



**LABORATORY DATA CONSULTANTS, INC.**

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ERM  
2525 Natomas Park Drive, Suite 350  
Sacramento, CA 95833  
ATTN: Ms. Maria Barajas-Albalawi

October 19, 2007

SUBJECT: BRC Parcel A & B, Data Validation

Dear Ms. Barajas-Albalawi

Enclosed are the final validation reports for the fractions listed below. These SDGs were received on October 10, 2007. Attachment 1 is a summary of the samples that were reviewed for each analysis.

**LDC Project # 17587:**

<b><u>SDG #</u></b>	<b><u>Fraction</u></b>
F71060299, F71070122, F71100119	Radium-226 & Radium-228, Isotopic Uranium & Isotopic Thorium

The data validation was performed under EPA Level III and Level IV guidelines. The analyses were validated using the following documents, as applicable to each method:

- USEPA, Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, October 2004
- EPA SW 846, Third Edition, Test Methods for Evaluating Solid Waste, update 1, July 1992; update IIA, August 1993; update II, September 1994; update IIB, January 1995; update III, December 1996; update IIIA, April 1998

Please feel free to contact us if you have any questions.

Sincerely,

Erlinda T. Rauto  
Operations Manager/Senior Chemist



**BRC Parcel A & B  
Data Validation Reports  
LDC# 17587**

Radium-226 & Radium-228

LDC

**Laboratory Data Consultants, Inc.  
Data Validation Report**

**Project/Site Name:** BRC Parcel 4A & 4B  
**Collection Date:** September 5, 2007  
**LDC Report Date:** October 16, 2007  
**Matrix:** Soil  
**Parameters:** Radium-226 & Radium-228  
**Validation Level:** EPA Level III  
**Laboratory:** TestAmerica

**Sample Delivery Group (SDG):** F71060299

**Sample Identification**

TSB-AR-01-0'  
TSB-AR-01-0'-Dup  
TSB-AR-01-10'  
TSB-AR-02-0'  
TSB-AR-02-10'  
TSB-AR-04-0'  
TSB-AR-04-10'  
TSB-AR-05-0'  
TSB-AR-05-10'  
TSB-AR-07-0'  
TSB-AR-07-10'  
TSB-AR-04-0'DUP

## Introduction

This data review covers 12 soil samples listed on the cover sheet. The analyses were per EPA Method 901.1/RICH Method RC5017 for Radium-226 and Radium-228.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (October 2004) as there are no current guidelines for the method stated above.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blank results are summarized in Section III.

Field duplicates are summarized in Section VIII.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

- J+ Data are qualified as estimated, with a high bias likely to occur. False positives or false negatives are unlikely to have been reported.
- J- Data are qualified as estimated, with a low bias likely to occur. False positives or false negatives are unlikely to have been reported.
- U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.
- J Indicates an estimated value.
- R Quality control indicates the data is not usable.
- N Presumptive evidence of presence of the constituent.
- UU Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.
- A Indicates the finding is based upon technical validation criteria.
- P Indicates the finding is related to a protocol/contractual deviation.
- None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

## **I. Technical Holding Times**

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

## **II. Calibration**

### **a. Initial Calibration**

All criteria for the initial calibration were met.

Detector efficiency was determined for each detector and each radionuclide.

Self absorption factors were determined for each sample when applicable.

### **b. Continuing Calibration**

Calibration verification and background determination were performed at the required frequencies. Results were within laboratory control limits.

## **III. Blanks**

Method blanks were reviewed for each matrix as applicable. Blank results contained less than the minimum detectable activity (MDA).

No field blanks were identified in this SDG.

## **IV. Accuracy and Precision Data**

### **a. Matrix Spike/Matrix Spike Duplicates**

Matrix spike (MS) and matrix spike duplicate (MSD) analyses were not required by the method.

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable. Relative percent differences (RPD) were within QC limits.

### **b. Laboratory Control Samples**

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

### **c. Chemical Recovery**

All chemical recoveries were within validation criteria.

## V. Minimum Detectable Activity

All minimum detectable activities met required detection limits.

## VI. Sample Result Verification

Raw data were not reviewed for this SDG.

## VII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

## VIII. Field Duplicates

Samples TSB-AR-01-0' and TSB-AR-01-0'-Dup were identified as field duplicates. No radium-226 or radium-228 was detected in any of the samples with the following exceptions:

Isotope	Activity (pCi/g)		RPD (Limits)	Flag	A or P
	TSB-AR-01-0'	TSB-AR-01-0'-Dup			
Radium-226	1.08	0.959	12 ( $\leq 50$ )	-	-
Radium-228	1.75	1.50	15 ( $\leq 50$ )	-	-

**BRC Parcel 4A & 4B  
Radium-226 & Radium-228 - Data Qualification Summary - SDG F71060299**

No Sample Data Qualified in this SDG

**BRC Parcel 4A & 4B  
Radium-226 & Radium-228 - Laboratory Blank Data Qualification Summary - SDG  
F71060299**

No Sample Data Qualified in this SDG

**BRC Parcel 4A & 4B  
Radium-226 & Radium-228 - Field Blank Data Qualification Summary - SDG  
F71060299**

No Sample Data Qualified in this SDG



LDC #: 17587A29

**VALIDATION COMPLETENESS WORKSHEET**

Date: 10-10-07

SDG #: F71060299

Level III

Page: 1 of 1

Laboratory: Test America

Reviewer: MG

9/14 Radium 226, Radium 228 (EPA Meth 901.1 / RICH-RC-5017)

2nd Reviewer: [Signature]

**METHOD:** Radium 226 (EPA Method 903.1/Method RICH-RC5005) Radium 228 (EPA Method 904.0/Method RICH-RC5005)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

Validation Area			Comments
I.	Technical holding times	A	Sampling dates: 9-5-07
IIa.	Initial calibration	A	
IIb.	Calibration verification	A	
III.	Blanks	A	
IVa.	Matrix Spike/(Matrix Spike) Duplicates	A	DUP
IVb.	Laboratory control samples	A	LCS
IVc.	Chemical recovery	A	
V.	Sample result verification	N	
VI.	Minimum detectable activity (MDA)	A	
VII.	Overall assessment of data	A	
VIII.	Field duplicates	SW	D = 1+2
XIV.	Field blanks	N	

Note: A = Acceptable  
 N = Not provided/applicable  
 SW = See worksheet

ND = No compounds detected  
 R = Rinstate  
 FB = Field blank

D = Duplicate  
 TB = Trip blank  
 EB = Equipment blank

Validated Samples:  
 all soil

1	TSB-AR-01-0'	11	TSB-AR-07-10'	21		31	
2	TSB-AR-01-0'-Dup	12	TSB-AR-04-0'DUP	22		32	
3	TSB-AR-01-10'	13	PBS	23		33	
4	TSB-AR-02-0'	14		24		34	
5	TSB-AR-02-10'	15		25		35	
6	TSB-AR-04-0'	16		26		36	
7	TSB-AR-04-10'	17		27		37	
8	TSB-AR-05-0'	18		28		38	
9	TSB-AR-05-10'	19		29		39	
10	TSB-AR-07-0'	20		30		40	

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

LDC #: 17587A29  
 SDG #: F7I060299

**VALIDATION FINDINGS WORKSHEET**  
**Field Duplicates**

Page: 1 of 1  
 Reviewer: MG  
 2nd reviewer: W

METHOD: Radiochemistry (Method: 901.1 / RICH-RC-5017)

N N/A  
 N N/A

Were field duplicate pairs identified in this SDG?

Were target isotopes detected in the field duplicate pairs?

Isotopes	Activity ( <u>PCi/g</u> )		RPD
	1	2	
Ra-226	1.08	0.959	12 ( $\leq 50$ )
Ra-228	1.75	1.50	15 ( $\downarrow$ )

Isotopes	Activity ( )		RPD

Isotopes	Activity ( )		RPD

Isotopes	Activity ( )		RPD

**Laboratory Data Consultants, Inc.  
Data Validation Report**

**Project/Site Name:** BRC Parcel 4A & 4B  
**Collection Date:** September 6, 2007  
**LDC Report Date:** October 16, 2007  
**Matrix:** Soil/Water  
**Parameters:** Radium-226 & Radium-228  
**Validation Level:** EPA Level III  
**Laboratory:** TestAmerica

**Sample Delivery Group (SDG):** F71070122

**Sample Identification**

TSB-AR-08-0'  
TSB-AR-08-10'  
TSB-AR-11-0'  
TSB-AR-11-0'-Dup  
TSB-AR-11-10'  
TSB-AR-14-0'  
TSB-AR-14-10'  
TSB-AR-13-0'  
TSB-AR-13-10'  
TSB-AR-10-0'  
TSB-AR-10-10'  
TSB-AR-9-0'  
TSB-AR-9-10'  
TSB-AR-12-0'  
TSB-AR-12-10'  
TSB-AR-3-0'  
TSB-AR-3-10'  
RINSATE 1  
TSB-AR-13-0'DUP

## Introduction

This data review covers 18 soil samples and one water sample listed on the cover sheet. The analyses were per EPA Method 901.1/RICH Method RC5017 for soil samples for Radium-226 and Radium-228, EPA Method 903.1/RICH Method RC5005 for water samples for Radium-226, and EPA Method 904.0/RICH Method RC5005 for water samples for Radium-228.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (October 2004) as there are no current guidelines for the method stated above.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blank results are summarized in Section III.

Field duplicates are summarized in Section VIII.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

- J+ Data are qualified as estimated, with a high bias likely to occur. False positives or false negatives are unlikely to have been reported.
- J- Data are qualified as estimated, with a low bias likely to occur. False positives or false negatives are unlikely to have been reported.
- U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.
- J Indicates an estimated value.
- R Quality control indicates the data is not usable.
- N Presumptive evidence of presence of the constituent.
- UU Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.
- A Indicates the finding is based upon technical validation criteria.
- P Indicates the finding is related to a protocol/contractual deviation.
- None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

## **I. Technical Holding Times**

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

## **II. Calibration**

### **a. Initial Calibration**

All criteria for the initial calibration were met.

Detector efficiency was determined for each detector and each radionuclide.

Self absorption factors were determined for each sample when applicable.

### **b. Continuing Calibration**

Calibration verification and background determination were performed at the required frequencies. Results were within laboratory control limits.

## **III. Blanks**

Method blanks were reviewed for each matrix as applicable. Blank results contained less than the minimum detectable activity (MDA).

Sample "RINSATE 1" was identified as a rinsate. No radium-226 or radium-228 was found in this blank.

## **IV. Accuracy and Precision Data**

### **a. Matrix Spike/Matrix Spike Duplicates**

Matrix spike (MS) and matrix spike duplicate (MSD) analyses were not required by the method.

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable. Relative percent differences (RPD) were within QC limits.

### **b. Laboratory Control Samples**

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

### **c. Chemical Recovery**

All chemical recoveries were within validation criteria.

## V. Minimum Detectable Activity

All minimum detectable activities met required detection limits.

## VI. Sample Result Verification

Raw data were not reviewed for this SDG.

## VII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

## VIII. Field Duplicates

Samples TSB-AR-11-0' and TSB-AR-11-0'-Dup were identified as field duplicates. No radium-226 or radium-228 was detected in any of the samples with the following exceptions:

Isotope	Activity (pCi/g)		RPD (Limits)
	TSB-AR-11-0'	TSB-AR-11-0'-Dup	
Radium-226	0.926	1.01	9 ( $\leq 50$ )
Radium-228	1.82	1.97	8 ( $\leq 50$ )

**BRC Parcel 4A & 4B  
Radium-226 & Radium-228 - Data Qualification Summary - SDG F71070122**

No Sample Data Qualified in this SDG

**BRC Parcel 4A & 4B  
Radium-226 & Radium-228 - Laboratory Blank Data Qualification Summary - SDG  
F71070122**

No Sample Data Qualified in this SDG

**BRC Parcel 4A & 4B  
Radium-226 & Radium-228 - Field Blank Data Qualification Summary - SDG  
F71070122**

No Sample Data Qualified in this SDG





**VALIDATION FINDINGS WORKSHEET**  
**Field Duplicates**

METHOD: Radiochemistry (Method: see cover)

- N N/A Were field duplicate pairs identified in this SDG?
- N N/A Were target isotopes detected in the field duplicate pairs?

Isotopes	Activity ( <u>PCi/g</u> )		RPD
	3	4	
Ra-226	0.926	1.01	9 (≤50)
Ra-228	1.82	1.97	8 (↓)

Isotopes	Activity (            )		RPD

Isotopes	Activity (            )		RPD

Isotopes	Activity (            )		RPD

**Laboratory Data Consultants, Inc.  
Data Validation Report**

**Project/Site Name:** BRC Parcel 4A and 4B  
**Collection Date:** September 7, 2007  
**LDC Report Date:** October 16, 2007  
**Matrix:** Soil/Water  
**Parameters:** Radium-226 & Radium-228  
**Validation Level:** EPA Level III & IV  
**Laboratory:** Test America

**Sample Delivery Group (SDG):** F71100119

**Sample Identification**

RINSATE 2  
TSB-AR-06-0'  
TSB-AR-06-0'-Dup  
TSB-AR-06-10'  
TSB-AJ-01-0'  
TSB-AJ-01-10'\*\*  
TSB-AJ-02-0'\*\*  
TSB-AJ-02-0'-Dup\*\*  
TSB-AJ-02-10'\*\*  
TSB-AJ-03-0'\*\*  
TSB-AJ-03-10'\*\*  
TSB-BJ-06-0'\*\*  
TSB-BJ-06-10'\*\*  
TSB-BJ-01-0'\*\*  
TSB-BJ-01-10'\*\*  
TSB-BJ-02-0'\*\*  
TSB-BJ-02-10'\*\*  
TSB-BR-06-0'\*\*  
TSB-BR-06-10'\*\*  
TSB-AR-06-0'DUP

\*\*Indicates sample underwent EPA Level IV review

## Introduction

This data review covers 19 soil samples and one water sample listed on the cover sheet. The analyses were per EPA Method 901.1/RICH Method RC5017 for soil samples for Radium-226 and Radium-228, EPA Method 903.1/RICH Method RC5005 for water samples for Radium-226, and EPA Method 904.0/RICH Method RC5005 for water samples for Radium-228.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (October 2004) as there are no current guidelines for the method stated above.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blank results are summarized in Section III.

Field duplicates are summarized in Section VIII.

Samples indicated by a double asterisk on the front cover underwent a EPA Level IV review. A EPA Level III review was performed on all of the other samples. Raw data were not evaluated for the samples reviewed by Level III criteria since this review is based on QC data.

The following are definitions of the data qualifiers:

- J+ Data are qualified as estimated, with a high bias likely to occur. False positives or false negatives are unlikely to have been reported.
- J- Data are qualified as estimated, with a low bias likely to occur. False positives or false negatives are unlikely to have been reported.
- U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.
- J Indicates an estimated value.
- R Quality control indicates the data is not usable.
- N Presumptive evidence of presence of the constituent.
- UU Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.
- A Indicates the finding is based upon technical validation criteria.
- P Indicates the finding is related to a protocol/contractual deviation.
- None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

## **I. Technical Holding Times**

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

## **II. Calibration**

### **a. Initial Calibration**

All criteria for the initial calibration were met.

Detector efficiency was determined for each detector and each radionuclide.

Self absorption factors were determined for each sample when applicable.

### **b. Continuing Calibration**

Calibration verification and background determination were performed at the required frequencies. Results were within laboratory control limits.

## **III. Blanks**

Method blanks were reviewed for each matrix as applicable. Blank results contained less than the minimum detectable activity (MDA).

Sample "RINSATE 2" was identified as a rinsate. No radium-226 or radium-228 was found in this blank.

## **IV. Accuracy and Precision Data**

### **a. Matrix Spike/Matrix Spike Duplicates**

Matrix spike (MS) and matrix spike duplicate (MSD) analyses were not required by the method.

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable. Results were within QC limits.

### **b. Laboratory Control Samples**

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

### **c. Chemical Recovery**

All chemical recoveries were within validation criteria.

## V. Minimum Detectable Activity

All minimum detectable activities met required detection limits.

## VI. Sample Result Verification

All sample result verifications were acceptable for samples on which a EPA Level IV review was performed. Raw data were not evaluated for the samples reviewed by Level III criteria.

## VII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

## VIII. Field Duplicates

Samples TSB-AR-06-0' and TSB-AR-06-0'-Dup and samples TSB-AJ-02-0'\*\*\* and TSB-AJ-02-0'-Dup\*\* were identified as field duplicates. No radium-226 or radium-228 was detected in any of the samples with the following exceptions:

Isotope	Activity (pCi/g)		RPD (Limits)
	TSB-AR-06-0'	TSB-AR-06-0'-Dup	
Radium-226	0.955	1.05	9 ( $\leq 50$ )
Radium-228	1.73	1.79	3 ( $\leq 50$ )

Isotope	Activity (pCi/g)		RPD (Limits)
	TSB-AJ-02-0'***	TSB-AJ-02-0'-Dup**	
Radium-226	1.19	1.08	10 ( $\leq 50$ )
Radium-228	1.78	1.96	10 ( $\leq 50$ )

**BRC Parcel 4A and 4B  
Radium-226 & Radium-228 - Data Qualification Summary - SDG F71100119**

No Sample Data Qualified in this SDG

**BRC Parcel 4A and 4B  
Radium-226 & Radium-228 - Laboratory Blank Data Qualification Summary - SDG  
F71100119**

No Sample Data Qualified in this SDG

**BRC Parcel 4A and 4B  
Radium-226 & Radium-228 - Field Blank Data Qualification Summary - SDG  
F71100119**

No Sample Data Qualified in this SDG

LDC #: 17587C29

**VALIDATION COMPLETENESS WORKSHEET**

Date: 10-11-07

SDG #: F71100119

Level III/IV

Page: 1 of 1

Laboratory: Test America

Reviewer: MG

Soil: Radium-226, Radium-228 (EPA 901.1/RICH-RC-5017)  
Water

2nd Reviewer: W

**METHOD:** Radium 226 (EPA Method 903.1/Method RICH-RC5005) Radium 228 (EPA Method 904.0/Method RICH-RC5005)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 9-7-07
IIa.	Initial calibration	A	
IIb.	Calibration verification	A	
III.	Blanks	A	
IVa.	Matrix Spike/(Matrix Spike) Duplicates	A	DUP
IVb.	Laboratory control samples	A	LCS
IVc.	Chemical recovery	A	
V.	Sample result verification	A	Not reviewed for Level III validation.
VI.	Minimum detectable activity (MDA)	A	
VII.	Overall assessment of data	A	
VIII.	Field duplicates	SW	D=2+3, D=7+8
XIV.	Field blanks	ND	R=1

Note: A = Acceptable  
N = Not provided/applicable  
SW = See worksheet

ND = No compounds detected  
R = Rinsate  
FB = Field blank

D = Duplicate  
TB = Trip blank  
EB = Equipment blank

Validated Samples: \*\* Indicates sample underwent Level IV validation

1	2	RINSATE 2	W	11	TSB-AJ-03-10***	S	21	1	PBS	31	
2		TSB-AR-06-0'	S	12	TSB-BJ-06-0***		22	2	PBW	32	
3		TSB-AR-06-0'-Dup		13	TSB-BJ-06-10***		23			33	
4		TSB-AR-06-10'		14	TSB-BJ-01-0***		24			34	
5		TSB-AJ-01-0'		15	TSB-BJ-01-10***		25			35	
6		TSB-AJ-01-10***		16	TSB-BJ-02-0***		26			36	
7		TSB-AJ-02-0***		17	TSB-BJ-02-10***		27			37	
8		TSB-AJ-02-0'-Dup**		18	TSB-BR-06-0***		28			38	
9		TSB-AJ-02-10***		19	TSB-BR-06-10***		29			39	
10		TSB-AJ-03-0***		20	TSB-AR-06-0'DUP		30			40	

Notes:



LDC #: 17587C29  
 SDG #: F7I100119

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2  
 Reviewer: MG  
 2nd Reviewer: W

Method: Radiochemistry (EPA Method *see cover* )

Validation Area	Yes	No	NA	Findings/Comments
<b>I. Technical holding times</b>				
All technical holding times were met.	✓			
<b>II. Calibration</b>				
Were all instruments and detectors calibration as required?	✓			
Were NIST traceable standards used for all calibrations?	✓			
Was the check source identified by activity and radionuclide?	✓			
Were check sources including background counts analyzed at the required frequency and within laboratory control limits?	✓			
<b>III. Blanks</b>				
Were blank analyses performed as required?	✓			
Were any activities detected in the blanks greater than the minimum detectable activity (MDA)? If yes, please see the Blanks validation completeness worksheet.		✓		
<b>IV. Matrix spikes and Duplicates</b>				
Were a matrix spike (MS) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. <u>Soil / Water</u>		✓		
Were the MS percent recoveries (%R) within the QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.			✓	
Was a duplicate sample analyzed at the required frequency of 5% in this SDG?	✓			
Were all duplicate sample duplicate error ratios (DER) $\leq 1.427$ . <u>0.58</u>	✓			
<b>V. Laboratory control samples</b>				
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 75-125%	✓			
<b>VI. Sample Chemical/Carrier Recovery</b>				
Was a tracer/carrier added to each sample?	✓			<i>Water only</i>
Were tracer/carrier recoveries within the QC limits?	✓			
<b>VII. Regional Quality Assurance and Quality Control</b>				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	
<b>VIII. Sample Result Verification</b>				
Were activities adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were the Minimum Detectable Activities (MDA) < RL?	✓			

LDC #: 17507C29  
SDG #: F7I00119

VALIDATION FINDINGS CHECKLIST

Page: 2 of 2  
Reviewer: MG  
2nd Reviewer: W

Validation Area	Yes	No	NA	Findings/Comments
IX: Overall assessment of data				
Overall assessment of data was found to be acceptable.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
X: Field duplicates				
Field duplicate pairs were identified in this SDG.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Target analytes were detected in the field duplicates.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
XI: Field blanks				
Field blanks were identified in this SDG.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Target analytes were detected in the field blanks.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

LDC #: 17587C29  
 SDG #: F7I100119

**VALIDATION FINDINGS WORKSHEET**  
**Field Duplicates**

Page: 1 of 1  
 Reviewer: MG  
 2nd reviewer: W

METHOD: Radiochemistry (Method: see cover)

N N/A  
 N N/A

Were field duplicate pairs identified in this SDG?  
 Were target isotopes detected in the field duplicate pairs?

Isotopes	Activity ( <u>PCi/g</u> )		RPD
	2	3	
Ra-226	0.955	1.05	9 ( $\leq 50$ )
Ra-228	1.73	1.79	3 ( $\downarrow$ )

Isotopes	Activity ( <u>PCi/g</u> )		RPD
	7	8	
Ra-226	1.19	1.08	10 ( $\leq 50$ )
Ra-228	1.78	1.96	10 ( $\downarrow$ )

Isotopes	Activity ( )		RPD

Isotopes	Activity ( )		RPD

LDC #: 17587C29  
 SDG #: F7110Q119

**VALIDATION FINDINGS WORKSHEET**  
**Level IV Recalculation Worksheet**

Page: 1 of 1  
 Reviewer: MG  
 2nd Reviewer: [Signature]

METHOD: Radiochemistry (Method: See cover)

Percent recoveries (%R) for a laboratory control sample, a matrix spike and a matrix spike duplicate sample were recalculated using the following formula:

$$\%R = \frac{\text{Found} \times 100}{\text{True}}$$

Where, Found = activity of each analyte measured in the analysis of the sample.  
 True = activity of each analyte in the source.

A matrix spike and matrix spike duplicate relative percent difference (RPD) was recalculated using the following formula:

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

Where, S = Original sample activity  
 D = Duplicate sample activity

Sample ID	Type of Analysis	Analyte	Found/S (units)	True/D (units)	Recalculated		Reported	Acceptable (Y/N)
					%R or RPD	%R or RPD		
LCS	Laboratory control sample	Cs-137	8.33 (pci/g)	8.13 (pci/g)	102	102		Y
—	Matrix spike sample	—	—	—	—	—		—
20	Duplicate RPD	Ra-228	1.73 (pci/g) ± 0.17 (1σ)	1.87 (pci/g) ± 0.16 (1σ)	RER2	RER2		Y
—	Chemical recovery	—	—	—	—	0.6		—

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.



**BRC Parcel A & B  
Data Validation Reports  
LDC# 17587**

Isotopic Uranium & Isotopic Thorium

LDC

**Laboratory Data Consultants, Inc.  
Data Validation Report**

**Project/Site Name:** BRC Parcel 4A & 4B  
**Collection Date:** September 5, 2007  
**LDC Report Date:** October 16, 2007  
**Matrix:** Soil  
**Parameters:** Isotopic Uranium & Isotopic Thorium  
**Validation Level:** EPA Level III  
**Laboratory:** TestAmerica  
**Sample Delivery Group (SDG):** F71060299

**Sample Identification**

TSB-AR-01-0'  
TSB-AR-01-0'-Dup  
TSB-AR-01-10'  
TSB-AR-02-0'  
TSB-AR-02-10'  
TSB-AR-04-0'  
TSB-AR-04-10'  
TSB-AR-05-0'  
TSB-AR-05-10'  
TSB-AR-07-0'  
TSB-AR-07-10'  
TSB-AR-04-0'DUP

## Introduction

This data review covers 12 soil samples listed on the cover sheet. The analyses were per Method RICH-RC5067 for Isotopic Uranium and Method RICH-RC5087 for Isotopic Thorium.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (October 2004) as there are no current guidelines for the method stated above.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blank results are summarized in Section III.

Field duplicates are summarized in Section VIII.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

- J+ Data are qualified as estimated, with a high bias likely to occur. False positives or false negatives are unlikely to have been reported.
- J- Data are qualified as estimated, with a low bias likely to occur. False positives or false negatives are unlikely to have been reported.
- U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.
- J Indicates an estimated value.
- R Quality control indicates the data is not usable.
- N Presumptive evidence of presence of the constituent.
- UU Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.
- A Indicates the finding is based upon technical validation criteria.
- P Indicates the finding is related to a protocol/contractual deviation.
- None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.



## **I. Technical Holding Times**

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

## **II. Calibration**

### **a. Initial Calibration**

All criteria for the initial calibration were met.

Detector efficiency was determined for each radionuclide of interest.

### **b. Continuing Calibration**

Calibration verification and background determination were performed at the required frequencies. Results were within control limits.

## **III. Blanks**

Method blanks were reviewed for each matrix as applicable. Blank results contained less than the minimum detectable activity (MDA).

No field blanks were identified in this SDG.

## **IV. Accuracy and Precision Data**

### **a. Matrix Spike/(Matrix Spike) Duplicate**

Matrix spike (MS) and matrix spike duplicate (MSD) analyses were not required by the method.

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable. Results were within QC limits.

### **b. Laboratory Control Samples**

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

### **c. Tracer Recovery**

All tracer recoveries were within validation criteria.

## V. Minimum Detectable Activity (MDA)

All minimum detectable activities met required detection limits.

## VI. Sample Result Verification

All sample result verifications were acceptable.

## VII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

## VIII. Field Duplicates

Samples TSB-AR-01-0' and TSB-AR-01-0'-Dup were identified as field duplicates. No isotopic uranium or isotopic thorium was detected in any of the samples with the following exceptions:

Isotope	Activity (pCi/g)		RPD (Limits)	Difference (Limits)	Flag	A or P
	TSB-AR-01-0'	TSB-AR-01-0'-Dup				
Th-228	1.65	1.58	4 ( $\leq 50$ )	-	-	-
Th-230	1.44	1.03	33 ( $\leq 50$ )	-	-	-
Th-232	1.49	1.54	3 ( $\leq 50$ )	-	-	-
U-233/234	0.702	0.788	-	0.09 pCi/g ( $\leq 0.6$ )	-	-
U-235/236	0.0214	0.0217	-	0.0003 pCi/g ( $\leq 0.6$ )	-	-
U-238	0.412	0.470	-	0.06 pCi/g ( $\leq 0.6$ )	-	-

**BRC Parcel 4A & 4B  
Isotopic Uranium & Isotopic Thorium - Data Qualification Summary - SDG F71060299**

No Sample Data Qualified in this SDG

**BRC Parcel 4A & 4B  
Isotopic Uranium & Isotopic Thorium - Laboratory Blank Data Qualification Summary  
- SDG F71060299**

No Sample Data Qualified in this SDG

**BRC Parcel 4A & 4B  
Isotopic Uranium & Isotopic Thorium - Field Blank Data Qualification Summary -  
SDG F71060299**

No Sample Data Qualified in this SDG

LDC #: 17587A59

**VALIDATION COMPLETENESS WORKSHEET**

Date: 10-10-07

SDG #: F71060299

Level III

Page: 1 of 1

Laboratory: Test America

Reviewer: MG

2nd Reviewer: [Signature]

mg

**METHOD:** Isotopic Uranium (EPA Method 909/Method RICH-RC5067), Isotopic Thorium (Method RICH-RC-5087)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 9-5-07
IIa.	Initial calibration	A	
IIb.	Calibration verification	A	
III.	Blanks	A	
IVa.	Matrix Spike/(Matrix Spike) Duplicates	A	DUP
IVa.	Laboratory control samples	A	LCS
V.	Tracer Recovery	A	
VI.	Minimum Detectable Activity (MDA)	A	
VII.	Sample result verification	N	
VIII.	Overall assessment of data	A	
IX.	Field duplicates	SW	D = 1+2
X.	Field blanks	N	

Note: A = Acceptable  
 N = Not provided/applicable  
 SW = See worksheet

ND = No compounds detected  
 R = Rinsate  
 FB = Field blank

D = Duplicate  
 TB = Trip blank  
 EB = Equipment blank

Validated Samples:  
 all soil

1	TSB-AR-01-0'	11	TSB-AR-07-10'	21		31	
2	TSB-AR-01-0'-Dup	12	TSB-AR-04-0'DUP	22		32	
3	TSB-AR-01-10'	13	PBS	23		33	
4	TSB-AR-02-0'	14		24		34	
5	TSB-AR-02-10'	15		25		35	
6	TSB-AR-04-0'	16		26		36	
7	TSB-AR-04-10'	17		27		37	
8	TSB-AR-05-0'	18		28		38	
9	TSB-AR-05-10'	19		29		39	
10	TSB-AR-07-0'	20		30		40	

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**VALIDATION FINDINGS WORKSHEET**  
**Field Duplicates**

METHOD: Radiochemistry (Method: RICH-RC-5067 / RICH-RC-5087)

N N/A  
 N N/A

Were field duplicate pairs identified in this SDG?  
 Were target isotopes detected in the field duplicate pairs?

Isotopes	Activity ( pCi/g )		RPD
	1	2	
Th-228	1.65	1.58	4 ( ≤ 50 )
Th-230	1.44	1.03	33 (   )
Th-232	1.49	1.54	3 ( ↓ )

Isotopes	Activity ( pCi/g )		by difference RPD
	1	2	
U-233/234	0.702	0.788	0.09 pCi/g ( ≤ 0.6 pCi/g )
U-235/236	0.0214	0.0217	0.0003 ↓ ( ↓ )
U-238	0.412	0.470	0.06 ↓ ( ↓ )

Isotopes	Activity ( )		RPD

Isotopes	Activity ( )		RPD

## Laboratory Data Consultants, Inc. Data Validation Report

**Project/Site Name:** BRC Parcel 4A & 4B  
**Collection Date:** September 6, 2007  
**LDC Report Date:** October 16, 2007  
**Matrix:** Soil/Water  
**Parameters:** Isotopic Uranium & Isotopic Thorium  
**Validation Level:** EPA Level III  
**Laboratory:** TestAmerica

**Sample Delivery Group (SDG):** F71070122

### Sample Identification

TSB-AR-08-0'  
TSB-AR-08-10'  
TSB-AR-11-0'  
TSB-AR-11-0'-Dup  
TSB-AR-11-10'  
TSB-AR-14-0'  
TSB-AR-14-10'  
TSB-AR-13-0'  
TSB-AR-13-10'  
TSB-AR-10-0'  
TSB-AR-10-10'  
TSB-AR-9-0'  
TSB-AR-9-10'  
TSB-AR-12-0'  
TSB-AR-12-10'  
TSB-AR-3-0'  
TSB-AR-3-10'  
RINSATE 1  
TSB-AR-13-0'DUP  
RINSATE 1DUP

## Introduction

This data review covers 18 soil samples and 2 water samples listed on the cover sheet. The analyses were per Method RICH-RC5067 for Isotopic Uranium and Method RICH-RC5087 for Isotopic Thorium.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (October 2004) as there are no current guidelines for the method stated above.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blank results are summarized in Section III.

Field duplicates are summarized in Section VIII.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

- J+ Data are qualified as estimated, with a high bias likely to occur. False positives or false negatives are unlikely to have been reported.
- J- Data are qualified as estimated, with a low bias likely to occur. False positives or false negatives are unlikely to have been reported.
- U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.
- J Indicates an estimated value.
- R Quality control indicates the data is not usable.
- N Presumptive evidence of presence of the constituent.
- UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.
- A Indicates the finding is based upon technical validation criteria.
- P Indicates the finding is related to a protocol/contractual deviation.
- None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

## I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

## II. Calibration

### a. Initial Calibration

All criteria for the initial calibration were met.

Detector efficiency was determined for each radionuclide of interest.

### b. Continuing Calibration

Calibration verification and background determination were performed at the required frequencies. Results were within control limits.

## III. Blanks

Method blanks were reviewed for each matrix as applicable. Blank results contained less than the minimum detectable activity (MDA).

Sample "RINSATE 1" was identified as a rinsate. No isotopic uranium or isotopic thorium was found in this blank.

## IV. Accuracy and Precision Data

### a. Matrix Spike/(Matrix Spike) Duplicate

Matrix spike (MS) and matrix spike duplicate (MSD) analyses were not required by the method.

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable. Results were within QC limits with the following exceptions:

DUP ID (Associated Samples)	Analyte	RER2 (Limits)	Flag	A or P
RINSATE 1DUP (All water samples in SDG F71070122)	Thorium-228	2.9 ( $\leq 2.58$ )	J (all detects) UJ (all non-detects)	A



## b. Laboratory Control Samples

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

## c. Tracer Recovery

All tracer recoveries were within validation criteria.

## V. Minimum Detectable Activity (MDA)

All minimum detectable activities met required detection limits.

## VI. Sample Result Verification

Raw data were not reviewed for this SDG.

## VII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

## VIII. Field Duplicates

Samples TSB-AR-11-0' and TSB-AR-11-0'-Dup were identified as field duplicates. No isotopic uranium or isotopic thorium was detected in any of the samples with the following exceptions:

Isotope	Activity (pCi/g)		RPD (Limits)	Difference (Limits)	Flag	A or P
	TSB-AR-11-0'	TSB-AR-11-0'-Dup				
Thorium-228	1.85	2.07	11 ( $\leq 50$ )	-	-	-
Thorium-230	1.06	1.36	25 ( $\leq 50$ )	-	-	-
Thorium-232	1.35	1.62	18 ( $\leq 50$ )	-	-	-
Uranium-233/234	0.305	0.348	-	0.04 pCi/g ( $\leq 0.6$ )	-	-
Uranium-235/236	0.0137U	0.0217	-	0.008 pCi/g ( $\leq 0.6$ )	-	-
Uranium-238	0.205	0.260	-	0.06 pCi/g ( $\leq 0.6$ )	-	-

**BRC Parcel 4A & 4B**

**Isotopic Uranium & Isotopic Thorium - Data Qualification Summary - SDG F7I070122**

SDG	Sample	Compound	Flag	A or P	Reason
F7I070122	RINSATE 1	Thorium-228	J (all detects) UJ (all non-detects)	A	Matrix spike/Matrix spike duplicates (RER2)

**BRC Parcel 4A & 4B**

**Isotopic Uranium & Isotopic Thorium - Laboratory Blank Data Qualification Summary - SDG F7I070122**

No Sample Data Qualified in this SDG

**BRC Parcel 4A & 4B**

**Isotopic Uranium & Isotopic Thorium - Field Blank Data Qualification Summary - SDG F7I070122**

No Sample Data Qualified in this SDG

LDC #: 17587B59

**VALIDATION COMPLETENESS WORKSHEET**

Date: 10-10-07

SDG #: F71070122

Level III

Page: 1 of 1

Laboratory: Test America

Reviewer: MG

2nd Reviewer: W

*only*  
**METHOD:** Isotopic Uranium (EPA Method 9090/Method RICH-RC5067), Isotopic Thorium (Method RICH-RC-5087)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 9-6-07
IIa.	Initial calibration	A	
IIb.	Calibration verification	A	
III.	Blanks	A	
IVa.	Matrix Spike/(Matrix Spike) Duplicates	SW	DUP
IVa.	Laboratory control samples	A	LCS
V.	Tracer Recovery	A	
VI.	Minimum Detectable Activity (MDA)	A	
VII.	Sample result verification	N	
VIII.	Overall assessment of data	A	
IX.	Field duplicates	SW	D = 3+4 R = 18
X.	Field blanks	ND	

Note: A = Acceptable  
 N = Not provided/applicable  
 SW = See worksheet

ND = No compounds detected  
 R = Rinsate  
 FB = Field blank

D = Duplicate  
 TB = Trip blank  
 EB = Equipment blank

## Validated Samples:

1	TSB-AR-08-0'	S	11	TSB-AR-10-10'	S	21	PBS	31	
2	TSB-AR-08-10'		12	TSB-AR-9-0'		22	PBW	32	
3	TSB-AR-11-0'		13	TSB-AR-9-10'		23		33	
4	TSB-AR-11-0'-Dup		14	TSB-AR-12-0'		24		34	
5	TSB-AR-11-10'		15	TSB-AR-12-10'		25		35	
6	TSB-AR-14-0'		16	TSB-AR-3-0'		26		36	
7	TSB-AR-14-10'		17	TSB-AR-3-10'		27		37	
8	TSB-AR-13-0'		18	RINSATE 1	W	28		38	
9	TSB-AR-13-10'		19	TSB-AR-13-0'DUP (Th,U)	S	29		39	
10	TSB-AR-10-0'		20	RINSATE 1DUP (Th)	W	30		40	

Notes: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



**VALIDATION FINDINGS WORKSHEET**  
**Field Duplicates**

METHOD: Radiochemistry (Method: RICH-RC-5067/RICH-RC-5087)

N N/A  
 N N/A

Were field duplicate pairs identified in this SDG?  
 Were target isotopes detected in the field duplicate pairs?

Isotopes	Activity ( $\text{pCi/g}$ )		RPD
	3	4	
Th-228	1.85	2.07	11 ( $\leq 50$ )
Th-230	1.06	1.36	25 (   )
Th-232	1.35	1.62	18 ( ↓ )

Isotopes	Activity ( $\text{pCi/g}$ )		by difference RPD
	3	4	
U-233/234	0.305	0.348	0.04 $\text{pCi/g}$ ( $\leq 0.6 \text{ pCi/g}$ )
U-235/236	0.0137 U	0.0217	0.008 ( ↓ )
U-238	0.205	0.260	0.06 ( ↓ )

Isotopes	Activity ( )		RPD

Isotopes	Activity ( )		RPD

**Laboratory Data Consultants, Inc.  
Data Validation Report**

**Project/Site Name:** BRC Parcel 4A & 4B  
**Collection Date:** September 7, 2007  
**LDC Report Date:** October 16, 2007  
**Matrix:** Soil/Water  
**Parameters:** Isotopic Uranium & Isotopic Thorium  
**Validation Level:** EPA Level III & IV  
**Laboratory:** Test America

**Sample Delivery Group (SDG):** F71100119

**Sample Identification**

RINSATE 2	TSB-AR-06-0'-DupDUP
TSB-AR-06-0'	TSB-AR-06-10'DUP
TSB-AR-06-0'-Dup	
TSB-AR-06-10'	
TSB-AJ-01-0'	
TSB-AJ-01-10'**	
TSB-AJ-02-0'**	
TSB-AJ-02-0'-Dup**	
TSB-AJ-02-10'**	
TSB-AJ-03-0'**	
TSB-AJ-03-10'**	
TSB-BJ-06-0'**	
TSB-BJ-06-10'**	
TSB-BJ-01-0'**	
TSB-BJ-01-10'**	
TSB-BJ-02-0'**	
TSB-BJ-02-10'**	
TSB-BR-06-0'**	
TSB-BR-06-10'**	
RINSATE 2DUP	

\*\*Indicates sample underwent EPA Level IV review

## Introduction

This data review covers 20 soil samples and 2 water samples listed on the cover sheet. The analyses were per Method RICH-RC5067 for Isotopic Uranium and Method RICH-RC5087 for Isotopic Thorium.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (October 2004) as there are no current guidelines for the method stated above.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blank results are summarized in Section III.

Field duplicates are summarized in Section VIII.

Samples indicated by a double asterisk on the front cover underwent a EPA Level IV review. A EPA Level III review was performed on all of the other samples. Raw data were not evaluated for the samples reviewed by Level III criteria since this review is based on QC data.

The following are definitions of the data qualifiers:

- J+ Data are qualified as estimated, with a high bias likely to occur. False positives or false negatives are unlikely to have been reported.
- J- Data are qualified as estimated, with a low bias likely to occur. False positives or false negatives are unlikely to have been reported.
- U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.
- J Indicates an estimated value.
- R Quality control indicates the data is not usable.
- N Presumptive evidence of presence of the constituent.
- UU Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.
- A Indicates the finding is based upon technical validation criteria.
- P Indicates the finding is related to a protocol/contractual deviation.
- None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

## **I. Technical Holding Times**

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

## **II. Calibration**

### **a. Initial Calibration**

All criteria for the initial calibration were met.

Detector efficiency was determined for each radionuclide of interest.

### **b. Continuing Calibration**

Calibration verification and background determination were performed at the required frequencies. Results were within control limits.

## **III. Blanks**

Method blanks were reviewed for each matrix as applicable. Blank results contained less than the minimum detectable activity (MDA).

Sample "RINSATE 2" was identified as a rinsate. No isotopic uranium or isotopic thorium was found in this blank.

## **IV. Accuracy and Precision Data**

### **a. Matrix Spike/(Matrix Spike) Duplicate**

Matrix spike (MS) and matrix spike duplicate (MSD) samples were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits.

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable. Results were within QC limits.

### **b. Laboratory Control Samples**

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

### **c. Tracer Recovery**

All tracer recoveries were within validation criteria.



## V. Minimum Detectable Activity (MDA)

All minimum detectable activities met required detection limits.

## VI. Sample Result Verification

All sample result verifications were acceptable for samples on which a EPA Level IV review was performed. Raw data were not evaluated for the samples reviewed by Level III criteria.

## VII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

## VIII. Field Duplicates

Samples TSB-AR-06-0' and TSB-AR-06-0'-Dup and samples TSB-AJ-02-0'\*\*\* and TSB-AJ-02-0'-Dup\*\* were identified as field duplicates. No isotopic uranium or isotopic thorium was detected in any of the samples with the following exceptions:

Isotope	Activity (pCi/g)		RPD (Limits)	Difference (Limits)	Flag	A or P
	TSB-AR-06-0'	TSB-AR-06-0'-Dup				
Thorium-228	1.19	1.37	14 ( $\leq 50$ )	-	-	-
Thorium-230	0.973	0.950	2 ( $\leq 50$ )	-	-	-
Thorium-232	1.58	1.54	3 ( $\leq 50$ )	-	-	-
Uranium-233/234	0.246	0.356	-	0.11 pCi/g ( $\leq 0.6$ )	-	-
Uranium-238	0.240	0.265	-	0.02 pCi/g ( $\leq 0.6$ )	-	-

Isotope	Activity (pCi/g)		RPD (Limits)	Difference (Limits)	Flag	A or P
	TSB-AJ-02-0'***	TSB-AJ-02-0'-Dup**				
Thorium-228	1.29	1.71	28 ( $\leq 50$ )	-	-	-
Thorium-230	0.983	0.982	0 ( $\leq 50$ )	-	-	-
Thorium-232	1.38	1.36	1 ( $\leq 50$ )	-	-	-
Uranium-233/234	0.341	0.365	-	0.02 pCi/g ( $\leq 0.6$ )	-	-

Isotope	Activity (pCi/g)		RPD (Limits)	Difference (Limits)	Flag	A or P
	TSB-AJ-02-0***	TSB-AJ-02-0'-Dup**				
Uranium-238	0.272	0.318	-	0.05 pCi/g ( $\leq 0.6$ )	-	-

**BRC Parcel 4A & 4B  
Isotopic Uranium & Isotopic Thorium - Data Qualification Summary - SDG F7I100119**

No Sample Data Qualified in this SDG

**BRC Parcel 4A & 4B  
Isotopic Uranium & Isotopic Thorium - Laboratory Blank Data Qualification Summary  
- SDG F7I100119**

No Sample Data Qualified in this SDG

**BRC Parcel 4A & 4B  
Isotopic Uranium & Isotopic Thorium - Field Blank Data Qualification Summary -  
SDG F7I100119**

No Sample Data Qualified in this SDG

LDC #: 17587C59

**VALIDATION COMPLETENESS WORKSHEET**

Date: 10-11-07

SDG #: F71100119

Level III/IV

Page: 1 of 1

Laboratory: Test America

Reviewer: MG

2nd Reviewer: W

*SM*

**METHOD:** Isotopic Uranium (EPA Method 906/Method RICH-RC5067), Isotopic Thorium (Method RICH-RC-5087)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 9-7-07
IIa.	Initial calibration	A	
IIb.	Calibration verification	A	
III.	Blanks	A	
IVa.	Matrix Spike/(Matrix Spike) Duplicates	A	DUP
IVa.	Laboratory control samples	A	LCS
V.	Tracer Recovery	A	
VI.	Minimum Detectable Activity (MDA)	A	
VII.	Sample result verification	A	Not reviewed for Level III validation.
VIII.	Overall assessment of data	A	
IX.	Field duplicates	SW	D=2+3, D=7+8
X.	Field blanks	ND	R=1

Note: A = Acceptable  
 N = Not provided/applicable  
 SW = See worksheet  
 ND = No compounds detected  
 R = Rinsate  
 FB = Field blank  
 D = Duplicate  
 TB = Trip blank  
 EB = Equipment blank

Validated Samples: \*\* Indicates sample underwent Level IV validation

1 <sup>2</sup>	RINSATE 2	<i>W</i>	11	TSB-AJ-03-10***	<i>S</i>	21	TSB-AR-06-0'-Dup <sup>(Th)</sup> DUP	<i>S</i>	31	
2	TSB-AR-06-0'	<i>S</i>	12	TSB-BJ-06-0***		22	TSB-AR-06-10'DUP <sup>(U)</sup>		32	
3	TSB-AR-06-0'-Dup		13	TSB-BJ-06-10***		23	PBS		33	
4	TSB-AR-06-10'		14	TSB-BJ-01-0***		24 <sup>2</sup>	PBW		34	
5	TSB-AJ-01-0'		15	TSB-BJ-01-10***		25			35	
6	TSB-AJ-01-10***		16	TSB-BJ-02-0***		26			36	
7	TSB-AJ-02-0***		17	TSB-BJ-02-10***		27			37	
8	TSB-AJ-02-0'-Dup**		18	TSB-BR-06-0***		28			38	
9	TSB-AJ-02-10***		19	TSB-BR-06-10***		29			39	
10	TSB-AJ-03-0***	<i>W</i>	20 <sup>2</sup>	RINSATE 2DUP <sup>(Th,U)</sup>	<i>W</i>	30			40	

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

LDC #: 17587C59  
 SDG #: FTI100119

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2  
 Reviewer: MG  
 2nd Reviewer: ✓

Method: Radiochemistry (EPA Method RICH-RC-5067 / RICH-RC-5087)

Validation Area	Yes	No	NA	Findings/Comments
<b>I. Technical holding times</b>				
All technical holding times were met.	✓			
<b>II. Calibration</b>				
Were all instruments and detectors calibration as required?	✓			
Were NIST traceable standards used for all calibrations?	✓			
Was the check source identified by activity and radionuclide?	✓			
Were check sources including background counts analyzed at the required frequency and within laboratory control limits?	✓			
<b>III. Blanks</b>				
Were blank analyses performed as required?	✓			
Were any activities detected in the blanks greater than the minimum detectable activity (MDA)? If yes, please see the Blanks validation completeness worksheet.		✓		
<b>IV. Matrix spikes and Duplicates</b>				
Were a matrix spike (MS) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. <u>Soil / Water</u>		✓		
Were the MS percent recoveries (%R) within the QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.			✓	
Was a duplicate sample analyzed at the required frequency of 5% in this SDG?	✓			
Were all duplicate sample duplicate error ratios (DER) $\leq 1.427$ . <u>0.58</u>	✓			
<b>V. Laboratory control samples</b>				
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 75-125%	✓			
<b>VI. Sample Chemical/Carrier Recovery</b>				
Was a tracer/carrier added to each sample?	✓			
Were tracer/carrier recoveries within the QC limits?	✓			
<b>VII. Regional Quality Assurance and Quality Control</b>				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	
<b>VIII. Sample Result Verification</b>				
Were activities adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were the Minimum Detectable Activities (MDA) < RL?	✓			

LDC #: 17587C59  
 SDG #: FTI100119

VALIDATION FINDINGS CHECKLIST

Page: 2 of 2  
 Reviewer: MG  
 2nd Reviewer: W

Validation Area	Yes	No	NA	Findings/Comments
IX. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
X. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
XI. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.		✓		

LDC #: 17587C59  
 SDG #: F7E100119

**VALIDATION FINDINGS WORKSHEET**  
**Field Duplicates**

Page: 1 of 1  
 Reviewer: MG  
 2nd reviewer: ✓

**METHOD:** Radiochemistry (Method: RICH-RC-5067/RICH-RC-5087)

N/A  
 N/A

Were field duplicate pairs identified in this SDG?  
 Were target isotopes detected in the field duplicate pairs?

Isotopes	Activity ( pCi/g )		RPD
	2	3	
Th-228	1.19	1.37	14 (≤50)
Th-230	0.973	0.950	2 (   )
Th-232	1.58	1.54	3 ( ↓ )

Isotopes	Activity ( pCi/g )		by difference RPD
	2	3	
U-233/234	0.246	0.356	0.11 pCi/g (≤0.6 pCi/g)
U-238	0.240	0.265	0.02 ↓ ( ↓ )

Isotopes	Activity ( pCi/g )		RPD
	7	8	
Th-228	1.29	1.71	28 (≤50)
Th-230	0.983	0.982	0 (   )
Th-232	1.38	1.36	1 ( ↓ )
<u>U</u>			

Isotopes	Activity ( pCi/g )		by difference RPD
	7	8	
U-233/234	0.341	0.365	0.02 pCi/g (≤0.6 pCi/g)
U-238	0.272	0.318	0.05 ↓ ( ↓ )

LDC #: 17587C59  
 SDG #: F7I100119

**VALIDATION FINDINGS WORKSHEET**  
**Level IV Recalculation Worksheet**

Page: 1 of 1  
 Reviewer: MG  
 2nd Reviewer: ---

METHOD: Radiochemistry (Method: RICH-RC-5067/RICH-Rep-5087)

Percent recoveries (%R) for a laboratory control sample, a matrix spike and a matrix spike duplicate sample were recalculated using the following formula:

$$\%R = \frac{\text{Found}}{\text{True}} \times 100$$

Where, Found = activity of each analyte measured in the analysis of the sample.  
 True = activity of each analyte in the source.

A matrix spike and matrix spike duplicate relative percent difference (RPD) was recalculated using the following formula:

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

Where, S = Original sample activity  
 D = Duplicate sample activity

Sample ID	Type of Analysis	Analyte	Found/S (units)	True/D (units)	Recalculated		Acceptable (Y/N)
					%R or RPD	Reported %R or RPD	
LCS	Laboratory control sample	Th-230	2.27 (pCi/g)	2.28 (pCi/g)	100	99	Y
-	Matrix spike sample	-	-	-	-	-	-
22	Duplicate RPD	U-238	0.480 (pCi/g) ± 0.053 (1σ)	0.512 (pCi/g) ± 0.057 (1σ)	0.4	RER2 0.4	Y
6	Chemical recovery	Th-234	677.53 (cpm)	845.51 (dpm)	80	80	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.



LDC #: 17587C59  
 SDG #: F7E100119

**VALIDATION FINDINGS WORKSHEET**  
**Sample Calculation Verification**

Page: 1 of 1  
 Reviewer: ME  
 2nd reviewer: [Signature]

METHOD: Radiochemistry (Method: RICH-RC-5067/RICH-RG-5087)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

- N N/A Have results been reported and calculated correctly?  
 N N/A Are results within the calibrated range of the instruments?

Analyte results for # 6, Tn-232 reported with a positive detect were recalculated and verified using the following equation:

Activity = 
$$\frac{(\text{cpm} - \text{bckgrd cpm})}{(2.22)(E)(\text{Vol})(CF)}$$
 Recalculation: 
$$\frac{(81/200.2) - (1/1000.02)}{(2.22)(0.19908)(1.03g)(0.80)} = 1.108 \text{ pci/g}$$

E = Efficiency  
 Vol = Volume  
 CF = %R, Self-absorbance, abundance, ect.

#	Sample ID	Analyte	Reported Concentration (pci/g)	Calculated Concentration (pci/g)	Acceptable (Y/N)
1	6	Tn-228	1.16	1.16	Y
		Tn-230	1.92	1.92	
		Tn-232	1.11	1.11	
		U-233/234	0.912	0.914	
		U-235/236	0.0258	0.0254	
		U-238	0.519	0.520	
2	11	Tn-228	1.61	1.61	
		Tn-230	1.25	1.24	
		Tn-232	1.50	1.50	
		U-233/234	0.914	0.915	
		U-235/236	0.0409	0.0409	
		U-238	0.561	0.562	

Note: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_