



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RADIATION AND INDOOR AIR
National Air and Radiation Environmental Laboratory
540 South Morris Avenue, Montgomery, AL 36115-2601
(334) 270-3400

November 12, 1997

MEMORANDUM

SUBJECT: Radicanalytical Results for
Newfield Landfill Site
Soil Samples

FROM: John Griggs, Chief *John Griggs*
Monitoring and Analytical Services Branch

TO: Mark P. Winslow, Coordinator
Radiation Health and Safety Program

Attached are the results of isotopic uranium and thorium analyses on soil samples collected at Newfield Landfill Site. The samples constitute NAREL batch number 97-00121.

Radiochemical analyses usually require the subtraction of an instrument background measurement for a gross sample measurement. Both values are positive, but when the sample activity is low, random variations in the two measurements can cause the gross value to be less than the background, resulting in a measured activity less than zero. Although negative activities have no physical significance, they do have statistical significance, as for example in the evaluation of trends or the comparison of two groups of samples.

For all analyses except gamma spectroscopy, it is the policy of NAREL to report results as generated, whether positive, negative, or zero, together with the 2-sigma measurement uncertainty and a sample-specific estimate of the minimum detectable concentration (MDC). The activity, uncertainty, and MDC are given in the same units. The activity and 2-sigma uncertainty for a radionuclide measured by gamma spectroscopy are reported only if the nuclide is detected; so, the results of gamma analyses are never zero or negative. Nuclides that are not detected do not appear in the report, with the exception of Ba-140, Co-60, Cs-137, I-131, K-40, Ra-226, and Ra-228. If one of these seven nuclides is undetected, NAREL reports it as "Not Detected," or "ND," and provides a sample-specific estimate of the MDC.

Specific information concerning all aspects of the radiological analysis of the samples is

contained in the batch case narratives of the data packages. If you have any questions concerning the results, please contact me at (334) 270-3450.

Attachments

cc: Paul Giardina, EPA/Region 2, w/o attachments
Mary Clark, (6601J), w/o attachments
Sam T. Windham, NAREL

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

REPORT OF SAMPLE DELIVERY GROUP #9700121

Project: NEWFIELD LANDFILL
Procedure: Thorium
Date Reported: 11/07/1997

SAMPLES

NAREL Sample #	Client Sample ID	Type	Matrix	Date Collected	Date Received
97.05384T	NF1	SAM	SOIL	06/23/1997	06/25/1997
97.05385U	NF2	SAM	SOIL	06/23/1997	06/25/1997
97.05386V	NF3	SAM	SOIL	06/23/1997	06/25/1997
97.05387W	NF4	SAM	SOIL	06/23/1997	06/25/1997
97.05388X	NF5	SAM	SOIL	06/23/1997	06/25/1997
97.05389Y	NF6	SAM	SOIL	06/23/1997	06/25/1997
97.05390Q	NF7	SAM	SOIL	06/23/1997	06/25/1997
97.05391R	NF8	SAM	SOIL	06/23/1997	06/25/1997
97.05392T	NF9	SAM	SOIL	06/23/1997	06/25/1997
97.05393U	NF10	SAM	SOIL	06/23/1997	06/25/1997

EXCEPTIONS

1. Packaging and Shipping - No problems were observed.
2. Documentation - No problems were observed.
3. Sample Preparation - No problems were encountered.
4. Analysis - No problems were encountered.
5. Holding Times - All holding times were met.

QUALITY CONTROL

1. QC samples - All QC analysis results met NAREL acceptance criteria.
2. Yields - All chemical yields were within acceptance limits.
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 Chief of the Monitoring and Analytical Services Branch and the NAREL Quality Assurance Coordinator, or their designees, as verified by the following signatures.

Sam J Windham for 11/12/97
James B. Moore Date
Quality Assurance Coordinator

John Griggs 11/10/97
John Griggs, Ph.D. Date
Chief, Monitoring and Analytical Services Branch

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	Reagent 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 reagent blank result is considered unacceptable if it is more than 3 standard deviations (counting uncertainty) 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 estimated total uncertainty in the difference.

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

Each measurement 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.

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TH ANALYSES
SDG #9700121**

ANALYSIS SUMMARY

Analysis Procedure: TH
Title: Thorium

NAREL Sample #	QC Type	Preparation Procedure	Date Completed	Prep Batch #	QC Batch #
97.05384T		N/A	10/31/1997	0000303N	0000095Q
97.05385U		N/A	10/31/1997	0000303N	0000095Q
97.05386V		N/A	10/31/1997	0000303N	0000095Q
97.05387W		N/A	10/30/1997	0000303N	0000095Q
97.05388X		N/A	10/31/1997	0000303N	0000095Q
97.05389Y		N/A	10/31/1997	0000303N	0000095Q
97.05390Q		N/A	10/31/1997	0000303N	0000095Q
97.05390Q	DUP	N/A	10/31/1997	0000303N	0000095Q
97.05391R		N/A	10/31/1997	0000303N	0000095Q
97.05391R	MS	N/A	10/31/1997	0000303N	0000095Q
97.05391R	MSD	N/A	10/31/1997	0000303N	0000095Q
97.05392T		N/A	10/31/1997	0000303N	0000095Q
97.05393U		N/A	10/31/1997	0000303N	0000095Q
RBK-00361880A *	RBK	N/A	10/31/1997	0000303N	0000095Q

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

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 TH ANALYSES
 SDG #9700121**

SAMPLE ANALYSIS REPORT

Sample #:	97.05384T	QC batch #:	0000095Q
Matrix:	SOIL	Prep batch #:	0000303N
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	5.000e-03 GASH	Analysis procedure:	TH
Dry/wet weight:	77.04 %	Analyst:	AS
Ash/dry weight:	80.19 %	QC type:	ANA

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
10/30/1997 14:52	1000.0	AS02	DPG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Th227	6.23e+00	5.2e+00	7.3e+00	PCI/GDRY	10/27/1997
Th228	7.68e+00	6.5e+00	1.0e+01	PCI/GDRY	10/27/1997
Th230	2.40e+01	6.0e+00	3.2e+00	PCI/GDRY	10/27/1997
Th232	6.19e+00	3.1e+00	2.6e+00	PCI/GDRY	10/27/1997

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TH ANALYSES
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SAMPLE ANALYSIS REPORT

Sample #:	97.05385U	QC batch #:	0000095Q
Matrix:	SOIL	Prep batch #:	0000303N
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	5.000e-03 GASH	Analysis procedure:	TH
Dry/wet weight:	95.58 %	Analyst:	AS
Ash/dry weight:	90.00 %	QC type:	ANA

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
10/30/1997 14:52	1000.0	AS03	DPG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Th227	3.16e+00	3.5e+00	4.5e+00	PCI/GDRY	10/27/1997
Th228	8.71e+00	6.8e+00	1.0e+01	PCI/GDRY	10/27/1997
Th230	2.49e+01	6.7e+00	3.0e+00	PCI/GDRY	10/27/1997
Th232	1.29e+01	4.9e+00	3.2e+00	PCI/GDRY	10/27/1997

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SAMPLE ANALYSIS REPORT

Sample #:	97.05386V	QC batch #:	0000095Q
Matrix:	SOIL	Prep batch #:	0000303N
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.444e-01 GASH	Analysis procedure:	TH
Dry/wet weight:	99.94 %	Analyst:	AS
Ash/dry weight:	96.40 %	QC type:	ANA

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
10/30/1997 14:52	1000.0	AS04	DPG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Th227	6.91e-02	8.9e-02	1.4e-01	PCI/GDRY	10/27/1997
Th228	4.75e-01	1.8e-01	2.3e-01	PCI/GDRY	10/27/1997
Th230	4.59e-01	1.3e-01	4.5e-02	PCI/GDRY	10/27/1997
Th232	5.28e-01	1.4e-01	4.5e-02	PCI/GDRY	10/27/1997

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SAMPLE ANALYSIS REPORT

Sample #:	97.05387W	QC batch #:	0000095Q
Matrix:	SOIL	Prep batch #:	0000303N
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.243e-01 GASH	Analysis procedure:	TH
Dry/wet weight:	99.93 %	Analyst:	AS
Ash/dry weight:	98.00 %	QC type:	ANA

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
10/30/1997 02:52	1000.0	AS05	DPG

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2\sigma$ Uncertainty	MDC	Unit	Date
Th227	2.38e-02	7.9e-02	1.6e-01	PCI/GDRY	10/27/1997
Th228	5.77e-01	1.9e-01	2.3e-01	PCI/GDRY	10/27/1997
Th230	4.92e-01	1.4e-01	6.8e-02	PCI/GDRY	10/27/1997
Th232	6.66e-01	1.6e-01	4.8e-02	PCI/GDRY	10/27/1997

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SAMPLE ANALYSIS REPORT

Sample #:	97.05388X	QC batch #:	0000095Q
Matrix:	SOIL	Prep batch #:	0000303N
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	4.988e-01 GASH	Analysis procedure:	TH
Dry/wet weight:	99.95 %	Analyst:	AS
Ash/dry weight:	97.59 %	QC type:	ANA

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
10/30/1997 14:52	1000.0	AS06	DPG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Th227	3.59e-02	3.8e-02	5.1e-02	PCI/GDRY	10/27/1997
Th228	3.63e-01	9.7e-02	1.0e-01	PCI/GDRY	10/27/1997
Th230	4.73e-01	9.2e-02	2.8e-02	PCI/GDRY	10/27/1997
Th232	3.57e-01	7.9e-02	2.6e-02	PCI/GDRY	10/27/1997

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SAMPLE ANALYSIS REPORT

Sample #:	97.05389Y	QC batch #:	0000095Q
Matrix:	SOIL	Prep batch #:	0000303N
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.556e-01 GASH	Analysis procedure:	TH
Dry/wet weight:	99.92 %	Analyst:	AS
Ash/dry weight:	95.00 %	QC type:	ANA

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
10/30/1997 14:52	1000.0	AS07	DPG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Th227	9.91e-02	1.1e-01	1.7e-01	PCI/GDRY	10/27/1997
Th228	9.91e-01	2.5e-01	2.5e-01	PCI/GDRY	10/27/1997
Th230	1.37e+00	2.4e-01	7.9e-02	PCI/GDRY	10/27/1997
Th232	7.86e-01	1.8e-01	5.2e-02	PCI/GDRY	10/27/1997

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SAMPLE ANALYSIS REPORT

Sample #:	97.05390Q	QC batch #:	0000095Q
Matrix:	SOIL	Prep batch #:	0000303N
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.492e-01 GASH	Analysis procedure:	TH
Dry/wet weight:	99.94 %	Analyst:	AS
Ash/dry weight:	97.60 %	QC type:	ANA

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
10/30/1997 14:52	1000.0	AS08	DPG

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2\sigma$ Uncertainty	MDC	Unit	Date
Th227	1.09e-01	9.3e-02	1.2e-01	PCI/GDRY	10/27/1997
Th228	5.59e-01	1.7e-01	2.0e-01	PCI/GDRY	10/27/1997
Th230	5.71e-01	1.3e-01	5.3e-02	PCI/GDRY	10/27/1997
Th232	5.67e-01	1.3e-01	5.7e-02	PCI/GDRY	10/27/1997

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SAMPLE ANALYSIS REPORT

Sample #:	97.05390Q	QC batch #:	0000095Q
Matrix:	SOIL	Prep batch #:	0000303N
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.510e-01 GASH	Analysis procedure:	TH
Dry/wet weight:	99.94 %	Analyst:	AS
Ash/dry weight:	97.60 %	QC type:	DUP

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
10/30/1997 14:52	1000.0	AS09	DPG

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2\sigma$ Uncertainty	MDC	Unit	Date
Th227	6.58e-02	9.3e-02	1.6e-01	PCI/GDRY	10/27/1997
Th228	4.77e-01	2.0e-01	2.5e-01	PCI/GDRY	10/27/1997
Th230	5.95e-01	1.6e-01	5.2e-02	PCI/GDRY	10/27/1997
Th232	4.78e-01	1.4e-01	3.0e-02	PCI/GDRY	10/27/1997

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SAMPLE ANALYSIS REPORT

Sample #:	97.05391R	QC batch #:	0000095Q
Matrix:	SOIL	Prep batch #:	0000303N
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.566e-01 GASH	Analysis procedure:	TH
Dry/wet weight:	83.95 %	Analyst:	AS
Ash/dry weight:	98.80 %	QC type:	ANA

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
10/30/1997 14:52	1000.0	AS10	DPG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Th227	6.17e-02	7.9e-02	1.2e-01	PCI/GDRY	10/27/1997
Th228	2.83e-01	1.5e-01	2.1e-01	PCI/GDRY	10/27/1997
Th230	2.12e-01	8.8e-02	5.8e-02	PCI/GDRY	10/27/1997
Th232	4.30e-01	1.2e-01	4.4e-02	PCI/GDRY	10/27/1997

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SAMPLE ANALYSIS REPORT

Sample #:	97.05391R	QC batch #:	0000095Q
Matrix:	SOIL	Prep batch #:	0000303N
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.513e-01 GASH	Analysis procedure:	TH
Dry/wet weight:	83.95 %	Analyst:	AS
Ash/dry weight:	98.80 %	QC type:	MS

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
10/30/1997 14:52	1000.0	AS19	DPG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Th227	6.64e-02	8.2e-02	1.2e-01	PCI/GDRY	10/27/1997
Th228	4.44e-01	1.8e-01	2.3e-01	PCI/GDRY	10/27/1997
Th230	7.55e+00	6.4e-01	6.1e-02	PCI/GDRY	10/27/1997
Th232	2.55e-01	1.0e-01	6.1e-02	PCI/GDRY	10/27/1997

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SAMPLE ANALYSIS REPORT

Sample #:	97.05391R	QC batch #:	0000095Q
Matrix:	SOIL	Prep batch #:	0000303N
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.522e-01 GASH	Analysis procedure:	TH
Dry/wet weight:	83.95 %	Analyst:	AS
Ash/dry weight:	98.80 %	QC type:	MSD

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
10/30/1997 14:52	1000.0	AS21	DPG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Th227	1.53e-02	5.9e-02	1.3e-01	PCI/GDRY	10/27/1997
Th228	2.48e-01	1.5e-01	2.1e-01	PCI/GDRY	10/27/1997
Th230	7.39e+00	5.6e-01	5.3e-02	PCI/GDRY	10/27/1997
Th232	2.16e-01	8.2e-02	2.3e-02	PCI/GDRY	10/27/1997

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SAMPLE ANALYSIS REPORT

Sample #:	97.05392T	QC batch #:	0000095Q
Matrix:	SOIL	Prep batch #:	0000303N
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	5.038e-01 GASH	Analysis procedure:	TH
Dry/wet weight:	100.00 %	Analyst:	AS
Ash/dry weight:	97.19 %	QC type:	ANA

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
10/30/1997 14:52	1000.0	AS22	DPG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Th227	-2.48e-03	2.5e-02	6.5e-02	PCI/GDRY	10/27/1997
Th228	3.91e-01	9.7e-02	1.0e-01	PCI/GDRY	10/27/1997
Th230	3.00e-01	6.9e-02	2.6e-02	PCI/GDRY	10/27/1997
Th232	2.86e-01	6.7e-02	3.0e-02	PCI/GDRY	10/27/1997

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SAMPLE ANALYSIS REPORT

QC Sample #: RBK-00361880A

QC batch #: 0000095Q
Prep batch #: 0000303N
Prep procedure: N/A
Analysis procedure: TH
Analyst: AS
QC type: RBK

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
10/30/1997 14:52	1000.0	AS24	DPG

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2\sigma$ Uncertainty	MDC	Unit	Date
Th227	0.00e+00	0.0e+00	1.1e-02	PCI	10/27/1997
Th228	-2.05e-02	2.4e-02	5.1e-02	PCI	10/27/1997
Th230	7.74e-03	7.7e-03	5.8e-03	PCI	10/27/1997
Th232	5.15e-03	6.8e-03	1.0e-02	PCI	10/27/1997

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QC BATCH SUMMARY

QC batch #: 0000095Q
Preparation procedure: N/A
Analysis procedure: TH

NAREL Sample #	QC Type	Yield (%)	$\pm 2\sigma$ Uncertainty (%)	Analyst
97.05384T		92.76 %	2.69 %	AS
97.05385U		80.93 %	2.42 %	AS
97.05386V		98.46 %	2.75 %	AS
97.05387W		91.98 %	2.66 %	AS
97.05388X		94.51 %	2.66 %	AS
97.05389Y		79.50 %	2.40 %	AS
97.05390Q		89.27 %	2.55 %	AS
97.05390Q	DUP	96.65 %	2.78 %	AS
97.05391R		88.65 %	2.59 %	AS
97.05391R	MS	75.55 %	2.35 %	AS
97.05391R	MSD	92.54 %	2.71 %	AS
97.05392T		100.76 %	2.84 %	AS
97.05393U		96.36 %	2.79 %	AS
RBK-00361880A *	RBK	99.89 %	2.82 %	AS

* 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 #: 00000952

Analytical Procedure: TH

REAGENT BLANKS (PCI)

Sample ID	Nuclide	Activity ± 2σ
00361880A	TH227	0.00e+00 ± 0.0e+00
00361880A	TH228	-2.05e-02 ± 2.4e-02
00361880A	TH230	7.74e-03 ± 7.7e-03
00361880A	TH232	5.15e-03 ± 6.8e-03

LABORATORY DUPLICATES (PCI/GDRY)

Sample ID	Nuclide	Original ± 2σ	Duplicate ± 2σ	RPD	Z
97.05390Q	TH227	1.09e-01 ± 9.3e-02	6.58e-02 ± 9.3e-02	49.17	-0.64 OK
97.05390Q	TH228	5.59e-01 ± 1.7e-01	4.77e-01 ± 2.0e-01	15.75	-0.55 OK
97.05390Q	TH230	5.71e-01 ± 1.3e-01	5.95e-01 ± 1.6e-01	4.18	0.19 OK
97.05390Q	TH232	5.67e-01 ± 1.3e-01	4.78e-01 ± 1.4e-01	17.11	-0.74 OK

MATRIX SPIKES (PCI/GDRY)

Sample ID	Nuclide	Amt Added ± 2σ	Native ± 2σ	Measured ± 2σ	%R	Z
97.05391R	TH227	NO SPIKE DATA				
97.05391R	TH228	NO SPIKE DATA				
97.05391R	TH230	5.99e-00 ± 1.7e-01	2.12e-01 ± 8.8e-02	7.55e+00 ± 6.4e-01	122.65	1.64 OK
97.05391R	TH232	NO SPIKE DATA				

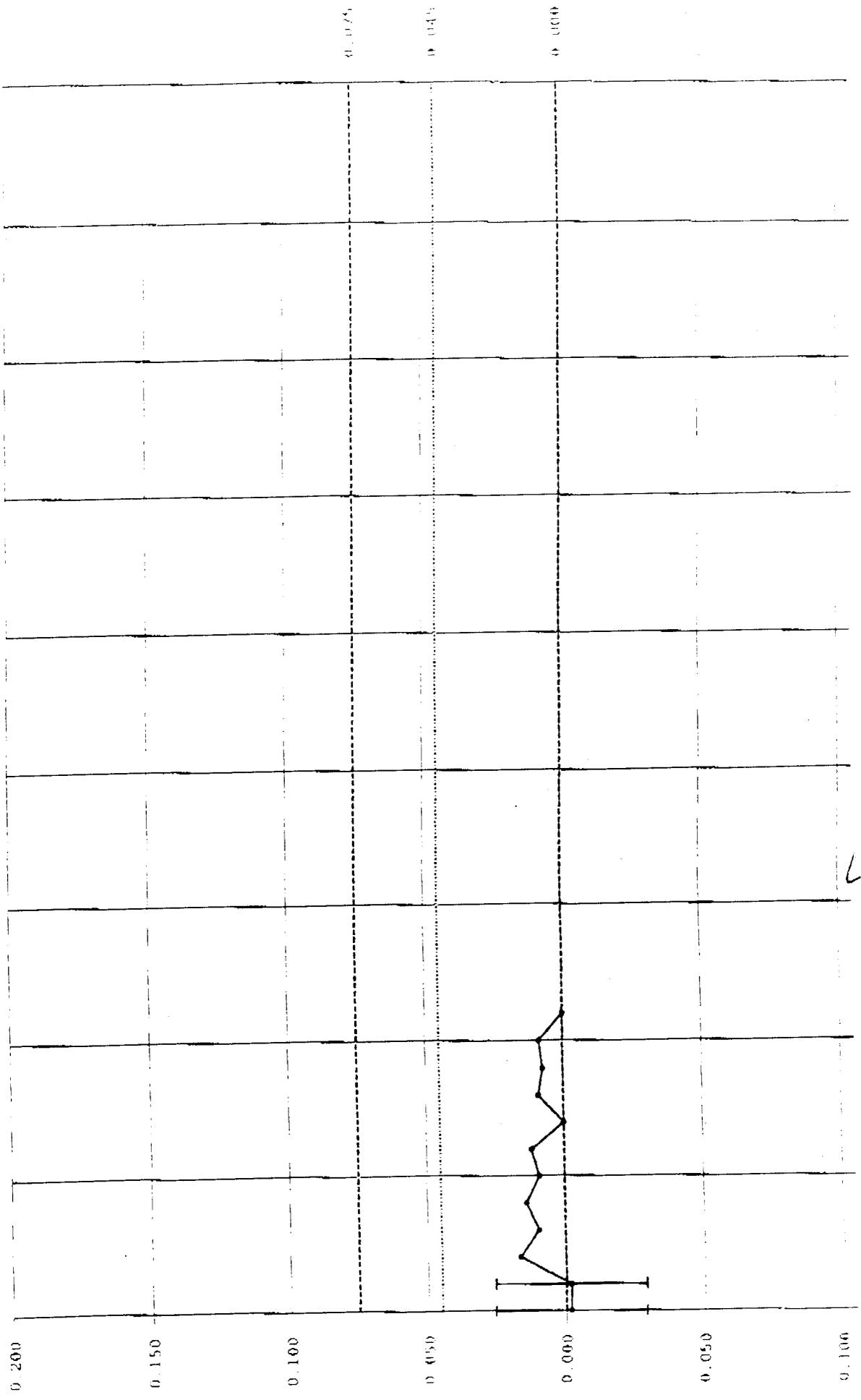
MATRIX SPIKE DUPLICATES (PCI/GDRY)

Sample ID	Nuclide	Amt Added ± 2σ	Measured ± 2σ	RPD	Z	%R	Z
97.05391R	TH227	NO SPIKE DATA					
97.05391R	TH228	NO SPIKE DATA					
97.05391R	TH230	5.96e+00 ± 1.7e-01	7.39e+00 ± 5.6e-01	1.96	0.12 OK	120.27	1.52 OK
97.05391R	TH232	NO SPIKE DATA					

Analyst: Albert Smith 11/6/97

QA Officer: Karl McLean 11/6/97

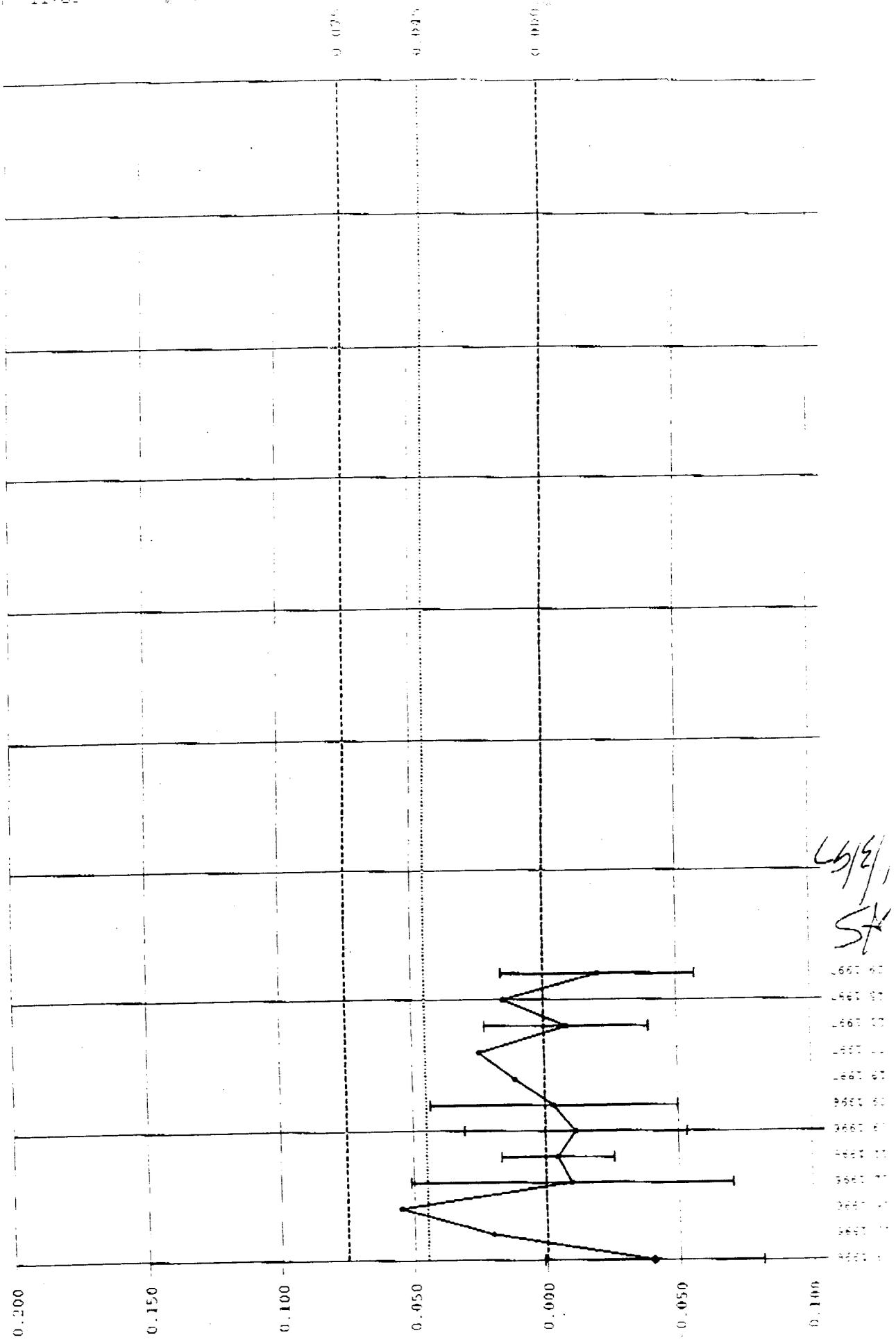
Reagent Blanks
Analyte: TH227
Procedure: TH
Analyst: Smith, Albert



LBK/11
SA

0.000
0.001
0.002
0.003
0.004
0.005
0.006
0.007
0.008
0.009
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0.095
0.096
0.097
0.098
0.099
0.100

Reagent Blanks
Analyte: TH228
Procedure: TH
Analyst: Smith, Albert



L6/21
SA

0.055	0.065
0.060	0.060
0.065	0.055
0.070	0.050
0.075	0.045
0.080	0.040
0.085	0.035
0.090	0.030
0.095	0.025
0.100	0.020
0.105	0.015
0.110	0.010
0.115	0.005
0.120	0.000

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	Reagent 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 reagent blank result is considered unacceptable if it is more than 3 standard deviations (counting uncertainty) 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 estimated total uncertainty in the difference.

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

Each measurement 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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 U ANALYSES
 SDG #9700121

ANALYSIS SUMMARY

Analysis Procedure: U
 Title: Uranium

NAREL Sample #	QC Type	Preparation Procedure	Date Completed	Prep Batch #	QC Batch #
97.05384T		N/A	10/30/1997	0000300K	0000085N
97.05385U		N/A	10/30/1997	0000300K	0000085N
97.05386V		N/A	10/30/1997	0000300K	0000085N
97.05387W		N/A	10/30/1997	0000300K	0000085N
97.05388X		N/A	10/30/1997	0000300K	0000085N
97.05389Y		N/A	10/30/1997	0000300K	0000085N
97.05390Q		N/A	10/30/1997	0000300K	0000085N
97.05390Q	DUP	N/A	10/30/1997	0000300K	0000085N
97.05391R		N/A	10/30/1997	0000300K	0000085N
97.05391R	MS	N/A	10/30/1997	0000300K	0000085N
97.05391R	MSD	N/A	10/30/1997	0000300K	0000085N
97.05392T		N/A	10/30/1997	0000300K	0000085N
97.05393U		N/A	10/30/1997	0000300K	0000085N
RBK-00362200T *	RBK	N/A	11/06/1997	0000300K	0000085N

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

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U ANALYSES
SDG #9700121**

SAMPLE ANALYSIS REPORT

Sample #:	97.05384T	QC batch #:	0000085N
Matrix:	SOIL	Prep batch #:	0000300K
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	5.000e-03 GASH	Analysis procedure:	U ANALYSES
Dry/wet weight:	77.04 %	Analyst:	AS
Ash/dry weight:	80.19 %	QC type:	ANA

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
10/29/1997 15:34	1000.0	AS02	DPG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
U234	6.43e+00	3.1e+00	2.7e+00	PCI/GDRY	10/29/1997
U235	1.54e+00	2.0e+00	3.2e+00	PCI/GDRY	10/29/1997
U238	9.32e+00	3.6e+00	2.2e+00	PCI/GDRY	10/29/1997

**U.S. ENVIRONMENTAL PROTECTION AGENCY
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U ANALYSES
SDG #9700121**

SAMPLE ANALYSIS REPORT

Sample #:	97.05385U	QC batch #:	0000085N
Matrix:	SOIL	Prep batch #:	0000300K
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	5.000e-03 GASH	Analysis procedure:	U
Dry/wet weight:	95.58 %	Analyst:	AS
Ash/dry weight:	90.00 %	QC type:	ANA

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
10/29/1997 15:35	1000.0	AS03	DPG

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2\sigma$ Uncertainty	MDC	Unit	Date
U234	2.87e+00	2.2e+00	2.4e+00	PCI/GDRY	10/29/1997
U235	1.72e+00	1.7e+00	1.3e+00	PCI/GDRY	10/29/1997
U238	6.94e+00	3.4e+00	2.8e+00	PCI/GDRY	10/29/1997

**U.S. ENVIRONMENTAL PROTECTION AGENCY
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U ANALYSES
SDG #9700121**

SAMPLE ANALYSIS REPORT

Sample #:	97.05386V	QC batch #:	0000085N
Matrix:	SOIL	Prep batch #:	0000300K
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.444e-01 GASH	Analysis procedure:	U
Dry/wet weight:	99.94 %	Analyst:	AS
Ash/dry weight:	96.40 %	QC type:	ANA

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
10/29/1997 15:35	1000.0	AS04	DPG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
U234	4.44e-01	1.3e-01	7.7e-02	PCI/GDRY	10/29/1997
U235	6.88e-02	5.5e-02	5.4e-02	PCI/GDRY	10/29/1997
U238	3.22e-01	1.1e-01	5.3e-02	PCI/GDRY	10/29/1997

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SDG #9700121**

SAMPLE ANALYSIS REPORT

Sample #:	97 05387W	QC batch #:	0000085N
Matrix:	SOIL	Prep batch #:	0000300K
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.243e-01 GASH	Analysis procedure:	U
Dry/wet weight:	99.93 %	Analyst:	AS
Ash/dry weight:	98.00 %	QC type:	ANA

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
10/29/1997 15:35	1000.0	AS05	DPG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
U234	4.37e-01	1.3e-01	4.5e-02	PCI/GDRY	10/29/1997
U235	1.03e-02	3.2e-02	7.0e-02	PCI/GDRY	10/29/1997
U238	2.87e-01	1.0e-01	5.3e-02	PCI/GDRY	10/29/1997

**U.S. ENVIRONMENTAL PROTECTION AGENCY
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SDG #9700121**

SAMPLE ANALYSIS REPORT

Sample #:	97.05388X	QC batch #:	0000085N
Matrix:	SOIL	Prep batch #:	0000300K
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	4.988e-01 GASH	Analysis procedure:	U
Dry/wet weight:	99.95 %	Analyst:	AS
Ash/dry weight:	97.59 %	QC type:	ANA

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
10/29/1997 15:35	1000.0	AS06	DPG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
U234	3.32e-01	7.6e-02	2.4e-02	PCI/GDRY	10/29/1997
U235	4.24e-02	3.0e-02	3.2e-02	PCI/GDRY	10/29/1997
U238	2.28e-01	6.2e-02	2.7e-02	PCI/GDRY	10/29/1997

**U.S. ENVIRONMENTAL PROTECTION AGENCY
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U ANALYSES
SDG #9700121**

SAMPLE ANALYSIS REPORT

Sample #:	97.05389Y	QC batch #:	0000085N
Matrix:	SOIL	Prep batch #:	0000300K
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.556e-01 GASH	Analysis procedure:	U
Dry/wet weight:	99.92 %	Analyst:	AS
Ash/dry weight:	95.00 %	QC type:	ANA

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
10/29/1997 15:35	1000.0	AS07	DPG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
U234	4.75e-01	1.4e-01	1.0e-01	PCI/GDRY	10/29/1997
U235	4.62e-02	4.7e-02	6.0e-02	PCI/GDRY	10/29/1997
U238	4.30e-01	1.3e-01	4.5e-02	PCI/GDRY	10/29/1997

**U.S. ENVIRONMENTAL PROTECTION AGENCY
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SDG #9700121**

SAMPLE ANALYSIS REPORT

Sample #:	97.05390Q	QC batch #:	0000085N
Matrix:	SOIL	Prep batch #:	0000300K
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.492e-01 GASH	Analysis procedure:	U
Dry/wet weight:	99.94 %	Analyst:	AS
Ash/dry weight:	97.60 %	QC type:	ANA

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
10/29/1997 15:35	1000.0	AS08	DPG

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2\sigma$ Uncertainty	MDC	Unit	Date
U234	3.89e-01	1.1e-01	5.3e-02	PCI/GDRY	10/29/1997
U235	7.18e-02	4.8e-02	2.4e-02	PCI/GDRY	10/29/1997
U238	3.11e-01	9.5e-02	4.9e-02	PCI/GDRY	10/29/1997

**U.S. ENVIRONMENTAL PROTECTION AGENCY
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SDG #9700121**

SAMPLE ANALYSIS REPORT

Sample #:	97.05390Q	QC batch #:	0000085N
Matrix:	SOIL	Prep batch #:	0000300K
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.510e-01 GASH	Analysis procedure:	U
Dry/wet weight:	99.94 %	Analyst:	AS
Ash/dry weight:	97.60 %	QC type:	DUP

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
10/29/1997 15:35	1000.0	AS09	DPG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
U234	6.07e-01	1.6e-01	9.4e-02	PCI/GDRY	10/29/1997
U235	1.29e-01	7.8e-02	3.5e-02	PCI/GDRY	10/29/1997
U238	4.41e-01	1.4e-01	2.9e-02	PCI/GDRY	10/29/1997

**U.S. ENVIRONMENTAL PROTECTION AGENCY
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U ANALYSES
SDG #9700121**

SAMPLE ANALYSIS REPORT

Sample #:	97.05391R	QC batch #:	0000085N
Matrix:	SOIL	Prep batch #:	0000300K
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.566e-01 GASH	Analysis procedure:	U
Dry/wet weight:	83.95 %	Analyst:	AS
Ash/dry weight:	98.80 %	QC type:	ANA

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
10/29/1997 15:35	1000.0	AS10	DPG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
U234	3.13e-01	9.8e-02	3.8e-02	PCI/GDRY	10/29/1997
U235	3.80e-02	4.0e-02	5.4e-02	PCI/GDRY	10/29/1997
U238	2.61e-01	9.0e-02	3.8e-02	PCI/GDRY	10/29/1997

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 SDG #9700121

SAMPLE ANALYSIS REPORT

Sample #:	97.05391R	QC batch #:	0000085N
Matrix:	SOIL	Prep batch #:	0000300K
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.513e-01 GASH	Analysis procedure:	U
Dry/wet weight:	83.95 %	Analyst:	AS
Ash/dry weight:	98.80 %	QC type:	MS

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
10/29/1997 15:35	1000.0	AS17	DPG

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2\sigma$ Uncertainty	MDC	Unit	Date
U234	3.78e+01	2.7e+00	9.4e-02	PCI/GDRY	10/29/1997
U235	2.41e+00	3.5e-01	8.4e-02	PCI/GDRY	10/29/1997
U238	3.85e+01	2.8e+00	7.8e-02	PCI/GDRY	10/29/1997



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U ANALYSES
SDG #9700121**

SAMPLE ANALYSIS REPORT

Sample #:	97.05391R	QC batch #:	0000085N
Matrix:	SOIL	Prep batch #:	0000300K
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.522e-01 GASH	Analysis procedure:	U
Dry/wet weight:	83.95 %	Analyst:	AS
Ash/dry weight:	98.80 %	QC type:	MSD

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
10/29/1997 15:35	1000.0	AS19	DPG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
U234	3.73e+01	2.6e+00	5.4e-02	PCI/GDRY	10/29/1997
U235	3.01e+00	3.8e-01	4.5e-02	PCI/GDRY	10/29/1997
U238	3.83e+01	2.7e+00	4.4e-02	PCI/GDRY	10/29/1997

**U.S. ENVIRONMENTAL PROTECTION AGENCY
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 U ANALYSES
 SDG #9700121**

SAMPLE ANALYSIS REPORT

QC Sample #:	RBK-00362200T	QC batch #:	0000085N
		Prep batch #:	0000300K
		Prep procedure:	N/A
		Analysis procedure:	U
		Analyst:	AS
		QC type:	RBK

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
11/05/1997 14:26	1000.0	AS39	JAM

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2\sigma$ Uncertainty	MDC	Unit	Date
U234	5.47e-02	2.8e-02	1.0e-02	PCI	11/05/1997
U235	8.19e-03	1.2e-02	1.2e-02	PCI	11/05/1997
U238	3.31e-02	2.2e-02	1.8e-02	PCI	11/05/1997

U.S. ENVIRONMENTAL PROTECTION AGENCY
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 SDG #9700121

QC BATCH SUMMARY

QC batch #: 0000085N
 Preparation procedure: N/A
 Analysis procedure: U

NAREL Sample #	QC Type	Yield (%)	$\pm 2\sigma$ Uncertainty (%)	Analyst
97.05384T		101.10 %	6.62 %	AS
97.05385U		98.24 %	6.41 %	AS
97.05386V		99.52 %	6.70 %	AS
97.05387W		97.73 %	6.34 %	AS
97.05388X		100.58 %	6.57 %	AS
97.05389Y		91.74 %	6.33 %	AS
97.05390Q		95.80 %	5.92 %	AS
97.05390Q	DUP	98.30 %	6.98 %	AS
97.05391R		102.57 %	6.58 %	AS
97.05391R	MS	96.64 %	6.41 %	AS
97.05391R	MSD	104.14 %	6.63 %	AS
97.05392T		96.13 %	6.17 %	AS
97.05393U		69.61 %	5.15 %	AS
RBK-00362200T *	RBK	41.83 %	3.34 %	AS

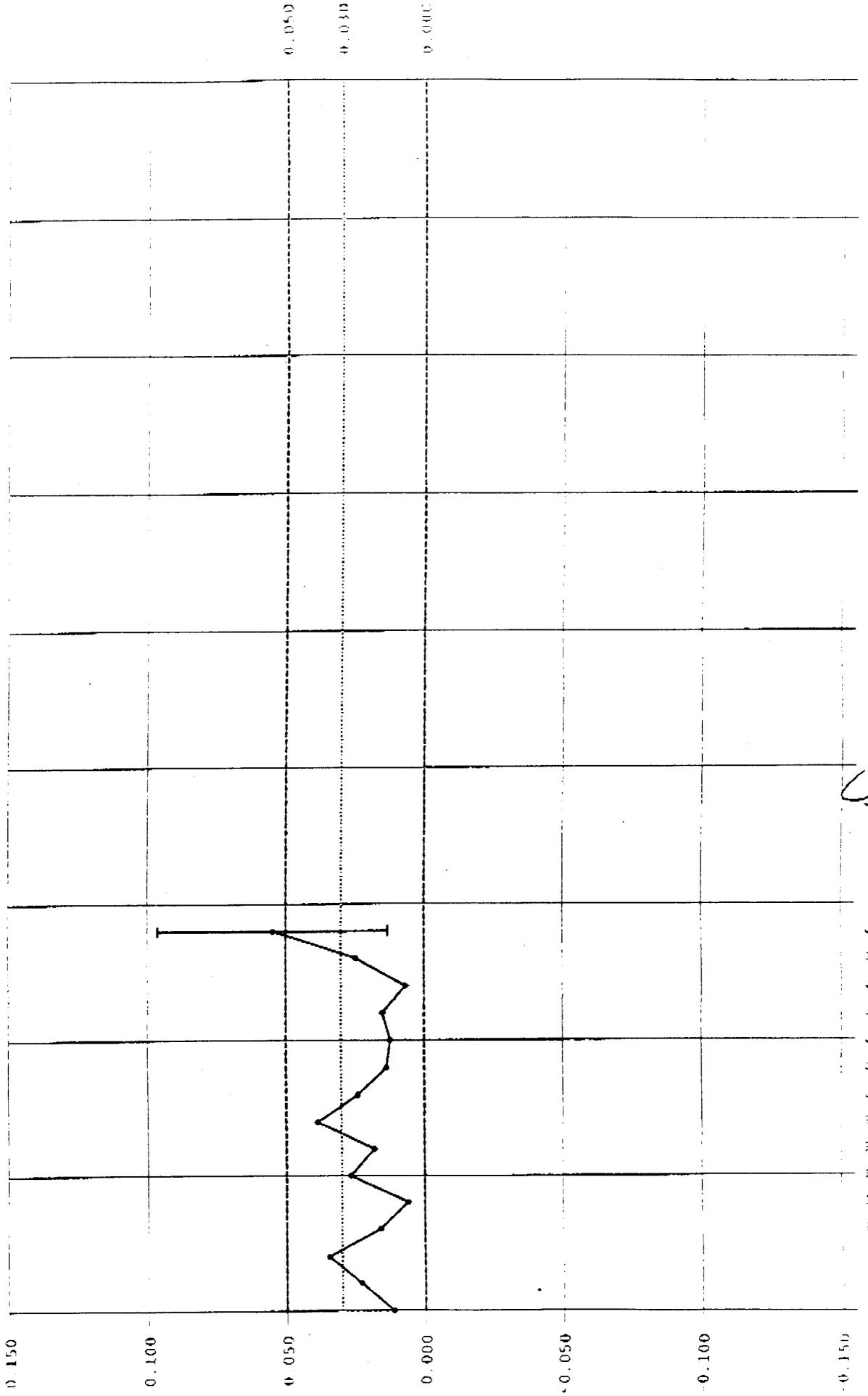
* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

Reagent Blanks

Analyte: U234

Procedure: U

Analyst: Smith, Albert



Lbpl
S1

0.000
0.005
0.010
0.015
0.020
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0.070
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0.145
0.150

