



Thursday, October 25, 2018

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

Re: ALS Workorder: 1809370
Project Name: AEA, SEPTEMBER 2018
Project Number: I18-016

Dear Ms. Waters-Husted:

Two water samples were received from CH2M HILL Plateau Remediation Company, on 9/19/2018. The samples were scheduled for the following analyses:

Strontium-90

Technetium-99

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: 1809370

Client Name: CH2M HILL Plateau Remediation Company

Client Project Name: AEA, SEPTEMBER 2018

Client Project Number: I18-016

Client PO Number: BOA 54854

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
B3KH80	1809370-1		WATER	17-Sep-18	12:36
B3KH80	1809370-2		WATER	17-Sep-18	12:36

1809370

C.O.C.#
I18-016-136
Page 1 of 1

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

Collector: Larry Rosane
I18-016

SAF No.: I18-016

Project Title: AEA, SEPTEMBER 2018

Shipped To (Lab): ALS Environmental Ft. Collins

Protocol: CERCLA

Contact/Requester: Karen Waters-Husted
Telephone No.: 509-376-4650

Sampling Origin: Hanford Site
Purchase Order/Charge Code: 300071

Logbook No.: HNF-N-506 105/1
Ice Chest No.: GWS-704

Method of Shipment: Commercial Carrier
Bill of Lading/Air Bill No.: 73254323402

Priority: 30 Days
Offsite Property No.: 9963

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
B3KH80 ①	N	9-17-18	1236	2x1-L G/P	SRISO_SEP_PRECIP_GPC: COMMON	6 Months	HNO3 to pH <2
B3KH80 ②	N	9-17-18	1236	1x500-mL G/P	TC99_SEP_LSC: COMMON	6 Months	HCl to pH <2

Received By:	Signature	Date/Time	Matrix *
Received By: SSU-1	<i>Troy Bacon</i>	SEP 17 2018 1340	S = Soil SE = Sediment SO = Solid SL = Sludge W = Water O = Oil A = Air
Received By: <i>Troy Bacon</i>	<i>Troy L. Bacon</i>	SEP 18 2018 0645	DS = Drum Solids DL = Drum Liquids T = Tissue WI = Wipe L = Liquid V = Vegetation X = Other
Received By: <i>Julie Ellinger</i>	<i>Julie Ellinger</i>	9/19/18 10:50	

Relinquished By: SSU-1
Jerry Rosane SEP 17 2018 1340

Relinquished By: SSU-1
Troy Bacon SEP 18 2018 0645

Relinquished By: Fed Ex
Fed Ex SEP 18 2018 1400

Relinquished By: *Fed Ex*

Received By: FEDEX
Julie Ellinger

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

Disposed By:

Disposal Date/Time:

Printed On: 8/6/2018

FSR ID = FSR64982

A-6004-842 (REV 3)

ORIGIN ID: PSCA (509) 376-0951
TM CALLAWAY
6287 LATIHA STREET
BLDG. 6267/600
RICHLAND, WA 99354
UNITED STATES US

SHIP DATE: 18SEP18
ACTWGT: 11.00 LB
CAD: 107066057/NET14040
BILL THIRD PARTY

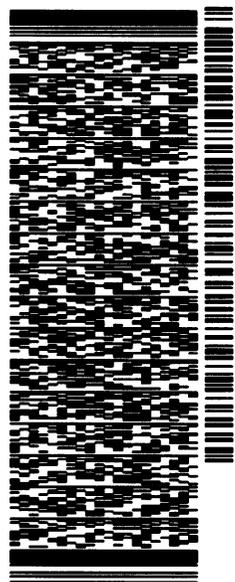
1809370

TO JULIE ELLINGSON
ALS GLOBAL
225 COMMERCE DRIVE

FORT COLLINS CO 80524
(970) 490-1511 REF PTR9963
INV DEPT:
PO

11-2-18
DCA

552J1/F78C/DCA5



TRK# 7732 5932 3402
0201

WED - 19 SEP 10:30A
PRIORITY OVERNIGHT
DSR

XH FTCA

CO-US DEN
80524



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Strontium-90

Case Narrative

CH2M HILL Plateau Remediation Company

AEA, SEPTEMBER 2018 – I18-016

Work Order Number: 1809370

1. The sample was prepared according to the current revision of SOP 707.
2. The sample was analyzed for the presence of ⁹⁰Sr according to the current revision of SOP 724. The analysis was completed on 09/29/2018.
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 the sample are reported in units of pCi/L. The sample was not filtered prior to analysis.
5. Sample volume was insufficient to allow preparation of a duplicate. A laboratory control sample duplicate (LCSD) was prepared in lieu of a client sample duplicate.
6. In accordance with project specific instructions, the evaluation threshold for Relative Percent Difference (RPD) has been set at 20%. RPD is defined as:

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

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

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



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

Pik Yee Yuen
Pik Yee Yuen
Radiochemistry Primary Data Reviewer

10/25/18
Date

Kath M. W.
Radiochemistry Final Data Reviewer

10/25/18
Date

Strontium-90 by GFPC

PAI 724 Rev 13

Method Blank Results

Lab Name: ALS -- Fort Collins

Work Order Number: 1809370

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: AEA, SEPTEMBER 2018 I18-016

Lab ID: SR180926-3MB

Sample Matrix: WATER
 Prep SOP: PAI 707 Rev 14
 Date Collected: 26-Sep-18
 Date Prepared: 26-Sep-18
 Date Analyzed: 29-Sep-18

Prep Batch: SR180926-3
 QCBatchID: SR180926-3-1
 Run ID: SR180926-3A
 Count Time: 90 minutes

Final Aliquot: 995 ml
 Result Units: pCi/l
 File Name: SRC0929A

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10098-97-2	Sr-90	3.53E-01 +/- 3.11E-01	6.38E-01	1.00E+00	NA	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1.010E+03	8.95E+02	ug	89.1	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.
 LT - Result is less than Requested MDC, greater than sample specific MDC.

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: SR1809370-1

Strontium-90 by GFPC

PAI 724 Rev 13

Laboratory Control Sample(s)**Lab Name:** ALS -- Fort Collins**Work Order Number:** 1809370**Client Name:** CH2M HILL Plateau Remediation Company**ClientProject ID:** AEA, SEPTEMBER 2018 I18-016**Lab ID:** SR180926-3LCS

Sample Matrix: WATER
Prep SOP: PAI 707 Rev 14
Date Collected: 26-Sep-18
Date Prepared: 26-Sep-18
Date Analyzed: 29-Sep-18

Prep Batch: SR180926-3
QCBatchID: SR180926-3-1
Run ID: SR180926-3A
Count Time: 30 minutes

Final Aliquot: 995 ml
Result Units: pCi/l
File Name: SRC0929B

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
10098-97-2	Sr-90	1.06E+01 +/- 2.79E+00	1.16E+00	1.060E+01	99.4	75 - 125	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1.010E+03	9.22E+02	ug	91.8	40 - 110 %	

Comments:**Qualifiers/Flags:**

U - Result is less than the sample specific MDC.
 LT - Result is less than Requested MDC, greater than 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: SR1809370-1

Strontium-90 by GFPC

PAI 724 Rev 13

Laboratory Control Sample(s)**Lab Name:** ALS -- Fort Collins**Work Order Number:** 1809370**Client Name:** CH2M HILL Plateau Remediation Company**ClientProject ID:** AEA, SEPTEMBER 2018 I18-016**Lab ID:** SR180926-3LCSD

Sample Matrix: WATER
Prep SOP: PAI 707 Rev 14
Date Collected: 26-Sep-18
Date Prepared: 26-Sep-18
Date Analyzed: 28-Sep-18

Prep Batch: SR180926-3
QCBatchID: SR180926-3-1
Run ID: SR180926-3A
Count Time: 30 minutes

Final Aliquot: 995 ml
Result Units: pCi/l
File Name: SRC0928

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
10098-97-2	Sr-90	1.15E+01 +/- 3.06E+00	1.35E+00	1.060E+01	108	75 - 125	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1.010E+03	9.08E+02	ug	90.3	40 - 110 %	

Comments:**Qualifiers/Flags:**

U - Result is less than the sample specific MDC.
 LT - Result is less than Requested MDC, greater than 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: SR1809370-1

Strontium-90 by GFPC

PAI 724 Rev 13

Duplicate Sample Results (DER)**Lab Name:** ALS -- Fort Collins**Work Order Number:** 1809370**Client Name:** CH2M HILL Plateau Remediation Company**ClientProject ID:** AEA, SEPTEMBER 2018 I18-016

Field ID:	
Lab ID:	SR180926-3LCSD

Sample Matrix: WATER**Prep SOP:** PAI 707 Rev 14**Date Collected:** 26-Sep-18**Date Prepared:** 26-Sep-18**Date Analyzed:** 28-Sep-18**Prep Batch:** SR180926-3**QCBatchID:** SR180926-3-1**Run ID:** SR180926-3A**Count Time:** 30 minutes**Final Aliquot:** 995 ml**Prep Basis:** Unfiltered**Moisture(%):** NA**Result Units:** pCi/l**File Name:** SRC0928

CASNO	Analyte	Sample				Duplicate				DER	DER Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10098-97-2	Sr-90	1.06E+01 +/-	2.79E+00	1.16E+00		1.15E+01 +/-	3.06E+00	1.35E+00		0.459	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: SR1809370-1

Strontium-90 by GFPC

PAI 724 Rev 13

Duplicate Sample Results (RPD)**Lab Name:** ALS -- Fort Collins**Work Order Number:** 1809370**Client Name:** CH2M HILL Plateau Remediation Company**ClientProject ID:** AEA, SEPTEMBER 2018 I18-016

Field ID:	
Lab ID:	SR180926-3LCSD

Sample Matrix: WATER**Prep SOP:** PAI 707 Rev 14**Date Collected:** 26-Sep-18**Date Prepared:** 26-Sep-18**Date Analyzed:** 28-Sep-18**Prep Batch:** SR180926-3**QCBatchID:** SR180926-3-1**Run ID:** SR180926-3A**Count Time:** 30 minutes**Final Aliquot:** 995 ml**Prep Basis:** Unfiltered**Moisture(%):** NA**Result Units:** pCi/l**File Name:** SRC0928

CASNO	Analyte	Sample				Duplicate				RPD	RPD Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10098-97-2	Sr-90	1.06E+01 +/-	2.79E+00	1.16E+00		1.15E+01 +/-	3.06E+00	1.35E+00		9.00	20

Comments:**Qualifiers/Flags:**

+ - Duplicate RPD not within limits.

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

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: SR1809370-1

Strontium-90 by GFPC

PAI 724 Rev 13

Sample Results**Lab Name:** ALS -- Fort Collins**Work Order Number:** 1809370**Client Name:** CH2M HILL Plateau Remediation Company**ClientProject ID:** AEA, SEPTEMBER 2018 I18-016

Field ID:	B3KH80
Lab ID:	1809370-1

Sample Matrix: WATER**Prep SOP:** PAI 707 Rev 14**Date Collected:** 17-Sep-18**Date Prepared:** 26-Sep-18**Date Analyzed:** 29-Sep-18**Prep Batch:** SR180926-3**QCBatchID:** SR180926-3-1**Run ID:** SR180926-3A**Count Time:** 90 minutes**Report Basis:** Unfiltered**Final Aliquot:** 995 ml**Prep Basis:** Unfiltered**Moisture(%):** NA**Result Units:** pCi/l**File Name:** SRC0929**Analysis ReqCode:** SRISO_SEP_PR

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10098-97-2	Sr-90	2.05E-01 +/- 2.83E-01	6.14E-01	1E+00	NA	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1.010E+03	9.89E+02	ug	98.4	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.

LT - Result is less than Requested MDC, greater than sample specific MDC.

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: SR1809370-1

Prep Batch ID: SR180926-3

Start Date: 09/26/18	End Date: 09/26/18	Concentration Method: NONE	Batch Created By: rgs
Start Time: 17:55	End Time: 17:55	Extract Method: PAI 70714	Date Created: 09/26/18
Prep Analyst: Reilly G. Stockton		Initial Volume Units: ml	Time Created: 17:55
Comments:		Final Volume Units: ml	Validated By: rgs
<div style="border: 1px solid black; height: 30px; width: 100%;"></div>			Date Validated: 09/28/18
			Time Validated: 7:38

QC Batch ID: SR180926-3-1

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
SR180926-3	CAR	XXXXXX	WATER	XXXXXX	1000	1000	NONE	1	1808517
SR180926-3	MB	XXXXXX	WATER	XXXXXX	1000	994.50	NONE	1	1808517
SR180926-3	LCS	XXXXXX	WATER	XXXXXX	1000	994.50	NONE	1	1808517
SR180926-3	LCSD	XXXXXX	WATER	XXXXXX	1000	994.50	NONE	1	1808517
1808517-2	SMP	XXXXXX	WATER	XXXXXX	1000	994.50	NONE	1	1808517
1808517-3	SMP	XXXXXX	WATER	XXXXXX	1000	994.50	NONE	1	1808517
1808517-4	SMP	XXXXXX	WATER	XXXXXX	1000	994.50	NONE	1	1808517
1809323-1	SMP	XXXXXX	WATER	XXXXXX	1000	994.50	NONE	1	1809323
1809323-2	SMP	XXXXXX	WATER	XXXXXX	1000	994.50	NONE	1	1809323
1809323-3	SMP	XXXXXX	WATER	XXXXXX	1000	994.50	NONE	1	1809323
1809370-1	SMP	B3KH80	WATER	9/17/2018	1000	994.50	NONE	1	1809370
1809403-1	SMP	XXXXXX	WATER	XXXXXX	1000	994.50	NONE	1	1809403
1809403-3	SMP	XXXXXX	WATER	XXXXXX	1000	994.50	NONE	1	1809403
1809403-4	SMP	XXXXXX	WATER	XXXXXX	1000	994.50	NONE	1	1809403
1809459-2	SMP	XXXXXX	WATER	XXXXXX	1000	994.50	NONE	1	1809459
1809461-1	SMP	XXXXXX	WATER	XXXXXX	1000	994.50	NONE	1	1809461
1809466-1	SMP	XXXXXX	WATER	XXXXXX	1000	994.50	NONE	1	1809466

QC Types

CAR	Carrier reference sample	DUP	Laboratory Duplicate
LCS	Laboratory Control Sample	LCSD	Laboratory Control Sample Duplicat
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 2018 – I18-016

Work Order Number: 1809370

1. The sample was prepared according to the current revision of SOP 755, with procedure modifications outlined in QASS 378635 and 378636.
2. The sample was analyzed for the presence of ^{99}Tc according to the current revision of SOP 704. The analysis was completed on 10/25/2018.
3. The analysis results for the sample are reported in units of pCi/L. The sample was not filtered prior to analysis.
4. 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.
5. In accordance with project specific instructions, the evaluation threshold for Relative Percent Difference (RPD) has been set at 20%. RPD is defined as:

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

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

6. The calculated yield, as determined by gamma spectrometric analysis of the $^{99\text{m}}\text{Tc}$ tracer, for sample 1809370-2 fell between 100% and 110%. To minimize the potential for low bias, results have been calculated conservatively assuming quantitative chemical yield (100%). The magnitude of the low bias is estimated to be less than 10% of the reported value and is acceptable according the ALS LQAP.
7. No anomalous situations were encountered during the preparation or analysis of this sample. All quality control criteria were met.



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

Pik Yee Yuen
Pik Yee Yuen
Radiochemistry Primary Data Reviewer

10/25/18
Date

Kath M. W.
Radiochemistry Final Data Reviewer

10/25/18
Date

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 11

Method Blank Results

Lab Name: ALS -- Fort Collins

Work Order Number: 1809370

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: AEA, SEPTEMBER 2018 I18-016

Lab ID: tc181017-2MB	Sample Matrix: WATER	Prep Batch: tc181017-2	Final Aliquot: 250 ml
	Prep SOP: PAI 755 Rev 12	QCBatchID: tc181017-2-1	Result Units: pCi/l
	Date Collected: 17-Oct-18	Run ID: TC181017-2A	File Name: B60_12_102501
	Date Prepared: 17-Oct-18	Count Time: 60 minutes	
	Date Analyzed: 25-Oct-18		

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
14133-76-7	Tc-99	3.00E-01 +/- 4.22E+00	7.04E+00	2.00E+01	NA	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Tc-99m	5.290E+03	5.09E+03	Pci	96.1	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.

LT - Result is less than Requested MDC, greater than sample specific MDC.

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: TC1809370-1

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 11

Laboratory Control Sample(s)

Lab Name: ALS -- Fort Collins

Work Order Number: 1809370

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: AEA, SEPTEMBER 2018 I18-016

Lab ID: tc181017-2LCS	Sample Matrix: WATER	Prep Batch: tc181017-2	Final Aliquot: 250 ml
	Prep SOP: PAI 755 Rev 12	QCBatchID: tc181017-2-1	Result Units: pCi/l
	Date Collected: 17-Oct-18	Run ID: TC181017-2A	File Name: B60_12_102201
	Date Prepared: 17-Oct-18	Count Time: 30 minutes	
	Date Analyzed: 23-Oct-18		

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
14133-76-7	Tc-99	9.10E+02 +/- 1.46E+02	1.03E+01	9.110E+02	99.9	75 - 125	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Tc-99m	5.290E+03	4.94E+03	Pci	93.3	40 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.
 LT - Result is less than Requested MDC, greater than 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: TC1809370-1

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 11

Duplicate Sample Results (DER)

Lab Name: ALS -- Fort Collins

Work Order Number: 1809370

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: AEA, SEPTEMBER 2018 I18-016

Field ID:	B3KH80
Lab ID:	1809370-2DUP

Sample Matrix: WATER

Prep SOP: PAI 755 Rev 12

Date Collected: 17-Sep-18

Date Prepared: 17-Oct-18

Date Analyzed: 23-Oct-18

Prep Batch: tc181017-2

QCBatchID: tc181017-2-1

Run ID: TC181017-2A

Count Time: 30 minutes

Report Basis: Unfiltered

Final Aliquot: 250 ml

Prep Basis: Unfiltered

Moisture(%): NA

Result Units: pCi/l

File Name: B60_12_102201

CASNO	Analyte	Sample				Duplicate				DER	DER Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
14133-76-7	Tc-99	-1.73E+00 +/- 5.66E+00		9.62E+00	U	2.25E+00 +/- 5.94E+00		9.87E+00	U	0.97	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: TC1809370-1

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 11

Duplicate Sample Results (RPD)

Lab Name: ALS -- Fort Collins

Work Order Number: 1809370

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: AEA, SEPTEMBER 2018 I18-016

Field ID:	B3KH80
Lab ID:	1809370-2DUP

Sample Matrix: WATER

Prep SOP: PAI 755 Rev 12

Date Collected: 17-Sep-18

Date Prepared: 17-Oct-18

Date Analyzed: 23-Oct-18

Prep Batch: tc181017-2

QCBatchID: tc181017-2-1

Run ID: TC181017-2A

Count Time: 30 minutes

Report Basis: Unfiltered

Final Aliquot: 250 ml

Prep Basis: Unfiltered

Moisture(%): NA

Result Units: pCi/l

File Name: B60_12_102201

CASNO	Analyte	Sample				Duplicate				RPD	RPD Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
14133-76-7	Tc-99	-1.73E+00 +/- 5.66E+00		9.62E+00	U	2.25E+00 +/- 5.94E+00		9.87E+00	U	NC	20

Comments:

Qualifiers/Flags:

+ - Duplicate RPD not within limits.

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

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: TC1809370-1

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 11

Sample Results

Lab Name: ALS -- Fort Collins

Work Order Number: 1809370

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: AEA, SEPTEMBER 2018 I18-016

Field ID:	B3KH80
Lab ID:	1809370-2

Sample Matrix: WATER

Prep SOP: PAI 755 Rev 12

Date Collected: 17-Sep-18

Date Prepared: 17-Oct-18

Date Analyzed: 23-Oct-18

Prep Batch: tc181017-2

QCBatchID: tc181017-2-1

Run ID: TC181017-2A

Count Time: 30 minutes

Report Basis: Unfiltered

Final Aliquot: 250 ml

Prep Basis: Unfiltered

Moisture(%): NA

Result Units: pCi/l

File Name: B60_12_102201

Analysis ReqCode: TC99_SEP_LSC

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
14133-76-7	Tc-99	-1.73E+00 +/- 5.66E+00	9.62E+00	2E+01	NA	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Tc-99m	5.290E+03	5.36E+03	Pci	101	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.

LT - Result is less than Requested MDC, greater than sample specific MDC.

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: TC1809370-1

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 11

Sample Duplicate Results

Lab Name: ALS -- Fort Collins

Work Order Number: 1809370

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: AEA, SEPTEMBER 2018 I18-016

Field ID:	B3KH80
Lab ID:	1809370-2DUP

Sample Matrix: WATER

Prep SOP: PAI 755 Rev 12

Date Collected: 17-Sep-18

Date Prepared: 17-Oct-18

Date Analyzed: 23-Oct-18

Prep Batch: tc181017-2

QCBatchID: tc181017-2-1

Run ID: TC181017-2A

Count Time: 30 minutes

Report Basis: Unfiltered

Final Aliquot: 250 ml

Prep Basis: Unfiltered

Moisture(%): NA

Result Units: pCi/l

File Name: B60_12_102201

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
14133-76-7	Tc-99	2.25E+00 +/- 5.94E+00	9.87E+00	2E+01	NA	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Tc-99m	5.290E+03	5.16E+03	Pci	97.6	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.

LT - Result is less than Requested MDC, greater than sample specific MDC.

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: TC1809370-1

Date Printed:

Thursday, October 25, 2018

ALS -- Fort Collins

LIMS Version: 6.883

Page 1 of 1

Prep Batch ID: tc181017-2

Start Date: 10/17/18	End Date: 10/17/18	Concentration Method: NONE	Batch Created By: trs
Start Time: 14:56	End Time: 14:56	Extract Method: PAI 75512	Date Created: 10/17/18
Prep Analyst: Tyler R. Secor		Initial Volume Units: ml	Time Created: 14:56
Comments:		Final Volume Units: ml	Validated By: trs
<div style="border: 1px solid black; height: 30px; width: 100%;"></div>			Date Validated: 10/18/18
			Time Validated: 13:56

QC Batch ID: tc181017-2-1

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
tc181017-2	MB	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1809204
tc181017-2CB1	MB	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1809204
tc181017-2CB2	MB	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1809204
tc181017-2CB3	MB	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1809204
tc181017-2	LCS	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1809204
1809370-2	DUP	B3KH80	WATER	9/17/2018	250	250	NONE	1	1809370
1809204-1	SMP	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1809204
1809204-2	SMP	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1809204
1809269-7	SMP	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1809269
1809370-2	SMP	B3KH80	WATER	9/17/2018	250	250	NONE	1	1809370
1809396-2	SMP	XXXXXX	WATER	XXXXXX	125	125	NONE	1	1809396
1809403-11	SMP	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1809403
1809403-2	SMP	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1809403
1809461-2	SMP	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1809461
1809536-1	SMP	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1809536
1809537-1	SMP	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1809537
1809581-1	SMP	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1809581
1809582-6	SMP	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1809582

QC Types

CAR	Carrier reference sample	DUP	Laboratory Duplicate
LCS	Laboratory Control Sample	LCSD	Laboratory Control Sample Duplicat
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.

CLS 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 Tc99^m 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.

CLS 8/12/09

CLS 8/12/09

Attach vendor label on the right side of page →

CLS 8/12/09

Rx# 670410
 Date Ordered : 17Oct2018
 Date/Time Prepared : 18Oct2018 02:09 MT
ALS LABORATORY GROUP
 225 COMMERCE DR
 FORT COLLINS CO 80524 - 2762
 1 0359 Fort Collins



Patient : Per Physician Order
 Product : Tc-99m **Sodium Pertechnetate Unit Dose mCi (AP)**
 Disp Amt : 0.54 mCi
 Calibration: 18Oct2018 10:00 MT

Not for Human Use For Calibration Use Only
 Indication : **Calibration**
 Dispense Date : 18Oct2018 Lot# : E18291 - 0036 Price(est) : N/A
 Use By : 19Oct2018 02:09 MT Physician : Charles Orchard, RSO NPT :
 Notes NDC : RPh : B.Stoltz

Caution: Federal law prohibits dispensing without a prescription - Rx only All Tc-99m drugs are below 0.15 uCi of Mo-99mCi of Tc-99m m BUII

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 Te99
 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.

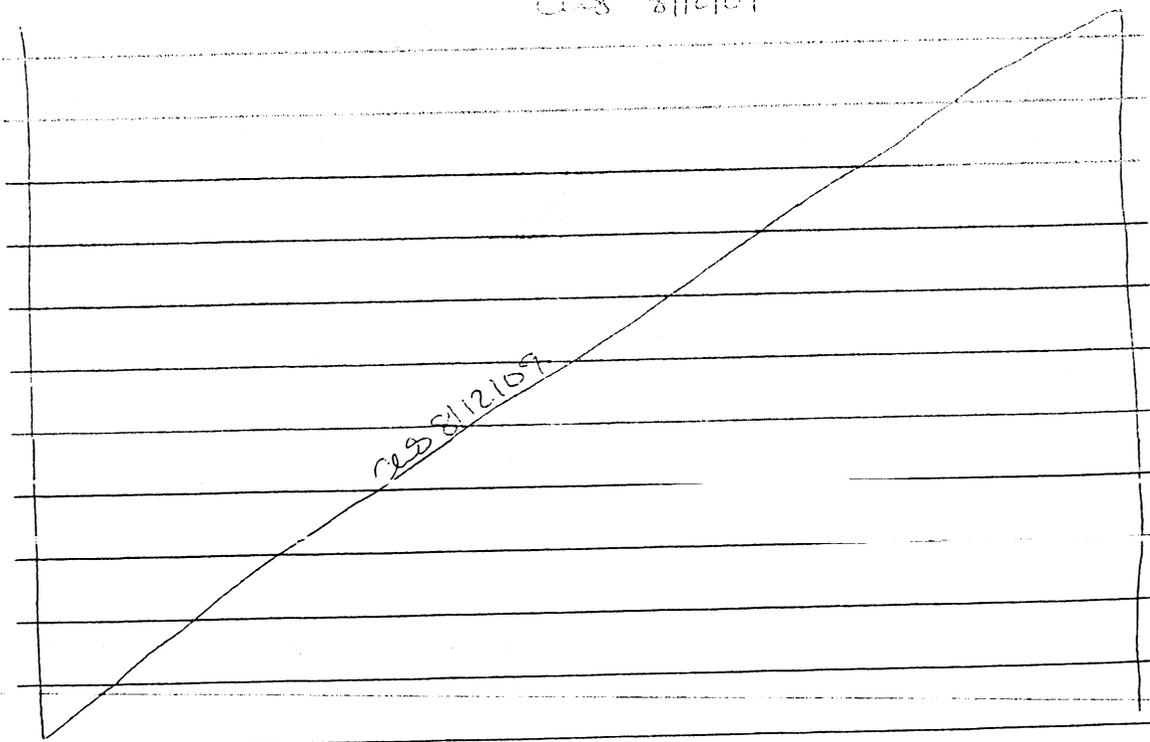
ews 8/12/09

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

ews 8/12/09

ews 8/12/09

ews 8/12/09



TECHNICIAN/ANALYST *Crystal Sheaffer*

DATE 8/12/09

DEPARTMENT MANAGER *[Signature]*

DATE 8/12/09

378635