



Ft. Collins, Colorado

LIMS Version: 7.004

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Wednesday, February 19, 2020

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

Re: ALS Workorder: 2001346
Project Name: Performance Assessment, January
Project Number: A20-001

Dear Ms. Waters-Husted:

Three water samples were received from CH2M HILL Plateau Remediation Company, on 1/23/2020. The samples were scheduled for the following analyses:

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. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained from ALS Environmental.

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

Sincerely,

ALS Environmental
Katie M. O'Brien
Project Manager

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

| | | |
|---|---|-----------------------------------|
| SAMPLE ISSUE RESOLUTION (SIR) REPORT | | SIR Number: SIR20-0167 |
| | | Rev. Number: 0 |
| | | Date Initiated: 01/27/2020 |
| <u>SAMPLE EVENT INFORMATION</u> | | |
| SAF NUM(S): | A20-001 | |
| LABORATORY: | ALS | |
| <u>SAMPLING INFORMATION</u> | | |
| NUMBER OF SAMPLES: | 1 | |
| SAMPLE NUMBERS: | B3TR63 | |
| SAMPLE MATRIX: | WATER | |
| SDG NUM(S): | ALS2001346 | |
| <u>ISSUE BACKGROUND</u> | | |
| CLASS: | Laboratory Issue | |
| TYPE: | Chain of Custody Issue | |
| DESCRIPTION: | Upon chain of custody data entry for SDG ALS2001346, COC A20-001-015 (Sample #B3TR63), the final "Received By" signature, receipt date, and receipt time are missing. | |
| <u>RESOLUTION</u> | | |
| PROPOSED RESOLUTION: | Document and close. | |
| FINAL RESOLUTION: | Document and close. | |
| SUBMITTED BY: | | |
| GIBSON, GG | _____ | 01/27/2020 _____ |
| ACCEPTED BY: | | |
| HEY, BE | _____ | 01/27/2020 _____ |

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 2001346

Client Name: CH2M HILL Plateau Remediation Company

Client Project Name: Performance Assessment, January

Client Project Number: A20-001

Client PO Number: BOA 54854

| Client Sample Number | Lab Sample Number | COC Number | Matrix | Date Collected | Time Collected |
|----------------------|-------------------|------------|--------|----------------|----------------|
| B3TR59 | 2001346-1 | | WATER | 22-Jan-20 | 7:20 |
| B3TR60 | 2001346-2 | | WATER | 22-Jan-20 | 9:19 |
| B3TR63 | 2001346-3 | | WATER | 21-Jan-20 | 10:43 |

| | | |
|---|---|--------------------------------|
| CH2MHill Plateau Remediation Company | CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST | C.O.C. # A20-001-013 |
| | | Page 1 of 1 |

2001346

| | | |
|---|--|---|
| Collector: Juan Aguilar CHPRC | Contact/Requester: Karen Waters-Husted | Telephone No.: 509-376-4650 |
| SAF No.: A20-001 | Sampling Origin: Hanford Site | Purchase Order/Charge Code: 300071 |
| Project Title: Performance Assessment, Januar | Logbook No.: HNF-N-506 -112189 | Ice Chest No.: GWS-109 |
| Shipped To (Lab): ALS Environmental Ft. Collins | Method of Shipment Commercial Carrier | Bill of Lading/Air Bill No.: 7775 8058 3722 |
| Protocol: Monitoring | Priority: 30 Days | Offsite Property No.: N/A |

| | |
|---|------------------------------------|
| 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 |
|------------|--------|---|-------------|------|-------------------|--------------------------|--------------|--------------|
| B3TR59 | N | | JAN 22 2020 | 0720 | 1x250-mL P | TRITIUM_DIST_LSC: COMMON | 6 Months | None |

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| Relinquished By | Received By | Matrix * |
|--|---|---|
| Print First and Last Name: Juan Aguilar Signature: Date/Time: JAN 22 2020 0935 | Print First and Last Name: Kevin Patterson Signature: Date/Time: JAN 22 2020 0935 | 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 |
| Kevin Patterson Signature: Date/Time: JAN 22 2020 1460 | FEDEX | |
| FEDEX | TYLER MOSSOR | |
| | | |

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

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February 19, 2020

Rev. 0

| | | |
|---|---|--------------------------------|
| CH2MHill Plateau Remediation Company | CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST | C.O.C. # A20-001-014 |
| | | Page 1 of 1 |

2001306

| | | |
|---|--|---|
| Collector: Juan Aguilar CHPRC | Contact/Requester: Karen Waters-Husted | Telephone No.: 509-376-4650 |
| SAF No.: A20-001 | Sampling Origin: Hanford Site | Purchase Order/Charge Code: 300071 |
| Project Title: Performance Assessment, Januar | Logbook No.: HNF-N-506-112189 | Ice Chest No.: GWS-109 |
| Shipped To (Lab): ALS Environmental Ft. Collins | Method of Shipment Commercial Carrier | Bill of Lading/Air Bill No.: 7775 8058 3722 |
| Protocol: Monitoring | Priority: 30 Days | Offsite Property No.: N/A |

| | |
|---|------------------------------------|
| 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 |
|------------|--------|---|-------------|------|-------------------|--------------------------|--------------|--------------|
| B3TR60 | N | W | JAN 22 2020 | 0919 | 1x250-mL P | TRITIUM_DIST_LSC: COMMON | 6 Months | None |

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| Relinquished By | Received By | Matrix * |
|--|---|--|
| Print First and Last Name: Juan Aguilar Signature: Date/Time: JAN 22 2020 0935 | Print First and Last Name: Kevin Patterson Signature: Date/Time: JAN 22 2020 0935 | 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 |
| Juan Aguilar CHPRC Kevin Patterson ICHPRC | Kevin Patterson ICHPRC TYLER MOSSOR | |

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

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2001346

| | | |
|--|---|--|
| Collector: Jeff Tucksen CHPRC | Contact/Requester: Karen Waters-Husted | Telephone No.: 509-376-4650 |
| SAF No.: A20-001 | Sampling Origin: Hanford Site | Purchase Order/Charge Code: 300071 |
| Project Title: Performance Assessment, Januar | Logbook No.: HNF-N-506-111-95 | Ice Chest No.: GWS-109 |
| Shipped To (Lab): ALS Environmental Ft. Collins | Method of Shipment: Commercial Carrier | Bill of Lading/Air Bill No.: 7775 8058 3722 |
| Protocol: Monitoring | Priority: 30 Days | Offsite Property No.: N/A |

| | |
|---|------------------------------------|
| 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 |
|-------------|--------|---|-------------|------|-------------------|----------------------|--------------|---------------|
| B3TR63 3 | N | W | JAN 21 2020 | 1043 | 1x500-mL G/P | TC99_SEP_LSC: COMMON | 6 Months | HNO3 to pH <2 |

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| Relinquished By | | | Received By | | | Matrix * | |
|---------------------------|-----------|------------------|---------------------------|-----------|------------------|---------------|-------------------|
| Print First and Last Name | Signature | Date/Time | Print First and Last Name | Signature | Date/Time | | |
| Jeff Tucksen CHPRC | | JAN 21 2020 1200 | Jeff Lucas CHPRC | | JAN 21 2020 1200 | S = Soil | DS = Drum Solids |
| Jeff Lucas CHPRC | | JAN 21 2020 1210 | SSU-1 | | JAN 21 2020 1210 | SE = Sediment | DL = Drum Liquids |
| SSU-1 | | JAN 22 2020 0700 | Troy Bacon CHPRC | | JAN 22 2020 0700 | SO = Solid | T = Tissue |
| Troy Bacon CHPRC | | JAN 22 2020 1400 | FEDEX | | JAN 22 2020 1430 | SL = Sludge | WI = Wipe |
| FEDEX | | | TYLER MOSSOR | | | 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: |
|---------------------------------|---|--------------|------------|

ALS2001346

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ORIGIN ID: PSCA (509) 528-9426
LESLY WALL
CH2M
6267 LATAH ST.
6289 LATAH ST.
RICHLAND, WA 99354
UNITED STATES US

SHIP DATE: 22 JAN 20
ACTWGT: 67.00 LB
CAD: 107088051/NET4220

BILL THIRD PARTY

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

10-2

FORT COLLINS CO 80524

1.2°C

(970) 490-1511

REF: COOLER# GWS-109/CAQNF300072

INV:
PO:

DEPT:



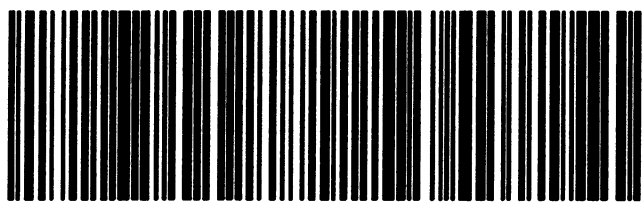
568J2DFR2FE4A

TRK# 7775 8058 3722
0201

THU - 23 JAN 10:30A
PRIORITY OVERNIGHT

XH FTCA

DSR
80524
CO-US DEN



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Technetium-99

Case Narrative

CH2M HILL Plateau Remediation Company

Performance Assessment, January – A20-001

Work Order Number: 2001346

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 02/04/2020.
3. The duplicate of sample 2001343-7 is shared for this work order. The duplicate was performed on a CH2M HILL Plateau Remediation Company sample. The results can be found in the following report.
4. An approximate volume of 15 or 20 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 the sample 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:

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

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

7. No anomalous situations were encountered during the preparation or analysis of 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

2/13/20
Date

Kath M. W.
Radiochemistry Final Data Reviewer

2/19/20
Date

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 12

Method Blank Results

Lab Name: ALS -- Fort Collins

Work Order Number: 2001346

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: Performance Assessment, January A20-001

Lab ID: TC200127-2MB

Sample Matrix: WATER

Prep Batch: TC200127-2

Final Aliquot: 250 ml

Prep SOP: PAI 755 Rev 12

QCBatchID: TC200127-2-1

Result Units: pCi/l

Date Collected: 27-Jan-20

Run ID: TC200127-2A

File Name: Z20200204_0403

Date Prepared: 27-Jan-20

Count Time: 30 minutes

Date Analyzed: 04-Feb-20

| CASNO | Target Nuclide | Result +/- 2 s TPU | MDC | Requested MDC | DL | Lab Qualifier |
|------------|----------------|-----------------------|----------|---------------|----|---------------|
| 14133-76-7 | Tc-99 | 1.21E+00 +/- 1.18E+00 | 1.85E+00 | 2.00E+01 | NA | U |

Chemical Yield Summary

| Carrier/Tracer | Amount Added | Result | Units | Yield | Control Limits | Flag |
|----------------|--------------|----------|-------|-------|----------------|------|
| Tc-99m | 1.160E+04 | 1.10E+04 | Pci | 94.5 | 40 - 110 % | |

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

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

Y2 - Chemical Yield outside default limits.

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: TC2001346-1

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 12

Laboratory Control Sample(s)

Lab Name: ALS -- Fort Collins

Work Order Number: 2001346

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: Performance Assessment, January A20-001

Lab ID: TC200127-2LCS

Sample Matrix: WATER

Prep Batch: TC200127-2

Final Aliquot: 250 ml

Prep SOP: PAI 755 Rev 12

QCBatchID: TC200127-2-1

Result Units: pCi/l

Date Collected: 27-Jan-20

Run ID: TC200127-2A

File Name: Z20200204_0403

Date Prepared: 27-Jan-20

Count Time: 30 minutes

Date Analyzed: 04-Feb-20

| CASNO | Target Nuclide | Results +/- 2s TPU | MDC | Spike Added | % Rec | Control Limits | Lab Qualifier |
|------------|----------------|-----------------------|----------|-------------|-------|----------------|---------------|
| 14133-76-7 | Tc-99 | 9.07E+02 +/- 1.45E+02 | 1.94E+00 | 9.110E+02 | 99.6 | 75 - 125 | |

Chemical Yield Summary

| Carrier/Tracer | Amount Added | Result | Units | Yield | Control Limits | Flag |
|----------------|--------------|----------|-------|-------|----------------|------|
| Tc-99m | 1.160E+04 | 1.05E+04 | Pci | 90.1 | 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: TC2001346-1

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 12

Duplicate Sample Results (DER)

Lab Name: ALS -- Fort Collins

Work Order Number: 2001346

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: Performance Assessment, January A20-001

| | |
|-----------|--------------|
| Field ID: | Shared QC |
| Lab ID: | 2001343-7DUP |

Sample Matrix: WATER

Prep SOP: PAI 755 Rev 12

Date Collected: 22-Jan-20

Date Prepared: 27-Jan-20

Date Analyzed: 04-Feb-20

Prep Batch: TC200127-2

QCBatchID: TC200127-2-1

Run ID: TC200127-2A

Count Time: 30 minutes

Report Basis: Unfiltered

Final Aliquot: 100 ml

Prep Basis: Unfiltered

Moisture(%): NA

Result Units: pCi/l

File Name: Z20200204_0403

| CASNO | Analyte | Sample | | | | Duplicate | | | | DER | DER Lim |
|------------|---------|--------------|----------|----------|-------|--------------|----------|----------|-------|-------|---------|
| | | Result +/- | 2 s TPU | MDC | Flags | Result +/- | 2 s TPU | MDC | Flags | | |
| 14133-76-7 | Tc-99 | 9.18E+03 +/- | 1.46E+03 | 4.76E+00 | | 8.90E+03 +/- | 1.42E+03 | 4.75E+00 | | 0.273 | 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: TC2001346-1

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 12

Duplicate Sample Results (RPD)

Lab Name: ALS -- Fort Collins

Work Order Number: 2001346

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: Performance Assessment, January A20-001

| | |
|-----------|--------------|
| Field ID: | Shared QC |
| Lab ID: | 2001343-7DUP |

Sample Matrix: WATER

Prep SOP: PAI 755 Rev 12

Date Collected: 22-Jan-20

Date Prepared: 27-Jan-20

Date Analyzed: 04-Feb-20

Prep Batch: TC200127-2

QCBatchID: TC200127-2-1

Run ID: TC200127-2A

Count Time: 30 minutes

Report Basis: Unfiltered

Final Aliquot: 100 ml

Prep Basis: Unfiltered

Moisture(%): NA

Result Units: pCi/l

File Name: Z20200204_0403

| CASNO | Analyte | Sample | | | | Duplicate | | | | RPD | RPD Lim |
|------------|---------|--------------|----------|----------|-------|--------------|----------|----------|-------|------|---------|
| | | Result +/- | 2 s TPU | MDC | Flags | Result +/- | 2 s TPU | MDC | Flags | | |
| 14133-76-7 | Tc-99 | 9.18E+03 +/- | 1.46E+03 | 4.76E+00 | | 8.90E+03 +/- | 1.42E+03 | 4.75E+00 | | 3.00 | 20 |

Comments:

Qualifiers/Flags:

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

Abbreviations:

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

Data Package ID: TC2001346-1

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 12

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 2001346
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: Performance Assessment, January A20-001

| | |
|------------------|-----------|
| Field ID: | Shared QC |
| Lab ID: | 2001343-7 |

Sample Matrix: WATER
Prep SOP: PAI 755 Rev 12
Date Collected: 22-Jan-20
Date Prepared: 27-Jan-20
Date Analyzed: 04-Feb-20

Prep Batch: TC200127-2
QCBatchID: TC200127-2-1
Run ID: TC200127-2A
Count Time: 30 minutes
Report Basis: Unfiltered

Final Aliquot: 100 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: Z20200204_0403

| CASNO | Target Nuclide | Result +/- 2 s TPU | MDC | Requested MDC | DL | Lab Qualifier |
|------------|----------------|-----------------------|----------|---------------|----|---------------|
| 14133-76-7 | Tc-99 | 9.18E+03 +/- 1.46E+03 | 4.76E+00 | 2E+01 | NA | |

Chemical Yield Summary

| Carrier/Tracer | Amount Added | Result | Units | Yield | Control Limits | Flag |
|----------------|--------------|----------|-------|-------|----------------|------|
| Tc-99m | 1.160E+04 | 1.06E+04 | Pci | 91.8 | 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: TC2001346-1

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 12

Sample Duplicate Results

Lab Name: ALS -- Fort Collins

Work Order Number: 2001346

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: Performance Assessment, January A20-001

| | | | |
|-----------------------------|----------------------------------|---------------------------------|----------------------------------|
| Field ID: Shared QC | Sample Matrix: WATER | Prep Batch: TC200127-2 | Final Aliquot: 100 ml |
| Lab ID: 2001343-7DUP | Prep SOP: PAI 755 Rev 12 | QCBatchID: TC200127-2-1 | Prep Basis: Unfiltered |
| | Date Collected: 22-Jan-20 | Run ID: TC200127-2A | Moisture(%): NA |
| | Date Prepared: 27-Jan-20 | Count Time: 30 minutes | Result Units: pCi/l |
| | Date Analyzed: 04-Feb-20 | Report Basis: Unfiltered | File Name: Z20200204_0403 |

| CASNO | Target Nuclide | Result +/- 2 s TPU | MDC | Requested MDC | DL | Lab Qualifier |
|------------|----------------|-----------------------|----------|---------------|----|---------------|
| 14133-76-7 | Tc-99 | 8.90E+03 +/- 1.42E+03 | 4.75E+00 | 2E+01 | NA | |

Chemical Yield Summary

| Carrier/Tracer | Amount Added | Result | Units | Yield | Control Limits | Flag |
|----------------|--------------|----------|-------|-------|----------------|------|
| Tc-99m | 1.160E+04 | 1.08E+04 | Pci | 92.7 | 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.
- 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: TC2001346-1

Date Printed:

Wednesday, February 12, 2020

ALS -- Fort Collins

LIMS Version: 7.004

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Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 12

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 2001346
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: Performance Assessment, January A20-001

| | |
|------------------|-----------|
| Field ID: | B3TR63 |
| Lab ID: | 2001346-3 |

Sample Matrix: WATER
Prep SOP: PAI 755 Rev 12
Date Collected: 21-Jan-20
Date Prepared: 27-Jan-20
Date Analyzed: 04-Feb-20

Prep Batch: TC200127-2
QCBatchID: TC200127-2-1
Run ID: TC200127-2A
Count Time: 30 minutes
Report Basis: Unfiltered

Final Aliquot: 100 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: Z20200204_0403

Analysis ReqCode: TC99_SEP_LSC

| CASNO | Target Nuclide | Result +/- 2 s TPU | MDC | Requested MDC | DL | Lab Qualifier |
|------------|----------------|-----------------------|----------|---------------|----|---------------|
| 14133-76-7 | Tc-99 | 2.86E+00 +/- 3.02E+00 | 4.77E+00 | 2E+01 | NA | U |

Chemical Yield Summary

| Carrier/Tracer | Amount Added | Result | Units | Yield | Control Limits | Flag |
|----------------|--------------|----------|-------|-------|----------------|------|
| Tc-99m | 1.160E+04 | 1.08E+04 | Pci | 92.9 | 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.

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: TC2001346-1

Prep Batch ID: TC200127-2

| | | | |
|--------------------------------|--------------------|----------------------------|--------------------------|
| Start Date: 01/27/20 | End Date: 01/27/20 | Concentration Method: NONE | Batch Created By: jcp |
| Start Time: 9:57 | End Time: 9:57 | Extract Method: PAI 75512 | Date Created: 01/27/20 |
| Prep Analyst: John C. Petrovic | | Initial Volume Units: ml | Time Created: 9:58 |
| Comments: | | Final Volume Units: ml | Validated By: jcp |
| | | | Date Validated: 01/28/20 |
| | | | Time Validated: 10:56 |

QC Batch ID: TC200127-2-1

| Lab ID | QC Type | Field ID | Matrix | Date Collected | Initial Wt/Vol | Final Wt/Vol | Cleanup Method | Cleanup DF | Order Number |
|---------------|---------|----------|--------|----------------|----------------|--------------|----------------|------------|--------------|
| TC200127-2 | MB | XXXXXX | WATER | XXXXXX | 250 | 250 | NONE | 1 | 2001343 |
| TC200127-2CB1 | MB | XXXXXX | WATER | XXXXXX | 250 | 250 | NONE | 1 | 2001343 |
| TC200127-2CB2 | MB | XXXXXX | WATER | XXXXXX | 250 | 250 | NONE | 1 | 2001343 |
| TC200127-2CB3 | MB | XXXXXX | WATER | XXXXXX | 250 | 250 | NONE | 1 | 2001343 |
| TC200127-2 | LCS | XXXXXX | WATER | XXXXXX | 250 | 250 | NONE | 1 | 2001343 |
| 2001343-7 | DUP | XXXXXX | WATER | XXXXXX | 100 | 100 | NONE | 1 | 2001343 |
| 2001316-1 | SMP | XXXXXX | WATER | XXXXXX | 100 | 100 | NONE | 1 | 2001316 |
| 2001316-2 | SMP | XXXXXX | WATER | XXXXXX | 100 | 100 | NONE | 1 | 2001316 |
| 2001317-3 | SMP | XXXXXX | WATER | XXXXXX | 100 | 100 | NONE | 1 | 2001317 |
| 2001343-6 | SMP | XXXXXX | WATER | XXXXXX | 100 | 100 | NONE | 1 | 2001343 |
| 2001343-7 | SMP | XXXXXX | WATER | XXXXXX | 100 | 100 | NONE | 1 | 2001343 |
| 2001345-2 | SMP | XXXXXX | WATER | XXXXXX | 100 | 100 | NONE | 1 | 2001345 |
| 2001346-3 | SMP | B3TR63 | WATER | 1/21/2020 | 100 | 100 | NONE | 1 | 2001346 |

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 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.

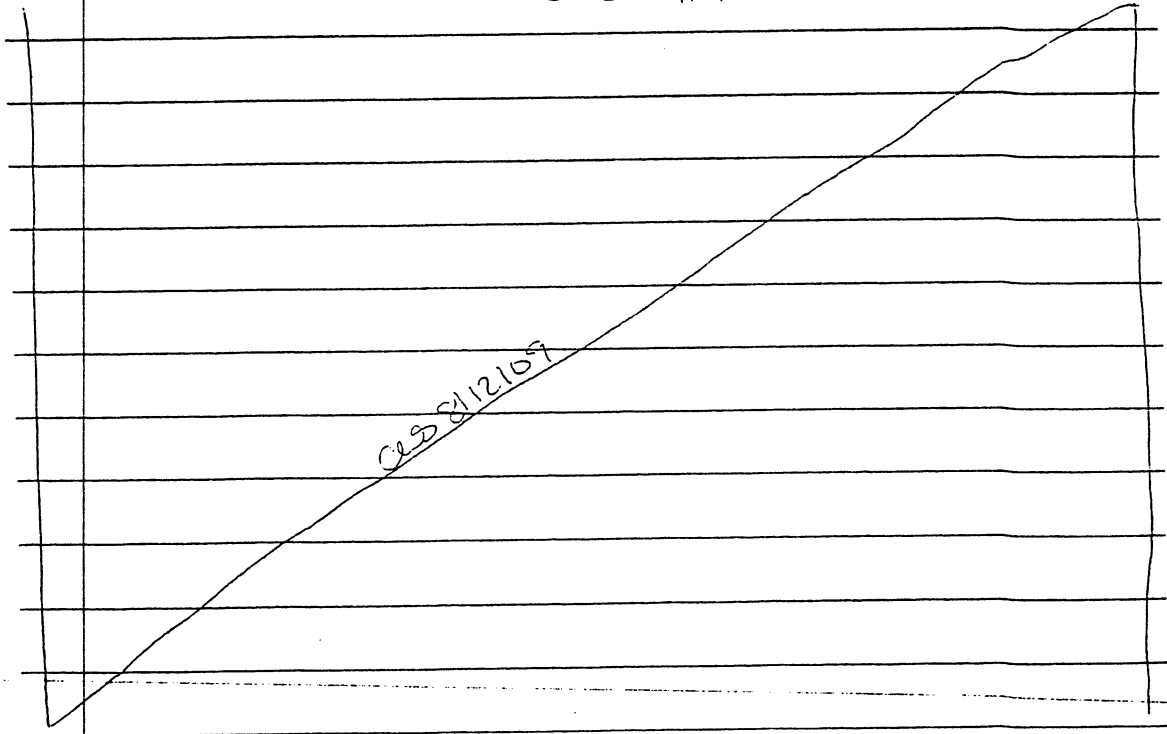
ces 8/12/09

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 Sheeffer

DATE 8/12/09

DEPARTMENT MANAGER [Signature]

DATE 8/12/09

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.

CWS 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.


CWS 8/12/09


CWS 8/12/09

Attach vendor label

Rx# 866965
 Date Ordered : 27Jan2020
 Date/Time Prepared : 28Jan2020 00:15 MT
ALS LABORATORY GROUP
 225 COMMERCE DR
 FORT COLLINS CO 80524-2762
 1 0430 Fort Collins

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

Safetrac 

CAUTION

RADIOACTIVE MATERIALS

Patient : Per Physician Order
 Product : Tc - 99m **Sodium Pertechnetate Unit Dose mCi (Ho)**
 Disp Amt : **0.54 mCi**
 Calibration : **28Jan2020 08:00 MT**
 Source - Not for Human Use For Calibration Use Only
 Indication : **Point Source mCi**
 Dispense Date : **28Jan2020** Lot# : **E20028-0001** Price(est) : **N/A**
 Use By : **29Jan2020 00:15 MT** Physician : **Charles Orchard, RSO** NPT :
 Notes : NDC : RPh : **B. Young**

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 at BUD.

TECHNICIAN/ANALYST Cristal Sheaffer

DATE 8/12/09

DEPARTMENT MANAGER Jeffery

DATE 8/12/09

378636

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



Tritium Case Narrative

CH2M HILL Plateau Remediation Company Performance Assessment, January – A20-001

Work Order Number: 2001346

1. These samples were prepared according to the current revision of SOP 700.
2. The samples were analyzed for the presence of tritium according to the current revision of SOP 704. The analyses were completed on 01/29/2020.
3. The matrix spikes of sample 2001299-1 are shared for this work order. The matrix spikes were performed on a CH2M HILL Plateau Remediation Company sample and the results are acceptable. The results can be found in the following report.
4. The analysis results for these samples are reported in units of pCi/L. The samples were not filtered prior to analysis.
5. In accordance with project specific instructions, the evaluation threshold for Relative Percent Difference (RPD) has been set at 20%. RPD is defined as:

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

Where: S = sample activity result and D = duplicate activity result. RPD is not evaluated for sample/duplicate pairs where the reported activity 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 these samples. All quality control criteria were met.



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

Pik Yee Yuen
Pik Yee Yuen
Radiochemistry Primary Data Reviewer

2/13/20
Date

Kath M. W.
Radiochemistry Final Data Reviewer

2/19/20
Date

Tritium by Liquid Scintillation

PAI 704 Rev 12

Method Blank Results

Lab Name: ALS -- Fort Collins

Work Order Number: 2001346

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: Performance Assessment, January A20-001

Lab ID: 3H200127-1MB

Sample Matrix: WATER

Prep Batch: 3H200127-1

Final Aliquot: 10.0 ml

Prep SOP: PAI 700 Rev 15

QCBatchID: 3H200127-1-1

Result Units: pCi/l

Date Collected: 27-Jan-20

Run ID: 3H200127-1A

File Name: B65_13_012801

Date Prepared: 27-Jan-20

Count Time: 120 minutes

Date Analyzed: 29-Jan-20

| CASNO | Target Nuclide | Result +/- 2 s TPU | MDC | Requested MDC | DL | Lab Qualifier |
|------------|----------------|------------------------|----------|---------------|----|---------------|
| 10028-17-8 | H-3 | -3.74E+01 +/- 1.83E+02 | 3.10E+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: H32001346-1

Tritium by Liquid Scintillation

PAI 704 Rev 12

Laboratory Control Sample(s)

Lab Name: ALS -- Fort Collins

Work Order Number: 2001346

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: Performance Assessment, January A20-001

Lab ID: 3H200127-1LCS

Sample Matrix: WATER

Prep Batch: 3H200127-1

Final Aliquot: 9.84 ml

Prep SOP: PAI 700 Rev 15

QCBatchID: 3H200127-1-1

Result Units: pCi/l

Date Collected: 27-Jan-20

Run ID: 3H200127-1A

File Name: B65_13_012801

Date Prepared: 27-Jan-20

Count Time: 120 minutes

Date Analyzed: 29-Jan-20

| CASNO | Target Nuclide | Results +/- 2s TPU | MDC | Spike Added | % Rec | Control Limits | Lab Qualifier |
|------------|----------------|-----------------------|----------|-------------|-------|----------------|---------------|
| 10028-17-8 | H-3 | 1.63E+04 +/- 2.51E+03 | 3.15E+02 | 1.620E+04 | 101 | 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: H32001346-1

Tritium by Liquid Scintillation

PAI 704 Rev 12

Matrix Spike Results

Lab Name: ALS -- Fort Collins
Work Order Number: 2001346
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: Performance Assessment, January A20-001

| | | | |
|---|----------------------------------|----------------------------------|---------------------------------|
| Field ID: Shared QC | Sample Matrix: WATER | Prep Batch: 3H200127-1 | Final Aliquot: 9.84 ml |
| Lab ID: 2001299-1MS | Prep SOP: PAI 700 Rev 15 | QCBatchID: 3H200127-1-1 | Prep Basis: Unfiltered |
| Analysis ReqCode: TRITIUM_DIST_L | Date Collected: 20-Jan-20 | Run ID: 3H200127-1A | Moisture(%): 100.000 |
| | Date Prepared: 27-Jan-20 | Count Time: 100.6 minutes | Result Units: pCi/l |
| | Date Analyzed: 28-Jan-20 | Report Basis: Unfiltered | File Name: B65_13_012801 |

| CASNO | Target Nuclide | Matrix Spike | Sample Results | MDC | Spike Added | % Rec | Control Limits | Lab Qualifier |
|------------|----------------|--------------|----------------|----------|-------------|-------|----------------|---------------|
| 10028-17-8 | H-3 | 3.95E+04 | 2.46E+04 | 3.45E+02 | 1.620E+04 | 91.3 | 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: H32001346-1

Tritium by Liquid Scintillation

PAI 704 Rev 12

Matrix Spike Results

Lab Name: ALS -- Fort Collins
Work Order Number: 2001346
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: Performance Assessment, January A20-001

| | | | |
|---|----------------------------------|----------------------------------|---------------------------------|
| Field ID: Shared QC | Sample Matrix: WATER | Prep Batch: 3H200127-1 | Final Aliquot: 9.84 ml |
| Lab ID: 2001299-1MSD | Prep SOP: PAI 700 Rev 15 | QCBatchID: 3H200127-1-1 | Prep Basis: Unfiltered |
| Analysis ReqCode: TRITIUM_DIST_L | Date Collected: 20-Jan-20 | Run ID: 3H200127-1A | Moisture(%): 100.000 |
| | Date Prepared: 27-Jan-20 | Count Time: 96.85 minutes | Result Units: pCi/l |
| | Date Analyzed: 29-Jan-20 | Report Basis: Unfiltered | File Name: B65_13_012801 |

| CASNO | Target Nuclide | Matrix Spike | Sample Results | MDC | Spike Added | % Rec | Control Limits | Lab Qualifier |
|------------|----------------|--------------|----------------|----------|-------------|-------|----------------|---------------|
| 10028-17-8 | H-3 | 4.11E+04 | 2.46E+04 | 3.52E+02 | 1.620E+04 | 101 | 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: H32001346-1

Tritium by Liquid Scintillation

PAI 704 Rev 12

Sample Results

Lab Name: ALS -- Fort Collins

Work Order Number: 2001346

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: Performance Assessment, January A20-001

| | |
|------------------|-----------|
| Field ID: | Shared QC |
| Lab ID: | 2001299-1 |

Sample Matrix: WATER

Prep SOP: PAI 700 Rev 15

Date Collected: 20-Jan-20

Date Prepared: 27-Jan-20

Date Analyzed: 28-Jan-20

Prep Batch: 3H200127-1

QCBatchID: 3H200127-1-1

Run ID: 3H200127-1A

Count Time: 120 minutes

Report Basis: Unfiltered

Final Aliquot: 10.0 ml

Prep Basis: Unfiltered

Moisture(%): 100.000

Result Units: pCi/l

File Name: B65_13_012801

| CASNO | Target Nuclide | Result +/- 2 s TPU | MDC | Requested MDC | DL | Lab Qualifier |
|------------|----------------|-----------------------|----------|---------------|----|---------------|
| 10028-17-8 | H-3 | 2.46E+04 +/- 3.78E+03 | 3.10E+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: H32001346-1

Tritium by Liquid Scintillation

PAI 704 Rev 12

Duplicate Sample Results (DER)

Lab Name: ALS -- Fort Collins

Work Order Number: 2001346

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: Performance Assessment, January A20-001

| | |
|-----------|--------------|
| Field ID: | Shared QC |
| Lab ID: | 2001299-1MSD |

Sample Matrix: WATER

Prep SOP: PAI 700 Rev 15

Date Collected: 20-Jan-20

Date Prepared: 27-Jan-20

Date Analyzed: 29-Jan-20

Prep Batch: 3H200127-1

QCBatchID: 3H200127-1-1

Run ID: 3H200127-1A

Count Time: 96.85 minutes

Report Basis: Unfiltered

Final Aliquot: 9.84 ml

Prep Basis: Unfiltered

Moisture(%): 100.000

Result Units: pCi/l

File Name: B65_13_012801

| CASNO | Analyte | Sample | | | | Duplicate | | | | DER | DER Lim |
|------------|---------|--------------|----------|----------|-------|--------------|----------|----------|-------|-------|---------|
| | | Result +/- | 2 s TPU | MDC | Flags | Result +/- | 2 s TPU | MDC | Flags | | |
| 10028-17-8 | H-3 | 3.95E+04 +/- | 6.03E+03 | 3.45E+02 | | 4.11E+04 +/- | 6.27E+03 | 3.52E+02 | | 0.183 | 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: H32001346-1

Tritium by Liquid Scintillation

PAI 704 Rev 12

Duplicate Sample Results (RPD)

Lab Name: ALS -- Fort Collins

Work Order Number: 2001346

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: Performance Assessment, January A20-001

| | |
|-----------|--------------|
| Field ID: | Shared QC |
| Lab ID: | 2001299-1MSD |

Sample Matrix: WATER

Prep SOP: PAI 700 Rev 15

Date Collected: 20-Jan-20

Date Prepared: 27-Jan-20

Date Analyzed: 29-Jan-20

Prep Batch: 3H200127-1

QCBatchID: 3H200127-1-1

Run ID: 3H200127-1A

Count Time: 96.85 minutes

Report Basis: Unfiltered

Final Aliquot: 9.84 ml

Prep Basis: Unfiltered

Moisture(%): 100.000

Result Units: pCi/l

File Name: B65_13_012801

| CASNO | Analyte | Sample | | | | Duplicate | | | | RPD | RPD Lim |
|------------|---------|--------------|----------|----------|-------|--------------|----------|----------|-------|------|---------|
| | | Result +/- | 2 s TPU | MDC | Flags | Result +/- | 2 s TPU | MDC | Flags | | |
| 10028-17-8 | H-3 | 3.95E+04 +/- | 6.03E+03 | 3.45E+02 | | 4.11E+04 +/- | 6.27E+03 | 3.52E+02 | | 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: H32001346-1

Tritium by Liquid Scintillation

PAI 704 Rev 12

Duplicate Sample Results (DER)

Lab Name: ALS -- Fort Collins

Work Order Number: 2001346

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: Performance Assessment, January A20-001

| | |
|-----------|--------------|
| Field ID: | B3TR60 |
| Lab ID: | 2001346-2DUP |

Sample Matrix: WATER

Prep SOP: PAI 700 Rev 15

Date Collected: 22-Jan-20

Date Prepared: 27-Jan-20

Date Analyzed: 29-Jan-20

Prep Batch: 3H200127-1

QCBatchID: 3H200127-1-1

Run ID: 3H200127-1A

Count Time: 120 minutes

Report Basis: Unfiltered

Final Aliquot: 10.0 ml

Prep Basis: Unfiltered

Moisture(%): 100.000

Result Units: pCi/l

File Name: B65_13_012801

| CASNO | Analyte | Sample | | | | Duplicate | | | | DER | DER Lim |
|------------|---------|--------------|----------|----------|-------|--------------|----------|----------|-------|-------|---------|
| | | Result +/- | 2 s TPU | MDC | Flags | Result +/- | 2 s TPU | MDC | Flags | | |
| 10028-17-8 | H-3 | 2.90E+02 +/- | 1.97E+02 | 3.10E+02 | U | 7.48E+01 +/- | 1.87E+02 | 3.10E+02 | U | 0.791 | 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: H32001346-1

Tritium by Liquid Scintillation

PAI 704 Rev 12

Duplicate Sample Results (RPD)

Lab Name: ALS -- Fort Collins

Work Order Number: 2001346

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: Performance Assessment, January A20-001

| | |
|-----------|--------------|
| Field ID: | B3TR60 |
| Lab ID: | 2001346-2DUP |

Sample Matrix: WATER

Prep SOP: PAI 700 Rev 15

Date Collected: 22-Jan-20

Date Prepared: 27-Jan-20

Date Analyzed: 29-Jan-20

Prep Batch: 3H200127-1

QCBatchID: 3H200127-1-1

Run ID: 3H200127-1A

Count Time: 120 minutes

Report Basis: Unfiltered

Final Aliquot: 10.0 ml

Prep Basis: Unfiltered

Moisture(%): 100.000

Result Units: pCi/l

File Name: B65_13_012801

| CASNO | Analyte | Sample | | | | Duplicate | | | | RPD | RPD Lim |
|------------|---------|--------------|----------|----------|-------|--------------|----------|----------|-------|-----|---------|
| | | Result +/- | 2 s TPU | MDC | Flags | Result +/- | 2 s TPU | MDC | Flags | | |
| 10028-17-8 | H-3 | 2.90E+02 +/- | 1.97E+02 | 3.10E+02 | U | 7.48E+01 +/- | 1.87E+02 | 3.10E+02 | 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: H32001346-1

Tritium by Liquid Scintillation

PAI 704 Rev 12

Sample Results

Lab Name: ALS -- Fort Collins

Work Order Number: 2001346

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: Performance Assessment, January A20-001

| | |
|------------------|-----------|
| Field ID: | B3TR59 |
| Lab ID: | 2001346-1 |

Sample Matrix: WATER

Prep SOP: PAI 700 Rev 15

Date Collected: 22-Jan-20

Date Prepared: 27-Jan-20

Date Analyzed: 29-Jan-20

Prep Batch: 3H200127-1

QCBatchID: 3H200127-1-1

Run ID: 3H200127-1A

Count Time: 120 minutes

Report Basis: Unfiltered

Final Aliquot: 10.0 ml

Prep Basis: Unfiltered

Moisture(%): 100.000

Result Units: pCi/l

File Name: B65_13_012801

Analysis ReqCode: TRITIUM_DIST_L

| CASNO | Target Nuclide | Result +/- 2 s TPU | MDC | Requested MDC | DL | Lab Qualifier |
|------------|----------------|------------------------|----------|---------------|----|---------------|
| 10028-17-8 | H-3 | -1.56E+01 +/- 1.84E+02 | 3.10E+02 | 4E+02 | NA | U |

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

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

Y2 - Chemical Yield outside default limits.

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

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Sample specific Minimum Detectable Concentration

BDL - Below Detection Limit

DL - Decision Level

Data Package ID: H32001346-1

Tritium by Liquid Scintillation

PAI 704 Rev 12

Sample Results

Lab Name: ALS -- Fort Collins

Work Order Number: 2001346

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: Performance Assessment, January A20-001

| | |
|------------------|-----------|
| Field ID: | B3TR60 |
| Lab ID: | 2001346-2 |

Sample Matrix: WATER

Prep SOP: PAI 700 Rev 15

Date Collected: 22-Jan-20

Date Prepared: 27-Jan-20

Date Analyzed: 29-Jan-20

Prep Batch: 3H200127-1

QCBatchID: 3H200127-1-1

Run ID: 3H200127-1A

Count Time: 120 minutes

Report Basis: Unfiltered

Final Aliquot: 10.0 ml

Prep Basis: Unfiltered

Moisture(%): 100.000

Result Units: pCi/l

File Name: B65_13_012801

Analysis ReqCode: TRITIUM_DIST_L

| CASNO | Target Nuclide | Result +/- 2 s TPU | MDC | Requested MDC | DL | Lab Qualifier |
|------------|----------------|-----------------------|----------|---------------|----|---------------|
| 10028-17-8 | H-3 | 2.90E+02 +/- 1.97E+02 | 3.10E+02 | 4E+02 | NA | U |

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

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

Y2 - Chemical Yield outside default limits.

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

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Sample specific Minimum Detectable Concentration

BDL - Below Detection Limit

DL - Decision Level

Data Package ID: H32001346-1

Tritium by Liquid Scintillation

PAI 704 Rev 12

Sample Duplicate Results

Lab Name: ALS -- Fort Collins

Work Order Number: 2001346

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: Performance Assessment, January A20-001

| | | | |
|-----------------------------|----------------------------------|---------------------------------|---------------------------------|
| Field ID: B3TR60 | Sample Matrix: WATER | Prep Batch: 3H200127-1 | Final Aliquot: 10.0 ml |
| Lab ID: 2001346-2DUP | Prep SOP: PAI 700 Rev 15 | QCBatchID: 3H200127-1-1 | Prep Basis: Unfiltered |
| | Date Collected: 22-Jan-20 | Run ID: 3H200127-1A | Moisture(%): 100.000 |
| | Date Prepared: 27-Jan-20 | Count Time: 120 minutes | Result Units: pCi/l |
| | Date Analyzed: 29-Jan-20 | Report Basis: Unfiltered | File Name: B65_13_012801 |

| CASNO | Target Nuclide | Result +/- 2 s TPU | MDC | Requested MDC | DL | Lab Qualifier |
|------------|----------------|-----------------------|----------|---------------|----|---------------|
| 10028-17-8 | H-3 | 7.48E+01 +/- 1.87E+02 | 3.10E+02 | 4E+02 | NA | U |

Comments:

Qualifiers/Flags:

- U - Result is less than the sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
- Y2 - Chemical Yield outside default limits.
- 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: H32001346-1

Date Printed:

Wednesday, February 12, 2020

ALS -- Fort Collins

Page 1 of 1

LIMS Version: 7.004

Prep Batch ID: 3H200127-1

| | | | |
|----------------------------------|--------------------|----------------------------|--------------------------|
| Start Date: 01/27/20 | End Date: 01/27/20 | Concentration Method: NONE | Batch Created By: rgs |
| Start Time: 6:56 | End Time: 6:56 | Extract Method: PAI 70015 | Date Created: 01/27/20 |
| Prep Analyst: Reilly G. Stockton | | Initial Volume Units: ml | Time Created: 6:56 |
| Comments: | | Final Volume Units: ml | Validated By: rgs |
| | | | Date Validated: 01/28/20 |
| | | | Time Validated: 8:07 |

QC Batch ID: 3H200127-1-1

| Lab ID | QC Type | Field ID | Matrix | Date Collected | Initial Wt/Vol | Final Wt/Vol | Cleanup Method | Cleanup DF | Order Number |
|---------------|---------|----------|--------|----------------|----------------|--------------|----------------|------------|--------------|
| 3H200127-1 | MB | XXXXXX | WATER | XXXXXX | 30 | 10 | NONE | 1 | 2001294 |
| 3H200127-1CB1 | MB | XXXXXX | WATER | XXXXXX | 30 | 10 | NONE | 1 | 2001294 |
| 3H200127-1CB2 | MB | XXXXXX | WATER | XXXXXX | 30 | 10 | NONE | 1 | 2001294 |
| 3H200127-1CB3 | MB | XXXXXX | WATER | XXXXXX | 30 | 10 | NONE | 1 | 2001294 |
| 3H200127-1 | LCS | XXXXXX | WATER | XXXXXX | 30 | 9.8361 | NONE | 1 | 2001294 |
| 2001299-1 | MS | XXXXXX | WATER | XXXXXX | 30 | 9.8361 | NONE | 1 | 2001299 |
| 2001299-1 | MSD | XXXXXX | WATER | XXXXXX | 30 | 9.8361 | NONE | 1 | 2001299 |
| 2001346-2 | DUP | B3TR60 | WATER | 1/22/2020 | 30 | 10 | NONE | 1 | 2001346 |
| 2001294-5 | SMP | XXXXXX | WATER | XXXXXX | 30 | 10 | NONE | 1 | 2001294 |
| 2001294-6 | SMP | XXXXXX | WATER | XXXXXX | 30 | 10 | NONE | 1 | 2001294 |
| 2001295-1 | SMP | XXXXXX | WATER | XXXXXX | 30 | 10 | NONE | 1 | 2001295 |
| 2001299-1 | SMP | XXXXXX | WATER | XXXXXX | 30 | 10 | NONE | 1 | 2001299 |
| 2001316-2 | SMP | XXXXXX | WATER | XXXXXX | 30 | 10 | NONE | 1 | 2001316 |
| 2001345-1 | SMP | XXXXXX | WATER | XXXXXX | 30 | 10 | NONE | 1 | 2001345 |
| 2001346-1 | SMP | B3TR59 | WATER | 1/22/2020 | 30 | 10 | NONE | 1 | 2001346 |
| 2001346-2 | SMP | B3TR60 | WATER | 1/22/2020 | 30 | 10 | NONE | 1 | 2001346 |

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 |