

LABORATORY DATA CONSULTANTS, INC. 7750 El Camino Real, Suite 2L Carlsbad, CA 92009 Phone: 760/634-0437 Fax: 760/634-0439

ERM

January 22, 2008

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

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 January 2, 2008. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project # 18035:

SDG#

Fraction

TRNC/D-3RD, TRNC/D-5RD, TRNC/D-6RD, TRNC/D-7RD

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

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BRC Tronox Parcel C/D Data Validation Reports LDC# 18035

Radium-226 & Radium-228

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

BRC Tronox Parcel C/D

Collection Date:

November 13, 2007

LDC Report Date:

January 14, 2008

Matrix:

Soil/Water

Parameters:

Radium-226 & Radium-228

Validation Level:

EPA Level III

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): TRNC/D-3RD

Sample Identification

TSB-DR-06-0'

TSB-DR-06-10'

TSB-DR-05-0'

TSB-DR-05-0'-FD

TSB-DR-05-10'

TSB-DR-03-0'

TSB-DR-03-10'

TSB-DJ-01-0'

TSB-DJ-01-10'

TSB-DR-04-0'

TSB-DR-04-10'

TSB-CR-04-0'

TSB-CR-04-10'

TSB-CR-05-0'

TSB-CR-05-10'

TSB-CR-06-0'

TSB-CR-06-10'

RINSATE-2

TSB-DR-03-0'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/Method RICH-RC5017 for soil samples for Radium-226 and Radium-228, EPA Method 903.1/Method RICH-RC5005 for water samples for Radium-226, and EPA Method 904.0/Method RICH-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-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 for the water samples in this SDG.

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-DR-05-0' and TSB-DR-05-0'-FD were identified as field duplicates. No radium-226 or radium-228 was detected in any of the samples with the following exceptions:

	Activ	ity (pCi/g)				
Isotope	TSB-DR-05-0'	TSB-DR-05-0'-FD	RPD (Limits)	Difference (Limits)	Flag	A or P
Radium-226	1.07	0.971	10 (≤50)	-	-	-
Radium-228	1.63	1.64	1 (≤50)	-	-	-

BRC Tronox Parcel C/D
Radium-226 & Radium-228 - Data Qualification Summary - SDG TRNC/D-3RD

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D Radium-226 & Radium-228 - Laboratory Blank Data Qualification Summary - SDG TRNC/D-3RD

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D Radium-226 & Radium-228 - Field Blank Data Qualification Summary - SDG TRNC/D-3RD

No Sample Data Qualified in this SDG

SDG # Labora An fi Wate METH The sa	#: TRNC/D-3RD atory: Test America	a~233(<i>EPA</i> /Method RICH	Level III \ Me#\ 901.1 -RC5005) Radiur	m 228 (EPA Method 904.	
	Validation Area			Comments	
I.	Technical holding times	A	Sampling dates:	11-13-07	
lla.	Initial calibration	A			
llb.	Calibration verification	Α			
III.	Blanks	A			

DUP

LCS

Water only

D=3+4

R= 18

Note:

IVa.

IVb.

IVc.

V. VI.

VII.

VIII.

ΧIV

Field duplicates

Field blanks

A = Acceptable N = Not provided/applicable

Matrix Spike/(Matrix Spike) Duplicates

Minimum dectectable activity (MDA)

Laboratory control samples

Sample result verification

Overall assessment of data

Chemical recovery

SW = See worksheet

ND = No compounds detected

N

SW

ND

R = Rinsate FB = Field blank D = Duplicate

TB = Trip blank

EB = Equipment blank

Validated Samples:

1	TSB-DR-06-0'	S	11	TSB-DR-04-10'	5	21	PBS	31	
2	TSB-DR-06-10'		12	TSB-CR-04-0'		₂₂ 2	PBW	32	
3	TSB-DR-05-0'	Ш	13	TSB-CR-04-10'		23		33	
4	TSB-DR-05-0'-FD		14	TSB-CR-05-0'		24	200	34	
5	TSB-DR-05-10'		15	TSB-CR-05-10'		25		35	
6	TSB-DR-03-0'		16	TSB-CR-06-0'		26		36	
7	TSB-DR-03-10'		17	TSB-CR-06-10'	1	27		37	
8	TSB-DJ-01-0'		18 ²	RINSATE-2	W	28		38	
9	D TSB- Q J-01-10'		19	TSB-DR-03-0'DUP	5	29		39	
10	TSB-DR-04-0'		20			30		40	

Notes:_				
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LDC #: 18035A29 VALIDATION FINDINGS WORKSHEET SDG #: TRNC/D-3RD Field Duplicates

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Field Duplic	<u>ates</u>	Reviewer: MG- 2nd reviewer:
cover)	
lentified in this SDG?	pairs?	
Activity (pci/g)	
3	4	RPD
1.07	0.971	10 (450)
1.63	1.64	1 (1)
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Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

BRC Tronox Parcel C/D

Collection Date:

November 15, 2007

LDC Report Date:

January 14, 2008

Matrix:

Soil/Water

Parameters:

Radium-226 & Radium-228

Validation Level:

EPA Level III

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): TRNC/D-5RD

Sample Identification

TSB-FJ-03-0'

TSB-FJ-03-0'-FD

TSB-FJ-03-10'

TSB-FJ-10-0'

TSB-FJ-10-10'

TSB-FJ-04-0'

TSB-FJ-04-10'

TSB-FJ-02-0'

TSB-FJ-02-0'-FD

TSB-FJ-02-10'

TSB-FR-02-0'

TSB-FR-02-10'

TSB-FJ-09-0'

TSB-FJ-09-10'

TSB-FR-03-0'

TSB-FR-03-10'

RINSATE 3

TSB-FJ-03-10'DUP

TSB-FR-02-0'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/Method RICH-RC5017 for soil samples for Radium-226 and Radium-228, EPA Method 903.1/Method RICH-RC5005 for water samples for Radium-226, and EPA Method 904.0/Method RICH-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.
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- 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 3" 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 for the water samples in this SDG.

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-03-0' and TSB-FJ-03-0'-FD and samples TSB-FJ-02-0' and TSB-FJ-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:

	Activ	ity (pCi/g)					
Isotope	TSB-FJ-03-0'	TSB-FJ-03-0'-FD	RPD (Limits)	Difference (Limits)	Flag	A or P	
Radium-226	1.02	0.916	11 (≤50)	-	-	-	
Radium-228	1.50	1.70	12 (≤50)	-	-	-	

	Activ	ity (pCi/g)				
Isotope	TSB-FJ-02-0'	TSB-FJ-02-0'-FD	RPD (Limits)	Difference (Limits)	Flag	A or P
Radium-226	1.04	0.945	10 (≤50)	•	-	-
Radium-228	1.74	1.81	4 (≤50)	-	-	-

BRC Tronox Parcel C/D
Radium-226 & Radium-228 - Data Qualification Summary - SDG TRNC/D-5RD

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D
Radium-226 & Radium-228 - Laboratory Blank Data Qualification Summary - SDG
TRNC/D-5RD

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D Radium-226 & Radium-228 - Field Blank Data Qualification Summary - SDG TRNC/D-5RD

No Sample Data Qualified in this SDG

)G#	t: TRNC/D-5RD atory: Test America			_		Leve		SS WORKS		Date: 1-8-0 Page: 1 of 1 Reviewer: MG 2nd Reviewer: 1~				
Wa	Soil: Radium									/Method RICH-RC5005				
	·													
	amples listed below tion findings worksh		revie	wed for ead	ch of the f	ollow	ing va	lidation areas. \	/alidation finding	gs are noted in attache				
maai	ion in ango worker													
	Valida	tion	Area						Comments					
I.	Technical holding time	Technical holding times						Sampling dates: 11-15-07						
IIa.	Initial calibration				A									
lib.	Calibration verification	Calibration verification												
111.	Blanks				Α									
IVa.	Matrix Spike/(Matrix S	pike) [Duplica	tes	Α	Ţ	UP							
IVb.	Laboratory control san	Laboratory control samples				L	.cs							
IVc.	Chemical recovery				Α	V	Water only							
V.	Sample result verificat		N											
VI.	Minimum dectectable	y (MDA	v)	A	<u> </u>									
VII.	Overall assessment or	f data			Α									
VIII.	Field duplicates				SW	D=1+2, D=8+9								
ΧIV	Field blanks				ND	<u> </u>	र = ।	7						
ote: alidate	A = Acceptable N = Not provided/app SW = See worksheet ed Samples:			R = Rin	o compound sate eld blank	ds dete	ected	D = Duplica TB = Trip bl EB = Equip	ank					
1	TSB-FJ-03-0'	S	11	TSB-FR-02-0	t	5	21	PBS	31					
2	TSB-FJ-03-0'-FD	1	12	TSB-FR-02-1		-	22 2	PBW	32					
	TSB-FJ-03-10'		13	TSB-FJ-09-0'			23		33					
1	TSB-FJ-10-0'		14	TSB-FJ-09-1			24		34					
5	TSB-FJ-10-10'		15	TSB-FR-03-0)'		25		35					
5	TSB-FJ-04-0'		16	TSB-FR-03-1	0'		26		36					
7	TSB-FJ-04-10'		172	RINSATE 3		W	27		37					
3	TSB-FJ-02-0'		18	TSB-FJ-03-1	0'DUP	5	28		38					
,	TSB-FJ-02-0'-FD		19	TSB-FR-02-0	DUP	J	29		39					
	TSB-FJ-02-10'		20				30		40					

LDC #: 18035 B 29 VALIDATION FINDINGS WORKSHEET Page: 1 of 1 SDG #: TR NC /D - 5R D Field Duplicator

SDG #: 1 KNC/D - 3 KD	<u>Field Duplica</u>	<u>ates</u>	Reviewer:
METHOD: Radiochemistry (Method:	cover))	
	entified in this SDG?	pairs?	
	Activity (pci/q,	
Isotopes		2	RPD
Ra-226	1.02	0.916	11 (=50)
Ra -228	1.50	1.70	12 (1)
	Activity (PCi/q)	
Isotopes	8	9	RPD
Ra-226	1.04	0.945	10 (≤50)
Ra-228	1.74	1.81	4 (1)
	Activity (``	
isotopes		, <u>, , , , , , , , , , , , , , , , , , </u>	RPD
Isotopes	Activity ()	RPD
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Laboratory Data Consultants, Inc. **Data Validation Report**

Project/Site Name:

BRC Tronox Parcel C/D

Collection Date:

November 16, 2007

LDC Report Date:

January 14, 2008

Matrix:

Soil/Water

Parameters:

Radium-226 & Radium-228

Validation Level:

EPA Level III

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): TRNC/D-6RD

Sample Identification

TSB-FJ-08-0'

TSB-FJ-08-10'

TSB-FR-05-0'

TSB-FR-05-10'

TSB-FR-04-0'

TSB-FR-04-0'-FD

TSB-FR-04-10'

TSB-GR-01-0'

TSB-GR-01-5'

TSB-GJ-06-0'

TSB-GJ-06-5'

TSB-FJ-01-0'

TSB-FJ-01-10'

TSB-GJ-01-0'

TSB-GJ-01-5'

RINSATE 4

TSB-FR-04-0'DUP

TSB-FJ-01-0'DUP

Introduction

This data review covers 17 soil samples and one water sample listed on the cover sheet. The analyses were per EPA Method 901.1/Method RICH-RC5017 for soil samples for Radium-226 and Radium-228, EPA Method 903.1/Method RICH-RC5005 for water samples for Radium-226, and EPA Method 904.0/Method RICH-RC5005 for water samples for Radium-228.

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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 4" 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. Duplicate error ratios (DER) were within QC limits with the following exceptions:

DUP ID (Associated Samples)	Isotope	RPD (Limits)	DER (Limits)	Flag	A or P
TSB-FR-04-0'DUP (All soil samples in SDG TRNC/D-6RD)	Ra-226	-	2.8 (≤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. Chemical Recovery

All chemical recoveries were within validation criteria for the water samples in this SDG.

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-FR-04-0' and TSB-FR-04-0'-FD were identified as field duplicates. No radium-226 or radium-228 was detected in any of the samples with the following exceptions:

	Activ	ity (pCi/g)				
Isotope	TSB-FR-04-0'	TSB-FR-04-0'-FD	RPD (Limits)	Difference (Limits)	Flag	A or P
Radium-226	1.03	0.814	23 (≤50)	-	-	-
Radium-228	2.02	1.73	15 (≤50)	-	-	-

BRC Tronox Parcel C/D Radium-226 & Radium-228 - Data Qualification Summary - SDG TRNC/D-6RD

SDG	Sample	Isotope	Flag	A or P	Reason
TRNC/D-6RD	TSB-FJ-08-0' TSB-FR-05-0' TSB-FR-05-10' TSB-FR-04-0' TSB-FR-04-0'-FD TSB-FR-04-10' TSB-GR-01-0' TSB-GJ-06-0' TSB-GJ-06-5' TSB-FJ-01-10' TSB-FJ-01-10' TSB-GJ-01-10' TSB-GJ-01-5'	Ra-226	J (all detects) UJ (all non-detects)	A	Duplicate analysis (DER)

BRC Tronox Parcel C/D Radium-226 & Radium-228 - Laboratory Blank Data Qualification Summary - SDG TRNC/D-6RD

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D Radium-226 & Radium-228 - Field Blank Data Qualification Summary - SDG TRNC/D-6RD

No Sample Data Qualified in this SDG

												/ P-05
	#: <u>18035C29</u>		VA	LIDATION				ESS	WORKS	SHEET		Date: 1-8-08
	#: TRNC/D-6RD					_ev	el III					Page: <u>I</u> of <u>I</u> Reviewer: <u>M</u>
n Labor	atory: Test America			_				_	,		1	2nd Reviewer:
Wate	Soil: Radium-	23	96, I	Kadium - a	128 (E	PĄ .	Met h	901.	1 / RICH	1-RC-50	17)	
METH	IOD: Radium 226 (EPA	M	lethoo	d 903.1/Metl	nod RICH	-RC	5005)	Radiu	ım 228 (EF	PA Method	1904	.0/Method RICH-RC5005)
The s	amples listed below we	ere	revie	ewed for eac	ch of the f	ollov	ving va	alidati	on areas.	Validation	findi	ings are noted in attached
valida	tion findings workshee	ts.										
	Validatio	n.	Area							Comme	nts	
1.	Technical holding times				Α	Sar	npling d	ates:	11-1	6-07		
IIa.	Initial calibration				A					•		
IIb.	Calibration verification				A							
111.	Blanks				A							
IVa.	Matrix Spike/(Matrix Spik	e) [Duplica	ates	5W	1	QUP					
IVb.	Laboratory control sample				Α		LCS					
IVc.	Chemical recovery				Α		Wate	r 0	nly			
V.	Sample result verification)			N				7			
VI.	Minimum dectectable act		y (MD/	A)	Α							
VII.	Overall assessment of da				Α							
VIII.	Field duplicates				SW	D	= 5	+6				
ΧIV	Field blanks				ND	F	2 = 16	,			<u> </u>	
Note: Validat	A = Acceptable N = Not provided/applica SW = See worksheet ed Samples:	ble		R = Rins	o compound sate eld blank	s del	ected		D = Duplica TB = Trip b EB = Equip			
1	TSB-FJ-08-0'	<u> </u>	11	TSB-GJ-06-5'		5	21				31	
2	TSB-FJ-08-10'	١	12	TSB-FJ-01-0'			22				32	
3	TSB-FR-05-0'		13	TSB-FJ-01-10)'		23				33	
4	TSB-FR-05-10'		14	TSB-GJ-01-0			24				34	
5	TSB-FR-04-0'		15	TSB-GJ-01-5		Ų.	25		<u></u>		35	
6	TSB-FR-04-0'-FD		16 ²	RINSATE 4		W	26				36	
7	TSB-FR-04-10'		17	TSB-FR-04-0	DUP	S	27				37	
8	TSB-GR-01-0'	L	18	TSB-FJ-01-0'	DUP	↓	28				38	
9	TSB-GR-01-5'	L	19	PBS			29				39	
10	TSB-GJ-06-0'	Į	202	PBW			30	<u></u>			40	

Notes:

SDG #: TRNC/D-6RD LDC #: 18035C39

VALIDATION FINDINGS WORKSHEET **Duplicate Analysis**

Page: | of | Reviewer: MG 2nd Reviewer:

> S 00 METHOD: Radiochemistry (Method:__

Co ver

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

Was a duplicate sample analyzed the required frequency of 5% in this SDG? Y)N N/A Y (N) N/A

Were all duplicate sample duplicate error ratio (DER) \leq 1.42? DER= $\frac{|Act_{1}-Act_{2}|}{2^{-1}}$

Act = sample activity $\delta = 1$ sigma error

LEVEL IV ONLY:

Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations. Y N N/A

Ouslifications	Cuanifications	ひっくひ											
		70											
Associated Samples	1.03 110	100 15											
DER (Limits)	3.8 (4.2.58)												
Isotope	İ	1											
Matrix	1:05												
Duplicate ID	1											Comments:	
#	-											Comr	

LDC #: 18035C29 VALIDATION FINDINGS WORKSHEET Page: 1 of SDG #: TRNC/D-6RD Field Duplicates Reviewer: MG

Page:____of___

			2nd reviewer:
METHOD: Radiochemistry (Method: <u>see c</u>	cover)		
N N/A Were field duplicate pairs ide N N/A Were target isotopes detected	התוופס וח נוווא ביטס: ed in the field duplicate p	airs?	
	Activity (P	ci/q,	
Isotopes	5	6	RPD
Ra-226	1.03	0.814	23 (≤50)
Ra - 228	2.02	1.73	15 ()
	+ +		
	<u></u>		
	Activity (_ ·)	
Isotopes			RPD
	1		
	1	<u> </u>	
	Activity (\	1
Instance	Activity		-
Isotopes	+		RPD
	 		
			
			T
	Activity (<u> </u>	
Isotopes			RPD
			1
			<i>t</i>

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

BRC Tronox Parcel C/D

Collection Date:

November 19, 2007

LDC Report Date:

January 14, 2008

Matrix:

Soil/Water

Parameters:

Radium-226 & Radium-228

Validation Level:

EPA Level III & IV

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): TRNC/D-7RD

Sample Identification

TSB-GR-02-0'**

TSB-GR-02-0'-FD**

TSB-GR-02-5'**

TSB-GJ-04-0'**

TSB-GJ-04-5'**

TSB-GJ-02-0'**

TSB-GJ-02-0'-FD**

TSB-GJ-02-5'**

TSB-GJ-07-0'**

TSB-GJ-07-5'**

TSB-GJ-05-0'**

TSB-GJ-05-5'**

TSB-GJ-03-0'**

TSB-GJ-03-5'

RINSATE 5

TSB-GJ-04-0'DUP

^{**}Indicates sample underwent EPA Level IV review

Introduction

This data review covers 15 soil samples and one water sample listed on the cover sheet. The analyses were per EPA Method 901.1/Method RICH-RC5017 for soil samples for Radium-226 and Radium-228, EPA Method 903.1/Method RICH-RC5005 for water samples for Radium-226, and EPA Method 904.0/Method RICH-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.
- 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 5" 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 for the water samples in this SDG.

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-GR-02-0'** and TSB-GR-02-0'-FD** and samples TSB-GJ-02-0'** and TSB-GJ-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:

	Activ	ity (pCi/g)				
Isotope	TSB-GR-02-0'**	TSB-GR-02-0'-FD**	RPD (Limits)	Difference (Limits)	Flag	A or P
Radium-226	1.03	1.02	1 (≤50)	•	-	
Radium-228	1.67	1.97	16 (≤50)	-	-	-

	Activity (pCl/g)						
Isotope	TSB-GJ-02-0'**	TSB-GJ-02-0'-FD**	RPD (Limits)	Difference (Limits)	Flag	A or P	
Radium-226	1.30	1.28	2 (≤50)	-	•	-	
Radium-228	1.62	2.04	23 (≤50)	_	-	-	

BRC Tronox Parcel C/D
Radium-226 & Radium-228 - Data Qualification Summary - SDG TRNC/D-7RD

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D Radium-226 & Radium-228 - Laboratory Blank Data Qualification Summary - SDG TRNC/D-7RD

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D Radium-226 & Radium-228 - Field Blank Data Qualification Summary - SDG TRNC/D-7RD

No Sample Data Qualified in this SDG

	t: 18035D29 VALIDA 7 #: TRNC/D-7RD		PLETENESS WORKSHEET evel III/IV	Date: <u>/ - 8 - 0</u> £ Page: 1 of /
Labor 976 Wate METH	atory: Test America Soil: Radium - 236, Rad OD: Radium 226 (EPA Method 903.1)	ium- 238 Method RICH	(EPA 901.1 / RICH-RC-5017) I-RC5005) Radium 228 (EPA Method 904 following validation areas. Validation find	Reviewer: MG 2nd Reviewer: WG 4.0/Method RICH-RC5005)
vanua				
Valida	Validation Area		Comments	
I.	T	A	Comments Sampling dates: 11 - 19 - 07	
I.	Validation Area	A	1. 10	

DUP

LC5

water only

D= 1+2

R=15

Not reviewed for Level III validation.

N	lote	٠.

111.

IVa.

IVb.

IVc.

V.

VI.

VII.

VIII.

Blanks

A = Acceptable

Field duplicates

Field blanks

Matrix Spike/(Matrix Spike) Duplicates

Minimum dectectable activity (MDA)

Laboratory control samples

Sample result verification

Overall assessment of data

Chemical recovery

N = Not provided/applicable

ND = No compounds detected R = Rinsate

A

SW

ND

A

D = Duplicate

SW = See worksheet FB = Field blank

TB = Trip blank EB = Equipment blank

D = 6 + 7

Validated Samples: ** Indicates sample underwent Level IV validation

							_	Γ,
1	TSB-GR-02-0'**	5	11	TSB-GJ-05-0'**	<u> </u>	21	 31	
2	TSB-GR-02-0'-FD**		12	TSB-GJ-05-5'**	1	22	32	
3	TSB-GR-02-5'**		13	TSB-GJ-03-0'**		23	 33	
4	TSB-GJ-04-0'**		14	TSB-GJ-03-5'	J	24	34	
5	TSB-GJ-04-5'**		15 Q	RINSATE 5	W	25	35	
6	TSB-GJ-02-0'**		16	TSB-GJ-04-0'DUP	5	26	36	
7	TSB-GJ-02-0'-FD**		17 l	PBS		27	37	
8	TSB-GJ-02-5'**		18 Z	PBW		28	 38	
9	TSB-GJ-07-0'**		19			29	39	
10	TSB-GJ-07-5'**	J	20			30	40	

Notes:	 		
-			

LDC #: 18035 D29 SDG #: TRNC/D~7RD Page: lof 2 Reviewer: MG 2nd Reviewer: V

Method: Radiochemistry (EPA Method See cover)

Validation Area	Yes	No	NA	Findings/Comments
. Technical holding times				
All technical holding times were met.	/			
II: Calibration				· · · · · · · · · · · · · · · · · · ·
Were all instruments and detectors calibration as required?	1			
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?	1			
III. Blanks	г 7		ı —	T
Were blank analyses performed as required?	V			
Were any activities detected in the blanks greater than the minimum detectable activity (MDA)? If yes, please see the Blanks validation completeness worksheet.		/		
V. Matrix spikes and Duplicates			ı	
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.	1		✓	
Was a duplicate sample anaylzed at the required frequency of 5% in this SDG?	V			
Nere all duplicate sample duplicate error rations (DER) <u>≤1.429</u> .				
/. Laboratory control samples				
Vas an LCS analyzed per analytical batch?	V			
Nere the LCS percent recoveries (%R) and relative percent difference (RPD) within the 75-125%	/			
/I. Sample Chemical/Carrier Recovery				
Vas a tracer/carrier added to each sample?	1			
Vere tracer/carrier recoveries within the QC limits?	/			
/II. Regional Quality Assurance and Quality Control				
Vere performance evaluation (PE) samples performed?		_/		
Vere the performance evaluation (PE) samples within the acceptance limits?		**********		
/iii. Sample Result Verification				
Vere activities adjusted to reflect all sample dilutions and dry weight factors	/			
Vere the Minimum Detectable Activities (MDA) < RL?	/	<u> </u>		

LDC #: 18035 D29 SDG #: TRNC/D-7RD

VALIDATION FINDINGS CHECKLIST

Page: 2 of 2
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.	/			I
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 #: 18035 D29 SDG #: TRNC/D-TRD

VALIDATION FINDINGS WORKSHEET Field Duplicates

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

)

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

	Activity (pci/g,	
Isotopes		2	RPD
Ra-226	1.03	1.02	1 (450)
Ra-228	1.67	1.97	16 (=50)

	Activity (pci/g)	
Isotopes	. 6	7	RPD
Ra-226	1.30	1. 28	2 (±50)
Ra-228	1.62	2.04	a3 (↓)

	Activity ()	
Isotopes		RPD
·		

	Activity ()	
Isotopes			RPD

SDG#: TRNC/D-7RD LDC #: (8035 Dag

VALIDATION FINDINGS WORKSHEET **Level IV Recalculation Worksheet**

2nd Reviewer: Reviewer:

1

METHOD: Radiochemistry (Method:_

see cover

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

 $%R = Found \times 100$ True

Found = activity of each analyte $\underline{\text{measured}}$ in the analysis of the sample. True = activity of each analyte in the source. Where,

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

RPD = $\frac{1S-D_1}{(S+D)/2} \times 100$

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

					Recalculated	Reported	
Sample ID	Type of Analysis	Analyte	Found/S (units)	True/D (units)	%R or RPD	%R or RPD	Acceptable (Y/N)
	Laboratory control sample						
507		Cs-137	7.92 (pci/4)	12 (pcig) 7.97 (pcig)	66	56	>
	Matrix spike sample						
1		1				ļ	l
	Duplicate RPD				RERA	RERA	
91		Ra-228	1,72 (pci/g) ± 0.14 (10)	1,72 (pci/q) 1.86 (pci/q) ± 0.15 (10) \$	7.0	7.0	>
	Chemical recovery						
(l

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	#:_	18035 D29
SDG	#:	TRNC/D-7RD

VALIDATION FINDINGS WORKSHEET Sample Calculation Verification

Page:	OT
Reviewer:	MG
2nd reviewer:	1 ~

METHOD: Radiochemistry	(Method:	see	cover)

Please see qualifications bel	ow for all questions	answered "N". Not applicabl	e questions are	e identified as "N/A".
, icase ose qualification is a			1 '	

N N/A

Have results been reported and calculated correctly?

Are results within the calibrated range of the instruments?

#	Sample ID	Analyte	Reported Concentration (PCi /4)	Calculated Concentration	Acceptable (Y/N)
,	ı	Ra-226	1.03	(pci/g)	Y
		1 Rq-228	. 1.67	1.66	
		, 41		ı	
2		Ra-226	0.914	0.914	
		Ra - 228	1.69	1.67	υ
		· ·			·
		,			
			i		
				.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	

Note:			
	•	 	

BRC Tronox Parcel C/D Data Validation Reports LDC# 18035

Isotopic Uranium & Isotopic Thorium

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

BRC Tronox Parcel C/D

Collection Date:

November 13, 2007

LDC Report Date:

January 14, 2008

Matrix:

Soil/Water

Parameters:

Isotopic Uranium & Isotopic Thorium

Validation Level:

EPA Level III

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): TRNC/D-3RD

Sample Identification

TSB-DR-06-0'

TSB-DR-06-10'

TSB-DR-05-0'

TSB-DR-05-0'-FD

TSB-DR-05-10'

TSB-DR-03-0'

TSB-DR-03-10'

TSB-DJ-01-0'

TSB-DJ-01-10'

TSB-DR-04-0'

TSB-DR-04-10'

TSB-CR-04-0'

TSB-CR-04-10'

TSB-CR-05-0'

TSB-CR-05-10'

TSB-CR-06-0'

TSB-CR-06-10'

RINSATE-2

TSB-DR-03-0'DUP

RINSATE-2DUP

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) with the following exceptions:

Method Blank ID	Isotope	Activity (pCi/L)	Associated Samples
PBW	U-233/234	0.313 pCi/L	All water samples in SDG TRNC/D-3RD

No sample data were qualified based on the contaminants found in the method blanks.

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) analyses were not required by the method.

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

DUP ID (Associated Samples)	Isotope	RPD (Limits)	DER (Limits)	Flag	A or P
RINSATE-2DUP (All water samples in SDG TRNC/D-3RD)	U-233/234	-	4.1 (≤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-DR-05-0' and TSB-DR-05-0'-FD were identified as field duplicates. No isotopic uranium or isotopic thorium was detected in any of the samples with the following exceptions:

	Activity	_				
Isotope	TSB-DR-05-0' TSB-DR-05-0'-FD		RPD (Limits)	Difference (Limits)	Flag	A or P
Thorium-228	1.87	1.39	29 (≤50)		•	•
Thorium-230	0.998	1.02	2 (≤50)	-	•	•
Thorium-232	1.69	1.32	25 (≤50)	-	-	-
Uranium-233/234	0.229	0.241	-	0.01 pCi/g (≤0.6)	-	-

	Activity					
Isotope	TSB-DR-05-0' TSB-DR-05-0'-FD		RPD (Limits)	Difference (Limits)	Flag	A or P
Uranium-235/236	0.0146	0.0124U	-	0.00 pCi/g (≤0.6)		-
Uranium-238	0.201	0.189	-	0.01 pCi/g (≤0.6)	-	-

BRC Tronox Parcel C/D Isotopic Uranium & Isotopic Thorium - Data Qualification Summary - SDG TRNC/D-3RD

SDG Sample		Isotope	Flag	A or P	Reason
TRNC/D-3RD	RINSATE-2	U-233/234	J (all detects) UJ (all non-detects)	А	Duplicate analysis (DER)

BRC Tronox Parcel C/D Isotopic Uranium & Isotopic Thorium - Laboratory Blank Data Qualification Summary - SDG TRNC/D-3RD

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D Isotopic Uranium & Isotopic Thorium - Field Blank Data Qualification Summary - SDG TRNC/D-3RD

No Sample Data Qualified in this SDG

LDC #:	18035A59	VALIDATION COMPLETENESS WORKSHEET	Date: 1- 8 -08
SDG #:_	TRNC/D-3RD	Level III	Page: <u>1</u> of_/
Laborato	ry: Test America		Reviewer: MG
			2nd Reviewer:

9n

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	Α	Sampling dates: 11-13-07
lla.	Initial calibration	Α	
Ilb.	Calibration verification	Α	
III.	Blanks	SW	
IVa.	Matrix Spike/(Matrix Spike) Duplicates	SW	DUP
IVa.	Laboratory control samples	A	LCS
V.	Tracer Recovery	A	
VI.	Minimum Detectable Activity (MDA)	Α	
VII.	Sample result verification	N	
VIII.	Overall assessment of data	A	
IX.	Field duplicates	SW	D=3+4
X	Field blanks	ND	R= 18

Note:

ma

A = Acceptable

ND = No compounds detected

D = Duplicate

N = Not provided/applicable SW = See worksheet R = Rinsate FB = Field blank TB = Trip blank
EB = Equipment blank

Validated Samples:

-						
1	TSB-DR-06-0' 5	11	TSB-DR-04-10' 5	21	PBSI	31
2 1	TSB-DR-06-10'	12	TSB-CR-04-0'	22 2	PBS2 (TH)	32
3	TSB-DR-05-0'	13 1	TSB-CR-04-10'	23 3	PBW	33
41,2	TSB-DR-05-0'-FD	14 1	TSB-CR-05-0'	24		34
5 1	TSB-DR-05-10'	15 l	TSB-CR-05-10'	25		35
₆ 1	TSB-DR-03-0'	16 l	TSB-CR-06-0'	26		36
7	TSB-DR-03-10'	17	TSB-CR-06-10'	27		37
ء, ء 8	TSB-DJ-01-0'	18 3	RINSATE-2 W	28		38
9	D TSB-¢J-01-10'	19	TSB-DR-03-0'DUP (U,Th) S	29		39
10	TSB-DR-04-0'	203	RINSATE-2DUP	30		40

Notes:	Isotopic Uranium	only	for	井	1		
	-	7					

18035A59W.wpd

TRNC/D-3RD 18035 A 59 SDG #: LDC #:_

VALIDATION FINDINGS WORKSHEET Blanks

Page: __of__ Reviewer: 2nd Reviewer:

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

Were blank analyses performed as required? If no, please see qualifications below. NN N/A

Were any activities detected in the blanks greater than the minimum detectable activity (MDA)? If yes, please see qualifications below. N N/A

		8				
	Sample Identification	lalifie				
Z.V.)	Sample Ide	No sample was adjalified	1	-		
all water (N.D.)		mple				
all w		N° S				
- 11						
Associated Samples:						
,	Blank Action	Levei				
	Blank ID	PBW	0.313			
Units: PC1/L	Isotope		U-233/234 0.313			

•						
	Sample Identification					
	Sample Id					
Samples:						
Associated Samples:						
1	Blank Action	Level		•		
	Blank ID					
Units:	Isotope					

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT: If there is activity in the blank above the MDA, sample results within 10x the blank activity will be qualified as not detected "U".

TRNC/D-3RD LDC #: 18035 A 59 SDG #:

VALIDATION FINDINGS WORKSHEET

Duplicate Analysis

Reviewer: MG Page: / of 2nd Reviewer:

METHOD: Radiochemistry (Method: RICH-RC-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 duplicate sample analyzed the required frequency of 5% in this SDG? Were all duplicate sample duplicate error ratio (DER) \leq 1.42? DER= $\frac{|\text{Act}_{1^-}\text{Act}_{2^-}|}{2\cdot58}$

Act = sample activity $\delta = 1$ sigma error

LEVEL IV ONLY:

Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations. Y N N/A

	Qualifications	5/05/A										
	Associated Samples	all water										
	DER (Limits)	4.1 (£ 3.58)										
	Isotope	U-233/234										
	Matrix	Water										
-	Duplicate ID	20										
	#	1										

Comments:

LDC #: 18035A59 SDG #: TRNC/D-3RD

VALIDATION FINDINGS WORKSHEET Field Duplicates

Page:	of
Reviewer:_	MG
2nd reviewer:	10

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

YN N/A

Were field duplicate pairs identified in this SDG?

Were target isotopes detected in the field duplicate pairs?

	Activity (scily,	
Isotopes	3	4	RPD
Th-228	1.87	1.39	29 (±50)
Th-230	0.998	1.02	a ()
Th-232	1.69	1.32	25 (1)

	Activity (pci/q.)	by difference		
Isotopes	3	4	RPD		
U- 233/234	0.229	0.241	0.01 PCi/2 (=0.6 PCi/2)		
U-235/236	0.0146	0.0124 U	0.00 ()		
U-238	0.201	0.189	0.01		

	Activity ()	
Isotopes		RPD

	Activity ()	
Isotopes			RPD

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

BRC Tronox Parcel C/D

Collection Date:

November 15, 2007

LDC Report Date:

January 14, 2008

Matrix:

Soil/Water

Parameters:

Isotopic Uranium & Isotopic Thorium

Validation Level:

EPA Level III

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): TRNC/D-5RD

Sample Identification

TSB-FJ-03-0'

TSB-FJ-03-0'-FD

TSB-FJ-03-10'

TSB-FJ-10-0'

TSB-FJ-10-10'

TSB-FJ-04-0'

TSB-FJ-04-10'

TSB-FJ-02-0'

TSB-FJ-02-0'-FD

TSB-FJ-02-10'

TSB-FR-02-0'

TSB-FR-02-10'

TSB-FJ-09-0'

TSB-FJ-09-10'

TSB-FR-03-0'

TSB-FR-03-10'

RINSATE 3

TSB-FJ-03-0'DUP

TSB-FJ-03-0'-FDDUP

TSB-FR-02-0'DUP

RINSATE 3DUP

Introduction

This data review covers 19 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 3" 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.

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-03-0' and TSB-FJ-03-0'-FD and samples TSB-FJ-02-0' and TSB-FJ-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:

	Activity	(pCi/g)				
Isotope	TSB-FJ-03-0'	TSB-FJ-03-0'-FD	RPD (Limits)	Difference (Limits)	Flag	A or P
Uranium-233/234	0.479	0.685	-	0.21 pCi/g (≤0.6)	-	•
Uranium-235/236	0.00889U	0.0253	-	0.02 pCi/g (≤0.6)	-	-
Uranium-238	0.410	0.397	-	0.01 pCi/g (≤0.6)	-	•
Thorium-228	1.22	1.43	16 (≤50)	-	-	-
Thorium-230	0.958	1.31	31 (≤50)	-	-	-
Thorium-232	1.26	1.74	32 (≤50)	-	-	-

	Activity	/ (pCi/g)				
Isotope	TSB-FJ-02-0'	TSB-FJ-02-0'-FD	RPD (Limits)	Difference (Limits)	Flag	A or P
Uranium-233/234	0.409	0.325	-	0.08 pCi/g (≤0.6)	-	-
Uranium-235/236	0.0160	0.0239	-	0.01 pCi/g (≤0.6)	-	-
Uranium-238	0.391	0.278	-	0.11 pCi/g (≤0.6)	-	•
Thorium-228	1.84	1.37	29 (≤50)	-		•

	Activity	(pCi/g)				A or P	
Isotope	TSB-FJ-02-0'	TSB-FJ-02-0'-FD	RPD (Limits)	Difference (Limits)	Flag		
Thorium-230	1.26	1.35	7 (≤50)	-	-	-	
Thorium-232	1.38	1.92	33 (≤50)	-	-	-	

BRC Tronox Parcel C/D Isotopic Uranium & Isotopic Thorium - Data Qualification Summary - SDG TRNC/D-5RD

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D Isotopic Uranium & Isotopic Thorium - Laboratory Blank Data Qualification Summary - SDG TRNC/D-5RD

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D Isotopic Uranium & Isotopic Thorium - Field Blank Data Qualification Summary - SDG TRNC/D-5RD

No Sample Data Qualified in this SDG

LDC#									Date: <u> / -</u>		
	:: TRNC/D-5RD atory: Test America				L	_eve			Page: <u> </u>	16	
The sa	mples listed below w	ere	PA N					67),Isotopic Thorium (Malidation	ethod RICH-RC-5087) n findings are noted in atta	ached	
validat	ion findings workshee				······································			C		1	
	Validati	on_	Area		A	Com	oling d	Comme ates: 11-15-07	enis		
l. IIa.	Technical holding times Initial calibration				A	Sam	onny a	ales. 11 13 01			
IIb.	Calibration verification				A						
III.	Blanks	-			A						
IVa.	Matrix Spike/(Matrix Spil	(e) [Duplica	ates	A	D	900				
IVa.	Laboratory control samples				Α	L	cs				
V.	Tracer Recovery		A								
VI.	Minimum Detectable Ac	·)	Α								
VII.	Sample result verificatio		N								
VIII.	Overall assessment of d				Α						
IX.	Field duplicates				SW	D= 1+2. D=8+9					
x	Field blanks				ND	R	= 1	1			
Note:	A = Acceptable N = Not provided/applic SW = See worksheet	able		R = Rin	o compounds sate eld blank	s dete	cted	D = Duplicate TB = Trip blank EB = Equipment blanl	(
Validate	ed Samples:										
1	TSB-FJ-03-0'	5	11	TSB-FR-02-0	r	5	212	RINSATE 3DUP	31		
	TSB-FJ-03-0'-FD	١	12	TSB-FR-02-1		Ī	22 1	PBS	32		
	TSB-FJ-03-10'		13	TSB-FJ-09-0'		1	23 2	PBW	33		
	TSB-FJ-10-0'		14	TSB-FJ-09-10	ים'		24		34		
	TSB-FJ-10-10'		15	TSB-FR-03-0	,		25		35		
	TSB-FJ-04-0'		16	TSB-FR-03-1	0'		26		36		
	TSB-FJ-04-10'		17 2	RINSATE 3		W	27		37		
8	TSB-FJ-02-0'		18	TSB-FJ-03-0	DUP (U)	5	28		38		
9	TSB-FJ-02-0'-FD		19	TSB-FJ-03-0'	-FDDUP	<u>}</u>	29		39		
10	TSB-FJ-02-10'	1	20	TSB-FR-02-0	DUP (U,Th) [30		40		

Notes:_

LDC #: 18035B59 SDG #: TRNC/D-5RD

VALIDATION FINDINGS WORKSHEET Field Duplicates

Page: 1 of 1
Reviewer: MG

2nd reviewer: 1

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

M N/A

Were field duplicate pairs identified in this SDG?

<u>WN N/A</u> Were target isotopes detected in the field duplicate pairs?

	Activity (pci/g)	by difference		
Isotopes		2			
U-233/234	0.479	0.685	0.21 pci/ (±0.6 pci/g)		
U - 235/236	0.00889 U	0.0253	0.02 ()		
U-238	0.410	0.397	0.01		
·					

		Activity (
1	sotopes		2	RPD
ヿ	h-228	1. 22	1.43	16 (450)
7	h-230	0.958	1.31	31 (1)
7	h-232	1.26	1.74	32 (1)
7	h-232	1.26	1.7	14
		The state of the s		

	Activity (pci/g,	by difference		
Isotopes	8	9	RPD		
U-233/234	0.409	0.325	0.08 pci/ (= 0.6 pci/s)		
U-235/236	0.0160	0.0239	0.01 ()		
U-238	0.391	0.278	0.11 \ (\ \)		
	·				

	Activity (PCi /q)		·
Isotopes	8	9	RPD .
Th. 228	1.84	1.37	29 (±50)
Th-230	1.26	1.35	7 (1)
Th-232	1.38	1.92	33 ()

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

BRC Tronox Parcel C/D

Collection Date:

November 16, 2007

LDC Report Date:

January 14, 2008

Matrix:

Soil/Water

Parameters:

Isotopic Uranium & Isotopic Thorium

Validation Level:

EPA Level III

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): TRNC/D-6RD

Sample Identification

TSB-FJ-08-0'

TSB-FJ-08-10'

TSB-FR-05-0'

TSB-FR-05-10'

TSB-FR-04-0'

TSB-FR-04-0'-FD

TSB-FR-04-10'

TSB-GR-01-0'

TSB-GR-01-5'

TSB-GJ-06-0'

TSB-GJ-06-5'

TSB-FJ-01-0'

TSB-FJ-01-10'

TSB-GJ-01-0'

TSB-GJ-01-5'

RINSATE 4

TSB-FJ-08-0'DUP

TSB-FR-05-10'DUP

TSB-FJ-01-0'DUP

Introduction

This data review covers 18 soil samples and one water sample 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 4" 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.

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-FR-04-0' and TSB-FR-04-0'-FD were identified as field duplicates. No isotopic uranium or isotopic thorium was detected in any of the samples with the following exceptions:

	Activity (pCi/g)					
isotope			RPD (Limits)	Difference (Limits)	Flag	A or P
Uranium-233/234	0.527	0.662	-	0.14 pCi/g (≤0.6)	-	-
Uranium-238	0.282	0.377	-	0.10 pCi/g (≤0.6)	-	-
Thorium-228	1.60	1.52	5 (≤50)	-	-	-
Thorium-230	1.11	0.970	13 (≤50)	-	-	-
Thorium-232	1.69	1.55	9 (≤50)	•	-	-

BRC Tronox Parcel C/D Isotopic Uranium & Isotopic Thorium - Data Qualification Summary - SDG TRNC/D-6RD

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D Isotopic Uranium & Isotopic Thorium - Laboratory Blank Data Qualification Summary - SDG TRNC/D-6RD

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D Isotopic Uranium & Isotopic Thorium - Field Blank Data Qualification Summary - SDG TRNC/D-6RD

No Sample Data Qualified in this SDG

	t: TRNC/D-6RD atory: <u>Test America</u>					FENE el III	SS WORKS	IEET	Date: 1- 8 - Page: 1_of_ Reviewer: MG 2nd Reviewer:(
			9n ∜						
VIETH	IOD: Isotopic Uranium (EPA N	/lethod 908 /	Method RI	ICH-	RC50	67),Isotopic Thor	ium (Method f	RICH-RC-5087)
	amples listed below wer tion findings worksheets		ewed for eac	ch of the fo	ollow	ing va	lidation areas. V	alidation findin	gs are noted in attache
railuai	lion inlumgs worksheets	'•			· · · · · ·				
	Validation					Comments			
l.	Technical holding times			A	Sam	pling da	ates: 11-16	-07	
lla.	Initial calibration			Α					
IIb.	Calibration verification			Α					
III.	Blanks			A					
IVa.	Matrix Spike/(Matrix Spike)	Duplica	ates	A	D	40	(SDG: TR	NC/D-5RI)
IVa.	Laboratory control samples	i		À	L	CS			,
V.	Tracer Recovery			Ą					
VI.	Minimum Detectable Activity (MDA)			Α					
VII.	Sample result verification			N					
VIII.	Overall assessment of data	a		Α					
IX.	Field duplicates			SW	D= 5+6				
x	Field blanks			ND	R = 16				
Note: /alidate	A = Acceptable N = Not provided/applicabl SW = See worksheet ed Samples:	е	R = Rin	o compounds sate eld blank	s dete	ected	D = Duplicate TB = Trip bla EB = Equipm	nk	
1	TSB-FJ-08-0' S	11	TSB-GJ-06-5		5	21	PBS	31	
	TSB-FJ-08-10'	12	TSB-FJ-01-0'			22)	PBW	32	
	TSB-FR-05-0'	13	TSB-FJ-01-10			23		33	
	TSB-FR-05-10'	14	TSB-GJ-01-0			24		34	
	TSB-FR-04-0'	15	TSB-GJ-01-5		T	25		35	
	TSB-FR-04-0'-FD	162			W	26		36	
	TSB-FR-04-10'	17	TSB-FJ-08-0'	DUP (Th)	5	27		37	
	TSB-GR-01-0'	18	TSB-FR-05-1	0'DUP(U)	. 1	28		38	
	TSB-GR-01-5'	19	TSB-FJ-01-0'			29		39	
	TSB-GJ-06-0'	20				30		40	

LDC #: 18035C59 SDG #: TRNC/D-6RD

VALIDATION FINDINGS WORKSHEET Field Duplicates

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

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

(<u>)</u> N N/A (<u>Y</u>) N N/A

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

	Activity (pci/g)	by difference	
Isotopes	5	0 6	RPD	
U- 233/234	0.527	0.662	0.14 pci/q (£0.6 pci/g)	
U-238	0.282	0.377	0.10 1 (1)	

	Activity (PCi/q)	
Isotopes	5	6	RPD
Th-228	1.60	1.52	5 (≤ 50)
Tu-230	1.11	0.970	13 ()
T4-232	1.69	1.55	9 (1)
·			

·	Activity ()	
Isotopes		RPD ·

	Activity ()	·
Isotopes			RPD

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

BRC Tronox Parcel C/D

Collection Date:

November 19, 2007

LDC Report Date:

January 11, 2008

Matrix:

Soil/Water

Parameters:

Isotopic Uranium & Isotopic Thorium

Validation Level:

EPA Level III & IV

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): TRNC/D-7RD

Sample Identification

TSB-GR-02-0'**

TSB-GR-02-0'-FD**

TSB-GR-02-5'**

TSB-GJ-04-0'**

TSB-GJ-04-5'**

TSB-GJ-02-0'**

TSB-GJ-02-0'-FD**

TSB-GJ-02-5'**

TSB-GJ-07-0'**

TSB-GJ-07-5'**

TSB-GJ-05-0'**

TSB-GJ-05-5'**

TSB-GJ-03-0'**

TSB-GJ-03-5'

RINSATE 5

TSB-GJ-04-0'DUP

^{**}Indicates sample underwent EPA Level IV review

Introduction

This data review covers 15 soil samples and one water sample 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).

Sample "RINSATE 5" 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.

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-GR-02-0'** and TSB-GR-02-0'-FD** and samples TSB-GJ-02-0'** and TSB-GJ-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:

	Activity	(pCi/g)				
Isotope	TSB-GR-02-0'**	TSB-GR-02-0'-FD**	RPD (Limits)	Difference (Limits)	Flag	A or P
Thorium-228	1.69	1.66	2 (≤50)	-		
Thorium-230	1.17	1.10	6 (≤50)	-		
Thorium-232	1.44	1.22	17 (≤50)	-		
Uranium-233/234	0.393	0.302	-	0.09 pCi/g (≤0.6)	-	-
Uranium-235/236	0.0240	0.0113U	-	0.01 pCi/g (≤0.6)	-	
Uranium-238	0.292	0.295	-	0.00 pCi/g (≤0.6)	-	-

	Activity	Activity (pCi/g)				
Isotope	TSB-GJ-02-0'**	TSB-GJ-02-0'-FD**	RPD (Limits)	Difference (Limits)	Flag	A or F
Thorium-228	1.64	1.87	13 (≤50)	-		
Thorium-230	1.76	1.61	9 (≤50)	-		
Thorium-232	1.42	1.44	1 (≤50)	-		

	Activity	(pCi/g)			*. :	
Isotope	TSB-GJ-02-0'**	TSB-GJ-02-0'-FD**	RPD (Limits)	Difference (Limits)	Flag	A or P
Uranium-233/234	1.28	0.759	-	0.52 pCi/g (≤0.6)	-	-
Uranium-235/236	0.0340	0.0176		0.02 pCi/g (≤0.6)	-	-
Uranium-238	0.794	0.422	-	0.37 pCi/g (≤0.6)	-	-

BRC Tronox Parcel C/D Isotopic Uranium & Isotopic Thorium - Data Qualification Summary - SDG TRNC/D-7RD

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D Isotopic Uranium & Isotopic Thorium - Laboratory Blank Data Qualification Summary - SDG TRNC/D-7RD

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D Isotopic Uranium & Isotopic Thorium - Field Blank Data Qualification Summary - SDG TRNC/D-7RD

No Sample Data Qualified in this SDG

	#: 18035D59 #: TRNC/D-7RD atory: Test America	V <i>F</i>	ALIDATIOI 		PLETI evel II		S WORKS	HEET	Date: <u>I-8-0</u> 8 Page: <u>I</u> of <u>I</u> Reviewer: <u>MG</u>
	HOD: Isotopic Uranium	an K (E PA l		/Method R	RICH-R	C5067)),Isotopic Tho	orium (Metho	2nd Reviewer:
	amples listed below wition findings workshee		ewed for ea	ch of the f	followin	g valid	ation areas. V	/alidation find	dings are noted in attached
	Validation	on Area						Comments	
l.	Technical holding times			A	Sampl	ng dates	: 11-19-	07	
lla.	Initial calibration			Α					
IIb.	Calibration verification			Α					
III.	Blanks			A					
IVa.	Matrix Spike/(Matrix Spik	(e) Duplic	ates	Α	Du	P (SDG: TR	(NC/D-51	SD)
IVa.	Laboratory control samp	les		A	LC	<u> </u>			
V.	Tracer Recovery			A					
VI.	Minimum Detectable Act	tivity (MD	۹)	Д					
VII.	Sample result verification	n		Α	Not re	viewed f	or Level III valida	ation.	
VIII.	Overall assessment of d	ata		Α					
IX.	Field duplicates			SW	D=	1+2,	D=6+7		
Lx_	Field blanks			ND	R	= 15			
Note: Validat	A = Acceptable N = Not provided/applica SW = See worksheet ed Samples: ** Indicates s		R = Rin FB = Fi	eld blank		ed	D = Duplicat TB = Trip bla EB = Equipr	ank	
1	TSB-GR-02-0'**	S 11	TSB-GJ-05-0	***	5 :	21		31	
2	TSB-GR-02-0'-FD**	1 12	TSB-GJ-05-5			22		32	
3	TSB-GR-02-5'**	13	TSB-GJ-03-0			23		33	
4	TSB-GJ-04-0'**	14	TSB-GJ-03-5	j'		24		34	
5	TSB-GJ-04-5'**	15	RINSATE 5		W	25		35	
6	TSB-GJ-02-0'**	16	TSB-GJ-04-0	DUP (Th,	u) ₅	26		36	
7	TSB-GJ-02-0'-FD**	17	PBS			27		37	
8	TSB-GJ-02-5'**	18	PBW			28		38	
9	TSB-GJ-07-0'**	19				29		39	
10	TSB-GJ-07-5'**	20];	30		40	
Notes:									

LDC #: 18035 D 59 SDG #: TRNC/D - 7RD Page: 1 of 2
Reviewer: MG
2nd Reviewer: 1

Method: Radiochemistry (EPA Method RICH-RC-50)67/RICH-RC-5087

Method: Radiochemistry (EPA Method RICH-RC-50)61/	RIC	H-12	c - 5	087
Validation Area	Yes	No	NA	Findings/Comments
L Technical holding times				Γ.
All technical holding times were met.	_			
II. Calibration			-	
Were all instruments and detectors calibration as required?	/			
Were NIST traceable standards used for all calibrations?	1			
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. Bianks				
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?	V.			
Were all duplicate sample duplicate error rations (DER) <u>≤1.427</u> . ∂.58	. 🗸			
V. Laboratory control samples				
Was an LCS analyzed per analytical batch?	✓ <u> </u>			
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?	<u> </u>			
VII. Regional Quality Assurance and Quality Control	- 1		- 1	
Were performance evaluation (PE) samples performed?		/		
Were the performance evaluation (PE) samples within the acceptance limits?			<u> </u>	
VIII, Sample Result Verification	- 1		- 1	
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 #: 18035D59 SDG #: TRNC/D-7RD

VALIDATION FINDINGS CHECKLIST

Page: 2 of 2 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.				ı
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 #: 18035 D59 SDG #: TRNC/D-7RD

VALIDATION FINDINGS WORKSHEET Field Duplicates

Page:	(_of
Reviewer:_	MG
2nd reviewer:	

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

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

	Activity (pci/q)	
Isotopes		2	RPD
Th-228	1.69	1.66	a (±50)
Th-230	1.17	1.10	6 ()
Th-232	1.44	1.22	17 ()

	Activity (pci/g)	by difference		
Isotopes		2	RPD		
U-,233/234	0.393	0.302	0.09 pci/a (< 0.6 pci/a)		
U-235/236	0.0240	0.0113 U	0.01 ()		
U-238	0.292	0.295	0.00		

	Activity (pci/q)	
Isotopes	6	° 7	RPD
Tn- 778	1.64	1.87	13 (450)
Tu-230	1.76	1.61	9 ()
Tu-232	1.42	1.44	1 ()

	Activity (pci/q)	by difference		
Isotopes	6	7	RPD		
U- 233/234	1, 28	0.759	0.52 PCi/a (< 0.6 Pci/g)		
U-235/236	0.0340	0.0176	0.02 ()		
U-238	0.794	0.422	0.37 ()		
	·				

TRNC/D-TRD LDC #: 18035 D59 SDG #:

VALIDATION FINDINGS WORKSHEET **Level IV Recalculation Worksheet**

Page:___ 2nd Reviewer:_ Reviewer:

(* ·

METHOD: Radiochemistry (Method: 3 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 = Found x 100

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

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

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

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

					Recalculated	Reported	
Sample ID	Type of Analysis	Analyte	Found/S (units)	True/D (units)	%R or RPD	%R or RPD	Acceptable (Y/N)
	Laboratory control sample						((-)
708		Th-230	2.19 (PC/4)	19 (PC/A) 2.30 (PC/A)	95	96	>
	Matrix spike sample						
		1)	1	ļ		ı
	Duplicate RPD				RERZ	RERZ	
9)		N-933/334	1.33 (PCi/g) 1.17 (PCi/g) ± 0.11 (PCi/g)	1.17 (PCi/g)	0.4	0.3	Z *
	Chemical recovery			,			
		Th-334	447.06 (dpm) 592.33 (dpm)	592.33 (dpm)	75	75	>

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. 2 1 mits Va 10es Both

Varsion 1 0 (3/9/9000)

LDC #: 18035 D59 SDG #: TRNC/D-7RD

VALIDATION FINDINGS WORKSHEET Sample Calculation Verification

Page:	of(_	_
Reviewer:_	MG	
2nd reviewer:	- I /	-

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

WN N/A Are results within the calibrated range of the instruments?

Analyte results for $\frac{\pm 1}{0-235/236}$ reported with a positive detect were recalculated and verified using the following equation:

Activity =

Recalculation:

(cpm - bckgrd cpm) (2.22)(E)(Vol)(CF)

$$\frac{\left(\frac{8}{200.117}\right) - \left(\frac{1}{1000.183}\right)}{\left(\frac{2.22}{1000.183}\right)\left(\frac{0.38124}{1000.183}\right)\left(\frac{0.95}{1000.95}\right)} = 0.0241 \text{ pci/c}$$

E = Efficiency Vol = Volume

CF = %R, Self-absorbance, abundance, ect.

#	Sample ID	Analyte	Reported Concentration $(\rho C)/q$	Calculated Concentration (PCi/g)	Acceptable (Y/N)
(Th-228	1.69	1.70	· Y
		Th-230	1.17	1.18	
		Th-232	1.44	1.45.	
		U- 233/234	0.393	0.395	
		U-235/236	0.0240	0.0241	
		U-238	0.292	0.293	
2	11	Th-228	1.78	1.79	
		Tn-230	1.05	1.06	
		Tn-232	1.90	1.90	
		U-233/234	0.440	0.443	·
		U-238	0.321	0.322	,

Note:			
	•		