**
Work Order Number: 1909120
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID:
Lab ID: SR190925-1LCSD

Sample Matrix: WATER
Prep SOP: PAI 707 Rev 15
Date Collected: 25-Sep-19
Date Prepared: 25-Sep-19
Date Analyzed: 29-Sep-19

Prep Batch: SR190925-1
QCBatchID: SR190925-1-1
Run ID: SR190925-1A
Count Time: 75 minutes

Final Aliquot: 994 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: SRC0929

CASNO	Analyte	Sample				Duplicate				RPD	RPD Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10098-97-2	Sr-90	1.09E+01	+/- 2.68E+00	6.99E-01		1.13E+01	+/- 2.78E+00	7.32E-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: *SR1909120-1*

Strontium-90 by GFPC

PAI 724 Rev 13

Sample Results

Lab Name: **ALS -- Fort Collins**
Work Order Number: 1909120
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID: B3R502
Lab ID: 1909120-2

Analysis ReqCode: **SRISO_SEP_PR**

Sample Matrix: WATER
Prep SOP: PAI 707 Rev 15
Date Collected: 06-Sep-19
Date Prepared: 25-Sep-19
Date Analyzed: 29-Sep-19

Prep Batch: SR190925-1
QCBatchID: SR190925-1-1
Run ID: SR190925-1A
Count Time: 75 minutes
Report Basis: Unfiltered

Final Aliquot: 994 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: SRC0929

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10098-97-2	Sr-90	3.41E-01 +/- 3.22E-01	6.70E-01	1E+00	NA	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1.540E+03	1.38E+03	ug	89.4	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.

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: *SR1909120-1*

Strontium-90 by GFPC

PAI 724 Rev 13

Sample Results

Lab Name: **ALS -- Fort Collins**
Work Order Number: 1909120
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID: B3R4Y8
Lab ID: 1909120-6

Analysis ReqCode: **SRISO_SEP_PR**

Sample Matrix: WATER
Prep SOP: PAI 707 Rev 15
Date Collected: 06-Sep-19
Date Prepared: 25-Sep-19
Date Analyzed: 29-Sep-19

Prep Batch: SR190925-1
QCBatchID: SR190925-1-1
Run ID: SR190925-1A
Count Time: 75 minutes
Report Basis: Unfiltered

Final Aliquot: 994 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: SRC0929

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10098-97-2	Sr-90	2.57E-01 +/- 3.07E-01	6.59E-01	1E+00	NA	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1.260E+03	1.18E+03	ug	93.4	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.

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: *SR1909120-1*

Prep Batch ID: SR190925-1

Start Date: 09/25/19
Start Time: 12:12
Prep Analyst: Jirushaya Hantula

End Date: 09/25/19
End Time: 12:12

Concentration Method: NONE
Extract Method: PAI 70715
Initial Volume Units: ml
Final Volume Units: ml

Batch Created By: jxh
Date Created: 09/25/19
Time Created: 12:29
Validated By: jxh
Date Validated: 09/27/19
Time Validated: 15:51

Comments:

QC Batch ID: SR190925-1-1

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
SR190925-1	CAR	XXXXXX	WATER	XXXXXX	1000	1000	NONE	1	1909096
SR190925-1	MB	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909096
SR190925-1	LCS	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909096
SR190925-1	LCSD	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909099
1909096-2	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909096
1909099-1	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909099
1909099-10	SMP	XXXXXX	WATER	XXXXXX	950	944.31	NONE	1	1909099
1909099-2	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909099
1909099-4	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909099
1909099-5	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909099
1909099-6	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909099
1909099-7	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909099
1909099-8	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909099
1909120-2	SMP	B3R502	WATER	9/6/2019	1000	994.01	NONE	1	1909120
1909120-6	SMP	B3R4Y8	WATER	9/6/2019	1000	994.01	NONE	1	1909120

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	

Technetium-99

Case Narrative

CH2M HILL Plateau Remediation Company

AEA, September 2019 – I19-028

Work Order Number: 1909120

1. The samples were prepared according to the current revision of SOP 755, with procedure modifications outlined in QASS 378635 and 378636.

2. The samples were analyzed for the presence of ^{99}Tc according to the current revision of SOP 704. The analyses were completed on 10/01/2019.

3. The analysis results for the samples are reported in units of pCi/L. The samples were not filtered prior to analysis.

4. A laboratory control sample duplicate (LCSD) was prepared in batch TC190925-1 to meet another client's duplicate requirements. The LCSD results are included in this package as an additional QC measure.

5. The duplicate of sample 1909176-7 is shared for this work order. The duplicate was performed on a CH2M HILL Plateau Remediation Company sample and the results are acceptable. The results can be found in the following report.

6. In accordance with project specific instructions, the evaluation threshold for Relative Percent Difference (RPD) has been set at 20%. RPD is defined as:

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

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

7. No anomalous situations were encountered during the preparation 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 — 10/3/19

Pik Yee Yuen
Radiochemistry Primary Data Reviewer

Date

10/3/19

Radiochemistry Final Data Reviewer

Date

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 12

Method Blank Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1909120
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Lab ID: TC190925-1MB

Sample Matrix: WATER
Prep SOP: PAI 755 Rev 12
Date Collected: 25-Sep-19
Date Prepared: 25-Sep-19
Date Analyzed: 01-Oct-19

Prep Batch: TC190925-1
QCBatchID: TC190925-1-3
Run ID: TC190925-1A
Count Time: 30 minutes

Final Aliquot: 250 ml
Result Units: pCi/l
File Name: Z20190930_1445

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
14133-76-7	Tc-99	2.01E-02 +/- 1.31E+00	2.35E+00	2.00E+01	NA	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Tc-99m	5.390E+03	5.17E+03	Pci	96.0	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.

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: *TC1909120-1*

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 12

Laboratory Control Sample(s)

Lab Name: ALS -- Fort Collins
Work Order Number: 1909120
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Lab ID: TC190925-1LCS

Sample Matrix: WATER
Prep SOP: PAI 755 Rev 12
Date Collected: 25-Sep-19
Date Prepared: 25-Sep-19
Date Analyzed: 01-Oct-19

Prep Batch: TC190925-1
QCBatchID: TC190925-1-3
Run ID: TC190925-1A
Count Time: 30 minutes

Final Aliquot: 250 ml
Result Units: pCi/l
File Name: Z20190930_1445

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
14133-76-7	Tc-99	8.55E+02 +/- 1.37E+02	2.32E+00	9.110E+02	93.8	75 - 125	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Tc-99m	5.390E+03	5.24E+03	Pci	97.2	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.
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: *TC1909120-1*

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 12

Laboratory Control Sample(s)

Lab Name: ALS -- Fort Collins
Work Order Number: 1909120
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Lab ID: TC190925-1LCSD

Sample Matrix: WATER
Prep SOP: PAI 755 Rev 12
Date Collected: 25-Sep-19
Date Prepared: 25-Sep-19
Date Analyzed: 01-Oct-19

Prep Batch: TC190925-1
QCBatchID: TC190925-1-3
Run ID: TC190925-1A
Count Time: 30 minutes

Final Aliquot: 250 ml
Result Units: pCi/l
File Name: Z20190930_1445

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
14133-76-7	Tc-99	8.55E+02 +/- 1.37E+02	2.29E+00	9.110E+02	93.8	75 - 125	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Tc-99m	5.390E+03	5.24E+03	Pci	97.4	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: *TC1909120-1*

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 12

Duplicate Sample Results (DER)

Lab Name: ALS -- Fort Collins
Work Order Number: 1909120
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID:
Lab ID: TC190925-1LCSD

Sample Matrix: WATER
Prep SOP: PAI 755 Rev 12
Date Collected: 25-Sep-19
Date Prepared: 25-Sep-19
Date Analyzed: 01-Oct-19

Prep Batch: TC190925-1
QCBatchID: TC190925-1-3
Run ID: TC190925-1A
Count Time: 30 minutes

Final Aliquot: 250 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: Z20190930_1445

CASNO	Analyte	Sample				Duplicate				DER	DER Lim
		Result +/- 2 s TPU		MDC	Flags	Result +/- 2 s TPU		MDC	Flags		
14133-76-7	Tc-99	8.55E+02 +/-	1.37E+02	2.32E+00		8.55E+02 +/-	1.37E+02	2.29E+00		0.00182	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: *TC1909120-1*

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 12

Duplicate Sample Results (RPD)

Lab Name: ALS -- Fort Collins
Work Order Number: 1909120
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID:
Lab ID: TC190925-1LCSD

Sample Matrix: WATER
Prep SOP: PAI 755 Rev 12
Date Collected: 25-Sep-19
Date Prepared: 25-Sep-19
Date Analyzed: 01-Oct-19

Prep Batch: TC190925-1
QCBatchID: TC190925-1-3
Run ID: TC190925-1A
Count Time: 30 minutes

Final Aliquot: 250 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: Z20190930_1445

CASNO	Analyte	Sample				Duplicate				RPD	RPD Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
14133-76-7	Tc-99	8.55E+02	+/- 1.37E+02	2.32E+00		8.55E+02	+/- 1.37E+02	2.29E+00		0.00	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: *TC1909120-1*

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 12

Duplicate Sample Results (DER)

Lab Name: ALS -- Fort Collins
Work Order Number: 1909120
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID: Shared QC
Lab ID: 1909176-7DUP

Sample Matrix: WATER
Prep SOP: PAI 755 Rev 12
Date Collected: 09-Sep-19
Date Prepared: 25-Sep-19
Date Analyzed: 01-Oct-19

Prep Batch: TC190925-1
QCBatchID: TC190925-1-3
Run ID: TC190925-1A
Count Time: 30 minutes

Final Aliquot: 100 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: Z20190930_1445

CASNO	Analyte	Sample				Duplicate				DER	DER Lim
		Result +/- 2 s TPU		MDC	Flags	Result +/- 2 s TPU		MDC	Flags		
14133-76-7	Tc-99	4.78E+03	+/- 7.63E+02	6.69E+00		4.42E+03	+/- 7.06E+02	5.97E+00		0.689	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: *TC1909120-1*

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 12

Duplicate Sample Results (RPD)

Lab Name: ALS -- Fort Collins
Work Order Number: 1909120
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID: Shared QC
Lab ID: 1909176-7DUP

Sample Matrix: WATER
Prep SOP: PAI 755 Rev 12
Date Collected: 09-Sep-19
Date Prepared: 25-Sep-19
Date Analyzed: 01-Oct-19

Prep Batch: TC190925-1
QCBatchID: TC190925-1-3
Run ID: TC190925-1A
Count Time: 30 minutes

Final Aliquot: 100 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: Z20190930_1445

CASNO	Analyte	Sample				Duplicate				RPD	RPD Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
14133-76-7	Tc-99	4.78E+03	+/- 7.63E+02	6.69E+00		4.42E+03	+/- 7.06E+02	5.97E+00		8.00	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: *TC1909120-1*

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 12

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1909120
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID: Shared QC
Lab ID: 1909176-7

Sample Matrix: WATER
Prep SOP: PAI 755 Rev 12
Date Collected: 09-Sep-19
Date Prepared: 25-Sep-19
Date Analyzed: 01-Oct-19

Prep Batch: TC190925-1
QCBatchID: TC190925-1-3
Run ID: TC190925-1A
Count Time: 30 minutes
Report Basis: Unfiltered

Final Aliquot: 100 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: Z20190930_1445

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
14133-76-7	Tc-99	4.78E+03 +/- 7.63E+02	6.69E+00	2E+01	NA	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Tc-99m	5.390E+03	4.67E+03	Pci	86.6	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: *TC1909120-1*

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 12

Sample Duplicate Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1909120
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID: Shared QC
Lab ID: 1909176-7DUP

Sample Matrix: WATER
Prep SOP: PAI 755 Rev 12
Date Collected: 09-Sep-19
Date Prepared: 25-Sep-19
Date Analyzed: 01-Oct-19

Prep Batch: TC190925-1
QCBatchID: TC190925-1-3
Run ID: TC190925-1A
Count Time: 30 minutes
Report Basis: Unfiltered

Final Aliquot: 100 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: Z20190930_1445

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
14133-76-7	Tc-99	4.42E+03 +/- 7.06E+02	5.97E+00	2E+01	NA	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Tc-99m	5.390E+03	5.15E+03	Pci	95.6	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 - 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: *TC1909120-1*

Date Printed: Thursday, October 03, 2019

ALS -- Fort Collins

LIMS Version: 6.912

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 12

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1909120
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID: B3R4C6
Lab ID: 1909120-1

Analysis ReqCode: TC99_SEP_LSC

Sample Matrix: WATER
Prep SOP: PAI 755 Rev 12
Date Collected: 06-Sep-19
Date Prepared: 25-Sep-19
Date Analyzed: 30-Sep-19

Prep Batch: TC190925-1
QCBatchID: TC190925-1-3
Run ID: TC190925-1A
Count Time: 30 minutes
Report Basis: Unfiltered

Final Aliquot: 100 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: Z20190930_1445

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
14133-76-7	Tc-99	-1.66E+00 +/- 3.30E+00	6.26E+00	2E+01	NA	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Tc-99m	5.390E+03	4.86E+03	Pci	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.

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: *TC1909120-1*

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 12

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1909120
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID: B3R4C8
Lab ID: 1909120-4

Analysis ReqCode: TC99_SEP_LSC

Sample Matrix: WATER
Prep SOP: PAI 755 Rev 12
Date Collected: 06-Sep-19
Date Prepared: 25-Sep-19
Date Analyzed: 30-Sep-19

Prep Batch: TC190925-1
QCBatchID: TC190925-1-3
Run ID: TC190925-1A
Count Time: 30 minutes
Report Basis: Unfiltered

Final Aliquot: 100 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: Z20190930_1445

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
14133-76-7	Tc-99	-1.22E+00 +/- 3.61E+00	6.73E+00	2E+01	NA	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Tc-99m	5.390E+03	4.56E+03	Pci	84.6	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: *TC1909120-1*

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 12

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1909120
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID: B3R4C7
Lab ID: 1909120-5

Analysis ReqCode: TC99_SEP_LSC

Sample Matrix: WATER
Prep SOP: PAI 755 Rev 12
Date Collected: 06-Sep-19
Date Prepared: 25-Sep-19
Date Analyzed: 30-Sep-19

Prep Batch: TC190925-1
QCBatchID: TC190925-1-3
Run ID: TC190925-1A
Count Time: 30 minutes
Report Basis: Unfiltered

Final Aliquot: 100 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: Z20190930_1445

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
14133-76-7	Tc-99	8.47E-02 +/- 3.30E+00	5.92E+00	2E+01	NA	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Tc-99m	5.390E+03	5.21E+03	Pci	96.8	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.

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: *TC1909120-1*

Prep Batch ID: TC190925-1

Start Date: 09/25/19
Start Time: 9:42
Prep Analyst: John C. Petrovic

End Date: 09/25/19
End Time: 9:42

Concentration Method: NONE
Extract Method: PAI 75512
Initial Volume Units: ml
Final Volume Units: ml

Batch Created By: jcp
Date Created: 09/25/19
Time Created: 9:42
Validated By: jcp
Date Validated: 09/26/19
Time Validated: 9:42

Comments:

QC Batch ID: TC190925-1-3

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
TC190925-1	MB	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1909120
TC190925-1CB1	MB	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1909120
TC190925-1CB2	MB	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1909120
TC190925-1CB3	MB	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1909120
TC190925-1	LCS	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1909120
TC190925-1	LCSD	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1909120
1909176-7	DUP	XXXXXX	WATER	XXXXXX	100	100	NONE	1	1909176
1909120-1	SMP	B3R4C6	WATER	9/6/2019	100	100	NONE	1	1909120
1909120-4	SMP	B3R4C8	WATER	9/6/2019	100	100	NONE	1	1909120
1909120-5	SMP	B3R4C7	WATER	9/6/2019	100	100	NONE	1	1909120
1909176-5	SMP	XXXXXX	WATER	XXXXXX	100	100	NONE	1	1909176
1909176-6	SMP	XXXXXX	WATER	XXXXXX	100	100	NONE	1	1909176
1909176-7	SMP	XXXXXX	WATER	XXXXXX	100	100	NONE	1	1909176
1909214-2	SMP	XXXXXX	WATER	XXXXXX	100	100	NONE	1	1909214

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

ALS Laboratory Group - Fort Collins

QUALITY ASSURANCE SUMMARY SHEET

PAR W.O. # / BATCH General
TEST Tc99
METHOD Prep
SOP/REV (PREP) 755
SOP/REV (ANAL)

Briefly document any QA or other problems or deviations associated with the analysis of samples. Problems could result from: log-in, color, odor, dilution, consistency, scheduling, equipment, or instrumentation, or may include documentation of minor deviations necessary due to unique DQO's or sample characteristics.

CAS 8/12/09

Tc99^m 711.2613.17 was used as a tracer for this batch. It has a half-life of 6 hours and therefore must be delivered the day of prep and diluted to a working level solution. The procedure noted below is standard for all Tc99^m dilutions.

1. Open the Pb shielded container and carefully remove the vial containing the Tc99m primary standard.
2. Withdraw a 1 mL aliquot of the Tc99^m primary standard from the vial using a 10 mL syringe fitted with a hypodermic needle. Dispense the aliquot into a disposable beaker that contains ~100 mL of DI water. Cap and mix well. This intermediate solution is a 1/100x dilution of the primary standard.
3. Using a 10 mL syringe, transfer 10 mL of the intermediate solution prepared in step 2 into a disposable beaker that contains ~70 mL of DI water. Cap and mix well. This working standard solution is a 1/800x dilution of the primary standard.

CAS 8/12/09

CAS 8/12/09

Attach vendor lab

CardinalHealth
CARDINAL HEALTH 414, LLC
DENVER
10400 48TH AVE,STE B
DENVER CO 80238
303.373.0579

Rx# 815134
Date Ordered : 25Sep2019
Date/Time Prepared : 26Sep2019 03:00 MT
ALS LABORATORY GROUP
225 COMMERCE DR
FORT COLLINS CO 80524-2762
1 0430 Fort Collins

Safetrac™ CH102984

Patient : SOURCE
Product : Tc-99m Sodium Pertechnetate Unit Dose mCi (NM)
Disp Amt : 0.52 mCi
Calibration: 26Sep2019 08:00 MT
Patient ID :
Ordered Amount : 0.50 mCi
Volume : 10.00 mL
Conc : 0.05 mCi/mL
CAUTION RADIOACTIVE MATERIALS
Source - Not for Human Use For Calibration Use Only
Indication : Point Source mCi
Dispense Date : 26Sep2019
Use By : 27Sep2019 03:00 MT
Lot# : E19269-0042
Physician : Charles Orchard, RSO
NDC :
Price(est) : N/A
NPT :
RPh : N.Pham
Notes
Caution: Federal law prohibits dispensing without a prescription - Rx only
All Tc-99m drugs are below 0.15 uCi of Mo-99/mCi of Tc-99m at BUD.

TECHNICIAN/ANALYST Crystal Sheaffer DATE 8/12/09

DEPARTMENT MANAGER [signature] DATE 8/12/09

378636

FORM 302r6.doc (4/22/04)

ALS Laboratory Group - Fort Collins

QUALITY ASSURANCE SUMMARY SHEET

PAR W.O. # / BATCH Generic
TEST Tc99
METHOD Prep
SOP/REV (PREP) 755
SOP/REV (ANAL)

Briefly document any QA or other problems or deviations associated with the analysis of samples. Problems could result from: log-in, color, odor, dilution, consistency, scheduling, equipment, or instrumentation, or may include documentation of minor deviations necessary due to unique DQO's or sample characteristics.

CES 8/12/09

CES 8/12/09

CES 8/12/09

Due to possible matrix interference, a ferric hydroxide precipitation was performed on all samples per SOP 755, section 8.2.10

CES 8/12/09

CES 8/12/09

TECHNICIAN/ANALYST Crystal Shewfelt DATE 8/12/09

DEPARTMENT MANAGER Jeffrey Z DATE 8/12/09

378635 FORM 302r6.doc (4/22/04)

Tritium

Case Narrative

CH2M HILL Plateau Remediation Company

AEA, September 2019 – I19-028

Work Order Number: 1909120

1. This sample was prepared according to the current revision of SOP 700.

2. The sample was analyzed for the presence of tritium according to the current revision of SOP 704. The analysis was completed on 09/21/2019.

3. The duplicate of sample 1909096-2 and the matrix spikes of sample 1909053-1 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. Prior to analysis of the sample, an approximate volume of 10 μL of nitro-methane was added to the sample and associated QC to bring them into the usable calibration range.

5. The analysis results for this samples are reported in units of pCi/L. The sample was not filtered prior to analysis.

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. 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.

7. The magnitude of the negative activity for the method blank is greater than the 3 sigma TPU. The analyst's review of the data does not indicate a problem with the instrument data or the subsequent reporting systems. It is believed that the data quality is unaffected and the results are submitted without qualification.

8. No further anomalous situations were encountered during the preparation or analysis of this sample. All remaining 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 — 10/3/19
Pik Yee Yuen — Date
Radiochemistry Primary Data Reviewer

10/3/19
Radiochemistry Final Data Reviewer — Date

Tritium by Liquid Scintillation

PAI 704 Rev 12

Method Blank Results

Lab Name: **ALS -- Fort Collins**
Work Order Number: 1909120
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Lab ID: 3H190918-5MB

Sample Matrix: WATER
Prep SOP: PAI 700 Rev 15
Date Collected: 18-Sep-19
Date Prepared: 18-Sep-19
Date Analyzed: 21-Sep-19

Prep Batch: 3H190918-5
QCBatchID: 3H190918-5-2
Run ID: 3H190918-5A
Count Time: 30 minutes

Final Aliquot: 10.0 ml
Result Units: pCi/l
File Name: Z20190920_1809

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10028-17-8	H-3	-1.16E+02 +/- 6.84E+01	1.68E+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: *H31909120-1*

Tritium by Liquid Scintillation

PAI 704 Rev 12

Laboratory Control Sample(s)

Lab Name: ALS -- Fort Collins
Work Order Number: 1909120
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Lab ID: 3H190918-5LCS

Sample Matrix: WATER
Prep SOP: PAI 700 Rev 15
Date Collected: 18-Sep-19
Date Prepared: 18-Sep-19
Date Analyzed: 21-Sep-19

Prep Batch: 3H190918-5
QCBatchID: 3H190918-5-2
Run ID: 3H190918-5A
Count Time: 30 minutes

Final Aliquot: 9.84 ml
Result Units: pCi/l
File Name: Z20190920_1809

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
10028-17-8	H-3	1.69E+04 +/- 2.67E+03	1.71E+02	1.660E+04	102	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: *H31909120-1*

Tritium by Liquid Scintillation

PAI 704 Rev 12

Matrix Spike Results

Lab Name: **ALS -- Fort Collins**
Work Order Number: 1909120
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID: Shared QC
Lab ID: 1909053-1MS

Analysis ReqCode: **TRITIUM_DIST_L**

Sample Matrix: WATER
Prep SOP: PAI 700 Rev 15
Date Collected: 03-Sep-19
Date Prepared: 18-Sep-19
Date Analyzed: 21-Sep-19

Prep Batch: 3H190918-5
QCBatchID: 3H190918-5-2
Run ID: 3H190918-5A
Count Time: 30 minutes
Report Basis: Unfiltered

Final Aliquot: 9.84 ml
Prep Basis: Unfiltered
Moisture(%): 100.000
Result Units: pCi/l
File Name: Z20190920_1809

CASNO	Target Nuclide	Matrix Spike	Sample Results	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
10028-17-8	H-3	3.43E+05	3.26E+05	1.72E+02	1.660E+04	104	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: *H31909120-1*

Tritium by Liquid Scintillation

PAI 704 Rev 12

Matrix Spike Results

Lab Name: **ALS -- Fort Collins**
Work Order Number: 1909120
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID: Shared QC
Lab ID: 1909053-1MSD

Analysis ReqCode: **TRITIUM_DIST_L**

Sample Matrix: WATER
Prep SOP: PAI 700 Rev 15
Date Collected: 03-Sep-19
Date Prepared: 18-Sep-19
Date Analyzed: 21-Sep-19

Prep Batch: 3H190918-5
QCBatchID: 3H190918-5-2
Run ID: 3H190918-5A
Count Time: 30 minutes
Report Basis: Unfiltered

Final Aliquot: 9.84 ml
Prep Basis: Unfiltered
Moisture(%): 100.000
Result Units: pCi/l
File Name: Z20190920_1809

CASNO	Target Nuclide	Matrix Spike	Sample Results	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
10028-17-8	H-3	3.44E+05	3.26E+05	1.72E+02	1.660E+04	110	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: *H31909120-1*

Tritium by Liquid Scintillation

PAI 704 Rev 12

Sample Results

Lab Name: **ALS -- Fort Collins**
Work Order Number: 1909120
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID: Shared QC
Lab ID: 1909053-1

Sample Matrix: WATER
Prep SOP: PAI 700 Rev 15
Date Collected: 03-Sep-19
Date Prepared: 18-Sep-19
Date Analyzed: 21-Sep-19

Prep Batch: 3H190918-5
QCBatchID: 3H190918-5-2
Run ID: 3H190918-5A
Count Time: 30 minutes
Report Basis: Unfiltered

Final Aliquot: 10.0 ml
Prep Basis: Unfiltered
Moisture(%): 100.000
Result Units: pCi/l
File Name: Z20190920_1809

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10028-17-8	H-3	3.26E+05 +/- 4.95E+04	1.69E+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: *H31909120-1*

Tritium by Liquid Scintillation

PAI 704 Rev 12

Duplicate Sample Results (DER)

Lab Name: **ALS -- Fort Collins**
Work Order Number: 1909120
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID: Shared QC
Lab ID: 1909053-1MSD

Sample Matrix: WATER
Prep SOP: PAI 700 Rev 15
Date Collected: 03-Sep-19
Date Prepared: 18-Sep-19
Date Analyzed: 21-Sep-19

Prep Batch: 3H190918-5
QCBatchID: 3H190918-5-2
Run ID: 3H190918-5A
Count Time: 30 minutes
Report Basis: Unfiltered

Final Aliquot: 9.84 ml
Prep Basis: Unfiltered
Moisture(%): 100.000
Result Units: pCi/l
File Name: Z20190920_1809

CASNO	Analyte	Sample				Duplicate				DER	DER Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10028-17-8	H-3	3.43E+05	+/- 5.22E+04	1.72E+02		3.44E+05	+/- 5.23E+04	1.72E+02		0.0128	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: *H31909120-1*

Tritium by Liquid Scintillation

PAI 704 Rev 12

Duplicate Sample Results (RPD)

Lab Name: **ALS -- Fort Collins**
Work Order Number: 1909120
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID: Shared QC
Lab ID: 1909053-1MSD

Sample Matrix: WATER
Prep SOP: PAI 700 Rev 15
Date Collected: 03-Sep-19
Date Prepared: 18-Sep-19
Date Analyzed: 21-Sep-19

Prep Batch: 3H190918-5
QCBatchID: 3H190918-5-2
Run ID: 3H190918-5A
Count Time: 30 minutes
Report Basis: Unfiltered

Final Aliquot: 9.84 ml
Prep Basis: Unfiltered
Moisture(%): 100.000
Result Units: pCi/l
File Name: Z20190920_1809

CASNO	Analyte	Sample				Duplicate				RPD	RPD Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10028-17-8	H-3	3.43E+05	+/- 5.22E+04	1.72E+02		3.44E+05	+/- 5.23E+04	1.72E+02		0.00	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: *H31909120-1*

Tritium by Liquid Scintillation

PAI 704 Rev 12

Duplicate Sample Results (DER)

Lab Name: **ALS -- Fort Collins**
Work Order Number: 1909120
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID: Shared QC
Lab ID: 1909096-2DUP

Sample Matrix: WATER
Prep SOP: PAI 700 Rev 15
Date Collected: 05-Sep-19
Date Prepared: 18-Sep-19
Date Analyzed: 21-Sep-19

Prep Batch: 3H190918-5
QCBatchID: 3H190918-5-2
Run ID: 3H190918-5A
Count Time: 30 minutes
Report Basis: Unfiltered

Final Aliquot: 10.0 ml
Prep Basis: Unfiltered
Moisture(%): 100.000
Result Units: pCi/l
File Name: Z20190920_1809

CASNO	Analyte	Sample				Duplicate				DER	DER Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10028-17-8	H-3	7.81E+02	+/- 2.17E+02	1.69E+02		7.80E+02	+/- 2.16E+02	1.69E+02		0.00263	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: *H31909120-1*

Tritium by Liquid Scintillation

PAI 704 Rev 12

Duplicate Sample Results (RPD)

Lab Name: **ALS -- Fort Collins**
Work Order Number: 1909120
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID: Shared QC
Lab ID: 1909096-2DUP

Sample Matrix: WATER
Prep SOP: PAI 700 Rev 15
Date Collected: 05-Sep-19
Date Prepared: 18-Sep-19
Date Analyzed: 21-Sep-19

Prep Batch: 3H190918-5
QCBatchID: 3H190918-5-2
Run ID: 3H190918-5A
Count Time: 30 minutes
Report Basis: Unfiltered

Final Aliquot: 10.0 ml
Prep Basis: Unfiltered
Moisture(%): 100.000
Result Units: pCi/l
File Name: Z20190920_1809

CASNO	Analyte	Sample				Duplicate				RPD	RPD Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10028-17-8	H-3	7.81E+02	+/- 2.17E+02	1.69E+02		7.80E+02	+/- 2.16E+02	1.69E+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: *H31909120-1*

Tritium by Liquid Scintillation

PAI 704 Rev 12

Sample Results

Lab Name: **ALS -- Fort Collins**
Work Order Number: 1909120
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID: Shared QC
Lab ID: 1909096-2

Sample Matrix: WATER
Prep SOP: PAI 700 Rev 15
Date Collected: 05-Sep-19
Date Prepared: 18-Sep-19
Date Analyzed: 21-Sep-19

Prep Batch: 3H190918-5
QCBatchID: 3H190918-5-2
Run ID: 3H190918-5A
Count Time: 30 minutes
Report Basis: Unfiltered

Final Aliquot: 10.0 ml
Prep Basis: Unfiltered
Moisture(%): 100.000
Result Units: pCi/l
File Name: Z20190920_1809

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10028-17-8	H-3	7.81E+02 +/- 2.17E+02	1.69E+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: *H31909120-1*

Tritium by Liquid Scintillation

PAI 704 Rev 12

Sample Duplicate Results

Lab Name: **ALS -- Fort Collins**
Work Order Number: 1909120
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID: Shared QC
Lab ID: 1909096-2DUP

Sample Matrix: WATER
Prep SOP: PAI 700 Rev 15
Date Collected: 05-Sep-19
Date Prepared: 18-Sep-19
Date Analyzed: 21-Sep-19

Prep Batch: 3H190918-5
QCBatchID: 3H190918-5-2
Run ID: 3H190918-5A
Count Time: 30 minutes
Report Basis: Unfiltered

Final Aliquot: 10.0 ml
Prep Basis: Unfiltered
Moisture(%): 100.000
Result Units: pCi/l
File Name: Z20190920_1809

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10028-17-8	H-3	7.80E+02 +/- 2.16E+02	1.69E+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: *H31909120-1*

Date Printed: Thursday, October 03, 2019

ALS -- Fort Collins

LIMS Version: 6.912

Tritium by Liquid Scintillation

PAI 704 Rev 12

Sample Results

Lab Name: **ALS -- Fort Collins**
Work Order Number: 1909120
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID: B3R4Y6
Lab ID: 1909120-3

Analysis ReqCode: **TRITIUM_DIST_L**

Sample Matrix: WATER
Prep SOP: PAI 700 Rev 15
Date Collected: 06-Sep-19
Date Prepared: 18-Sep-19
Date Analyzed: 21-Sep-19

Prep Batch: 3H190918-5
QCBatchID: 3H190918-5-2
Run ID: 3H190918-5A
Count Time: 30 minutes
Report Basis: Unfiltered

Final Aliquot: 10.0 ml
Prep Basis: Unfiltered
Moisture(%): 100.000
Result Units: pCi/l
File Name: Z20190920_1809

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10028-17-8	H-3	3.48E+03 +/- 6.30E+02	1.69E+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: *H31909120-1*

Prep Batch ID: 3H190918-5

Start Date: 09/18/19
Start Time: 12:07
Prep Analyst: Reilly G. Stockton

End Date: 09/18/19
End Time: 12:07

Concentration Method: NONE
Extract Method: PAI 70015
Initial Volume Units: ml
Final Volume Units: ml

Batch Created By: rgs
Date Created: 09/18/19
Time Created: 12:07
Validated By: rgs
Date Validated: 09/20/19
Time Validated: 8:57

Comments:

QC Batch ID: 3H190918-5-2

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
3H190918-5	MB	XXXXXX	WATER	XXXXXX	30	10	NONE	1	1908708
3H190918-5CB1	MB	XXXXXX	WATER	XXXXXX	30	10	NONE	1	1908708
3H190918-5CB2	MB	XXXXXX	WATER	XXXXXX	30	10	NONE	1	1908708
3H190918-5CB3	MB	XXXXXX	WATER	XXXXXX	30	10	NONE	1	1908708
3H190918-5	LCS	XXXXXX	WATER	XXXXXX	30	9.8361	NONE	1	1908708
1909053-1	MS	XXXXXX	WATER	XXXXXX	30	9.8361	NONE	1	1909053
1909053-1	MSD	XXXXXX	WATER	XXXXXX	30	9.8361	NONE	1	1909053
1909096-2	DUP	XXXXXX	WATER	XXXXXX	30	10	NONE	1	1909096
1908708-1	SMP	XXXXXX	WATER	XXXXXX	30	10	NONE	1	1908708
1909053-1	SMP	XXXXXX	WATER	XXXXXX	30	10	NONE	1	1909053
1909096-2	SMP	XXXXXX	WATER	XXXXXX	30	10	NONE	1	1909096
1909099-9	SMP	XXXXXX	WATER	XXXXXX	30	10	NONE	1	1909099
1909120-3	SMP	B3R4Y6	WATER	9/6/2019	30	10	NONE	1	1909120

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