Recd 2/27/99

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 20, 1998

MEMORANDUM

Attn: S. Hafflam

SUBJECT: Radiochemical Results for
Bell Canyon Samples

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

TO: Tom Kelly, Environmental Engineer
Region 9

Attached is a data package for gamma analysis of sediment samples collected from Bell Canyon in Ventura County. The samples constitute NAREL batch number 9800074. The results of further analyses will be sent as they are completed.

Radiochemical analyses usually require the subtraction of an instrument background measurement from 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 narrative of the data package. If you have any questions concerning the analytical results, please contact me at (334)270-3450.

Attachments

cc: Mike Bandrowski, Region 9, w/o attachments
Mary Clark, (6601J), w/o attachments
Ed Sensintaffar, NAREL

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

REPORT OF SAMPLE DELIVERY GROUP #9800074

Project: BELL CANYON
Analysis Procedure: Gamma spectroscopy
Date Reported: 11/17/1998

SAMPLES

NAREL Sample #	Client Sample ID	Type	Matrix	Date Collected	Date Received
98.05801V	RH012	SAM	SEDIMENT	06/11/1998	10/19/1998
98.05802W	RH015	SAM	SEDIMENT	06/11/1998	10/19/1998
98.05803X	RH021	SAM	SEDIMENT	06/12/1998	10/19/1998
98.05804Y	RH025	SAM	SEDIMENT	06/12/1998	10/19/1998
98.05805Z	RH041	SAM	SEDIMENT	06/16/1998	10/19/1998
98.05806A	RH046	SAM	SEDIMENT	06/16/1998	10/19/1998
98.05807B	RH047	SAM	SEDIMENT	06/16/1998	10/19/1998
98.05916F	RH003	SAM	SEDIMENT	06/10/1998	10/28/1998
98.05917G	RH004	SAM	SEDIMENT	06/10/1998	10/28/1998
98.05918H	RH005	SAM	SEDIMENT	06/10/1998	10/28/1998

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. 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.

James B. Moore 11/20/98

James B. Moore — Date
Quality Assurance Coordinator

John Griggs 11/18/98

John Griggs, Ph.D. — Date
Chief, Monitoring and Analytical Services Branch

GENERAL INFORMATION

SAMPLE TYPES

BLD	Blind sample
DBD	Double 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 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.

GENERAL INFORMATION (CONTINUED)

GAMMA ANALYSIS

The reporting format lists the gamma emitters in alphabetical order. The activity and 2-sigma uncertainty for radionuclides measured by gamma spectroscopy are reported only if the nuclide is detected. 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.

Due to potential spectral interferences and other possible problems associated with the determination of the activity of certain radionuclides, the activities for Th-234, Pa-234m, Ra-226, and U-235 are subject to greater possible error than other commonly reported radionuclides. It should be noted that this potential error is not included in the two-sigma counting error which is reported with each activity. Although in this report we do provide the calculated activities for these radionuclides, we recommend that the results be used only as a qualitative means of indicating the presence of these radionuclides and not as a quantitative measure of their concentration. The results for these nuclides are not used in the evaluation of quality control samples. Furthermore, because of mutual interference between Ra-226 and U-235, NAREL's gamma analysis software tends to overestimate the amounts of these nuclides whenever both are present in a sample. Lower estimates for Ra-226 activities can be obtained from the reported activities of its decay products, Pb-214 and Bi-214, which are likely to be somewhat less than the Ra-226 activity because of the potential escape of radon gas.

NAREL's gamma spectroscopy software corrects activities and MDCs for decay between collection and analysis, but only up to a limit of ten half-lives. So, if the decay time for a sample is more than ten half-lives of a radionuclide, that nuclide will almost always be undetected and the reported MDC will be meaningless. This is usually a problem only for short-lived radionuclides, such as I-131 and Ba-140, when there is a long delay between collection and analysis.

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #9800074

ANALYSIS SUMMARY

Analysis Procedure: GAMMA
Title: Gamma spectroscopy

NAREL Sample #	QC Type	Preparation Procedure	Date Completed	Prep Batch #	QC Batch #
98.05801V		N/A	11/12/1998	0001115Q	0000668G
98.05802W		N/A	11/04/1998	0000342W	0000668G
98.05803X		N/A	11/05/1998	0000342W	0000668G
98.05804Y		N/A	11/05/1998	0000342W	0000668G
98.05805Z		N/A	11/05/1998	0000342W	0000668G
98.05806A		N/A	11/05/1998	0000362A	0000668G
98.05807B		N/A	11/05/1998	0000362A	0000668G
98.05807B	DUP	N/A	11/06/1998	0000362A	0000668G
98.05916F		N/A	11/06/1998	0000362A	0000668G
98.05917G		N/A	11/06/1998	0000362A	0000668G
98.05918H		N/A	11/06/1998	0000362A	0000668G

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

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NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #9800074

SAMPLE ANALYSIS REPORT

Sample #:	98.05801V	QC batch #:	0000668G
Matrix:	SEDIMENT	Prep batch #:	0001115Q
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	6.130e+02 GDRY	Analysis procedure:	GAMMA
Dry/wet weight:	78.66 %	Analyst:	N/A
Ash/dry weight:	99.00 %	QC type:	ANA

Comment: BELL CANYON

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
11/12/1998 16:23	300.0	GE14	DJK

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		9.2e+01	PCI/GDRY	06/11/1998
Bi212		7.72e-01	1.7e-01		PCI/GDRY	06/11/1998
Bi214		6.27e-01	2.8e-02		PCI/GDRY	06/11/1998
Co60		ND		2.8e-02	PCI/GDRY	06/11/1998
Cs137		ND		2.8e-02	PCI/GDRY	06/11/1998
I131		ND		2.7e+01	PCI/GDRY	06/11/1998
K40		2.77e+01	3.9e-01		PCI/GDRY	06/11/1998
Pb212		8.11e-01	4.2e-02		PCI/GDRY	06/11/1998
Pb214		6.84e-01	3.2e-02		PCI/GDRY	06/11/1998
Ra224		9.50e-01	4.9e-01		PCI/GDRY	06/11/1998
Ra226	*	1.26e+00	3.4e-01		PCI/GDRY	06/11/1998
Ra228		8.37e-01	4.1e-02		PCI/GDRY	06/11/1998
Tl208		2.81e-01	1.8e-02		PCI/GDRY	06/11/1998

* An asterisk indicates a result whose value may be significantly over or underestimated.

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GAMMA ANALYSES
SDG #9800074

SAMPLE ANALYSIS REPORT

Sample #:	98.05802W	QC batch #:	0000668G
Matrix:	SEDIMENT	Prep batch #:	0000342W
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	5.610e+02 GDRY	Analysis procedure:	GAMMA
Dry/wet weight:	81.78 %	Analyst:	N/A
Ash/dry weight:	94.80 %	QC type:	ANA

Comment: BELL CANYON

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
11/04/1998 14:41	300.0	GE14	KNG

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		1.1e+02	PCI/GDRY	06/11/1998
Bi212		1.32e+00	1.9e-01		PCI/GDRY	06/11/1998
Bi214		1.57e+00	3.9e-02		PCI/GDRY	06/11/1998
Co60		ND		3.4e-02	PCI/GDRY	06/11/1998
Cs137		ND		3.9e-02	PCI/GDRY	06/11/1998
I131		ND		3.3e+01	PCI/GDRY	06/11/1998
K40		2.43e+01	3.9e-01		PCI/GDRY	06/11/1998
Pb212		1.40e+00	5.1e-02		PCI/GDRY	06/11/1998
Pb214		1.76e+00	4.4e-02		PCI/GDRY	06/11/1998
Ra224		9.89e-01	5.2e-01		PCI/GDRY	06/11/1998
Ra226	*	3.28e+00	4.6e-01		PCI/GDRY	06/11/1998
Ra228		1.37e+00	5.1e-02		PCI/GDRY	06/11/1998
Tl208		4.99e-01	2.2e-02		PCI/GDRY	06/11/1998

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U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #9800074

SAMPLE ANALYSIS REPORT

Sample #:	98.05803X	QC batch #:	0000668G
Matrix:	SEDIMENT	Prep batch #:	0000342W
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	6.530e+02 GDRY	Analysis procedure:	GAMMA
Dry/wet weight:	81.31 %	Analyst:	N/A
Ash/dry weight:	99.20 %	QC type:	ANA

Comment: BELL CANYON-BUFFER ZONE DRAINAGE

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
11/04/1998 19:44	300.0	GE14	KNG

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		8.7e+01	PCI/GDRY	06/12/1998
Bi212		7.23e-01	1.4e-01		PCI/GDRY	06/12/1998
Bi214		5.38e-01	2.5e-02		PCI/GDRY	06/12/1998
Co60		ND		2.7e-02	PCI/GDRY	06/12/1998
Cs137		ND		3.0e-02	PCI/GDRY	06/12/1998
I131		ND		2.6e+01	PCI/GDRY	06/12/1998
K40		2.80e+01	3.8e-01		PCI/GDRY	06/12/1998
Pb212		7.54e-01	3.6e-02		PCI/GDRY	06/12/1998
Pb214		5.80e-01	2.8e-02		PCI/GDRY	06/12/1998
Ra224		5.72e-01	3.7e-01		PCI/GDRY	06/12/1998
Ra226	*	1.11e+00	3.2e-01		PCI/GDRY	06/12/1998
Ra228		7.70e-01	3.8e-02		PCI/GDRY	06/12/1998
Tl208		2.56e-01	1.6e-02		PCI/GDRY	06/12/1998

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GAMMA ANALYSES
SDG #9800074

SAMPLE ANALYSIS REPORT

Sample #:	98.05804Y	QC batch #:	0000668G
Matrix:	SEDIMENT	Prep batch #:	0000342W
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	5.720e+02 GDRY	Analysis procedure:	GAMMA
Dry/wet weight:	87.79 %	Analyst:	N/A
Ash/dry weight:	99.20 %	QC type:	ANA

Comment: BELL CANYON-PARK CREEK

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
11/05/1998 00:47	300.0	GE14	KNG

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		1.0e+02	PCI/GDRY	06/12/1998
Bi212		6.91e-01	1.5e-01		PCI/GDRY	06/12/1998
Bi214		5.65e-01	2.8e-02		PCI/GDRY	06/12/1998
Co60		ND		3.2e-02	PCI/GDRY	06/12/1998
Cs137		ND		3.1e-02	PCI/GDRY	06/12/1998
I131		ND		2.8e+01	PCI/GDRY	06/12/1998
K40		2.99e+01	4.2e-01		PCI/GDRY	06/12/1998
Pb212		6.84e-01	3.7e-02		PCI/GDRY	06/12/1998
Pb214		6.43e-01	3.0e-02		PCI/GDRY	06/12/1998
Ra224		8.65e-01	4.4e-01		PCI/GDRY	06/12/1998
Ra226	*	1.31e+00	3.9e-01		PCI/GDRY	06/12/1998
Ra228		6.54e-01	4.1e-02		PCI/GDRY	06/12/1998
Tl208		2.45e-01	1.8e-02		PCI/GDRY	06/12/1998

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GAMMA ANALYSES
SDG #9800074

SAMPLE ANALYSIS REPORT

Sample #:	98.05805Z	QC batch #:	0000668G
Matrix:	SEDIMENT	Prep batch #:	0000342W
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	4.660e+02 GDRY	Analysis procedure:	GAMMA
Dry/wet weight:	93.73 %	Analyst:	N/A
Ash/dry weight:	94.60 %	QC type:	ANA

Comment: BELL CANYON-BACKGROUND

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
11/05/1998 05:49	300.0	GE14	KNG

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		1.1e+02	PCI/GDRY	06/16/1998
Bi212		1.34e+00	1.8e-01		PCI/GDRY	06/16/1998
Bi214		1.03e+00	3.4e-02		PCI/GDRY	06/16/1998
Co60		ND		3.1e-02	PCI/GDRY	06/16/1998
Cs137		9.00e-02	1.5e-02		PCI/GDRY	06/16/1998
I131		ND		3.2e+01	PCI/GDRY	06/16/1998
K40		2.59e+01	4.2e-01		PCI/GDRY	06/16/1998
Pb212		1.37e+00	4.5e-02		PCI/GDRY	06/16/1998
Pb214		1.09e+00	3.8e-02		PCI/GDRY	06/16/1998
Ra224		1.09e+00	4.7e-01		PCI/GDRY	06/16/1998
Ra226	*	2.30e+00	3.7e-01		PCI/GDRY	06/16/1998
Ra228		1.40e+00	5.0e-02		PCI/GDRY	06/16/1998
Th234	*	1.16e+00	2.9e-01		PCI/GDRY	06/16/1998
Tl208		4.74e-01	2.3e-02		PCI/GDRY	06/16/1998

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NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #9800074

SAMPLE ANALYSIS REPORT

Sample #:	98.05806A	QC batch #:	0000668G
Matrix:	SEDIMENT	Prep batch #:	0000362A
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	5.020e+02 GDRY	Analysis procedure:	GAMMA
Dry/wet weight:	84.31 %	Analyst:	N/A
Ash/dry weight:	93.00 %	QC type:	ANA

Comment: BELL CANYON-SILTSTONE CHATSWORTH FM.

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
11/05/1998 12:13	300.0	GE14	KNG

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		1.3e+02	PCI/GDRY	06/16/1998
Bi212		1.64e+00	2.2e-01		PCI/GDRY	06/16/1998
Bi214		1.42e+00	4.0e-02		PCI/GDRY	06/16/1998
Co60		ND		3.2e-02	PCI/GDRY	06/16/1998
Cs137		1.22e-01	1.8e-02		PCI/GDRY	06/16/1998
I131		ND		3.6e+01	PCI/GDRY	06/16/1998
K40		2.28e+01	4.0e-01		PCI/GDRY	06/16/1998
Pb212		1.83e+00	5.6e-02		PCI/GDRY	06/16/1998
Pb214		1.54e+00	4.5e-02		PCI/GDRY	06/16/1998
Ra224		1.64e+00	5.4e-01		PCI/GDRY	06/16/1998
Ra226	*	3.41e+00	4.7e-01		PCI/GDRY	06/16/1998
Ra228		1.80e+00	5.8e-02		PCI/GDRY	06/16/1998
Tl208		6.21e-01	2.6e-02		PCI/GDRY	06/16/1998

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NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #9800074

SAMPLE ANALYSIS REPORT

Sample #:	98.05807B	QC batch #:	0000668G
Matrix:	SEDIMENT	Prep batch #:	0000362A
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	4.650e+02 GDRY	Analysis procedure:	GAMMA
Dry/wet weight:	90.19 %	Analyst:	N/A
Ash/dry weight:	92.60 %	QC type:	ANA

Comment: BELL CANYON-BUFFER ZONE DRAINAGE

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
11/05/1998 17:16	300.0	GE14	KNG

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		1.1e+02	PCI/GDRY	06/16/1998
Bi212		1.42e+00	1.9e-01		PCI/GDRY	06/16/1998
Bi214		9.88e-01	3.4e-02		PCI/GDRY	06/16/1998
Co60		ND		3.3e-02	PCI/GDRY	06/16/1998
Cs137		5.12e-02	1.4e-02		PCI/GDRY	06/16/1998
I131		ND		3.2e+01	PCI/GDRY	06/16/1998
K40		2.42e+01	4.1e-01		PCI/GDRY	06/16/1998
Pb212		1.37e+00	4.5e-02		PCI/GDRY	06/16/1998
Pb214		1.03e+00	3.6e-02		PCI/GDRY	06/16/1998
Ra224		1.08e+00	4.7e-01		PCI/GDRY	06/16/1998
Ra226	*	2.29e+00	3.9e-01		PCI/GDRY	06/16/1998
Ra228		1.33e+00	5.0e-02		PCI/GDRY	06/16/1998
Th234	*	7.10e-01	2.6e-01		PCI/GDRY	06/16/1998
Tl208		4.84e-01	2.2e-02		PCI/GDRY	06/16/1998

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U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #9800074

SAMPLE ANALYSIS REPORT

Sample #:	98.05807B	QC batch #:	0000668G
Matrix:	SEDIMENT	Prep batch #:	0000362A
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	4.650e+02 GDRY	Analysis procedure:	GAMMA
Dry/wet weight:	90.19 %	Analyst:	N/A
Ash/dry weight:	92.60 %	QC type:	DUP

Comment: BELL CANYON-BUFFER ZONE DRAINAGE

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
11/06/1998 13:28	300.0	GE14	KNG

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		1.1e+02	PCI/GDRY	06/16/1998
Bi212		1.34e+00	1.9e-01		PCI/GDRY	06/16/1998
Bi214		9.69e-01	3.6e-02		PCI/GDRY	06/16/1998
Co60		ND		3.4e-02	PCI/GDRY	06/16/1998
Cs137		4.96e-02	1.4e-02		PCI/GDRY	06/16/1998
I131		ND		3.1e+01	PCI/GDRY	06/16/1998
K40		2.40e+01	4.0e-01		PCI/GDRY	06/16/1998
Pb212		1.37e+00	4.6e-02		PCI/GDRY	06/16/1998
Pb214		1.08e+00	3.8e-02		PCI/GDRY	06/16/1998
Ra224		8.38e-01	4.1e-01		PCI/GDRY	06/16/1998
Ra226	*	2.30e+00	3.9e-01		PCI/GDRY	06/16/1998
Ra228		1.41e+00	5.0e-02		PCI/GDRY	06/16/1998
Th234	*	8.57e-01	3.0e-01		PCI/GDRY	06/16/1998
Tl208		4.79e-01	2.2e-02		PCI/GDRY	06/16/1998

* An asterisk indicates a result whose value may be significantly over or underestimated.

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #9800074

SAMPLE ANALYSIS REPORT

Sample #:	98.05916F	QC batch #:	0000668G
Matrix:	SEDIMENT	Prep batch #:	0000362A
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	5.200e+02 GDRY	Analysis procedure:	GAMMA
Dry/wet weight:	96.53 %	Analyst:	N/A
Ash/dry weight:	96.40 %	QC type:	ANA

Comment: BELL CANYON

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
11/05/1998 22:20	300.0	GE14	KNG

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		1.2e+02	PCI/GDRY	06/10/1998
Bi212		1.59e+00	2.0e-01		PCI/GDRY	06/10/1998
Bi214		1.38e+00	3.8e-02		PCI/GDRY	06/10/1998
Co60		ND		3.6e-02	PCI/GDRY	06/10/1998
Cs137		3.56e-02	2.3e-02		PCI/GDRY	06/10/1998
I131		ND		3.6e+01	PCI/GDRY	06/10/1998
K40		2.74e+01	4.3e-01		PCI/GDRY	06/10/1998
Pb212		1.60e+00	5.3e-02		PCI/GDRY	06/10/1998
Pb214		1.51e+00	4.3e-02		PCI/GDRY	06/10/1998
Ra224		1.89e+00	6.2e-01		PCI/GDRY	06/10/1998
Ra226	*	3.61e+00	5.1e-01		PCI/GDRY	06/10/1998
Ra228		1.62e+00	5.5e-02		PCI/GDRY	06/10/1998
Tl208		5.58e-01	2.5e-02		PCI/GDRY	06/10/1998

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U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #9800074

SAMPLE ANALYSIS REPORT

Sample #:	98.05917G	QC batch #:	0000668G
Matrix:	SEDIMENT	Prep batch #:	0000362A
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.540e+02 GDRY	Analysis procedure:	GAMMA
Dry/wet weight:	82.86 %	Analyst:	N/A
Ash/dry weight:	99.00 %	QC type:	ANA

Comment: BELL CANYON

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
11/06/1998 03:23	300.0	GE14	KNG

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		1.4e+02	PCI/GDRY	06/10/1998
Bi212		8.44e-01	2.4e-01		PCI/GDRY	06/10/1998
Bi214		5.61e-01	4.3e-02		PCI/GDRY	06/10/1998
Co60		ND		5.0e-02	PCI/GDRY	06/10/1998
Cs137		ND		4.7e-02	PCI/GDRY	06/10/1998
I131		ND		3.9e+01	PCI/GDRY	06/10/1998
K40		2.84e+01	6.1e-01		PCI/GDRY	06/10/1998
Pb212		6.70e-01	4.9e-02		PCI/GDRY	06/10/1998
Pb214		6.47e-01	4.4e-02		PCI/GDRY	06/10/1998
Ra226	*	1.41e+00	4.8e-01		PCI/GDRY	06/10/1998
Ra228		6.08e-01	6.2e-02		PCI/GDRY	06/10/1998
Tl208		2.29e-01	2.7e-02		PCI/GDRY	06/10/1998

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U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #9800074

SAMPLE ANALYSIS REPORT

Sample #:	98.05918H	QC batch #:	0000668G
Matrix:	SEDIMENT	Prep batch #:	0000362A
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.560e+02 GDRY	Analysis procedure:	GAMMA
Dry/wet weight:	83.38 %	Analyst:	N/A
Ash/dry weight:	97.40 %	QC type:	ANA

Comment: BELL CANYON

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
11/06/1998 08:26	300.0	GE14	KNG

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		1.5e+02	PCI/GDRY	06/10/1998
Bi212		9.79e-01	2.6e-01		PCI/GDRY	06/10/1998
Bi214		8.23e-01	4.7e-02		PCI/GDRY	06/10/1998
Co60		ND		5.1e-02	PCI/GDRY	06/10/1998
Cs137		3.01e-02	1.7e-02		PCI/GDRY	06/10/1998
I131		ND		4.2e+01	PCI/GDRY	06/10/1998
K40		2.77e+01	6.1e-01		PCI/GDRY	06/10/1998
Pb212		1.03e+00	5.5e-02		PCI/GDRY	06/10/1998
Pb214		9.04e-01	4.8e-02		PCI/GDRY	06/10/1998
Ra224		9.03e-01	6.4e-01		PCI/GDRY	06/10/1998
Ra226	*	2.20e+00	5.1e-01		PCI/GDRY	06/10/1998
Ra228		1.12e+00	6.9e-02		PCI/GDRY	06/10/1998
Tl208		3.62e-01	2.9e-02		PCI/GDRY	06/10/1998

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U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #9800074

QC BATCH SUMMARY

QC batch #: 0000668G
Preparation procedure: N/A
Analysis procedure: GAMMA

NAREL Sample #	QC Type	Yield (%)	± 2σ Uncertainty (%)	Analyst
98.05801V		N/A		N/A
98.05802W		N/A		N/A
98.05803X		N/A		N/A
98.05804Y		N/A		N/A
98.05805Z		N/A		N/A
98.05806A		N/A		N/A
98.05807B		N/A		N/A
98.05807B	DUP	N/A		N/A
98.05916F		N/A		N/A
98.05917G		N/A		N/A
98.05918H		N/A		N/A

* 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 #: 0000668G Analytical Procedure: GAMMA

LABORATORY DUPLICATES (PCI/GDRY)

Sample ID	Nuclide	Original ± 2σ	Duplicate ± 2σ	RPD	Z
98.05807B	BA140				
98.05807B	BI212	1.42e+00 ± 1.9e-01	1.34e+00 ± 1.9e-01	5.80	-0.48 OK
98.05807B	BI214	9.88e-01 ± 3.4e-02	9.69e-01 ± 3.6e-02	1.94	-0.26 OK
98.05807B	CO60				
98.05807B	CS137	5.12e-02 ± 1.4e-02	4.96e-02 ± 1.4e-02	3.17	-0.15 OK
98.05807B	I131				
98.05807B	K40	2.42e+01 ± 4.1e-01	2.40e+01 ± 4.0e-01	0.83	-0.12 OK
98.05807B	PB212	1.37e+00 ± 4.5e-02	1.37e+00 ± 4.6e-02	0.00	0.00 OK
98.05807B	PB214	1.03e+00 ± 3.6e-02	1.08e+00 ± 3.8e-02	4.74	0.63 OK
98.05807B	RA224	1.08e+00 ± 4.7e-01	8.38e-01 ± 4.1e-01	25.23	-0.76 OK
98.05807B	RA228	1.33e+00 ± 5.0e-02	1.41e+00 ± 5.0e-02	5.84	0.78 OK
98.05807B	TL208	4.84e-01 ± 2.2e-02	4.79e-01 ± 2.2e-02	1.04	-0.13 OK

Analyst: _____ _____

QA Officer: Kirk McClure 11/18/98