U.S.ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
540 S. MORRIS AVE., MONTGOMERY, AL 36115
TH ANALYSES

REPORT OF SAMPLE DELIVERY GROUP #1100246

Project:	Dimock Residential GW Site, Dimock, PA
Analysis method:	Actinides (Thorium) by Extraction Chromatography
Report ID:	1100246-TH
Report type:	Original
Date reported:	03/21/2012
Total pages in report:	33

SAMPLES

NAREL Sample #	Client Sample ID	Location	Matrix	Date Collected	Date Received
B2.01498T	EB02	PA:DIMOCK	WATER-DRINKING	02/05/2012	02/07/2012
B2.01499U	HW45	PA:DIMOCK	WATER-DRINKING	02/06/2012	02/07/2012
B2.01510V	FB11	PA:DIMOCK	WATER-DRINKING	02/06/2012	02/08/2012
B2.01511W	HW30	PA:DIMOCK	WATER-DRINKING	02/06/2012	02/08/2012
B2.01513Y	HW31	PA:DIMOCK	WATER-DRINKING	02/06/2012	02/08/2012
B2.01514Z	HW43	PA:DIMOCK	WATER-DRINKING	02/06/2012	02/08/2012
B2.01515A	HW15A	PA:DIMOCK	WATER-DRINKING	02/07/2012	02/08/2012
B2.01518D	HW31Z	PA:DIMOCK	WATER-DRINKING	02/06/2012	02/08/2012
B2.01571J	HW47	PA:DIMOCK	WATER-DRINKING	02/08/2012	02/09/2012
B2.01572K	FB12	PA:DIMOCK	WATER-DRINKING	02/07/2012	02/09/2012
B2.01573L	FB13	PA:DIMOCK	WATER-DRINKING	02/08/2012	02/09/2012
B2.01574M	HW38	PA:DIMOCK	WATER-DRINKING	02/08/2012	02/09/2012
B2.01575N	HW51	PA:DIMOCK	WATER-DRINKING	02/07/2012	02/09/2012
B2.01623D	HW21	PA:DIMOCK	WATER-DRINKING	02/09/2012	02/10/2012
B2.01624E	HW23	PA:DIMOCK	WATER-DRINKING	02/08/2012	02/10/2012
B2.01625F	HW48	PA:DIMOCK	WATER-DRINKING	02/08/2012	02/10/2012
B2.01626G	HW48Z	PA:DIMOCK	WATER-DRINKING	02/08/2012	02/10/2012
B2.01728M	FB15	PA:DIMOCK	WATER-DRINKING	02/10/2012	02/13/2012
B2.01729N	HW16	PA:DIMOCK	WATER-DRINKING	02/10/2012	02/13/2012
B2.01730F	HW16Z	PA:DIMOCK	WATER-DRINKING	02/10/2012	02/13/2012

EXCEPTIONS

1. **Packaging and shipping**–No problems were observed.
2. **Documentation**— NAREL originally agreed to analyze 71 samples for this project, but sample collectors collected and shipped more samples than expected. NAREL then agreed to analyze 100 samples, which would make five batches of 20 for QC purposes. Actually 101 samples were received. With the client's permission, NAREL did not analyze the field blank received in the last shipment thus making the agreed upon total of 100 samples for analysis.
3. **Sample preparation**–No problems were encountered.
4. **Analysis**– Sample B2.01573 had a yield that was just below the lower acceptance limit. The analyst noted that a leak occurred during filtration process for this sample. Due to time constraints, the results for this sample are being reported.
5. **Holding times**–No holding times were specified.

QUALITY CONTROL

1. **QC samples**–All QC analysis results met NAREL acceptance criteria.
2. **Yields**–All chemical yields were within acceptance limits except for the yield for sample B2.01574.
3. **Instruments**–Response and background checks for all instruments used in these analyses met NAREL acceptance criteria.

CERTIFICATION

I certify that this data report complies with the terms and conditions of the Quality Assurance Project Plan, except as noted above. Release of the data contained in this report has been authorized by the Director of the Center for Environmental Radioanalytical Laboratory Science and the NAREL Quality Assurance Manager, or their designees, as verified by the following signatures.

for Kirk J. McKown 3/22/12

Mary F. Wisdom — Date
Quality Assurance Manager, NAREL

for Cynthia White (Acting CERLS Dir.) 3-22-12

John G. Griggs, Ph.D. — Date
Director, Center for Environmental Radioanalytical Laboratory Science

DIM0196459 DIM0196460

GENERAL INFORMATION

SAMPLE TYPES

BLD	Blind sample
FBK	Field blank
SAM	Normal sample

ANALYSIS QC TYPES

ANA	Normal analysis
DUP	Laboratory duplicate
LCS	Laboratory control sample (blank spike)
MS	Matrix spike
MSD	Matrix spike duplicate
RBK	Method blank

QUALITY INDICATORS

RPD	Relative Percent Difference
%R	Percent Recovery
Z	Number of standard deviations by which a QC measurement differs from the expected value

EVALUATION OF QC ANALYSES

A method blank result is considered unacceptable if it is more than 3 standard deviations below zero or more than 3 standard deviations above a predetermined upper control limit. For some analyses NAREL has set the upper control limit at zero. For others the control limit is a small positive number.

NAREL evaluates the results of duplicate and spike analyses using "*Z* scores." A *Z* score is the number of standard deviations by which the QC result differs from its ideal value. The score is considered acceptable if its absolute value is not greater than 3.

The *Z* score for a spiked sample is computed by dividing the difference between the measured value and the target value by the combined standard uncertainty of the difference.

The *Z* score for a duplicate analysis is computed by dividing the difference between the two measured values by the combined standard uncertainty of the difference. When the precision of paired MS/MSD analyses is evaluated, the native sample activity is subtracted from each measured value and the net concentrations are then converted to total activities before the *Z* score is computed.

Each standard uncertainty used to compute a *Z* score includes an additional fixed term to represent sources of measurement error other than counting error. This additional term is not used in the evaluation of reagent blanks.

NAREL reports the "relative percent difference," or RPD, between duplicate results and the "percent recovery," or %R, for spiked analyses, but does not use these values for evaluation.

U.S.ENVIRONMENTAL PROTECTION AGENCY
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SDG #1100246

ANALYSIS SUMMARY

Analysis Procedure: NAREL TH-EICHROM
Title: Actinides (Thorium) by Extraction Chromatography

NAREL Sample #	QC Type	Preparation Procedure	Date Completed	Assay Batch #	QC Batch #
B2.01498T		N/A	03/16/2012	0015812H	0008556J
B2.01498T	DUP	N/A	03/16/2012	0015812H	0008556J
B2.01499U		N/A	03/16/2012	0015812H	0008556J
B2.01510V		N/A	03/16/2012	0015812H	0008556J
B2.01511W		N/A	03/16/2012	0015812H	0008556J
B2.01513Y		N/A	03/16/2012	0015812H	0008556J
B2.01514Z		N/A	03/16/2012	0015812H	0008556J
B2.01515A		N/A	03/16/2012	0015812H	0008556J
B2.01518D		N/A	03/16/2012	0015812H	0008556J
B2.01571J		N/A	03/16/2012	0015812H	0008556J
B2.01572K		N/A	03/20/2012	0015821J	0008556J
B2.01573L		N/A	03/20/2012	0015821J	0008556J
B2.01574M		N/A	03/20/2012	0015821J	0008556J
B2.01575N		N/A	03/20/2012	0015821J	0008556J
B2.01623D		N/A	03/20/2012	0015821J	0008556J
B2.01624E		N/A	03/20/2012	0015821J	0008556J
B2.01625F		N/A	03/20/2012	0015821J	0008556J
B2.01626G		N/A	03/20/2012	0015821J	0008556J
B2.01728M		N/A	03/20/2012	0015821J	0008556J
B2.01729N		N/A	03/20/2012	0015821J	0008556J
B2.01730F		N/A	03/20/2012	0015821J	0008556J
LCS-00633464Z *	LCS	N/A	03/16/2012	0015812H	0008556J
RBK-00633463Y *	RBK	N/A	03/16/2012	0015812H	0008556J

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

PREPARATION METHOD(S) USED

Procedure ID	Title

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SAMPLE ANALYSIS REPORT

Sample #:	B2.01498T	QC batch #:	0008556J
Matrix:	WATER-DRINKING	Assay batch #:	0015812H
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.500e-01 L	Analysis procedure:	NAREL TH-EICHROM
Dry/wet weight:	N/A	Analyst:	SPK
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	Aqueous		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/15/2012 15:59	1000.0	AS81	GVJ

ANALYTICAL RESULTS

Analyte	Activity	± 2 σ Uncertainty	MDC	Unit	Date
Th227	-8.63e-03	5.7e-02	1.5e-01	PCI/L	03/14/2012 10:30 CDT
Th228	2.80e-02	6.7e-02	1.2e-01	PCI/L	03/14/2012 10:30 CDT
Th230	3.26e-02	5.8e-02	9.2e-02	PCI/L	03/14/2012 10:30 CDT
Th232	4.65e-03	4.3e-02	9.1e-02	PCI/L	03/14/2012 10:30 CDT

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SAMPLE ANALYSIS REPORT

Sample #:	B2.01498T	QC batch #:	0008556J
Matrix:	WATER-DRINKING	Assay batch #:	0015812H
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.500e-01 L	Analysis procedure:	NAREL TH-EICHROM
Dry/wet weight:	N/A	Analyst:	SPK
Ash/dry weight:	N/A	QC type:	DUP
Sample description:	N/A		
Comment:	Aqueous		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/15/2012 15:59	1000.0	AS82	GVJ

ANALYTICAL RESULTS

Analyte	Activity	± 2 σ Uncertainty	MDC	Unit	Date
Th227	1.72e-02	7.7e-02	1.5e-01	PCI/L	03/14/2012 10:30 CDT
Th228	-4.66e-03	6.4e-02	1.4e-01	PCI/L	03/14/2012 10:30 CDT
Th230	2.33e-02	5.0e-02	8.0e-02	PCI/L	03/14/2012 10:30 CDT
Th232	9.30e-03	4.2e-02	8.0e-02	PCI/L	03/14/2012 10:30 CDT

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SAMPLE ANALYSIS REPORT

Sample #:	B2.01499U	QC batch #:	0008556J
Matrix:	WATER-DRINKING	Assay batch #:	0015812H
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.500e-01 L	Analysis procedure:	NAREL TH-EICHROM
Dry/wet weight:	N/A	Analyst:	SPK
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/15/2012 15:59	1000.0	AS83	GVJ

ANALYTICAL RESULTS

Analyte	Activity	± 2 σ Uncertainty	MDC	Unit	Date
Th227	1.15e-02	1.1e-01	2.3e-01	PCI/L	03/14/2012 10:30 CDT
Th228	6.21e-02	9.6e-02	1.5e-01	PCI/L	03/14/2012 10:30 CDT
Th230	3.11e-02	6.7e-02	1.1e-01	PCI/L	03/14/2012 10:30 CDT
Th232	6.21e-03	5.7e-02	1.2e-01	PCI/L	03/14/2012 10:30 CDT

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SDG #1100246

SAMPLE ANALYSIS REPORT

Sample #:	B2.01510V	QC batch #:	0008556J
Matrix:	WATER-DRINKING	Assay batch #:	0015812H
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.500e-01 L	Analysis procedure:	NAREL TH-EICHROM
Dry/wet weight:	N/A	Analyst:	SPK
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	Aqueous		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/15/2012 15:59	1000.0	AS84	GVJ

ANALYTICAL RESULTS

Analyte	Activity	± 2 σ Uncertainty	MDC	Unit	Date
Th227	0.00e+00	6.5e-02	1.3e-01	PCI/L	03/14/2012 10:30 CDT
Th228	2.78e-02	7.1e-02	1.3e-01	PCI/L	03/14/2012 10:30 CDT
Th230	2.78e-02	6.0e-02	9.5e-02	PCI/L	03/14/2012 10:30 CDT
Th232	-1.11e-02	3.8e-02	1.1e-01	PCI/L	03/14/2012 10:30 CDT

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SAMPLE ANALYSIS REPORT

Sample #:	B2.01511W	QC batch #:	0008556J
Matrix:	WATER-DRINKING	Assay batch #:	0015812H
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.500e-01 L	Analysis procedure:	NAREL TH-EICHROM
Dry/wet weight:	N/A	Analyst:	SPK
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/15/2012 15:59	1000.0	AS85	GVJ

ANALYTICAL RESULTS

Analyte	Activity	± 2 σ Uncertainty	MDC	Unit	Date
Th227	2.12e-02	9.5e-02	1.8e-01	PCI/L	03/14/2012 10:30 CDT
Th228	5.72e-02	8.9e-02	1.4e-01	PCI/L	03/14/2012 10:30 CDT
Th230	2.29e-02	6.3e-02	1.1e-01	PCI/L	03/14/2012 10:30 CDT
Th232	0.00e+00	5.4e-02	1.2e-01	PCI/L	03/14/2012 10:30 CDT

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SAMPLE ANALYSIS REPORT

Sample #:	B2.01513Y	QC batch #:	0008556J
Matrix:	WATER-DRINKING	Assay batch #:	0015812H
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.500e-01 L	Analysis procedure:	NAREL TH-EICHROM
Dry/wet weight:	N/A	Analyst:	SPK
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/15/2012 15:59	1000.0	AS86	GVJ

ANALYTICAL RESULTS

Analyte	Activity	± 2 σ Uncertainty	MDC	Unit	Date
Th227	-1.12e-02	7.5e-02	1.9e-01	PCI/L	03/14/2012 10:30 CDT
Th228	1.21e-02	9.1e-02	1.9e-01	PCI/L	03/14/2012 10:30 CDT
Th230	4.86e-02	7.5e-02	1.0e-01	PCI/L	03/14/2012 10:30 CDT
Th232	1.82e-02	6.8e-02	1.3e-01	PCI/L	03/14/2012 10:30 CDT

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SDG #1100246

SAMPLE ANALYSIS REPORT

Sample #:	B2.01514Z	QC batch #:	0008556J
Matrix:	WATER-DRINKING	Assay batch #:	0015812H
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.500e-01 L	Analysis procedure:	NAREL TH-EICHROM
Dry/wet weight:	N/A	Analyst:	SPK
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/15/2012 15:59	1000.0	AS87	GVJ

ANALYTICAL RESULTS

Analyte	Activity	± 2 σ Uncertainty	MDC	Unit	Date
Th227	0.00e+00	7.9e-02	1.6e-01	PCI/L	03/14/2012 10:30 CDT
Th228	-4.74e-02	5.6e-02	1.9e-01	PCI/L	03/14/2012 10:30 CDT
Th230	0.00e+00	4.3e-02	8.8e-02	PCI/L	03/14/2012 10:30 CDT
Th232	-6.76e-03	4.5e-02	1.2e-01	PCI/L	03/14/2012 10:30 CDT

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SDG #1100246

SAMPLE ANALYSIS REPORT

Sample #:	B2.01515A	QC batch #:	0008556J
Matrix:	WATER-DRINKING	Assay batch #:	0015812H
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.500e-01 L	Analysis procedure:	NAREL TH-EICHROM
Dry/wet weight:	N/A	Analyst:	SPK
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/15/2012 15:59	1000.0	AS88	GVJ

ANALYTICAL RESULTS

Analyte	Activity	± 2 σ Uncertainty	MDC	Unit	Date
Th227	0.00e+00	1.0e-01	2.1e-01	PCI/L	03/14/2012 10:30 CDT
Th228	8.77e-03	1.5e-01	3.0e-01	PCI/L	03/14/2012 10:30 CDT
Th230	1.31e-01	1.4e-01	1.9e-01	PCI/L	03/14/2012 10:30 CDT
Th232	0.00e+00	5.5e-02	1.1e-01	PCI/L	03/14/2012 10:30 CDT

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SDG #1100246

SAMPLE ANALYSIS REPORT

Sample #:	B2.01518D	QC batch #:	0008556J
Matrix:	WATER-DRINKING	Assay batch #:	0015812H
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.500e-01 L	Analysis procedure:	NAREL TH-EICHROM
Dry/wet weight:	N/A	Analyst:	SPK
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/15/2012 15:59	1000.0	AS97	GVJ

ANALYTICAL RESULTS

Analyte	Activity	± 2 σ Uncertainty	MDC	Unit	Date
Th227	-1.06e-02	7.0e-02	1.8e-01	PCI/L	03/14/2012 10:30 CDT
Th228	3.43e-02	8.2e-02	1.5e-01	PCI/L	03/14/2012 10:30 CDT
Th230	5.14e-02	7.0e-02	7.4e-02	PCI/L	03/14/2012 10:30 CDT
Th232	-5.70e-03	3.8e-02	9.8e-02	PCI/L	03/14/2012 10:30 CDT

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SDG #1100246

SAMPLE ANALYSIS REPORT

Sample #:	B2.01571J	QC batch #:	0008556J
Matrix:	WATER-DRINKING	Assay batch #:	0015812H
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.500e-01 L	Analysis procedure:	NAREL TH-EICHROM
Dry/wet weight:	N/A	Analyst:	SPK
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/15/2012 15:59	1000.0	AS101	GVJ

ANALYTICAL RESULTS

Analyte	Activity	± 2 σ Uncertainty	MDC	Unit	Date
Th227	1.82e-02	8.1e-02	1.6e-01	PCI/L	03/14/2012 10:30 CDT
Th228	6.38e-02	8.2e-02	1.2e-01	PCI/L	03/14/2012 10:30 CDT
Th230	4.41e-02	6.0e-02	6.4e-02	PCI/L	03/14/2012 10:30 CDT
Th232	4.90e-03	4.5e-02	9.6e-02	PCI/L	03/14/2012 10:30 CDT

U.S.ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY

SDG #1100246

SAMPLE ANALYSIS REPORT

Sample #:	B2.01572K	QC batch #:	0008556J
Matrix:	WATER-DRINKING	Assay batch #:	0015821J
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.500e-01 L	Analysis procedure:	NAREL TH-EICHROM
Dry/wet weight:	N/A	Analyst:	SPK
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	Aqueous		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/19/2012 16:14	1000.0	AS89	GVJ

ANALYTICAL RESULTS

Analyte	Activity	± 2 σ Uncertainty	MDC	Unit	Date
Th227	1.87e-02	8.4e-02	1.6e-01	PCI/L	03/18/2012 14:00 CDT
Th228	2.04e-02	5.6e-02	1.0e-01	PCI/L	03/18/2012 14:00 CDT
Th230	4.58e-02	6.2e-02	6.6e-02	PCI/L	03/18/2012 14:00 CDT
Th232	1.02e-02	4.5e-02	8.7e-02	PCI/L	03/18/2012 14:00 CDT

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SDG #1100246

SAMPLE ANALYSIS REPORT

Sample #:	B2.01573L	QC batch #:	0008556J
Matrix:	WATER-DRINKING	Assay batch #:	0015821J
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.500e-01 L	Analysis procedure:	NAREL TH-EICHROM
Dry/wet weight:	N/A	Analyst:	SPK
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	Aqueous		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/19/2012 16:14	1000.0	AS90	GVJ

ANALYTICAL RESULTS

Analyte		Activity	± 2 σ Uncertainty	MDC	Unit	Date
Th227	*	-1.91e-02	1.3e-01	3.3e-01	PCI/L	03/18/2012 14:00 CDT
Th228	*	-1.04e-02	9.9e-02	2.4e-01	PCI/L	03/18/2012 14:00 CDT
Th230	*	3.11e-02	9.0e-02	1.3e-01	PCI/L	03/18/2012 14:00 CDT
Th232	*	4.14e-02	1.1e-01	2.0e-01	PCI/L	03/18/2012 14:00 CDT

* An asterisk indicates a result that may be significantly under or overestimated

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SDG #1100246

SAMPLE ANALYSIS REPORT

Sample #:	B2.01574M	QC batch #:	0008556J
Matrix:	WATER-DRINKING	Assay batch #:	0015821J
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.500e-01 L	Analysis procedure:	NAREL TH-EICHROM
Dry/wet weight:	N/A	Analyst:	SPK
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/19/2012 16:14	1000.0	AS91	GVJ

ANALYTICAL RESULTS

Analyte	Activity	± 2 σ Uncertainty	MDC	Unit	Date
Th227	3.46e-02	9.5e-02	1.7e-01	PCI/L	03/18/2012 14:00 CDT
Th228	7.04e-02	7.7e-02	1.0e-01	PCI/L	03/18/2012 14:00 CDT
Th230	2.82e-02	5.0e-02	6.1e-02	PCI/L	03/18/2012 14:00 CDT
Th232	0.00e+00	3.0e-02	6.1e-02	PCI/L	03/18/2012 14:00 CDT

U.S.ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY

SDG #1100246

SAMPLE ANALYSIS REPORT

Sample #:	B2.01575N	QC batch #:	0008556J
Matrix:	WATER-DRINKING	Assay batch #:	0015821J
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.500e-01 L	Analysis procedure:	NAREL TH-EICHROM
Dry/wet weight:	N/A	Analyst:	SPK
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/19/2012 16:14	1000.0	AS92	GVJ

ANALYTICAL RESULTS

Analyte	Activity	± 2 σ Uncertainty	MDC	Unit	Date
Th227	-8.09e-03	5.4e-02	1.4e-01	PCI/L	03/18/2012 14:00 CDT
Th228	3.07e-02	5.5e-02	8.6e-02	PCI/L	03/18/2012 14:00 CDT
Th230	8.78e-03	3.9e-02	7.5e-02	PCI/L	03/18/2012 14:00 CDT
Th232	0.00e+00	2.8e-02	5.7e-02	PCI/L	03/18/2012 14:00 CDT

U.S.ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY

SDG #1100246

SAMPLE ANALYSIS REPORT

Sample #:	B2.01623D	QC batch #:	0008556J
Matrix:	WATER-DRINKING	Assay batch #:	0015821J
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.500e-01 L	Analysis procedure:	NAREL TH-EICHROM
Dry/wet weight:	N/A	Analyst:	SPK
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/19/2012 16:15	1000.0	AS93	GVJ

ANALYTICAL RESULTS

Analyte	Activity	± 2 σ Uncertainty	MDC	Unit	Date
Th227	0.00e+00	5.4e-02	1.1e-01	PCI/L	03/18/2012 14:00 CDT
Th228	5.13e-02	7.2e-02	1.1e-01	PCI/L	03/18/2012 14:00 CDT
Th230	0.00e+00	4.4e-02	1.0e-01	PCI/L	03/18/2012 14:00 CDT
Th232	-4.66e-03	3.1e-02	8.0e-02	PCI/L	03/18/2012 14:00 CDT

U.S.ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY

SDG #1100246

SAMPLE ANALYSIS REPORT

Sample #:	B2.01624E	QC batch #:	0008556J
Matrix:	WATER-DRINKING	Assay batch #:	0015821J
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.500e-01 L	Analysis procedure:	NAREL TH-EICHROM
Dry/wet weight:	N/A	Analyst:	SPK
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/19/2012 16:15	1000.0	AS94	GVJ

ANALYTICAL RESULTS

Analyte	Activity	± 2 σ Uncertainty	MDC	Unit	Date
Th227	2.68e-02	7.8e-02	1.2e-01	PCI/L	03/18/2012 14:00 CDT
Th228	1.94e-02	6.3e-02	1.2e-01	PCI/L	03/18/2012 14:00 CDT
Th230	3.88e-02	6.0e-02	8.3e-02	PCI/L	03/18/2012 14:00 CDT
Th232	-2.42e-02	3.8e-02	1.2e-01	PCI/L	03/18/2012 14:00 CDT

U.S.ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY

SDG #1100246

SAMPLE ANALYSIS REPORT

Sample #:	B2.01625F	QC batch #:	0008556J
Matrix:	WATER-DRINKING	Assay batch #:	0015821J
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.500e-01 L	Analysis procedure:	NAREL TH-EICHROM
Dry/wet weight:	N/A	Analyst:	SPK
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/19/2012 16:15	1000.0	AS96	GVJ

ANALYTICAL RESULTS

Analyte	Activity	± 2 σ Uncertainty	MDC	Unit	Date
Th227	-8.43e-03	5.6e-02	1.4e-01	PCI/L	03/18/2012 14:00 CDT
Th228	1.83e-02	5.9e-02	1.1e-01	PCI/L	03/18/2012 14:00 CDT
Th230	4.57e-02	6.3e-02	9.0e-02	PCI/L	03/18/2012 14:00 CDT
Th232	-9.13e-03	3.2e-02	9.0e-02	PCI/L	03/18/2012 14:00 CDT

U.S.ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY

SDG #1100246

SAMPLE ANALYSIS REPORT

Sample #:	B2.01626G	QC batch #:	0008556J
Matrix:	WATER-DRINKING	Assay batch #:	0015821J
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.500e-01 L	Analysis procedure:	NAREL TH-EICHROM
Dry/wet weight:	N/A	Analyst:	SPK
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/19/2012 16:15	1000.0	AS97	GVJ

ANALYTICAL RESULTS

Analyte	Activity	± 2 σ Uncertainty	MDC	Unit	Date
Th227	5.42e-02	9.6e-02	1.2e-01	PCI/L	03/18/2012 14:00 CDT
Th228	2.45e-02	5.3e-02	8.4e-02	PCI/L	03/18/2012 14:00 CDT
Th230	2.45e-02	5.3e-02	8.4e-02	PCI/L	03/18/2012 14:00 CDT
Th232	-4.89e-03	3.2e-02	8.4e-02	PCI/L	03/18/2012 14:00 CDT

U.S.ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY

SDG #1100246

SAMPLE ANALYSIS REPORT

Sample #:	B2.01728M	QC batch #:	0008556J
Matrix:	WATER-DRINKING	Assay batch #:	0015821J
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.500e-01 L	Analysis procedure:	NAREL TH-EICHROM
Dry/wet weight:	N/A	Analyst:	SPK
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	Aqueous		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/19/2012 16:14	1000.0	AS101	GVJ

ANALYTICAL RESULTS

Analyte	Activity	± 2 σ Uncertainty	MDC	Unit	Date
Th227	3.42e-02	9.9e-02	1.5e-01	PCI/L	03/18/2012 14:00 CDT
Th228	6.18e-03	7.1e-02	1.5e-01	PCI/L	03/18/2012 14:00 CDT
Th230	4.33e-02	7.7e-02	1.2e-01	PCI/L	03/18/2012 14:00 CDT
Th232	-1.23e-02	4.3e-02	1.2e-01	PCI/L	03/18/2012 14:00 CDT

U.S.ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY

SDG #1100246

SAMPLE ANALYSIS REPORT

Sample #:	B2.01729N	QC batch #:	0008556J
Matrix:	WATER-DRINKING	Assay batch #:	0015821J
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.500e-01 L	Analysis procedure:	NAREL TH-EICHROM
Dry/wet weight:	N/A	Analyst:	SPK
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/19/2012 16:14	1000.0	AS103	GVJ

ANALYTICAL RESULTS

Analyte	Activity	± 2 σ Uncertainty	MDC	Unit	Date
Th227	-9.81e-03	6.5e-02	1.7e-01	PCI/L	03/18/2012 14:00 CDT
Th228	1.81e-01	1.2e-01	1.3e-01	PCI/L	03/18/2012 14:00 CDT
Th230	0.00e+00	3.4e-02	6.9e-02	PCI/L	03/18/2012 14:00 CDT
Th232	-5.32e-03	3.5e-02	9.1e-02	PCI/L	03/18/2012 14:00 CDT

U.S.ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY

SDG #1100246

SAMPLE ANALYSIS REPORT

Sample #:	B2.01730F	QC batch #:	0008556J
Matrix:	WATER-DRINKING	Assay batch #:	0015821J
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.500e-01 L	Analysis procedure:	NAREL TH-EICHROM
Dry/wet weight:	N/A	Analyst:	SPK
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/19/2012 16:15	1000.0	AS104	GVJ

ANALYTICAL RESULTS

Analyte	Activity	± 2 σ Uncertainty	MDC	Unit	Date
Th227	5.16e-02	9.1e-02	1.1e-01	PCI/L	03/18/2012 14:00 CDT
Th228	8.40e-02	1.0e-01	1.7e-01	PCI/L	03/18/2012 14:00 CDT
Th230	-4.67e-03	3.1e-02	8.0e-02	PCI/L	03/18/2012 14:00 CDT
Th232	9.32e-03	4.2e-02	8.0e-02	PCI/L	03/18/2012 14:00 CDT

U.S.ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY

SDG #1100246

SAMPLE ANALYSIS REPORT

Sample #:	LCS-00633464Z	QC batch #:	0008556J
Matrix:	N/A	Assay batch #:	0015812H
Sample type:	N/A	Prep procedure:	N/A
Amount analyzed:	1.000e+00 SAMP	Analysis procedure:	NAREL TH-EICHROM
Dry/wet weight:	N/A	Analyst:	SPK
Ash/dry weight:	N/A	QC type:	LCS
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/15/2012 15:59	1000.0	AS103	GVJ

ANALYTICAL RESULTS

Analyte	Activity	± 2 σ Uncertainty	MDC	Unit	Date
Th227	-2.10e-03	1.4e-02	3.6e-02	PCI	03/14/2012 10:30 CDT
Th228	-1.14e-03	7.5e-03	1.9e-02	PCI	03/14/2012 10:30 CDT
Th230	2.43e+00	2.1e-01	2.2e-02	PCI	03/14/2012 10:30 CDT
Th232	2.27e-03	1.0e-02	1.9e-02	PCI	03/14/2012 10:30 CDT

U.S.ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY

SDG #1100246

SAMPLE ANALYSIS REPORT

Sample #:	RBK-00633463Y	QC batch #:	0008556J
Matrix:	N/A	Assay batch #:	0015812H
Sample type:	N/A	Prep procedure:	N/A
Amount analyzed:	1.000e+00 SAMP	Analysis procedure:	NAREL TH-EICHROM
Dry/wet weight:	N/A	Analyst:	SPK
Ash/dry weight:	N/A	QC type:	RBK
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/15/2012 15:59	1000.0	AS104	GVJ

ANALYTICAL RESULTS

Analyte	Activity	± 2 σ Uncertainty	MDC	Unit	Date
Th227	5.84e-03	1.7e-02	2.5e-02	PCI	03/14/2012 10:30 CDT
Th228	7.36e-03	1.8e-02	3.3e-02	PCI	03/14/2012 10:30 CDT
Th230	4.21e-03	1.2e-02	2.1e-02	PCI	03/14/2012 10:30 CDT
Th232	0.00e+00	6.6e-03	1.4e-02	PCI	03/14/2012 10:30 CDT

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY

SDG 1100246

QC BATCH SUMMARY

QC batch #: 0008556J
Preparation procedure: N/A
Analysis procedure: NAREL TH-EICHROM

NAREL Sample #	QC Type	Yield (%)	± 2 σ Uncertainty (%)	Analyst
B2.01498T		81.34 %	2.60 %	SPK
B2.01498T	DUP	82.23 %	2.65 %	SPK
B2.01499U		61.50 %	2.11 %	SPK
B2.01510V		69.09 %	2.31 %	SPK
B2.01511W		68.66 %	2.31 %	SPK
B2.01513Y		65.36 %	2.21 %	SPK
B2.01514Z		56.71 %	2.00 %	SPK
B2.01515A		42.95 %	1.62 %	SPK
B2.01518D		66.18 %	2.23 %	SPK
B2.01571J		78.02 %	2.54 %	SPK
B2.01572K		72.65 %	2.39 %	SPK
B2.01573L		36.06 %	1.43 %	SPK
B2.01574M		75.37 %	2.43 %	SPK
B2.01575N		81.90 %	2.62 %	SPK
B2.01623D		81.21 %	2.59 %	SPK
B2.01624E		80.67 %	2.56 %	SPK
B2.01625F		82.23 %	2.63 %	SPK
B2.01626G		77.12 %	2.50 %	SPK
B2.01728M		61.91 %	2.09 %	SPK
B2.01729N		71.51 %	2.36 %	SPK
B2.01730F		80.65 %	2.59 %	SPK
LCS-00633464Z *	LCS	83.85 %	2.67 %	SPK
RBK-00633463Y *	RBK	89.43 %	2.84 %	SPK

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

National Air and Radiation Environmental Laboratory
QC Batch Report

QC Batch #: 0008556J Analytical Method: NAREL TH-EICHROM

METHOD BLANKS (PCI)

Sample ID	Nuclide	Activity ± 2σ	Prep Date	Flags
00633463Y	TH227	5.84e-03 ± 1.7e-02	2012-03-14	OK
00633463Y	TH228	7.36e-03 ± 1.8e-02	2012-03-14	OK
00633463Y	TH230	4.21e-03 ± 1.2e-02	2012-03-14	OK
00633463Y	TH232	0.00e+00 ± 6.6e-03	2012-03-14	OK

LABORATORY DUPLICATES (PCI/L)

Sample ID	Nuclide	Original ± 2σ	Duplicate ± 2σ	RPD	Z
B2.01498T	TH227	-8.63e-03 ± 5.7e-02	1.72e-02 ± 7.7e-02	600.30	0.54 OK
B2.01498T	TH228	2.80e-02 ± 6.7e-02	-4.66e-03 ± 6.4e-02	279.96	-0.70 OK
B2.01498T	TH230	3.26e-02 ± 5.8e-02	2.33e-02 ± 5.0e-02	33.37	-0.24 OK
B2.01498T	TH232	4.65e-03 ± 4.3e-02	9.30e-03 ± 4.2e-02	66.63	0.16 OK

LAB CONTROL SAMPLES (PCI)

Sample ID	Nuclide	Amt Added ± 2σ	Measured ± 2σ	%R	Z
00633464Z	TH227	NO SPIKE DATA			
00633464Z	TH228	NO SPIKE DATA			
00633464Z	TH230	2.54e+00 ± 2.2%	2.43e+00 ± 2.1e-01	95.85	-0.96 OK
00633464Z	TH232	NO SPIKE DATA			

Analyst: Shane Knockemus 3/20/12
Knockemus, Shane P.

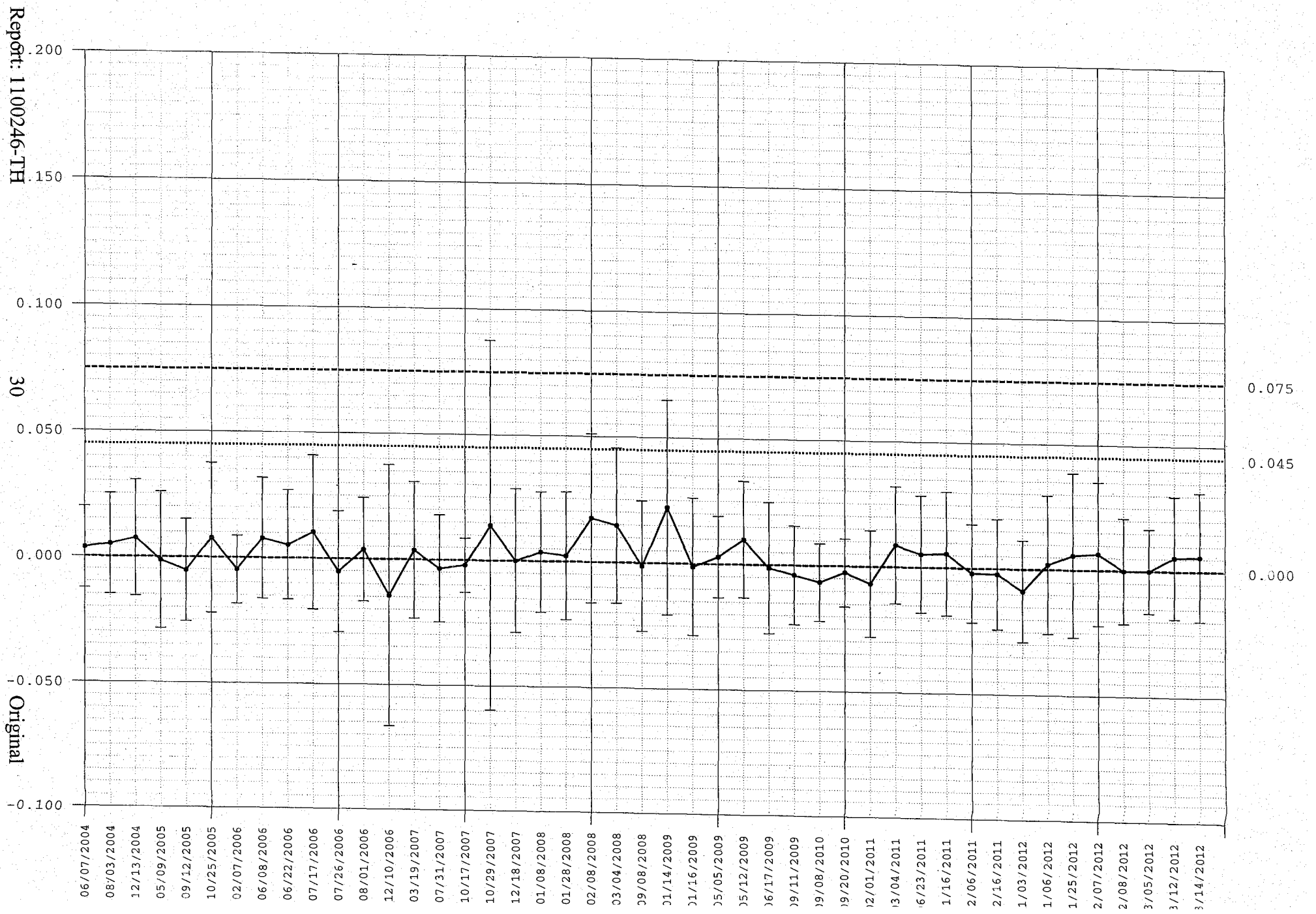
QA Officer: Carol D. McCue 3/20/12

Method Blanks

Analyte: TH227

Method: NAREL TH-EICHROM

Analyst: Knockemus, Shane P.



DIM0196488

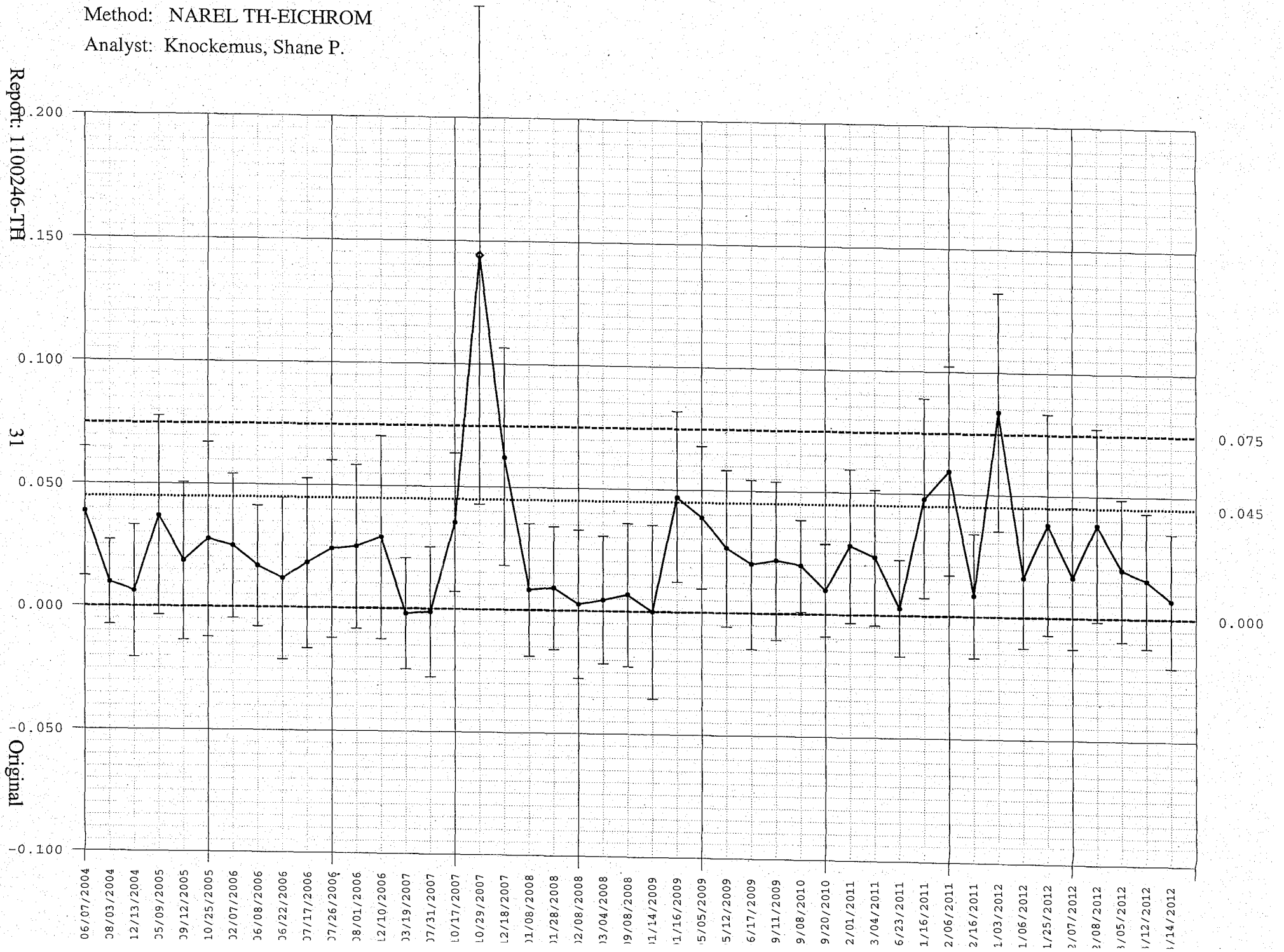
DIM0196459

Method Blanks

Analyte: TH228

Method: NAREL TH-EICHROM

Analyst: Knockemus, Shane P.



Report: 1100246-TH

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Original

DIM0196489

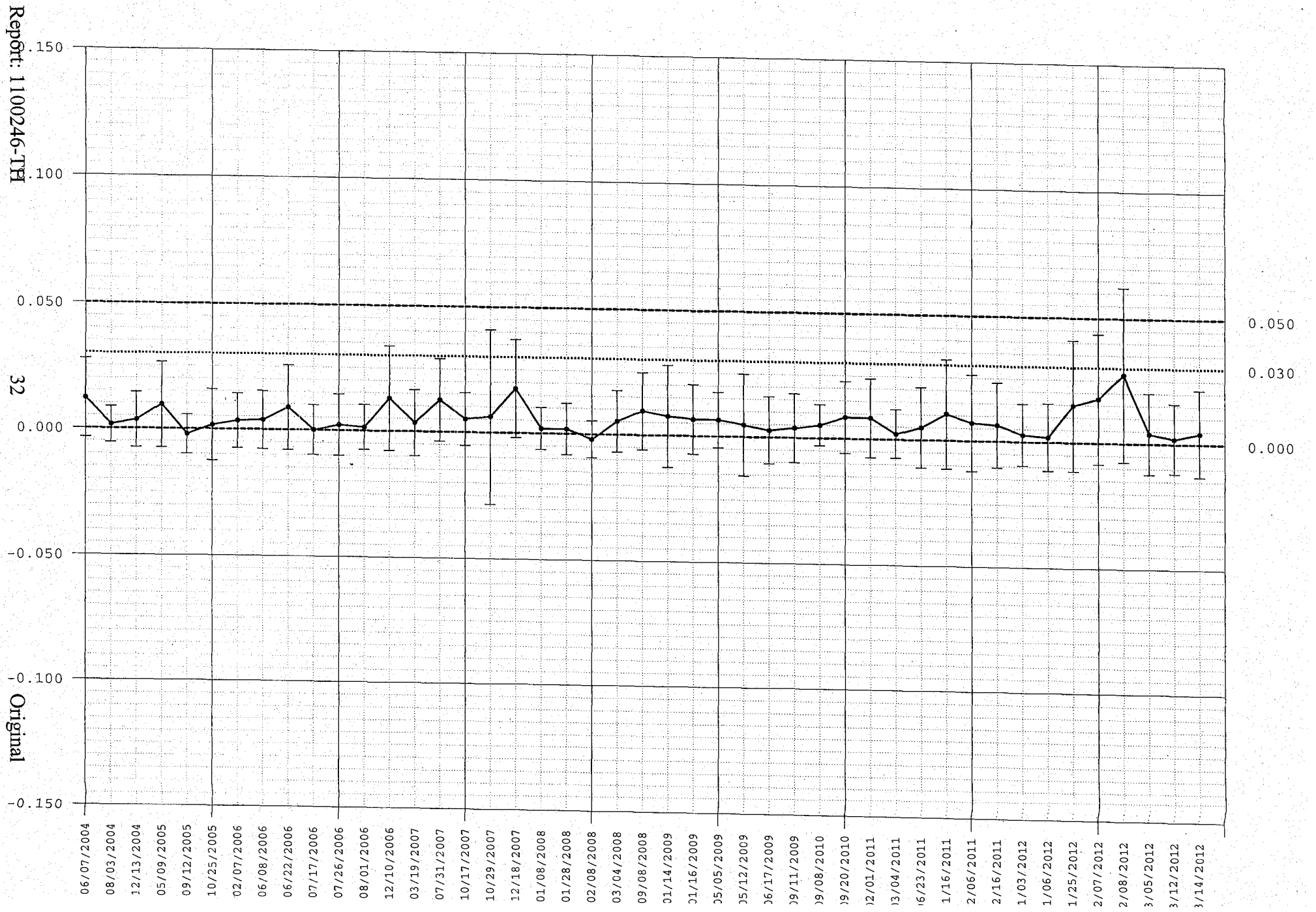
DIM0196459

Method Blanks

Analyte: TH230

Method: NAREL TH-EICHROM

Analyst: Knockemus, Shane P.



DIM0196490

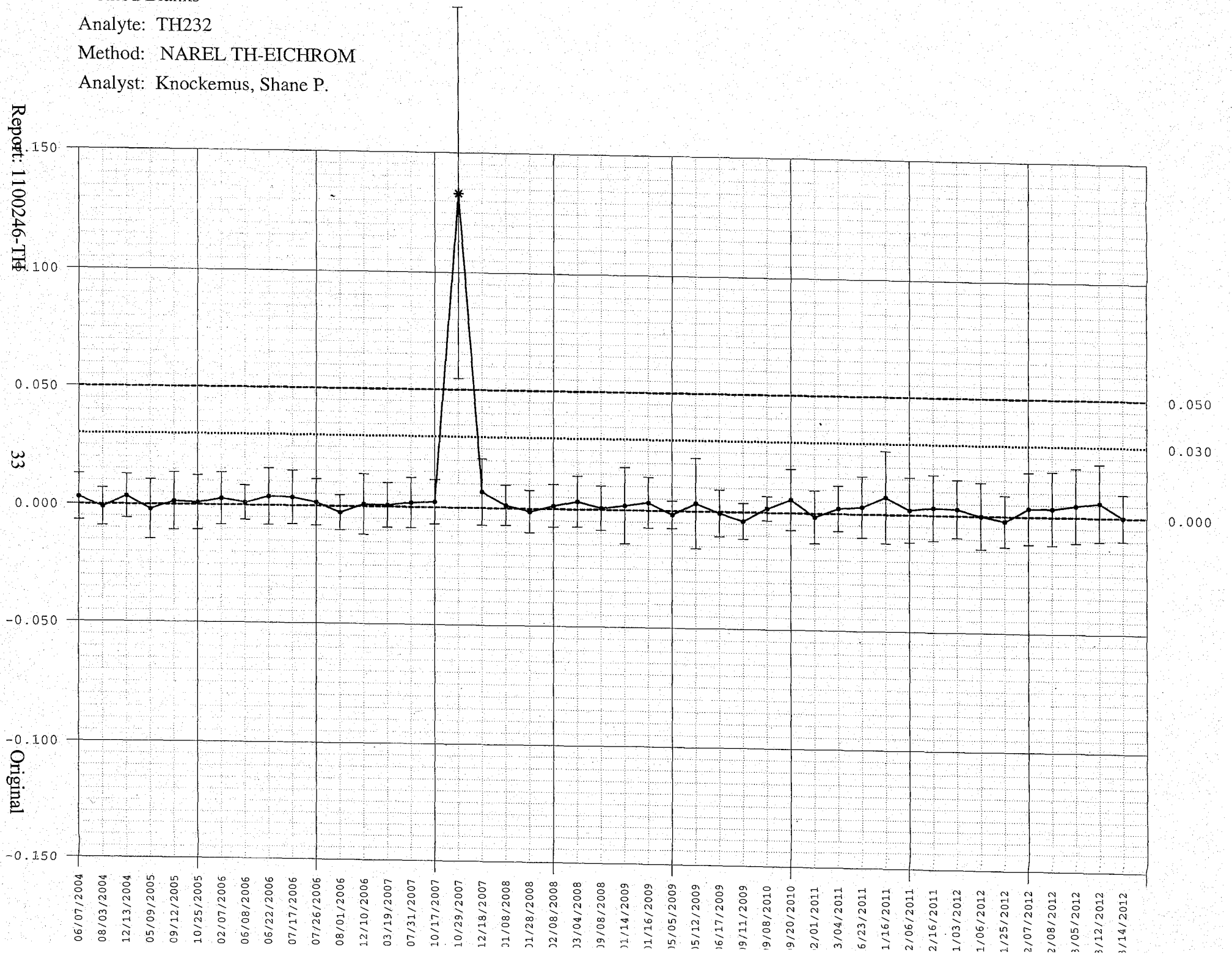
DIM0196459

Method Blanks

Analyte: TH232

Method: NAREL TH-EICHROM

Analyst: Knockemus, Shane P.



Report: 1100246-TH

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Original

DIM0196491

DIM0196459