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

January 9, 2008

SUBJECT: BRC Tronox Parcel C/D, Data Validation

Dear Ms. Barajas-Albalawi

Enclosed are the final validation reports for the fractions listed below. These SDGs were received on December 24, 2007. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project # 18016:

SDG #	Fraction
TRNC/D-1RD, TRNC/D-2RD, TRNC/D-4RD	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

80/20

LDC #18016 (ERM - Sacramento / BRC Tronox Parcel C/D)

LDC	SDG#	DATE REC'D	(3) DATE DUE	Iso. Thorium (5087)		Iso. U (5067)		Ra-226 (5005)		Ra-228 (5005)																											
Matrix:	Water/Soil			W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S
A	TRNC/D-1RD	12/24/07	01/16/08	1	11	1	11	1	11	1	11																										
B	TRNC/D-2RD	12/24/07	01/16/08	0	7	0	7	0	7	0	7																										
B	TRNC/D-2RD	12/24/07	01/16/08	0	9	0	9	0	9	0	9																										
C	TRNC/D-4RD	12/24/07	01/16/08	0	16	0	16	0	16	0	16																										
Total	T/LR			1	43	1	43	1	43	1	43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	176

Shaded cells indicate Level IV validation (all other cells are Level IIII validation). These sample counts do not include MS/MSD, and DUPs

BRC Tronox Parcel C/D
Data Validation Reports
LDC# 18016

Radium-226 & Radium-228

LDC Report# 18016A29

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: BRC Tronox Parcel C/D

Collection Date: November 9, 2007

LDC Report Date: January 7, 2008

Matrix: Soil/Water

Parameters: Radium-226 & Radium-228

Validation Level: EPA Level III

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): TRNC/D-1RD

Sample Identification

TSB-CR-07-0'
TSB-CR-07-10'
TSB-CJ-08-0'
TSB-CJ-08-0'-FD
TSB-CJ-08-10'
TSB-CJ-04-0'
TSB-CJ-04-10'
TSB-CJ-07-0'
TSB-CJ-07-10'
TSB-CJ-03-0'
TSB-CJ-03-10'
RINSATE 1
TSB-CR-07-0'DUP

Introduction

This data review covers 12 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.

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 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 contaminant concentrations were 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

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-CJ-08-0' and TSB-CJ-08-0'-FD 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-CJ-08-0'	TSB-CJ-08-0'-FD			
Radium-226	0.990	0.929	7 (≤50)	-	-
Radium-228	1.62	1.60	1 (≤50)	-	-

BRC Tronox Parcel C/D
Radium-226 & Radium-228 - Data Qualification Summary - SDG TRNC/D-1RD

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D
Radium-226 & Radium-228 - Laboratory Blank Data Qualification Summary - SDG TRNC/D-1RD

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D
Radium-226 & Radium-228 - Field Blank Data Qualification Summary - SDG TRNC/D-1RD

No Sample Data Qualified in this SDG

LDC #: 18016A29 **VALIDATION COMPLETENESS WORKSHEET** Date: 1-7-08

SDG #: TRNC/D-1RD Level III Page: 1 of 1

Laboratory: Test America Reviewer: MG

Soil: Radium-226, Radium-228 (EPA Meth 901.1/RICH-RC-5017) 2nd Reviewer:

Water

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: 11-9-07
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	Water only
V.	Sample result verification	N	
VI.	Minimum dectectable activity (MDA)	A	
VII.	Overall assessment of data	A	
VIII.	Field duplicates	SW	D = 3 + 4
XIV	Field blanks	ND	R = 12

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-CR-07-0' S	11	TSB-CJ-03-10' S	21		31	
2	TSB-CR-07-10'	12 2	RINSATE 1 W	22		32	
3	TSB-CJ-08-0'	13	TSB-CR-07-0'DUP S	23		33	
4	TSB-CJ-08-0'-FD	14 1	PBS	24		34	
5	TSB-CJ-08-10'	15 2	PBW	25		35	
6	TSB-CJ-04-0'	16		26		36	
7	TSB-CJ-04-10'	17		27		37	
8	TSB-CJ-07-0'	18		28		38	
9	TSB-CJ-07-10'	19		29		39	
10	TSB-CJ-03-0'	20		30		40	

Notes:

LDC #: 18016A29
SDG #: TRNC/D-1RD

VALIDATION FINDINGS WORKSHEET
Field Duplicates

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

METHOD: Radiochemistry (Method: See cover)

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

Isotopes	Activity (pCi/g)		RPD
	3	4	
Ra-226	0.999	0.929	7 (≤50)
Ra-228	1.62	1.60	1 (↓)

Isotopes	Activity ( )		RPD

Isotopes	Activity ( )		RPD

Isotopes	Activity ( )		RPD

LDC Report# 18016B29

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: BRC Tronox Parcel C/D

Collection Date: November 12, 2007

LDC Report Date: January 7, 2008

Matrix: Soil

Parameters: Radium-226 & Radium-228

Validation Level: EPA Level III & IV

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): TRNC/D-2RD

Sample Identification

TSB-CJ-02-0'**
TSB-CJ-02-10'**
TSB-CJ-01-0'**
TSB-CJ-01-10'**
TSB-CJ-01-0'-FD
TSB-CR-02-0'**
TSB-CR-02-10'**
TSB-CR-01-0'**
TSB-CR-01-10'**
TSB-CR-03-0'
TSB-CR-03-10'
TSB-CJ-05-0'**
TSB-CJ-05-10'
TSB-CJ-06-0'
TSB-CJ-06-0'-FD
TSB-CJ-06-10'
TSB-CR-01-0'DUP

**Indicates sample underwent EPA Level IV review

Introduction

This data review covers 17 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.

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.

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 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. 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-CJ-01-0'** and TSB-CJ-01-0'-FD and samples TSB-CJ-06-0' and TSB-CJ-06-0'-FD 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-CJ-01-0'**	TSB-CJ-01-0'-FD			
Radium-226	1.05	1.17	11 (≤50)	-	-
Radium-228	1.83	1.87	2 (≤50)	-	-

Isotope	Activity (pCi/g)		RPD (Limits)	Flag	A or P
	TSB-CJ-06-0'	TSB-CJ-06-0'-FD			
Radium-226	0.894	0.980	9 (≤50)	-	-
Radium-228	1.76	1.52	15 (≤50)	-	-

BRC Tronox Parcel C/D
Radium-226 & Radium-228 - Data Qualification Summary - SDG TRNC/D-2RD

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D
Radium-226 & Radium-228 - Laboratory Blank Data Qualification Summary - SDG TRNC/D-2RD

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D
Radium-226 & Radium-228 - Field Blank Data Qualification Summary - SDG TRNC/D-2RD

No Sample Data Qualified in this SDG

LDC #: 18016B29 **VALIDATION COMPLETENESS WORKSHEET** Date: 1-7-08
SDG #: TRNC/D-2RD Level III/IV Page: 1 of 1
Laboratory: Test America Reviewer: MG
2nd Reviewer: W

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

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: 11-12-07
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	N	
V.	Sample result verification	A	Not reviewed for Level III validation.
VI.	Minimum dectectable activity (MDA)	A	
VII.	Overall assessment of data	A	
VIII.	Field duplicates	SW	D=3+5, D=14+15
XIV	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: ** Indicates sample underwent Level IV validation

all Soil

1	TSB-CJ-02-0'**	11	TSB-CR-03-10'	21		31	
2	TSB-CJ-02-10'**	12	TSB-CJ-05-0'**	22		32	
3	TSB-CJ-01-0'**	13	TSB-CJ-05-10'	23		33	
4	TSB-CJ-01-10'**	14	TSB-CJ-06-0'	24		34	
5	TSB-CJ-01-0'-FD	15	TSB-CJ-06-0'-FD	25		35	
6	TSB-CR-02-0'**	16	TSB-CJ-06-10'	26		36	
7	TSB-CR-02-10'**	17	TSB-CR-01-0'DUP	27		37	
8	TSB-CR-01-0'**	18	PBS	28		38	
9	TSB-CR-01-10'**	19		29		39	
10	TSB-CR-03-0'	20		30		40	

Notes:

LDC #: 18016 B29
SDG #: TRNC/D-2RD

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: V

Method: Radiochemistry (EPA Method 901.1 / RICH-RC-5017

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
II. Calibration				
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 requiried frequency and within laboratory control limits?	✓			
III. Blanks				
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.		✓		
IV. Matrix spikes and Duplicates				
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. (Soil) / Water.		✓		
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 anaylzed at the required frequency of 5% in this SDG?	✓			
Were all duplicate sample duplicate error rations (DER) ≤~~1.42~~. 2.58	✓			
V. Laboratory control samples				
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 75-125%	✓			
VI. Sample Chemical/Carrier Recovery				
Was a tracer/carrier added to each sample?		✓		
Were tracer/carrier recoveries within the QC limits?			✓	
VII. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	
VIII. Sample Result Verification				
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 #: 18016B29
SDG #: TRNC/D-2RD

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer:

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 #: 18016B29
SDG #: TRNC/D-2RD

VALIDATION FINDINGS WORKSHEET
Field Duplicates

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

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

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

Isotopes	Activity (pCi/g)		RPD
	3	5	
Ra-226	1.05	1.17	11 (≤50)
Ra-228	1.83	1.87	2 (↓)

Isotopes	Activity (pCi/g)		RPD
	14	15	
Ra-226	0.894	0.980	9 (≤50)
Ra-228	1.76	1.52	15 (↓)

Isotopes	Activity ( )		RPD

Isotopes	Activity ( )		RPD

LDC #: 18016B29
SDG #: TRNC/D-2RD

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer:

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

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

$\%R = \frac{Found}{True} \times 100$ 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 %R or RPD	Reported %R or RPD	Acceptable (Y/N)
LCS	Laboratory control sample	Cs-137	8.02 (pCi/g)	7.98 (pCi/g)	101	101	Y
—	Matrix spike sample	—	—	—	—	—	—
17	Duplicate RPD	Ra-226	0.755 ± 0.069 (pCi/g) (1σ)	0.936 ± 0.080 (pCi/g) (1σ)	RER 2 1.7	RER 2 1.7	Y
—	Chemical recovery	—	—	—	—	—	—

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 #: 18016B29
SDG #: TRNC/D-2RD

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

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

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

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

(Y) N N/A Have results been reported and calculated correctly?

(Y) N N/A Are results within the calibrated range of the instruments?

Analyte results for #1, Ra-228 reported with a positive detect were recalculated and verified using the following equation:

Activity = $\frac{\text{(cpm - bckgrd cpm)}}{\text{(2.22)(E)(Vol)(CF)}}$

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

Recalculation:

$$\frac{(931/1000)}{(2.22)(0.01691)(0.2770)(53.3\,g)} = 1.680 \text{ pCi/g}$$

#	Sample ID	Analyte	Reported Concentration (pCi/g)	Calculated Concentration (pCi/g)	Acceptable (Y/N)
1	1	Ra-226	1.03	1.03	Y
		Ra-228	1.69	1.68	↓

Note:

LDC Report# 18016C29

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: BRC Tronox Parcel C/D

Collection Date: November 14, 2007

LDC Report Date: January 7, 2008

Matrix: Soil

Parameters: Radium-226 & Radium-228

Validation Level: EPA Level III

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): TRNC/D-4RD

Sample Identification

TSB-FR-01-0'
TSB-FR-01-10'
TSB-FJ-07-0'
TSB-FJ-07-10'
TSB-FJ-06-0'
TSB-FJ-06-0'-FD
TSB-FJ-06-10'
TSB-FJ-05-0'
TSB-FJ-05-10'
TSB-DR-01-0'
TSB-DR-01-10'
TSB-DR-02-0'
TSB-DR-02-10'
TSB-DR-02-0'-FD
JB-NW DITCH01-0'
JB-NW DITCH01-10'
TSB-FR-01-0'DUP

Introduction

This data review covers 17 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.

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 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. 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

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-FJ-06-0' and TSB-FJ-06-0'-FD and samples TSB-DR-02-0' and TSB-DR-02-0'-FD 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-FJ-06-0'	TSB-FJ-06-0'-FD			
Radium-226	0.946	0.950	0 (≤50)	-	-
Radium-228	1.82	1.73	5 (≤50)	-	-

Isotope	Activity (pCi/g)		RPD (Limits)	Flag	A or P
	TSB-DR-02-0'	TSB-DR-02-0'-FD			
Radium-226	1.10	0.979	12 (≤50)	-	-
Radium-228	1.84	1.77	4 (≤50)	-	-

BRC Tronox Parcel C/D
Radium-226 & Radium-228 - Data Qualification Summary - SDG TRNC/D-4RD

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D
Radium-226 & Radium-228 - Laboratory Blank Data Qualification Summary - SDG TRNC/D-4RD

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D
Radium-226 & Radium-228 - Field Blank Data Qualification Summary - SDG TRNC/D-4RD

No Sample Data Qualified in this SDG

LDC #: 18016C29 **VALIDATION COMPLETENESS WORKSHEET** Date: 1-7-08
SDG #: TRNC/D-4RD Level III Page: 1 of 1
Laboratory: Test America Reviewer: MG
2nd Reviewer:

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

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: 11-14-07
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	N	
V.	Sample result verification	N	
VI.	Minimum dectectable activity (MDA)	A	
VII.	Overall assessment of data	A	
VIII.	Field duplicates	SW	D = 5+6, D = 12+14
XIV	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-FR-01-0'	11	TSB-DR-01-10'	21		31	
2	TSB-FR-01-10'	12	TSB-DR-02-0'	22		32	
3	TSB-FJ-07-0'	13	TSB-DR-02-10'	23		33	
4	TSB-FJ-07-10'	14	TSB-DR-02-0'-FD	24		34	
5	TSB-FJ-06-0'	15	JB-NW DITCH01-0'	25		35	
6	TSB-FJ-06-0'-FD	16	JB-NW DITCH01-10'	26		36	
7	TSB-FJ-06-10'	17	TSB-FR-01-0'DUP	27		37	
8	TSB-FJ-05-0'	18	PBS	28		38	
9	TSB-FJ-05-10'	19		29		39	
10	TSB-DR-01-0'	20		30		40	

Notes:

LDC #: 18016C29
SDG #: TRNC/D-4RD

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Page: 1 of 1
Reviewer: MG
2nd reviewer: [illegible]

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

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

Isotopes	Activity (pCi/g)		RPD
	5	6	
Ra-226	0.946	0.950	0 (≤50)
Ra-228	1.82	1.73	5 (↓)

Isotopes	Activity (pCi/g)		RPD
	12	14	
Ra-226	1.10	0.979	12 (≤50)
Ra-228	1.84	1.77	4 (↓)

Isotopes	Activity ( )		RPD

Isotopes	Activity ( )		RPD

BRC Tronox Parcel C/D
Data Validation Reports
LDC# 18016

Isotopic Uranium & Isotopic Thorium

LDC Report# 18016A59

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: BRC Tronox Parcel C/D

Collection Date: November 9, 2007

LDC Report Date: January 8, 2008

Matrix: Soil/Water

Parameters: Isotopic Uranium & Isotopic Thorium

Validation Level: EPA Level III

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): TRNC/D-1RD

Sample Identification

TSB-CR-07-0'
TSB-CR-07-10'
TSB-CJ-08-0'
TSB-CJ-08-0'-FD
TSB-CJ-08-10'
TSB-CJ-04-0'
TSB-CJ-04-10'
TSB-CJ-07-0'
TSB-CJ-07-10'
TSB-CJ-03-0'
TSB-CJ-03-10'
RINSATE 1
TSB-CR-07-10'DUP
TSB-CJ-08-0'DUP
RINSATE 1DUP

Introduction

This data review covers 13 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 contaminants were 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.

b. Laboratory Control Samples

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

LCS ID	Isotope	%R (Limits)	Associated Samples	Flag	A or P
LCS	U-235/236	135 (75-125)	All water samples in SDG TRNC/D-1RD	J+ (all detects)	P

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-CJ-08-0' and TSB-CJ-08-0'-FD 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-CJ-08-0'	TSB-CJ-08-0'-FD				
Thorium-228	1.68	1.68	0 (≤50)	-	-	-
Thorium-230	1.84	1.47	22 (≤50)	-	-	-
Thorium-232	1.39	1.93	33 (≤50)	-	-	-
Uranium-233/234	0.395	0.173	-	0.22 pCi/g (≤0.6)	-	-
Uranium-238	0.329	0.507	-	0.18 pCi/g (≤0.6)	-	-

BRC Tronox Parcel C/D
Isotopic Uranium & Isotopic Thorium - Data Qualification Summary - SDG TRNC/D-1RD

SDG	Sample	Isotope	Flag	A or P	Reason
TRNC/D-1RD	RINSATE 1	U-235/236	J+ (all detects)	P	Laboratory control samples (%R)

BRC Tronox Parcel C/D
Isotopic Uranium & Isotopic Thorium - Laboratory Blank Data Qualification Summary - SDG TRNC/D-1RD

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D
Isotopic Uranium & Isotopic Thorium - Field Blank Data Qualification Summary - SDG TRNC/D-1RD

No Sample Data Qualified in this SDG

LDC #: 18016A59 **VALIDATION COMPLETENESS WORKSHEET** Date: 1-7-08
SDG #: TRNC/D-1RD Level III Page: 1 of 1
Laboratory: Test America Reviewer: MG
2nd Reviewer:

METHOD: Isotopic Uranium (~~EPA Method 908/~~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: 11-9-07
IIa.	Initial calibration	A	
IIb.	Calibration verification	A	
III.	Blanks	A	
IVa.	Matrix Spike/(Matrix Spike) Duplicates	A	DUP
IVa.	Laboratory control samples	SW	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
X	Field blanks	ND	R = 12

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-CR-07-0' S	11	TSB-CJ-03-10' S	21		31	
2	TSB-CR-07-10'	12 2	RINSATE 1 W	22		32	
3	TSB-CJ-08-0'	13	TSB-CR-07-10'DUP (Th) S	23		33	
4	TSB-CJ-08-0'-FD	14	TSB-CJ-08-0'DUP (U) ↓	24		34	
5	TSB-CJ-08-10'	15 2	RINSATE 1DUP (U,Th) W	25		35	
6	TSB-CJ-04-0'	16 1	PBS	26		36	
7	TSB-CJ-04-10'	17 2	PBW	27		37	
8	TSB-CJ-07-0'	18		28		38	
9	TSB-CJ-07-10'	19		29		39	
10	TSB-CJ-03-0' ↓	20		30		40	

Notes:

LDC #: 18016A59
SDG #: TRNC/D-1RD

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample (LCS)

Reviewer: MG
2nd Reviewer: W

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

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
(Y) N N/A Was a laboratory control sample (LCS) analyzed at the required frequency in this SDG?
Y (N) N/A Were all LCS percent recoveries (%R) within the control limits of 75-125%?
LEVEL IV ONLY:
Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	LCS ID	Matrix	Isotope	%R (limits)	Associated Samples	Qualifications
1	LCS	water	U-235/236	135 (75-125)	all water	J+ dets/P

Comments:

LDC #: 18016A59
SDG #: TRNC/D-IRD

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Page: 1 of 1
Reviewer: MG
2nd reviewer: [illegible]

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

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

Isotopes	Activity (pCi/g) 3	Activity (pCi/g) 4	RPD
Th-228	1.68	1.68	0 (≤50)
Th-230	1.84	1.47	22 (↓)
Th-232	1.39	1.93	33 (↓)

Isotopes	Activity (pCi/g) 3	Activity (pCi/g) 4	by difference ~~RPD~~
U-233/234	0.395	0.173	0.22 pCi/g (≤ 0.6 pCi/g)
U-238	0.329	0.507	0.18 ↓ (↓)

Isotopes	Activity ( )		RPD

Isotopes	Activity ( )		RPD

LDC Report# 18016B59

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: BRC Tronox Parcel C/D

Collection Date: November 12, 2007

LDC Report Date: January 8, 2008

Matrix: Soil

Parameters: Isotopic Uranium & Isotopic Thorium

Validation Level: EPA Level III & IV

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): TRNC/D-2RD

Sample Identification

TSB-CJ-02-0'**
TSB-CJ-02-10'**
TSB-CJ-01-0'**
TSB-CJ-01-10'**
TSB-CJ-01-0'-FD
TSB-CR-02-0'**
TSB-CR-02-10'**
TSB-CR-01-0'**
TSB-CR-01-10'**
TSB-CR-03-0'
TSB-CR-03-10'
TSB-CJ-05-0'**
TSB-CJ-05-10'
TSB-CJ-06-0'
TSB-CJ-06-0'-FD
TSB-CJ-06-10'
TSB-CR-01-0'DUP

**Indicates sample underwent EPA Level IV review

Introduction

This data review covers 17 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.

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.

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).

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 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-CJ-01-0'** and TSB-CJ-01-0'-FD and samples TSB-CJ-06-0' and TSB-CJ-06-0'-FD 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-CJ-01-0'**	TSB-CJ-01-0'-FD				
Thorium-228	1.47	1.63	10 (≤50)	-	-	-
Thorium-230	1.33	1.55	15 (≤50)	-	-	-
Thorium-232	1.58	1.28	21 (≤50)	-	-	-
Uranium-233/234	0.529	0.533	-	0.00 pCi/g (≤0.6)	-	-
Uranium-235/236	0.0223	0.0164U	-	0.01 pCi/g (≤0.6)	-	-
Uranium-238	0.383	0.451	-	0.07 pCi/g (≤0.6)	-	-

Isotope	Activity (pCi/g)		RPD (Limits)	Difference (Limits)	Flag	A or P
	TSB-CJ-06-0'	TSB-CJ-06-0'-FD				
Thorium-228	1.86	1.49	22 (≤50)	-	-	-
Thorium-230	0.868	0.802	8 (≤50)	-	-	-
Thorium-232	1.57	1.46	7 (≤50)	-	-	-

Isotope	Activity (pCi/g)		RPD (Limits)	Difference (Limits)	Flag	A or P
	TSB-CJ-06-0'	TSB-CJ-06-0'-FD				
Uranium-233/234	0.369	0.292	-	0.08 pCi/g (≤0.6)	-	-
Uranium-238	0.251	0.186	-	0.06 pCi/g (≤0.6)	-	-

BRC Tronox Parcel C/D
Isotopic Uranium & Isotopic Thorium - Data Qualification Summary - SDG TRNC/D-2RD

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D
Isotopic Uranium & Isotopic Thorium - Laboratory Blank Data Qualification Summary - SDG TRNC/D-2RD

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D
Isotopic Uranium & Isotopic Thorium - Field Blank Data Qualification Summary - SDG TRNC/D-2RD

No Sample Data Qualified in this SDG

LDC #: 18016B59 **VALIDATION COMPLETENESS WORKSHEET** Date: 1-7-08
SDG #: TRNC/D-2RD Level III/IV Page: 1 of 1
Laboratory: Test America Reviewer: MG
2nd Reviewer: W

MA

METHOD: Isotopic Uranium (~~EPA Method 908/~~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: 11-12-07
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= 3+5, D=14+15
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: ** Indicates sample underwent Level IV validation
all soil

1	TSB-CJ-02-0'**	11	TSB-CR-03-10'	21		31	
2	TSB-CJ-02-10'**	12	TSB-CJ-05-0'**	22		32	
3	TSB-CJ-01-0'**	13	TSB-CJ-05-10'	23		33	
4	TSB-CJ-01-10'**	14	TSB-CJ-06-0'	24		34	
5	TSB-CJ-01-0'-FD	15	TSB-CJ-06-0'-FD	25		35	
6	TSB-CR-02-0'**	16	TSB-CJ-06-10'	26		36	
7	TSB-CR-02-10'**	17	TSB-CR-01-0'DUP (Th, U)	27		37	
8	TSB-CR-01-0'**	18	PBS	28		38	
9	TSB-CR-01-10'**	19		29		39	
10	TSB-CR-03-0'	20		30		40	

Notes:

LDC #: 18016B59
SDG #: TRNC/D-2RD

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

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

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
II. Calibration				
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 requiried frequency and within laboratory control limits?	✓			
III. Blanks				
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.		✓		
IV. Matrix spikes and Duplicates				
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 (Soil) Water.		✓		
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 anaylzed at the required frequency of 5% in this SDG?	✓			
Were all duplicate sample duplicate error rations (DER) ~~≤1.42?~~ ≤2.58	✓			
V. Laboratory control samples				
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 75-125%	✓			
VI. Sample Chemical/Carrier Recovery				
Was a tracer/carrier added to each sample?	✓			
Were tracer/carrier recoveries within the QC limits?	✓			
VII. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	
VIII. Sample Result Verification				
Were activities adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were the Minimum Detectable Activities (MDA) < RL?	✓			

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 #: 18016B59
SDG #: TRNCD -2RD

VALIDATION FINDINGS WORKSHEET
Field Duplicates

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

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

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

Isotopes	Activity (pCi/g) 3	Activity (pCi/g) 5	RPD
Th-228	1.47	1.63	10 (≤50)
Th-230	1.33	1.55	15 (↓)
Th-232	1.58	1.28	21 (✓)

Isotopes	Activity (pCi/g) 3	Activity (pCi/g) 5	by difference ~~RPD~~
U-233/234	0.529	0.533	0.00 pCi/g (≤0.6 pCi/g)
U-235/236	0.0223	0.0164 U	0.01 (↓)
U-238	0.383	0.451	0.07 (↓)

Isotopes	Activity (pCi/g) 14	Activity (pCi/g) 15	RPD
Th-228	1.86	1.49	22 (≤50)
Th-230	0.868	0.802	8 (↓)
Th-232	1.57	1.46	7 (↓)

Isotopes	Activity (pCi/g) 14	Activity (pCi/g) 15	by difference ~~RPD~~
U-233/234	0.369	0.292	0.08 pCi/g (≤0.6 pCi/g)
U-238	0.251	0.186	0.06 (↓)

LDC #: 18016B59
SDG #: TRNC/D-2RD

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

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

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

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

$\%R = \frac{Found}{True} \times 100$ 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 %R or RPD	Reported %R or RPD	Acceptable (Y/N)
LCS	Laboratory control sample	U-238	0.884 (pCi/g)	0.901 (pCi/g)	98	98	Y
—	Matrix spike sample	—	—	—	—	—	—
17	Duplicate RPD	U-233/234	0.368 ± 0.045 (1σ) (pCi/g)	0.377 ± 0.047 (1σ) (pCi/g)	RER2 0.1	RER2 0.1	Y
1	Chemical recovery	Th-234	631.29 (dpm)	750.10 (dpm)	84	84	↓

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 #: 18016B59
SDG #: TRNC/D-2RD

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

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

METHOD: Radiochemistry (Method: RICH-RC-5067 / RICH-RC-3087

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
(Y) N N/A Have results been reported and calculated correctly?
(Y) N N/A Are results within the calibrated range of the instruments?

Analyte results for #1, Th-228 reported with a positive detect were recalculated and verified using the following equation:

Activity = $\frac{(cpm - bckgrd\ cpm)}{(2.22)(E)(Vol)(CF)}$

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

Recalculation:

$$\frac{\left(177/199.783\right) - \left(1/998.95\right)}{(2.22)(0.25595)(1.03g)(.8416)} \times 1.0184 = 1.830\ pCi/g$$

#	Sample ID	Analyte	Reported Concentration (pCi/g)	Calculated Concentration (pCi/g)	Acceptable (Y/N)
1	1	Th-228	1.83	1.83	Y
		Th-230	1.10	1.10	
		Th-232	1.63	1.63	
		U-233/234	0.640	0.641	
		U-235/236	0.0219	0.0219	
		U-238	0.460	0.460	

Note: _____

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: BRC Tronox Parcel C/D

Collection Date: November 14, 2007

LDC Report Date: January 8, 2008

Matrix: Soil

Parameters: Isotopic Uranium & Isotopic Thorium

Validation Level: EPA Level III

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): TRNC/D-4RD

Sample Identification

TSB-FR-01-0'
TSB-FR-01-10'
TSB-FJ-07-0'
TSB-FJ-07-10'
TSB-FJ-06-0'
TSB-FJ-06-0'-FD
TSB-FJ-06-10'
TSB-FJ-05-0'
TSB-FJ-05-10'
TSB-DR-01-0'
TSB-DR-01-10'
TSB-DR-02-0'
TSB-DR-02-10'
TSB-DR-02-0'-FD
JB-NW DITCH01-0'
JB-NW DITCH01-10'
TSB-FR-01-10'DUP
TSB-FJ-07-0'DUP

Introduction

This data review covers 18 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.

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).

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

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-FJ-06-0' and TSB-FJ-06-0'-FD and samples TSB-DR-02-0' and TSB-DR-02-0'-FD 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-FJ-06-0'	TSB-FJ-06-0'-FD				
Thorium-228	1.33	1.81	31 (≤50)	-	-	-
Thorium-230	0.904	1.07	17 (≤50)	-	-	-
Thorium-232	1.33	1.39	4 (≤50)	-	-	-
Uranium-233/234	0.455	0.360	-	0.10 pCi/g (≤0.6)	-	-
Uranium-238	0.247	0.210	-	0.04 pCi/g (≤0.6)	-	-

Isotope	Activity (pCi/g)		RPD (Limits)	Difference (Limits)	Flag	A or P
	TSB-DR-02-0'	TSB-DR-02-0'-FD				
Thorium-228	1.65	1.47	12 (≤50)	-	-	-
Thorium-230	1.06	1.11	5 (≤50)	-	-	-
Thorium-232	1.57	1.33	17 (≤50)	-	-	-
Uranium-233/234	0.584	0.355	-	0.23 pCi/g (≤0.6)	-	-
Uranium-238	0.374	0.287	-	0.09 pCi/g (≤0.6)	-	-

BRC Tronox Parcel C/D
Isotopic Uranium & Isotopic Thorium - Data Qualification Summary - SDG TRNC/D-4RD

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D
Isotopic Uranium & Isotopic Thorium - Laboratory Blank Data Qualification Summary - SDG TRNC/D-4RD

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D
Isotopic Uranium & Isotopic Thorium - Field Blank Data Qualification Summary - SDG TRNC/D-4RD

No Sample Data Qualified in this SDG

LDC #: 18016C59 **VALIDATION COMPLETENESS WORKSHEET** Date: 1-7-08
SDG #: TRNC/D-4RD Level III Page: 1 of 1
Laboratory: Test America Reviewer: MG
2nd Reviewer:

mA

METHOD: Isotopic Uranium (~~EPA Method 908~~/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: 11-14-07
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 = 5+6, D = 12+14
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-FR-01-0'	11	TSB-DR-01-10'	21		31	
2	TSB-FR-01-10'	12	TSB-DR-02-0'	22		32	
3	TSB-FJ-07-0'	13	TSB-DR-02-10'	23		33	
4	TSB-FJ-07-10'	14	TSB-DR-02-0'-FD	24		34	
5	TSB-FJ-06-0'	15	JB-NW DITCH01-0'	25		35	
6	TSB-FJ-06-0'-FD	16	JB-NW DITCH01-10'	26		36	
7	TSB-FJ-06-10'	17	TSB-FR-01-10'DUP (Th)	27		37	
8	TSB-FJ-05-0'	18	TSB-FJ-07-0'DUP (U)	28		38	
9	TSB-FJ-05-10'	19	PBS	29		39	
10	TSB-DR-01-0'	20		30		40	

Notes:

LDC #: 18016C59
SDG #: TRNC/D-4RD

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd reviewer: [signature]

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

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

Isotopes	Activity (pCi/g) 5	Activity (pCi/g) 6	RPD
Th-228	1.33	1.81	31 (≤50)
Th-230	0.904	1.07	17 (")
Th-232	1.33	1.39	4 (")

Isotopes	Activity (pCi/g) 5	Activity (pCi/g) 6	by difference ~~RPD~~
U-233/234	0.455	0.360	0.10 pCi/g (≤ 0.6 pCi/g)
U-238	0.247	0.210	0.04 " (")

Isotopes	Activity (pCi/g) 12	Activity (pCi/g) 14	RPD
Th-228	1.65	1.47	12 (≤50)
Th-230	1.06	1.11	5 (")
Th-232	1.57	1.33	17 (")

Isotopes	Activity (pCi/g) 12	Activity (pCi/g) 14	by difference ~~RPD~~
U-233/234	0.584	0.355	0.23 pCi/g (≤ 0.6 pCi/g)
U-238	0.374	0.287	0.09 " (")