

October 20, 2015

Analytical Data Package Prepared For
CH2M Hill Plateau Remediation

Radiochemical Analysis By
TestAmerica Inc

2800 G.W. Way, Richland Wa, 99354, (509)-375-3131.

Assigned Laboratory Code: TARL
Data Package Contains 14 Pages

Report No.: 67405

Results in this report relate only to the sample(s) analyzed.

SDG No.	Order No.	Client Sample ID (List Order)	Lot-Sa No.	Work Order	Report DB ID	Batch No.
W07265	X16-001	B32TX7	J5J060411-1	M7N941AA	9M7N9410	5280026



Certificate of Analysis

CH2M Hill Plateau Remediation Company
P.O. Box 1600
Mail Stop – R3-60
Richland, WA 99352

October 20, 2015

Attention: Scot Fitzgerald

SAF Number	:	X16-001
Date SDG Closed	:	October 5, 2015
Number of Samples	:	One (1)
Sample Type	:	Water
SDG Number	:	W07265
Data Deliverable	:	15-Day / Summary

CASE NARRATIVE

I. Introduction

On October 5, 2015, one sample was received at TestAmerica (TARL). Upon receipt, the sample was assigned laboratory ID numbers to correspond with the CH2M specific IDs.

II. Sample Receipt

The sample was received in good condition and no anomalies were noted during check-in.

III. Analytical Results/Methodology

The analytical results for this report are presented by laboratory sample ID. Each set of data includes sample identification information, analytical results and the appropriate associated statistical errors.

The requested analyses were:

Liquid Scintillation Counting
Tritium by method RL-LSC-005

CH2M Hill Plateau Remediation Company
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IV. Quality Control

The analytical results for each analysis performed includes a minimum of one laboratory control sample (LCS), one method (reagent) blank, and one duplicate sample analysis. Any exceptions have been noted in the "Comments" section.

QC and sample results are reported in the same units.

V. Comments

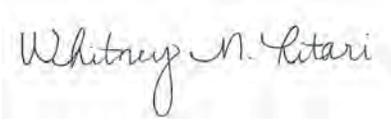
Liquid Scintillation Counting

Tritium by method RL-LSC-005:

The Matrix Spike in batch 5280026 exceeds acceptance criteria due to sample results show activity greater than five times the expected spike value. No other analytical or quality issues were noted. The sample results and associated batch QC results are within contractual requirements.

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.

Reviewed and approved:



Whitney Ritari
Project Manager

Digitally signed by Whitney
Ritari
Date: 2015.10.20 16:39:22
-07'00'

Drinking Water Method Cross References

DRINKING WATER ASTM METHOD CROSS REFERENCES		
Referenced Method	Isotope(s)	TestAmerica Richland's SOP No.
EPA 901.1	Cs-134, I-131	RL-GAM-001
EPA 900.0	Alpha & Beta	RL-GPC-001
EPA 00-02	Gross Alpha (Coprecipitation)	RL-GPC-002
EPA 903.0	Total Alpha Radium (Ra-226)	RL-RA-002
EPA 903.1	Ra-226	RL-RA-001
EPA 904.0	Ra-228	RL-RA-001
EPA 905.0	Sr-89/90	RL-GPC-003
ASTM D5174	Uranium	RL-KPA-003
EPA 906.0	Tritium	RL-LSC-005

Results in this report relate only to the sample(s) analyzed.

Uncertainty Estimation

TestAmerica Richland has adopted the internationally accepted approach to estimating uncertainties described in "NIST Technical Note 1297, 1994 Edition". The approach, "Law of Propagation of Errors", involves the identification of all variables in an analytical method which are used to derive a result. These variables are related to the analytical result (R) by some functional relationship, $R = \text{constants} * f(x,y,z,\dots)$. The components (x,y,z) are evaluated to determine their contribution to the overall method uncertainty. The individual component uncertainties (u_i) are then combined using a statistical model that provides the most probable overall uncertainty value. All component uncertainties are categorized as type A, evaluated by statistical methods, or type B, evaluated by other means. Uncertainties not included in the components, such as sample homogeneity, are combined with the component uncertainty as the square root of the sum-of-the-squares of the individual uncertainties. The uncertainty associated with the derived result is the combined uncertainty (u_c) multiplied by the coverage factor (1,2, or 3).

When three or more sample replicates are used to derive the analytical result, the type A uncertainty is the standard deviation of the mean value (S/\sqrt{n}), where S is the standard deviation of the derived results. The type B uncertainties are all other random or non-random components that are not included in the standard deviation.

The derivation of the general "Law of Propagation of Errors" equations and specific example are available on request.

Report Definitions

Action Lev	An agreed upon activity level used to trigger some action when the final result is greater than or equal to the Action Level. Often the Action Level is related to the Decision Limit.
Batch	The QC preparation batch number that relates laboratory samples to QC samples that were prepared and analyzed together.
Bias	Defined by the equation (Result/Expected)-1 as defined by ANSI N13.30.
COC No	Chain of Custody Number assigned by the Client or TestAmerica.
Count Error (#s)	Poisson counting statistics of the gross sample count and background. The uncertainty is absolute and in the same units as the result. For Liquid Scintillation Counting (LSC) the batch blank count is the background.
CSU (#s) <i>u_c Combined Standard Uncert.</i>	All known uncertainties associated with the preparation and analysis of the sample are propagated to give a measure of the uncertainty associated with the result, <i>u_c the combined standard uncertainty</i> . The uncertainty is absolute and in the same units as the result.
(#s), Coverage Factor	The coverage factor defines the width of the confidence interval, 1, 2 or 3 standard deviations.
CRDL (RL)	Contractual Required Detection Limit as defined in the Client's Statement Of Work or TestAmerica "default" nominal detection limit. Often referred to the reporting level (RL)
Lc	Decision Level based on instrument background or blank, adjusted by the Efficiency, Chemical Yield, and Volume associated with the sample. The Type I error probability is approximately 5%. $Lc = (1.645 * \sqrt{2 * (BkgrndCnt / BkgrndCntMin) / SCntMin}) * (ConvFct / (Eff * Yld * Abn * Vol) * IngrFct)$. For LSC methods the batch blank is used as a measure of the background variability. Lc cannot be calculated when the background count is zero.
Lot-Sample No	The number assigned by the LIMS software to track samples received on the same day for a given client. The sample number is a sequential number assigned to each sample in the Lot.
MDC MDA	Detection Level based on instrument background or blank, adjusted by the Efficiency, Chemical Yield, and Volume with a Type I and II error probability of approximately 5%. $MDC = (4.65 * \sqrt{(BkgrndCnt / BkgrndCntMin) / SCntMin} + 2.71 / SCntMin) * (ConvFct / (Eff * Yld * Abn * Vol) * IngrFct)$. For LSC methods the batch blank is used as a measure of the background variability.
Primary Detector	The instrument identifier associated with the analysis of the sample aliquot.
Ratio U-234/U-238	The U-234 result divided by the U-238 result. The U-234/U-238 ratio for natural uranium in NIST SRM 4321C is 1.038.
Rst/MDC	Ratio of the Result to the MDC. A value greater than 1 may indicate activity above background at a high level of confidence. Caution should be used when applying this factor and it should be used in concert with the qualifiers associated with the result.
Rst/TotUcert	Ratio of the Result to the Total Uncertainty. If the uncertainty has a coverage factor of 2 a value greater than 1 may indicate activity above background at approximately the 95% level of confidence assuming a two-sided confidence interval. Caution should be used when applying this factor and it should be used in concert with the qualifiers associated with the result.
Report DB No	Sample Identifier used by the report system. The number is based upon the first five digits of the Work Order Number.
RER	The equation Replicate Error Ratio = $(S - D) / [\sqrt{TPUs^2 + TPUD^2}]$ as defined by ICPT BOA where S is the original sample result, D is the result of the duplicate, TPUs is the total uncertainty of the original sample and TPUD is the total uncertainty of the duplicate sample.
SDG	Sample Delivery Group Number assigned by the Client or assigned by TestAmerica upon sample receipt.
Sum Rpt Alpha Spec Rst(s)	The sum of the reported alpha spec results for tests derived from the same sample excluding duplicate result where the results are in the same units.
Work Order	The LIMS software assign test specific identifier.
Yield	The recovery of the tracer added to the sample such as Pu-242 used to trace a Pu-239/40 method.

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CH2M Hill Plateau Remediation Company		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST		C.O.C.# X16-001-137	
Collector K.C. Patterson/CHPRC		Contact/Requester Karen Waters-Husted		Telephone No. 509-376-4650	
SAF No. X16-001		Sampling Origin Hanford Site		Purchase Order/Charge Code 303271	
Project Title 100-BC-5 RI, OCTOBER 2015		Logbook No. HNF-N-506 77/64		Ice Chest No. N/A	
Shipped To (Lab) TestAmerica Incorporated, Richland		Method of Shipment GOVERNMENT VEHICLE		Bill of Lading/Air Bill No. N/A	
Protocol CERCLA		Priority: 15 Days		Offsite Property No. N/A	
POSSIBLE SAMPLE HAZARDS/REMARKS *** 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 438.1		SPECIAL INSTRUCTIONS Hold Time Submit deliverables & invoices to ACP Sample Management		Total Activity Exemption: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
Sample No. B32TX7	Filter N	Date 10/05/2015	Time 1017	No/Type Container 1x1-L P	Holding Time 6 Months
Sample Analysis 906.0_Tritium_LSC: COMMON			Sample ID M7N94		Preservative None



J5J 060411
 SD5# 6007258
 77-101715 W07265

Relinquished By K.C. Patterson/CHPRC	Print	Sign	Date/Time OCT 05 2015 1030	Received By F.M. HALL/CHPRC	Print	Sign	Date/Time OCT 05 2015 1030	Matrix*
Relinquished By F.M. Hall/CHPRC	Print	Sign	Date/Time OCT 05 2015 1400	Received By J. Friesz, TARL	Print	Sign	Date/Time OCT 05 2015 1400	S = Soil SE = Sediment SO = Solid SL = Sludge W = Water O = Oil A = Air
Relinquished By Red 1	Print	Sign	Date/Time	Received By	Print	Sign	Date/Time	DS = Drum Solids DL = Drum Liquids T = Tissue WI = Wipe L = Liquid V = Vegetation X = Other
Relinquished By	Print	Sign	Date/Time	Received By	Print	Sign	Date/Time	
FINAL SAMPLE DISPOSITION		Disposal Method (e.g., Return to customer, per lab procedure, used in process)			Disposed By		Date/Time	

Date Time Received: 10/5/15 1400 Container GM Screen Result: (Airlock) 8 cpm Initials [J]
 Sample GM Screen Result (Sample Receiving) 8 cpm Initials [J]
 Client: PCW SDG #: 6007258 WO 7265 SAF #: X16-001 NA []
 Lot Number: J5J060411 JF-107115
 Chain of Custody # X16-001-137

Shipping Container ID or Air Bill Number : _____ NA []

Samples received inside shipping container cooler box Yes [] Continue with 1 through 4. Initial appropriate response.
No [] Go to 5, add comment to #16.

- 1. Custody Seals on shipping container intact? Yes [] No [] No Custody Seal []
- 2. Custody Seals dated and signed? Yes [] No [] No Custody Seal []
- 3. Cooler temperature: 8.4 °C NA []
- 4. Vermiculite packing materials is NA [] Wet [] Dry []

Item 5 through 16 for samples. Initial appropriate response.

- 5. Chain of Custody record present? Yes [] No []
- 6. Number of samples received (Each sample may contain multiple bottles): 1
- 7. Containers received: 1 xlp

- 8. Sample holding times exceeded? NA [] Yes [] No []
- 9. Samples have: _____ tape _____ hazard labels custody seals appropriate sample labels
- 10. Matrix: _____ A (FLT, Wipe, Solid, Soil) (Water) _____ S (Air, Niosh 7400) _____ T (Biological, Ni-63)

- 11. Samples: _____ are in good condition _____ are leaking _____ are broken
 _____ have air bubbles (Only for samples requiring no head space) _____ Other _____

- 12. Sample pH appropriate for analysis requested Yes [] No [] NA []
 (If acidification is necessary go to pH area & document sample ID, initial pH, amount of HNO₃ added and pH after addition on table)

- 13. Were any anomalies identified in sample receipt? Yes [] No []

- 14. Description of anomalies (include sample numbers): NA [] _____

- 15. Sample Location, Sample Collector Listed on COC? * Yes [] No []
 *For documentation only. No corrective action needed.

- 16. Additional Information: N/A

[] Client Courier denied temperature check. [] Client Courier unpack cooler.

Sample Check-in List completed by Sample Custodian:
Signature: [Signature] Date: 10/5/15

Client Notification needed? Yes [] No [] Date: _____
By: _____
Person contacted: _____

[] No action necessary; process as is
Project Manager: [Signature] Date: 10-7-15

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Sample Results Summary

Date: 20-Oct-15

TestAmerica Inc TARL

Ordered by Method, Batch No., Client Sample ID.

Report No. : 67405

SDG No: W07264

Batch	Client Id Work Order	Parameter	Result +- CSU (2 s)	Qual	Units	Tracer Yield	MDL	CRDL	RPD
5280026	906.0_H3_LSC								
	B32N98 DUP								
	M7N9Q1AF H-3		9.72E+03 +- 4.7E+02		pCi/L	100%	3.27E+02	4.00E+02	2.5
	B32TX7								
	M7N941AA H-3		6.73E+03 +- 3.8E+02		pCi/L	100%	3.29E+02	4.00E+02	
	No. of Results:	2							

TestAmerica Inc RPD - Relative Percent Difference.

rptTALRchSaSum
mary2 V5.4.1
A2002

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QC Results Summary
TestAmerica Inc TARL
Ordered by Method, Batch No, QC Type,.

Date: 20-Oct-15

Report No. : 67405

SDG No.: W07264

Batch	Work Order	Parameter	Result +- CSU (2 s)	Qual	Units	Tracer Yield	LCS Recovery	Bias	MDL
906.0_H3_LSC									
5280026	MATRIX SPIKE, B32N98								
	M7N9Q1AE	H-3	2.54E+03 +- 7.6E+02		pCi/L	100%	169%	0.7	3.91E+02
5280026	LCS,								
	M7PKF1AC	H-3	3.02E+03 +- 2.7E+02		pCi/L	100%	109%	0.1	3.49E+02
TRITIUM_DIST_LSC									
5285027	BLANK QC,								
	M7PKF2AA	H-3	1.66E+02 +- 1.6E+02	U	pCi/L	100%			3.54E+02
No. of Results: 3									

FORM II

Date: 20-Oct-15

DUPLICATE RESULTS

Lab Name: TestAmerica Inc
 Lot-Sample No.: J5J060407-1
 Client Sample ID: B32N98 DUP

SDG: W07264
 Report No.: 67405
 COC No.: S16-010-284

Collection Date: 10/5/2015 12:48:00 PM
 Received Date: 10/5/2015 2:00:00 PM
 Matrix: WATER

Parameter	Result, Orig Rst	Qual	Count Error (2 s)	CSU (2 s)	MDL, Action Lev	Rpt Unit, CRDL	Yield	Rst/MDL, Rst/TotUcert	Analysis, Prep Date	Total Sa Size	Aliquot Size	Primary Detector
Batch: 5280026	906.0_H3_LSC											
	H-3	9.72E+03	3.6E+02	4.7E+02	3.27E+02	pCi/L	100%	(29.7)	10/10/15 05:46 a		0.00501	LSC4
		9.96E+03	RPD 2.5		4.00E+02		(41.1)		Orig Sa DB ID: 9M7N9Q10		L	

No. of Results: 1 Comments:

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FORM II

Date: 20-Oct-15

BLANK RESULTS

Lab Name: TestAmerica Inc SDG: W07264
 Matrix: WATER Report No.: 67405

Parameter	Result	Qual	Count Error (2 s)	CSU (2 s)	MDL, Lc	Rpt Unit, CRDL	Yield	Rst/MDL, Rst/TotUcert	Analysis, Prep Date	Total Sa Size	Aliquot Size	Primary Detector
Batch: 5285027 TRITIUM_DIST_LSC Work Order: M7PKF2AA Report DB ID: M7PKF2AB												
H-3	1.66E+02	U	1.5E+02	1.6E+02	3.54E+02	pCi/L	100%	0.47	10/14/15 04:58 a	0.00501	L	LSC4
					1.68E+02	4.00E+02		(2.)				

No. of Results: 1 Comments:

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**FORM II
LCS RESULTS**

Date: 20-Oct-15

Lab Name: TestAmerica Inc

SDG: W07265

Matrix: WATER

Report No. : 67405

Parameter	Result	Qual	Count Error (2 s)	CSU (2 s)	MDL	Report Unit	Yield	Expected	Expected Uncert	Recovery, Bias	Analysis, Prep Date	Aliquot Size	Primary Detector
Batch: 5280026	906.0_H3_LSC												
	3.02E+03		2.4E+02	2.7E+02	3.49E+02 pCi/L		100%	2.78E+03	8.3E+01	109%	10/10/15 09:57 a	0.00504	LSC4
							Rec Limits:	70	130	0.1		L	

Work Order: M7PKF1AC

Report DB ID: M7PKF1CS

No. of Results: 1 Comments:

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FORM II

Date: 20-Oct-15

MATRIX SPIKE RESULTS

Lab Name: TestAmerica Inc SDG: W07264 Matrix: WATER
 Lot-Sample No.: J5J060407-1, B32N98 Report No.: 67405

Parameter	SpikeResult, Orig Rst	Count Error (2 s)	CSU (2 s)	MDC MDA	Rpt Unit	Yield	Rec-covery	Expected, Uncert	Analysis, Prep Date	Aliquot Size	Analy Method, Primary Detector
Batch: 5280026	Work Order: M7N9Q1AE	Report DB ID: M7N9Q1EW	Report DB ID: M7N9Q1EW			Orig Sa DB ID: 9M7N9Q10					
H-3	2.54E+03	4.5E+02	7.6E+02	3.91E+02	pCi/L	100%	168.79%	1.50E+03	10/10/15 04:23 a	0.00432	906.0_H3_LSC
	9.96E+03							4.5E+01		L	LSC4

Number of Results: 1

Comments:

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