



Friday, May 17, 2019

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

Re: ALS Workorder: 1904512
Project Name: SURV, April 2019
Project Number: S19-004

Dear Ms. Waters-Husted:

One water sample was received from CH2M HILL Plateau Remediation Company, on 4/25/2019. The sample was scheduled for the following analyses:

Gamma Spectroscopy

Gross Alpha/Beta

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. 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.

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 1904512

Client Name: CH2M HILL Plateau Remediation Company

Client Project Name: SURV, April 2019

Client Project Number: S19-004

Client PO Number: BOA 54854

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
B3NKN8	1904512-1		WATER	23-Apr-19	9:12

CH2MHill Plateau Remediation Company	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST 1904512	C.O.C. # S19-004-014 <small>Page 1 of 1</small>
---	---	--

Collector: Chris Fulton /CHPRC	Contact/Requester: Karen Waters-Husted	Telephone No.: 509-376-4650
SAF No.: S19-004	Sampling Origin: Hanford Site	Purchase Order/Charge Code: 300071
Project Title: SURV, April 2019	Logbook No.: HNF-N-506 -108-57	Ice Chest No.: 605-699
Shipped To (Lab): ALS Environmental Ft. Collins	Method of Shipment Commercial Carrier	Bill of Lading/Air Bill No.: 77505010 1733
Protocol: SURV	Priority: 30 Days	Offsite Property No.: 10941

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
 Low Volume Wells. Do not use for QC.

Sample No.	Filter	*	Date	Time	No/Type Container	Sample Analysis	Holding Time	Preservative
B3NKN8	① N	W	4-23-19	0912	1x1-L P	9310_ALPHABETA_GPC: COMMON	6 Months	HNO3 to pH <2
B3NKN8	↓ N	W	4-23-19	0912	1x1-L G/P	GAMMA_GS: COMMON	6 Months	HNO3 to pH <2
B3NKN8	↓ N	W	4-23-19	0912	1x500-mL G/P	TC99_SEP_LSC: COMMON	6 Months	HNO3 to pH <2

Relinquished By: Chris Fulton /CHPRC <small>Print First and Last Name Signature Date/Time</small> APR 23 2019 11:25	Received By: SSU-1 <small>Print First and Last Name Signature Date/Time</small> APR 23 2019 11:25	Matrix * S = Soil DS = Drum Solids SE = Sediment DL = Drum Liquid SO = Solid T = Tissue SL = Sludge WI = Wipe W = Water L = Liquid O = Oil V = Vegetation A = Air X = Other
Relinquished By: SSU-1 <small>Print First and Last Name Signature Date/Time</small> APR 24 2019 1100	Received By: Lesly Wall /CHPRC <small>Print First and Last Name Signature Date/Time</small> APR 24 2019 1100	
Relinquished By: Lesly Wall /CHPRC <small>Print First and Last Name Signature Date/Time</small> APR 24 2019 1400	Received By: FEDEX <small>Print First and Last Name Signature Date/Time</small>	
Relinquished By: FEDEX <small>Print First and Last Name Signature Date/Time</small>	Received By: Emily Lyons <small>Print First and Last Name Signature Date/Time</small> 04-25-19 1015	
FINAL SAMPLE DISPOSITION Disposal Method (e.g., Return to customer, per lab procedure, used in process):		Disposed By: _____ Date/Time: _____

3-0137

ALS1904512

May 22, 2019

Rev. 0



ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: CHPRC Workorder No: 1904512
Project Manager: KMO Initials: Em Date: 04-25-19

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

Em 4-25-19

* 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: [Signature] 4/24/19

1904512

ORIGIN ID: PSCA (509) 528-9426
LESLEY WALL
CH2M
6267 LATAH ST.
6269 LATAH ST.
RICHLAND, WA 99354
UNITED STATES US

SHIP DATE: 24APR19
ACTWGT: 18.00 LB
CAD: 107068051/NET4100

BILL THIRD PARTY

TO **JULIE ELLINGSON**
ALS GLOBAL
225 COMMERCE DRIVE

10-2

565.1107E5/23AD

FORT COLLINS CO 80524

(970) 490-1511

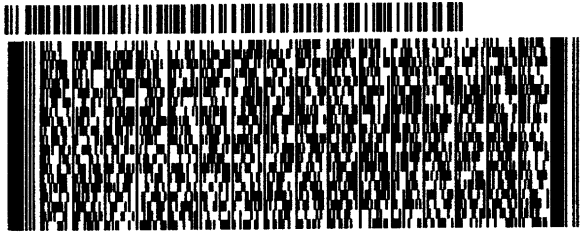
REF: PTR#10941/COOLER#GWS-6

INV:

PO:

DEPT:

Amb.



THU - 25 APR 10:30A
PRIORITY OVERNIGHT

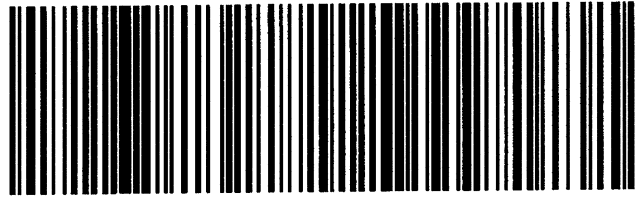
TRK# 7750 5010 1733
0201

DSR

80524

CO-US DEN

XH FTCA



After printing this label:

1. Use the 'Print' button on this page to print your label to your laser or inkjet printer.
2. Fold the printed page along the horizontal line.
3. Place label in shipping pouch and affix it to your shipment so that the barcode portion of the label can be read and scanned.

Warning: Use only the printed original label for shipping. Using a photocopy of this label for shipping purposes is fraudulent and could result in additional billing charges, along with the cancellation of your FedEx account number.

Use of this system constitutes your agreement to the service conditions in the current FedEx Service Guide, available on fedex.com. FedEx will not be responsible for any claim in excess of \$100 per package, whether the result of loss, damage, delay, non-delivery, misdelivery, or misinformation, unless you declare a higher value, pay an additional charge, document your actual loss and file a timely claim. Limitations found in the current FedEx Service Guide apply. Your right to recover from FedEx for any loss, including intrinsic value of the package, loss of sales, income interest, profit, attorney's fees, costs, and other forms of damage whether direct, incidental, consequential, or special is limited to the greater of \$100 or the authorized declared value. Recovery cannot exceed actual documented loss. Maximum for items of extraordinary value is \$1,000, e.g. jewelry, precious metals, negotiable instruments and other items listed in Our ServiceGuide. Written claims must be filed within strict time limits, see current FedEx Service Guide.



Gamma Spectroscopy Case Narrative

CH2M HILL Plateau Remediation Company

SURV, April 2019 – S19-004

Work Order Number: 1904512

1. The sample was prepared according to the current revision of SOP739.
2. The sample was analyzed for the presence of gamma emitting radionuclides according to the current revision of SOP713. The analysis was completed on 05/07/2019.
3. The analysis results for the sample are reported in units of pCi/L. The sample was 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:

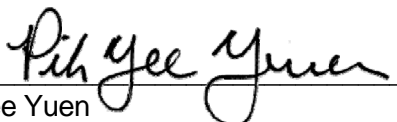
$$RPD = \frac{|S - D|}{(S + D)/2} * 100$$

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. There are cases where the magnitude of negative activity is greater than the 2σ TPU. Under typical conditions, where background data is normally distributed and analyzed by paired observations, this event is likely to occur at least 2.5% of the time. Review of the data does not indicate a problem with the instrument or reporting systems and results are reported without further qualification.
6. No problems were encountered with either the client sample or the associated quality control 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
Radiochemistry Primary Data Reviewer

5/16/19

Date



Radiochemistry Final Data Reviewer

5/17/19

Date

Gamma Spectroscopy Results

PAI 713 Rev 14

Method Blank Results

Lab Name: ALS -- Fort Collins

Work Order Number: 1904512

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: SURV, April 2019 S19-004

Lab ID: GS190426-2AMB	Sample Matrix: WATER	Prep Batch: GS190426-2	Final Aliquot: 1000 ml
Library: FANP.LIB	Prep SOP: PAI 739 Rev 12	QCBatchID: GS190426-2-1	Result Units: pCi/l
	Date Collected: 26-Apr-19	Run ID: GS190426-2A	File Name: 190422d09
	Date Prepared: 26-Apr-19	Count Time: 1000 minutes	
	Date Analyzed: 06-May-19		

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10198-40-0	Co-60	3.14E+00 +/- 2.66E+00	4.21E+00		NA	U
10045-97-3	Cs-137	1.66E-01 +/- 2.52E+00	4.28E+00	1.00E+01	NA	U
14683-23-9	Eu-152	-1.04E+01 +/- 1.45E+01	2.59E+01		NA	U
15585-10-1	Eu-154	-1.02E+01 +/- 1.47E+01	2.60E+01		NA	U
14391-16-3	Eu-155	1.30E+00 +/- 4.33E+00	7.22E+00		NA	U

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TP
 !!
 Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
 Y2 - Chemical Yield outside default limits.
 SQ - Spectral quality prevents accurate quantitation.
 SI - Nuclide identification and/or quantitation is tentative.
 TI - Nuclide identification is tentative.
 R - Nuclide has exceeded 8 half-lives.
 M - Requested MDC not met.
 B - Analyte concentration greater than MDC.
 B3 - Analyte concentration greater than MDC but less than Requested MDC.
 DL - Decision Level

Abbreviations:

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

Data Package ID: GSW1904512-1

Gamma Spectroscopy Results

PAI 713 Rev 14

Laboratory Control Sample(s)

Lab Name: ALS -- Fort Collins
Work Order Number: 1904512
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: SURV, April 2019 S19-004

Lab ID: GS190426-2LCS	Sample Matrix: WATER	Prep Batch: GS190426-2	Final Aliquot: 1000 ml
Library: ANALYTICAL.LI	Prep SOP: PAI 739 Rev 12	QCBatchID: GS190426-2-1	Result Units: pCi/l
	Date Collected: 26-Apr-19	Run ID: GS190426-2A	File Name: 190428d01
	Date Prepared: 26-Apr-19	Count Time: 30 minutes	
	Date Analyzed: 07-May-19		

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
14596-10-2	Am-241	9.88E+04 +/- 1.19E+04	2.62E+03	1.010E+05	97.5	85 - 115	
10198-40-0	Co-60	4.22E+04 +/- 4.96E+03	1.67E+02	4.270E+04	98.9	85 - 115	
10045-97-3	Cs-137	3.80E+04 +/- 4.48E+03	2.47E+02	3.830E+04	99.3	85 - 115	

Comments:

Qualifiers/Flags:
 U - Result is less than the sample specific MDC or less than the associated TP
 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

SQ - Spectral quality prevents accurate quantitation.
 SI - Nuclide identification and/or quantitation is tentative.
 TI - Nuclide identification is tentative.
 R - Nuclide has exceeded 8 halfives.

Data Package ID: GSW1904512-1

Gamma Spectroscopy Results

PAI 713 Rev 14

Duplicate Sample Results (DER)

Lab Name: ALS -- Fort Collins
Work Order Number: 1904512
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: SURV, April 2019 S19-004

Field ID:	B3NKN8
Lab ID:	1904512-1DUP

Library: FANP.LIB

Sample Matrix: WATER
Prep SOP: PAI 739 Rev 12
Date Collected: 23-Apr-19
Date Prepared: 26-Apr-19
Date Analyzed: 07-May-19

Prep Batch: GS190426-2
QCBatchID: GS190426-2-1
Run ID: GS190426-2A
Count Time: 500 minutes
Report Basis: Unfiltered

Final Aliquot: 1000 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: 190964d04

CASNO	Analyte	Sample				Duplicate				DER	DER Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10198-40-0	Co-60	-3.96E+00 +/- 3.65E+00	6.82E+00	U	-1.86E+00 +/- 5.98E+00	1.07E+01	U	0.598	3		
10045-97-3	Cs-137	-5.34E-01 +/- 4.20E+00	7.22E+00	U	-2.13E+00 +/- 4.81E+00	8.44E+00	U	0.5	3		
14683-23-9	Eu-152	1.06E+01 +/- 1.81E+01	3.03E+01	U	-1.05E+01 +/- 2.94E+01	5.27E+01	U	1.22	3		
15585-10-1	Eu-154	1.83E+00 +/- 1.80E+01	3.11E+01	U	-1.18E+01 +/- 2.80E+01	4.99E+01	U	0.819	3		
14391-16-3	Eu-155	3.64E+00 +/- 4.26E+00	6.96E+00	U	6.08E+00 +/- 1.19E+01	1.97E+01	U	0.386	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

- SQ - Spectral quality prevents accurate quantitation.
- SI - Nuclide identification and/or quantitation is tentative.
- TI - Nuclide identification is tentative.
- R - Nuclide has exceeded 8 half-lives.
- G - Sample density differs by more than 15% of LCS density.

Data Package ID: GSW1904512-1

Gamma Spectroscopy Results

PAI 713 Rev 14

Duplicate Sample Results (RPD)

Lab Name: ALS -- Fort Collins
 Work Order Number: 1904512
 Client Name: CH2M HILL Plateau Remediation Company
 ClientProject ID: SURV, April 2019 S19-004

Field ID:	B3NKN8
Lab ID:	1904512-1DUP

Library: FANP.LIB

Sample Matrix: WATER
 Prep SOP: PAI 739 Rev 12
 Date Collected: 23-Apr-19
 Date Prepared: 26-Apr-19
 Date Analyzed: 07-May-19
 Prep Batch: GS190426-2
 QCBatchID: GS190426-2-1
 Run ID: GS190426-2A
 Count Time: 500 minutes
 Report Basis: Unfiltered
 Final Aliquot: 1000 ml
 Prep Basis: Unfiltered
 Moisture(%): NA
 Result Units: pCi/l
 File Name: 190964d04

CASNO	Analyte	Sample				Duplicate				RPD	RPD Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10198-40-0	Co-60	-3.96E+00 +/- 3.65E+00		6.82E+00	U	-1.86E+00 +/- 5.98E+00		1.07E+01	U	NC	20
10045-97-3	Cs-137	-5.34E-01 +/- 4.20E+00		7.22E+00	U	-2.13E+00 +/- 4.81E+00		8.44E+00	U	NC	20
14683-23-9	Eu-152	1.06E+01 +/- 1.81E+01		3.03E+01	U	-1.05E+01 +/- 2.94E+01		5.27E+01	U	NC	20
15585-10-1	Eu-154	1.83E+00 +/- 1.80E+01		3.11E+01	U	-1.18E+01 +/- 2.80E+01		4.99E+01	U	NC	20
14391-16-3	Eu-155	3.64E+00 +/- 4.26E+00		6.96E+00	U	6.08E+00 +/- 1.19E+01		1.97E+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
- SQ - Spectral quality prevents accurate quantitation.
- SI - Nuclide identification and/or quantitation is tentative.
- TI - Nuclide identification is tentative.
- R - Nuclide has exceeded 8 half-lives.
- G - Sample density differs by more than 15% of LCS density.

Data Package ID: GSW1904512-1

Gamma Spectroscopy Results

PAI 713 Rev 14

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1904512
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: SURV, April 2019 S19-004

Field ID:	B3NKN8
Lab ID:	1904512-1

Library: FANP.LIB
Analysis ReqCode: GAMMA_GS: CO

Sample Matrix: WATER
Prep SOP: PAI 739 Rev 12
Date Collected: 23-Apr-19
Date Prepared: 26-Apr-19
Date Analyzed: 06-May-19

Prep Batch: GS190426-2
QCBatchID: GS190426-2-1
Run ID: GS190426-2A
Count Time: 500 minutes
Report Basis: Unfiltered

Final Aliquot: 1000 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: 190508d08

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10198-40-0	Co-60	-3.96E+00 +/- 3.65E+00	6.82E+00		NA	U
10045-97-3	Cs-137	-5.34E-01 +/- 4.20E+00	7.22E+00	1E+01	NA	U
14683-23-9	Eu-152	1.06E+01 +/- 1.81E+01	3.03E+01		NA	U
15585-10-1	Eu-154	1.83E+00 +/- 1.80E+01	3.11E+01		NA	U
14391-16-3	Eu-155	3.64E+00 +/- 4.26E+00	6.96E+00		NA	U

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TP
 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

SQ - Spectral quality prevents accurate quantitation.
 SI - Nuclide identification and/or quantitation is tentative.
 TI - Nuclide identification is tentative.
 R - Nuclide has exceeded 8 halfives.
 G - Sample density differs by more than 15% of LCS density.

Data Package ID: GSW1904512-1

Gamma Spectroscopy Results

PAI 713 Rev 14

Sample Duplicate Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1904512
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: SURV, April 2019 S19-004

Field ID:	B3NKN8
Lab ID:	1904512-1DUP

Library: FANP.LIB

Sample Matrix: WATER
Prep SOP: PAI 739 Rev 12
Date Collected: 23-Apr-19
Date Prepared: 26-Apr-19
Date Analyzed: 07-May-19

Prep Batch: GS190426-2
QCBatchID: GS190426-2-1
Run ID: GS190426-2A
Count Time: 500 minutes
Report Basis: Unfiltered

Final Aliquot: 1000 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: 190964d04

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10198-40-0	Co-60	-1.86E+00 +/- 5.98E+00	1.07E+01		NA	U
10045-97-3	Cs-137	-2.13E+00 +/- 4.81E+00	8.44E+00	1E+01	NA	U
14683-23-9	Eu-152	-1.05E+01 +/- 2.94E+01	5.27E+01		NA	U
15585-10-1	Eu-154	-1.18E+01 +/- 2.80E+01	4.99E+01		NA	U
14391-16-3	Eu-155	6.08E+00 +/- 1.19E+01	1.97E+01		NA	U

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TPU.
 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.

SQ - Spectral quality prevents accurate quantitation.
 SI - Nuclide identification and/or quantitation is tentative.
 TI - Nuclide identification is tentative.
 R - Nuclide has exceeded 8 halfives.
 G - Sample density differs by more than 15% of LCS density.

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: GSW1904512-1

Date Printed:

Wednesday, May 15, 2019

ALS -- Fort Collins

Page 1 of 1

LIMS Version: 6.896

Prep Batch ID: GS190426-2

Start Date: 04/26/19 Start Time: 12:00 Prep Analyst: Steven D. White	End Date: 04/30/19 End Time: 12:00	Concentration Method: NONE Extract Method: PAI 73912 Initial Volume Units: ml Final Volume Units: ml	Batch Created By: sdw Date Created: 04/26/19 Time Created: 13:50 Validated By: sdw Date Validated: 04/26/19 Time Validated: 14:18
---	---	---	--

Comments:

QC Batch ID: GS190426-2-1

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
GS190426-2A	MB	XXXXXX	WATER	XXXXXX	1000	1000	NONE	1	1904512
GS190426-2	LCS	XXXXXX	WATER	XXXXXX	1000	1000	NONE	1	1904512
1904512-1	DUP	B3NKN8	WATER	4/23/2019	1000	1000	NONE	1	1904512
1904512-1	SMP	B3NKN8	WATER	4/23/2019	1000	1000	NONE	1	1904512

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		



Gross Alpha/Beta Case Narrative

CH2M HILL Plateau Remediation Company

SURV, April 2019 – S19-004

Work Order Number: 1904512

1. This sample was prepared according to the current revision of SOP 702.
2. The sample was analyzed for gross alpha and beta activity by gas flow proportional counting according to the current revision of SOP 724. The analysis was completed on 05/01/2019. Gross alpha results are referenced to ²⁴¹Am. Gross beta results are referenced to ⁹⁰Sr/Y.
3. The analysis results for this sample are reported in units of pCi/L. The sample was not filtered prior to analysis.
4. The duplicate of sample 1904510-1 and the matrix spike of sample 1904413-1 are shared for this work order. The duplicate and matrix spike were performed on CH2M HILL Plateau Remediation Company samples. The results can be found in the following report.
5. In accordance with project specific instructions, the evaluation threshold for Relative Percent Difference (RPD) has been set at 20%. RPD is defined as:

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

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

6. 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

5/16/19
Date

Kath M. W.
Radiochemistry Final Data Reviewer

5/17/19
Date

Gross Alpha/Beta by GFPC

PAI 724 Rev 13

Method Blank Results**Lab Name:** ALS -- Fort Collins**Work Order Number:** 1904512**Client Name:** CH2M HILL Plateau Remediation Company**ClientProject ID:** SURV, April 2019 S19-004**Lab ID:** AB190429-2MB**Sample Matrix:** WATER**Prep Batch:** AB190429-2**Final Aliquot:** 200 ml**Prep SOP:** PAI 702 Rev 21**QC Batch ID:** AB190429-2-2**Result Units:** pCi/l**Date Collected:** 29-Apr-19**Run ID:** AB190429-2A**File Name:** ABA0501A**Date Prepared:** 29-Apr-19**Count Time:** 1000 minutes**Date Analyzed:** 01-May-19

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
12587-46-1	GROSS ALPHA	-3.18E-01 +/- 3.88E-01	7.06E-01	3.00E+00	NA	U
12587-47-2	GROSS BETA	-2.64E-01 +/- 6.00E-01	1.01E+00	4.00E+00	NA	U

Comments:**Qualifiers/Flags:**

U - Result is less than the sample specific MDC.

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

Y2 - Chemical Yield outside default limits.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Sample specific Minimum Detectable Concentration

BDL - Below Detection Limit

M - Requested MDC not met.

B - Analyte concentration greater than MDC.

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

DL - Decision Level

Data Package ID: AB1904512-1

Gross Alpha/Beta by GFPC

PAI 724 Rev 13

Laboratory Control Sample(s)

Lab Name: ALS -- Fort Collins
Work Order Number: 1904512
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: SURV, April 2019 S19-004

Lab ID: AB190429-2LCS	Sample Matrix: WATER	Prep Batch: AB190429-2	Final Aliquot: 200 ml
	Prep SOP: PAI 702 Rev 21	QCBatchID: AB190429-2-2	Result Units: pCi/l
	Date Collected: 29-Apr-19	Run ID: AB190429-2A	File Name: ABA0430B
	Date Prepared: 29-Apr-19	Count Time: 30 minutes	
	Date Analyzed: 30-Apr-19		

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
12587-46-1	GROSS ALPHA	2.89E+02 +/- 5.16E+01	6.81E+00	2.330E+02	124	72 - 130	
12587-47-2	GROSS BETA	2.30E+02 +/- 3.95E+01	1.28E+01	2.330E+02	98.6	86 - 115	

Comments:

Qualifiers/Flags:

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

Abbreviations:

- TPU - Total Propagated Uncertainty
- MDC - Minimum Detectable Concentration

Data Package ID: AB1904512-1

Gross Alpha/Beta by GFPC

PAI 724 Rev 13

Matrix Spike Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1904512
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: SURV, April 2019 S19-004

<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Field ID: Shared QC</td> </tr> <tr> <td style="padding: 2px;">Lab ID: 1904413-1MS</td> </tr> </table> <p>Analysis ReqCode: 9310_ALPHABET</p>	Field ID: Shared QC	Lab ID: 1904413-1MS	<p>Sample Matrix: WATER Prep SOP: PAI 702 Rev 21 Date Collected: 18-Apr-19 Date Prepared: 29-Apr-19 Date Analyzed: 30-Apr-19</p>	<p>Prep Batch: AB190429-2 QCBatchID: AB190429-2-2 Run ID: AB190429-2A Count Time: 30 minutes Report Basis: Unfiltered</p>	<p>Final Aliquot: 200 ml Prep Basis: Unfiltered Moisture(%): NA Result Units: pCi/l File Name: ABA0430B</p>
Field ID: Shared QC					
Lab ID: 1904413-1MS					

CASNO	Target Nuclide	Matrix Spike	Sample Results	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
12587-46-1	GROSS ALPHA	2.81E+02	3.01E+00	9.71E+00	2.330E+02	119	72 - 130	
12587-47-2	GROSS BETA	3.65E+02	1.43E+02	1.14E+01	2.330E+02	95.3	86 - 115	

Comments:

Qualifiers/Flags:

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

Abbreviations:

MDC - Sample specific Minimum Detectable Concentration

Data Package ID: AB1904512-1

Gross Alpha/Beta by GFPC

PAI 724 Rev 13

Sample Results**Lab Name:** ALS -- Fort Collins**Work Order Number:** 1904512**Client Name:** CH2M HILL Plateau Remediation Company**ClientProject ID:** SURV, April 2019 S19-004

Field ID:	Shared QC
Lab ID:	1904413-1

Sample Matrix: WATER**Prep Batch:** AB190429-2**Final Aliquot:** 200 ml**Prep SOP:** PAI 702 Rev 21**QC Batch ID:** AB190429-2-2**Prep Basis:** Unfiltered**Date Collected:** 18-Apr-19**Run ID:** AB190429-2A**Moisture(%):** NA**Date Prepared:** 29-Apr-19**Count Time:** 240 minutes**Result Units:** pCi/l**Date Analyzed:** 30-Apr-19**Report Basis:** Unfiltered**File Name:** ABA0430C

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
12587-46-1	GROSS ALPHA	3.01E+00 +/- 1.75E+00	2.81E+00	3E+00	NA	
12587-47-2	GROSS BETA	1.43E+02 +/- 2.31E+01	2.59E+00	4E+00	NA	

Comments:**Qualifiers/Flags:**

U - Result is less than the sample specific MDC.

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

Y2 - Chemical Yield outside default limits.

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

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Sample specific Minimum Detectable Concentration

BDL - Below Detection Limit

DL - Decision Level

Data Package ID: AB1904512-1

Gross Alpha/Beta by GFPC

PAI 724 Rev 13

Duplicate Sample Results (DER)

Lab Name: ALS -- Fort Collins
Work Order Number: 1904512
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: SURV, April 2019 S19-004

Field ID:	Shared QC
Lab ID:	1904510-1DUP

Sample Matrix: WATER
Prep SOP: PAI 702 Rev 21
Date Collected: 24-Apr-19
Date Prepared: 29-Apr-19
Date Analyzed: 30-Apr-19

Prep Batch: AB190429-2
QCBatchID: AB190429-2-2
Run ID: AB190429-2A
Count Time: 240 minutes
Report Basis: Unfiltered

Final Aliquot: 200 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: ABA0430C

CASNO	Analyte	Sample				Duplicate				DER	DER Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
12587-46-1	GROSS ALPHA	3.91E+00 +/- 1.47E+00		1.89E+00		6.06E+00 +/- 1.85E+00		2.01E+00		1.82	3
12587-47-2	GROSS BETA	4.21E+01 +/- 7.07E+00		2.14E+00		4.58E+01 +/- 7.67E+00		2.37E+00		0.709	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: AB1904512-1

Gross Alpha/Beta by GFPC

PAI 724 Rev 13

Duplicate Sample Results (RPD)

Lab Name: ALS -- Fort Collins
 Work Order Number: 1904512
 Client Name: CH2M HILL Plateau Remediation Company
 ClientProject ID: SURV, April 2019 S19-004

Field ID:	Shared QC
Lab ID:	1904510-1DUP

Sample Matrix: WATER
 Prep SOP: PAI 702 Rev 21
 Date Collected: 24-Apr-19
 Date Prepared: 29-Apr-19
 Date Analyzed: 30-Apr-19

Prep Batch: AB190429-2
 QCBatchID: AB190429-2-2
 Run ID: AB190429-2A
 Count Time: 240 minutes
 Report Basis: Unfiltered

Final Aliquot: 200 ml
 Prep Basis: Unfiltered
 Moisture(%): NA
 Result Units: pCi/l
 File Name: ABA0430C

CASNO	Analyte	Sample				Duplicate				RPD	RPD Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
12587-46-1	GROSS ALPHA	3.91E+00 +/-	1.47E+00	1.89E+00		6.06E+00 +/-	1.85E+00	2.01E+00		NC	20
12587-47-2	GROSS BETA	4.21E+01 +/-	7.07E+00	2.14E+00		4.58E+01 +/-	7.67E+00	2.37E+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: AB1904512-1

Gross Alpha/Beta by GFPC

PAI 724 Rev 13

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1904512
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: SURV, April 2019 S19-004

Field ID:	Shared QC
Lab ID:	1904510-1

Sample Matrix: WATER
Prep SOP: PAI 702 Rev 21
Date Collected: 24-Apr-19
Date Prepared: 29-Apr-19
Date Analyzed: 30-Apr-19

Prep Batch: AB190429-2
QC Batch ID: AB190429-2-2
Run ID: AB190429-2A
Count Time: 240 minutes
Report Basis: Unfiltered

Final Aliquot: 200 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: ABA0430C

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
12587-46-1	GROSS ALPHA	3.91E+00 +/- 1.47E+00	1.89E+00	3E+00	NA	
12587-47-2	GROSS BETA	4.21E+01 +/- 7.07E+00	2.14E+00	4E+00	NA	

Comments:

Qualifiers/Flags:

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

Abbreviations:

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

Data Package ID: AB1904512-1

Gross Alpha/Beta by GFPC

PAI 724 Rev 13

Sample Duplicate Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1904512
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: SURV, April 2019 S19-004

Field ID: Shared QC	Sample Matrix: WATER	Prep Batch: AB190429-2	Final Aliquot: 200 ml
Lab ID: 1904510-1DUP	Prep SOP: PAI 702 Rev 21	QCBatchID: AB190429-2-2	Prep Basis: Unfiltered
	Date Collected: 24-Apr-19	Run ID: AB190429-2A	Moisture(%): NA
	Date Prepared: 29-Apr-19	Count Time: 240 minutes	Result Units: pCi/l
	Date Analyzed: 30-Apr-19	Report Basis: Unfiltered	File Name: ABA0430C

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
12587-46-1	GROSS ALPHA	6.06E+00 +/- 1.85E+00	2.01E+00	3E+00	NA	
12587-47-2	GROSS BETA	4.58E+01 +/- 7.67E+00	2.37E+00	4E+00	NA	

Comments:

Qualifiers/Flags:

- U - Result is less than the sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
- Y2 - Chemical Yield outside default limits.
- 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: AB1904512-1

Date Printed:

Wednesday, May 15, 2019

ALS -- Fort Collins

Page 1 of 1

LIMS Version: 6.896

Gross Alpha/Beta by GFPC

PAI 724 Rev 13

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1904512
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: SURV, April 2019 S19-004

Field ID:	B3NKN8
Lab ID:	1904512-1

Sample Matrix: WATER
Prep SOP: PAI 702 Rev 21
Date Collected: 23-Apr-19
Date Prepared: 29-Apr-19
Date Analyzed: 30-Apr-19

Prep Batch: AB190429-2
QC Batch ID: AB190429-2-2
Run ID: AB190429-2A
Count Time: 240 minutes
Report Basis: Unfiltered

Final Aliquot: 200 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: ABA0430C

Analysis ReqCode: 9310_ALPHABET

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
12587-46-1	GROSS ALPHA	1.16E+01 +/- 2.78E+00	2.12E+00	3E+00	NA	
12587-47-2	GROSS BETA	1.14E+01 +/- 2.33E+00	2.17E+00	4E+00	NA	

Comments:

Qualifiers/Flags:

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

Abbreviations:

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

Data Package ID: AB1904512-1



Technetium-99

Case Narrative

CH2M HILL Plateau Remediation Company

SURV, April 2019 – S19-004

Work Order Number: 1904512

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 ⁹⁹Tc according to the current revision of SOP 704. The analysis was completed on 05/14/2019.
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:

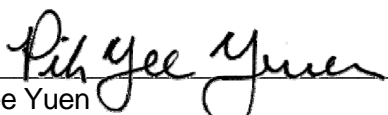
$$RPD = \frac{|S - D|}{(S + D)/2} * 100$$

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

6. 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.
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
Radiochemistry Primary Data Reviewer

5/16/19
Date



Kath M. W.
Radiochemistry Final Data Reviewer

5/17/19
Date

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 12

Method Blank Results

Lab Name: ALS -- Fort Collins

Work Order Number: 1904512

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: SURV, April 2019 S19-004

Lab ID: TC190429-2MB	Sample Matrix: WATER	Prep Batch: TC190429-2	Final Aliquot: 250 ml
	Prep SOP: PAI 755 Rev 12	QCBatchID: TC190429-2-4	Result Units: pCi/l
	Date Collected: 30-Apr-19	Run ID: TC190429-2A	File Name: Z20190514_1101
	Date Prepared: 30-Apr-19	Count Time: 90 minutes	
	Date Analyzed: 14-May-19		

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
14133-76-7	Tc-99	-1.23E+00 +/- 6.17E-01	1.20E+00	2.00E+01	NA	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Tc-99m	3.940E+03	3.58E+03	Pci	90.9	40 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

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

Y2 - Chemical Yield outside default limits.

M - Requested MDC not met.

B - Analyte concentration greater than MDC.

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

DL - Decision Level

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Sample specific Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: TC1904512-1

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 12

Laboratory Control Sample(s)

Lab Name: ALS -- Fort Collins
Work Order Number: 1904512
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: SURV, April 2019 S19-004

Lab ID: TC190429-2LCS	Sample Matrix: WATER	Prep Batch: TC190429-2	Final Aliquot: 250 ml
	Prep SOP: PAI 755 Rev 12	QCBatchID: TC190429-2-4	Result Units: pCi/l
	Date Collected: 30-Apr-19	Run ID: TC190429-2A	File Name: Z20190513_0846
	Date Prepared: 30-Apr-19	Count Time: 30 minutes	
	Date Analyzed: 14-May-19		

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
14133-76-7	Tc-99	8.97E+02 +/- 1.44E+02	2.10E+00	9.110E+02	98.5	75 - 125	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Tc-99m	3.940E+03	3.74E+03	Pci	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.
- 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: TC1904512-1

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 12

Laboratory Control Sample(s)

Lab Name: ALS -- Fort Collins

Work Order Number: 1904512

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: SURV, April 2019 S19-004

Lab ID: TC190429-2LCSD	Sample Matrix: WATER	Prep Batch: TC190429-2	Final Aliquot: 250 ml
	Prep SOP: PAI 755 Rev 12	QCBatchID: TC190429-2-4	Result Units: pCi/l
	Date Collected: 30-Apr-19	Run ID: TC190429-2A	File Name: Z20190513_0846
	Date Prepared: 30-Apr-19	Count Time: 30 minutes	
	Date Analyzed: 14-May-19		

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
14133-76-7	Tc-99	8.81E+02 +/- 1.41E+02	2.18E+00	9.110E+02	96.8	75 - 125	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Tc-99m	3.940E+03	3.60E+03	Pci	91.4	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: TC1904512-1

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 12

Duplicate Sample Results (DER)

Lab Name: ALS -- Fort Collins
Work Order Number: 1904512
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: SURV, April 2019 S19-004

Field ID:	
Lab ID:	TC190429-2LCSD

Sample Matrix: WATER
Prep SOP: PAI 755 Rev 12
Date Collected: 30-Apr-19
Date Prepared: 30-Apr-19
Date Analyzed: 14-May-19

Prep Batch: TC190429-2
QCBatchID: TC190429-2-4
Run ID: TC190429-2A
Count Time: 30 minutes

Final Aliquot: 250 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: Z20190513_0846

CASNO	Analyte	Sample				Duplicate				DER	DER Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
14133-76-7	Tc-99	8.97E+02 +/-	1.44E+02	2.10E+00		8.81E+02 +/-	1.41E+02	2.18E+00		0.154	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: TC1904512-1

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 12

Duplicate Sample Results (RPD)

Lab Name: ALS -- Fort Collins
Work Order Number: 1904512
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: SURV, April 2019 S19-004

Field ID:	
Lab ID:	TC190429-2LCSD

Sample Matrix: WATER
Prep SOP: PAI 755 Rev 12
Date Collected: 30-Apr-19
Date Prepared: 30-Apr-19
Date Analyzed: 14-May-19

Prep Batch: TC190429-2
QCBatchID: TC190429-2-4
Run ID: TC190429-2A
Count Time: 30 minutes

Final Aliquot: 250 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: Z20190513_0846

CASNO	Analyte	Sample				Duplicate				RPD	RPD Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
14133-76-7	Tc-99	8.97E+02 +/-	1.44E+02	2.10E+00		8.81E+02 +/-	1.41E+02	2.18E+00		2.00	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: TC1904512-1

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 12

Sample Results

Lab Name: ALS -- Fort Collins

Work Order Number: 1904512

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: SURV, April 2019 S19-004

Field ID:	B3NKN8
Lab ID:	1904512-1

Sample Matrix: WATER

Prep SOP: PAI 755 Rev 12

Date Collected: 23-Apr-19

Date Prepared: 30-Apr-19

Date Analyzed: 13-May-19

Prep Batch: TC190429-2

QCBatchID: TC190429-2-4

Run ID: TC190429-2A

Count Time: 30 minutes

Report Basis: Unfiltered

Final Aliquot: 250 ml

Prep Basis: Unfiltered

Moisture(%): NA

Result Units: pCi/l

File Name: Z20190513_0846

Analysis ReqCode: TC99_SEP_LSC

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
14133-76-7	Tc-99	4.47E+00 +/- 1.84E+00	2.18E+00	2E+01	NA	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Tc-99m	3.940E+03	3.73E+03	Pci	94.6	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: TC1904512-1

Prep Batch ID: TC190429-2

Start Date: 04/30/19	End Date: 04/30/19	Concentration Method: NONE	Batch Created By: trs
Start Time: 10:13	End Time: 10:13	Extract Method: PAI 75512	Date Created: 04/29/19
Prep Analyst: Tyler R. Secor		Initial Volume Units: ml	Time Created: 10:13
Comments:		Final Volume Units: ml	Validated By: trs
<div style="border: 1px solid black; height: 30px; width: 100%;"></div>			Date Validated: 05/09/19
			Time Validated: 11:09

QC Batch ID: TC190429-2-4

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
TC190429-2	MB	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1904384
TC190429-2CB1	MB	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1904384
TC190429-2CB2	MB	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1904384
TC190429-2CB3	MB	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1904384
TC190429-2	LCS	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1904384
TC190429-2	LCSD	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1904384
1904384-1	SMP	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1904384
1904410-1	SMP	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1904410
1904410-2	SMP	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1904410
1904512-1	SMP	B3NKN8	WATER	4/23/2019	250	250	NONE	1	1904512

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 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.

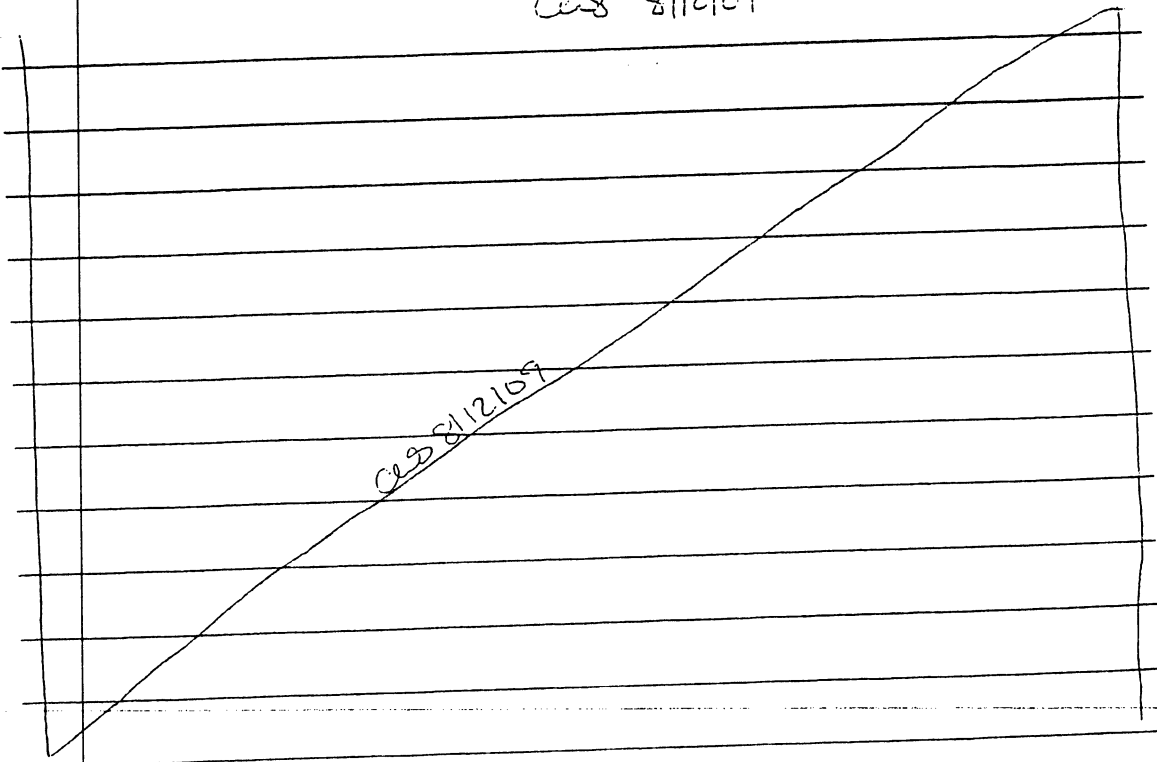
ces 8/12/09

ces 8/12/09

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 Sheefer

DATE 8/12/09

DEPARTMENT MANAGER [Signature]

DATE 8/12/09

378635

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

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


CardinalHealth
 CARDINAL HEALTH 414, LLC
 DENVER
 10400 48TH AVE, STE 8
 DENVER CO 80238
 303.373.0578

Rx# 754017
 Date Ordered : 08May2019
 Date/Time Prepared : 09May2019 00:36 MT
ALS LABORATORY GROUP
 225 COMMERCE DR
 FORT COLLINS CO 80524 - 2762
 1 0359 Fort Collins



Patient : ALS ENVIRONMENTAL
Product : Tc - 99m Sodium Pertechnetate Unit Dose mCi (Ho)
Disp Amt : 0.51 mCi
Calibration : 09May2019 08:00 MT
 Source - Not for Human Use For Calibration Use Only
 Indication : **Point Source mCi**
 Dispense Date : 09May2019 Lot# : E19129-0002 Price (est) : N/A
 Use By : 10May2019 00:36 MT Physician : Charles Orchard, RSO NPT :
 NDC : 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 Shepherd

DATE 8/12/09

DEPARTMENT MANAGER Jeffery Z

DATE 8/12/09

378636

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