

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 15 Pages

Report No.: 72655

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.
W08048	F16-046	B3J6Y7	J8D230404-1	NAQG01AA	9NAQG010	8115013
		B3J711	J8D230404-2	NAQG11AA	9NAQG110	8115013



Certificate of Analysis

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

May 8, 2018

Attention: Scot Fitzgerald

SAF Number	:	F16-046
Date SDG Closed	:	April 23, 2018
Number of Samples	:	Two (2)
Sample Type	:	Water
SDG Number	:	W08048
Data Deliverable	:	15-Day / Summary

CASE NARRATIVE

I. Introduction

On April 23, 2018, two samples were received at TestAmerica (TARL). Upon receipt, the samples were assigned laboratory ID numbers to correspond with the CH2M specific IDs.

II. Sample Receipt

The samples were 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:

Gamma Spectroscopy
Gamma Spec (LL) by method RL-GAM-001

CH2M Hill Plateau Remediation Company
May 8, 2018

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

Gamma Spectroscopy

Gamma Spec (LL) by method RL-GAM-001:

No analytical or quality issues were noted. The sample result 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:



Digitally signed by
Ashley L. Worthy
Date: 2018.05.08
11:36:30 -07'00'

Ashley L. Worthy
Project Manager

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 MDL	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.

CH2M Hill Plateau Remediation Company		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST			F16-046-1692	PAGE 1 OF 1
COLLECTOR Daniel Klug CHPRC		COMPANY CONTACT SUMNER, LC	TELEPHONE NO. 376-3922	PROJECT COORDINATOR SUMNER, LC	REQUIRED TAT 15 Days	
SAMPLING LOCATION 289-TA, Pre Tc99IX Resin Tanks, Valve V11-Y20 <i>A</i>		PROJECT DESIGNATION 200W Pump & Treat - Treatment Plant Compliance Sampling - Water		SAF NO. F16-046	ORIGINAL	
ICE CHEST NO. N/A		FIELD LOGBOOK NO. <i>HNF-N-491-16/96</i>	ACTUAL SAMPLE DEPTH N/A	PURCHASE ORDER/CHARGE CODE 304235		
SHIPPED TO TestAmerica Incorporated, Richland		OFFSITE PROPERTY NO. N/A		BILL OF LADING/AIR BILL NO. N/A		

MATRIX* A=Air DL=Drum L=Liquids DS=Drum Solids L=Liquid O=Oil S=Soil SE=Sediment T=Tissue V=Vegetation W=Water WI=Wipe X=Other	POSSIBLE SAMPLE HAZARDS/ REMARKS *Contains Radioactive Material at concentrations that are not be regulated for transportation per 49 CFR/IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1.	PRESERVATION HNO3 to pH <2
	SPECIAL HANDLING AND/OR STORAGE N/A	HOLDING TIME 6 Months
		TYPE OF CONTAINER G/P
		NO. OF CONTAINER(S) 4
		VOLUME 1L
SAMPLE ANALYSIS GAMMA LL: COBALT 60 LL (Cobalt-60);		

J8D230404

W08048

SAMPLE NO.	FILTERED	MATRIX*	SAMPLE DATE	SAMPLE TIME	
B3017	N/A	WATER	APR 23 2018	1155	✓

NAG60

CHAIN OF POSSESSION RELINQUISHED BY/REMOVED FROM Daniel Klug CHPRC	DATE/TIME <i>1230</i> APR 23 2018	SIGN/ PRINT NAMES RECEIVED BY/STORED IN Ivan Schaeffer CHPRC	DATE/TIME APR 23 2018 <i>1230</i>	SPECIAL INSTRUCTIONS TRVL-18-108
Ivan Schaeffer CHPRC	APR 23 2018 <i>1510</i>	T. Hohl TARR	APR 23 2018 <i>1510</i>	<i>4/23/18 15:10</i>

FINAL SAMPLE DISPOSITION	DISPOSAL METHOD	DISPOSED BY	DATE/TIME
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CH2M Hill Plateau Remediation Company		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST			F16-046-1706	PAGE 1 OF 1
COLLECTOR Daniel Klug CHPRC	COMPANY CONTACT SUMNER, LC	TELEPHONE NO. 376-3922	PROJECT COORDINATOR SUMNER, LC		REQUIRED TAT 15 Days	
SAMPLING LOCATION 289-TA, Post Tc99IX Resin Tanks, Valve V06-Y22		PROJECT DESIGNATION 200W Pump & Treat - Treatment Plant Compliance Sampling - Water		SAF NO. F16-046	ORIGINAL	
ICE CHEST NO. N/A	FIELD LOGBOOK NO. HNF-N-491-16/96	ACTUAL SAMPLE DEPTH N/A	PURCHASE ORDER/CHARGE CODE 304235	METHOD OF SHIPMENT GOVERNMENT VEHICLE		
SHIPPED TO TestAmerica Incorporated, Richland		OFFSITE PROPERTY NO. N/A		BILL OF LADING/AIR BILL NO. N/A		

MATRIX* A=Air DL=Drum Liquids DS=Drum Solids L=Liquid O=Oil S=Soil SE=Sediment T=Tissue V=Vegetation W=Water WI=Wipe X=Other	POSSIBLE SAMPLE HAZARDS/ REMARKS *Contains Radioactive Material at concentrations that are not be regulated for transportation per 49 CFR/IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1.	PRESERVATION	HNO3 to pH <2
		HOLDING TIME	6 Months
		TYPE OF CONTAINER	G/P
		NO. OF CONTAINER(S)	4
		VOLUME	1L
SPECIAL HANDLING AND/OR STORAGE N/A		SAMPLE ANALYSIS	GAMMA LL: COBALT 60 LL (Cobalt-60);

J8D230404
W08048

SAMPLE NO.	FILTERED	MATRIX*	SAMPLE DATE	SAMPLE TIME	
B3011	N/A	WATER	APR 23 2018	1103	✓

NAQGI

CHAIN OF POSSESSION		SIGN/ PRINT NAMES		SPECIAL INSTRUCTIONS
RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME	TRVL-18-108
Daniel Klug CHPRC	APR 23 2018 1230	Ivan Schaeffer CHPRC	APR 23 2018 1230	15:10
Ivan Schaeffer CHPRC	APR 23 2018 1510	T. Holm TARL	4/23/18	
FINAL SAMPLE DISPOSITION	DISPOSAL METHOD	DISPOSED BY		DATE/TIME

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THE LEADER IN ENVIRONMENTAL TESTING

Date/Time Received: 4/23/18 15:10 Container GM Screen Result: (Airlock) 0 cpm Initials: SH
Sample GM Screen Result (Sample Receiving) 0 cpm Initials: SH
Container Alpha Screen Result: (Airlock) 0 cpm Initials: SH
Sample Alpha Screen Result (Sample Receiving) 0 cpm Initials: SH
Client: FLH SDG #: W08048 SAF #: _____ NA []

Lot Number: J8D230404 7071

Chain of Custody # F16-046-1692, 1706

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

Samples received inside shipping container/cooler/box Yes [X] 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 [SH]
- 2. Custody Seals dated and signed? Yes [] No [] No Custody Seal [SH]
- 3. Cooler temperature: 3.8°C Ice NA []
- 4. Vermiculite/packing materials is NA [X] Wet [] Dry []

Item 5 through 16 for samples. Initial appropriate response.

- 5. Chain of Custody record present? Yes [X] No []
- 6. Number of samples received (Each sample may contain multiple bottles): 2
- 7. Containers received: 8 XLP

8. Sample holding times exceeded? NA [] Yes [] No [X]

9. Samples have: _____ tape _____ hazard labels SH custody seals SH appropriate sample labels

10. Matrix: _____ A (FLT, Wipe, Solid, Soil) SH I (Water) _____ S (Air, Niosh 7400) _____ T (Biological, Ni-63)

11. Samples: SH 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 [X]

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

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

16. Additional Information: NA

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

Sample Check-in List completed by Sample Custodian:
Signature: [Signature] Date: 4/23/18

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

[] No action necessary; process as if
Project Manager: [Signature] Date: 4-24-18

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Sample Results Summary

Date: 08-May-18

TestAmerica Inc TARL

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

Report No. : 72655

SDG No: W08048

Batch	Client Id Work Order	Parameter	Result +- CSU (2 s)	Qual	Units	Tracer Yield	MDL	CRDL	RPD
8115013	GAMMA_GS								
	B3J6Y7								
	NAQG01AA	CO-60	-3.79E-02 +- 3.9E+00	U	pCi/L		3.08E+00	1.00E+01	
	B3J6Y7 DUP								
	NAQG01AC	CO-60	-2.94E+00 +- 5.0E+00	U	pCi/L		3.89E+00	1.00E+01	-194.9
	B3J711								
	NAQG11AA	CO-60	-1.42E+00 +- 3.7E+00	U	pCi/L		2.89E+00	1.00E+01	
No. of Results: 3									

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

Date: 08-May-18

Report No. : 72655

SDG No.: W08048

Batch	Work Order	Parameter	Result +- CSU (2 s)	Qual	Units	Tracer Yield	LCS Recovery	Bias	MDL
GAMMA_GS									
8115013	BLANK QC,								
	NAQJ31AA	CO-60	6.82E-01 +- 2.3E+00	U	pCi/L				2.64E+00
8115013	LCS,								
	NAQJ31AC	CO-60	3.12E+01 +- 5.8E+00		pCi/L		103%	0.0	2.36E+00
		CS-137	4.23E+01 +- 6.9E+00		pCi/L		107%	0.1	3.14E+00
		EU-152	5.45E+01 +- 1.1E+01		pCi/L		87%	-0.1	9.05E+00
No. of Results: 4									

TestAmerica Inc Bias - (Result/Expected)-1 as defined by ANSI N13.30.
 rptSTLRchQcSummary V5.8.5 A2002 U Qual - Analyzed for but not detected above limiting criteria, Mdc/Mda/Mdl, Total Uncert, RDL or not identified by gamma scan software.

FORM I

Date: 08-May-18

SAMPLE RESULTS

Lab Name: TestAmerica Inc
Lot-Sample No.: J8D230404-1
Client Sample ID: B3J6Y7

SDG: W08048
Report No.: 72655
COC No.: F16-046-1692

Collection Date: 4/23/2018 11:55:00 AM
Received Date: 4/23/2018 3:10:00 PM
Matrix: WATER

Ordered by Client Sample ID, Batch No.

Parameter	Result	Qual	Count Error (2 s)	CSU (2 s)	MDL, Action Lev	Rpt Unit, Lc	Yield CRDL(RL)	Rst/MDL, Rst/TotUcert	Analysis, Prep Date	Total Sa Size	Aliquot Size	Primary Detector
Batch: 8115013	GAMMA_GS				Work Order: NAQG01AA	Report DB ID: 9NAQG010						
CO-60	-3.79E-02	U	3.9E+00	3.9E+00	3.08E+00 pCi/L	1.37E+00	1.00E+01	-0.01	5/1/18 12:51 p		2.50252	\$GER11
								-0.02			L	

No. of Results: 1 Comments:

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FORM I

Date: 08-May-18

SAMPLE RESULTS

Lab Name: TestAmerica Inc
Lot-Sample No.: J8D230404-2
Client Sample ID: B3J711

SDG: W08048
Report No.: 72655
COC No.: F16-046-1706

Collection Date: 4/23/2018 11:03:00 AM
Received Date: 4/23/2018 3:10:00 PM
Matrix: WATER

Ordered by Client Sample ID, Batch No.

Parameter	Result	Qual	Count Error (2 s)	CSU (2 s)	MDL, Action Lev	Rpt Unit, Lc	Yield CRDL(RL)	Rst/TotUcert	Analysis, Prep Date	Total Sa Size	Aliquot Size	Primary Detector
Batch: 8115013	GAMMA_GS				Work Order: NAQG11AA	Report DB ID: 9NAQG110						
CO-60	-1.42E+00	U	3.7E+00	3.7E+00	2.89E+00 pCi/L	1.27E+00	1.00E+01	-0.49	5/1/18 12:51 p		2.50163	\$GER18
								-0.77			L	

No. of Results: 1 Comments:

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FORM II

Date: 08-May-18

DUPLICATE RESULTS

Lab Name: TestAmerica Inc
 Lot-Sample No.: J8D230404-1
 Client Sample ID: B3J6Y7 DUP

SDG: W08048
 Report No.: 72655
 COC No.: F16-046-1692
 Matrix: WATER

Collection Date: 4/23/2018 11:55:00 AM

Received Date: 4/23/2018 3:10:00 PM

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: 8115013	GAMMA_GS								Orig Sa DB ID: 9NAQG010			
CO-60	-2.94E+00	U	5.0E+00	5.0E+00	3.89E+00	pCi/L	1.00E+01	-0.76	5/1/18 12:51 p		2.52598	\$GER12
	-3.79E-02	U	RPD	-194.9				-(1.2)			L	

No. of Results: 1 Comments:

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FORM II

Date: 08-May-18

BLANK RESULTS

Lab Name: TestAmerica Inc

SDG: W08048

Matrix: WATER

Report No.: 72655

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: 8115013 GAMMA_GS Work Order: NAQJ31AA Report DB ID: NAQJ31AB												
CO-60	6.82E-01	U	2.3E+00	2.3E+00	2.64E+00	pCi/L		0.26	5/1/18 12:52 p		2.50063	\$GER19
					1.12E+00	1.00E+01		0.59			L	

No. of Results: 1 Comments:

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FORM II
LCS RESULTS

Date: 08-May-18

Lab Name: TestAmerica Inc

SDG: W08048

Matrix: WATER

Report No. : 72655

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: 8115013	GAMMA_GS												
CO-60	3.12E+01		5.8E+00	5.8E+00	2.36E+00	pCi/L		3.04E+01		103%	5/1/18 12:50 p	2.5	GER10\$1
							Rec Limits:	80	120	0.0		L	
CS-137	4.23E+01		6.9E+00	6.9E+00	3.14E+00	pCi/L		3.94E+01		107%	5/1/18 12:50 p	2.5	GER10\$1
							Rec Limits:	80	120	0.1		L	
EU-152	5.45E+01		1.1E+01	1.1E+01	9.05E+00	pCi/L		6.24E+01		87%	5/1/18 12:50 p	2.5	GER10\$1
							Rec Limits:	80	120	-0.1		L	

No. of Results: 3 Comments:

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