Paragon Analytics, Inc.

Radiochemistry Case Narrative

^{226}Radium by EPA Method 903.1(m)

New Horizons

CSMRI / 2112

PAI WO 0212096

1. This report consists of three filter samples received by Paragon on 12/19/02.

2. These samples were digested according to SOP 773R7 and then aliquoted according to QASS 253318. The aliquot size for each sample was calculated to be 0.25 filters, which is equivalent to the 250mL aliquot taken from the digestate. The samples were then prepared and analyzed according to Paragon Analytics, Inc. procedures PAI SOP783R3. The analyses were completed on 1/8/03.

3. The analysis results for these samples are reported on an 'as received' basis in units of pCi/filter.

4. To minimize the potential for low bias, samples with observed chemical yields between 100% and 110% have been calculated conservatively assuming quantitative chemical yield (100%). The magnitude of the low bias is estimated to be less than 10% of the reported value. These samples are identified with an "Y1" flag on the Data Reduction Raw Data Report, which can be found in Section 4, "Raw Data" of this report.

5. Due to insufficient sample volume a sample duplicate could not be prepared. A duplicate of the LCS was prepared instead. Please refer to QASS 241341.

6. No further anomalous situations were noted during the preparation and analysis of these samples. All remaining quality control criteria were met.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, Paragon Analytics, Inc. certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Radiochemistry Instrument Technician — Date: 1-15-03

Radiochemistry Final Data Review — Date: 1/15/03

Ra-226 by Radon Emanation - Method 903.1

Method PAI SOP 783R1

Method Blank Results

Client Name: New Horizons
Client Project Name: CSMRI
Client Project Number: 2112

Reported on: Wednesday, January 15, 2003 10:15:00
Laboratory Name: Paragon Analytics, Inc.
PAI Work Order: 0212096

Field ID:
Lab ID: RE00103BLK1

Sample Matrix: Filter
Date Prepared: 23-Dec-02
Prep SOP: PAI 783R3
Prep Batch: RE00103

Date Collected: 23-Dec-02
Date Analyzed: 08-Jan-03
Analytical SOP: PAI 783R3

Final Aliquot: 0.2500
Aliquot Units: filter
Report Basis: As Received
Count Time (min.): 60

Target Nuclide	Result +/- 2s TPU	MDC	Reporting Units	Lab Qualifier
Ra-226	-0.02 +/- 0.27	0.50	pCi/filt	U

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.
LT - Result is less than Requested MDC, greater than sample specific MDC.
Y1 - Chemical Yield in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
B3 - Analyte concentration greater than MDC but less than Requested MDC.
B - Analyte concentration greater than MDC.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
MDC - Minimum Detectable Concentration (see PAI SOP 709)

Data Package ID: *RE2260212096-1*

Ra-226 by Radon Emanation - Method 903.1

Method PAI SOP 783R1

Method Blank Results

Client Name: New Horizons
Client Project Name: CSMRI
Client Project Number: 2112

Reported on: Wednesday, January 15, 2003 10:15:00
Laboratory Name: Paragon Analytics, Inc.
PAI Work Order: 0212096

Field ID:
Lab ID: RE00103BLK2

Sample Matrix: Filter
Date Prepared: 23-Dec-02
Prep SOP: PAI 783R3
Prep Batch: RE00103

Date Collected: 23-Dec-02
Date Analyzed: 08-Jan-03
Analytical SOP: PAI 783R3

Final Aliquot: 0.2500
Aliquot Units: filter
Report Basis: As Received
Count Time (min.): 60

Target Nuclide	Result +/- 2s TPU	MDC	Reporting Units	Lab Qualifier
Ra-226	0.07 +/- 0.13	0.23	pCi/filt	U

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.
LT - Result is less than Requested MDC, greater than sample specific MDC.
Y1 - Chemical Yield in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
B3 - Analyte concentration greater than MDC but less than Requested MDC.
B - Analyte concentration greater than MDC.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
MDC - Minimum Detectable Concentration (see PAI SOP 709)

Data Package ID: *RE2260212096-1*

Ra-226 by Radon Emanation - Method 903.1

Method PAI SOP 783R1

LCS Results

Reported on: Wednesday, January 15, 2003 10:15:00

Client Name: New Horizons
Client Project Name: CSMRI
Client Project Number: 2112

Laboratory Name: Paragon Analytics, Inc.
PAI Work Order: 0212096

Field ID:
Lab ID: RE00103LCS1

Sample Matrix: Filter
Date Prepared: 23-Dec-02
Prep SOP: PAI 783R3
Prep Batch: RE00103

Date Collected: 23-Dec-02
Date Analyzed: 08-Jan-03
Analytical SOP: PAI 783R3

Final Aliquot: 0.2500
Aliquot Units: filter
Report Basis: As Received
Count Time (min.): 60

Target Nuclide	LCS Results +/- 2s TPU	MDC	Spike Added	Reporting Units	LCS Recovery	Control Limits	Lab Qualifier
Ra-226	202 +/- 20	0.55	203	pCi/filt	99%	80-120%	P

Comments:

Data Package ID: *RE2260212096-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.
LT - Result is less than Requested MDC, greater than sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
Y2 - Chemical Yield outside default limits.
* - Duplicate DER not within control limits.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS Recovery within control limits.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
MDC - Minimum Detectable Concentration (see PAI SOP 709)

Ra-226 by Radon Emanation - Method 903.1

Method PAI SOP 783R1

LCS Results

Client Name: New Horizons
Client Project Name: CSMRI
Client Project Number: 2112

Reported on: Wednesday, January 15, 2003 10:15:00
Laboratory Name: Paragon Analytics, Inc.
PAI Work Order: 0212096

Field ID:
Client ID: RE00103LCS1-D1

Sample Matrix: Filter
Date Prepared: 23-Dec-02
Prep SOP: PAI 783R3
Prep Batch: RE00103

Date Collected: 23-Dec-02
Date Analyzed: 08-Jan-03
Analytical SOP: PAI 783R3

Final Aliquot: 0.2500
Aliquot Units: filter
Report Basis: As Received
Count Time (min.): 60

Target Nuclide	LCS Results +/- 2s TPU	MDC	Spike Added	Reporting Units	LCS Recovery	Control Limits	Lab Qualifier
Ra-226	201 +/- 20	0.47	203	pCi/filt	99%	80-120%	P

Comments:

Data Package ID: *RE2260212096-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.
LT - Result is less than Requested MDC, greater than sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
Y2 - Chemical Yield outside default limits.
* - Duplicate DER not within control limits.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS Recovery within control limits.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
MDC - Minimum Detectable Concentration (see PAI SOP 709)

Ra-226 by Radon Emanation - Method 903.1

Method PAI SOP 783R1

Duplicate Sample Results (DER)

Reported on: Wednesday, January 15, 2003 10:15:00

Client Name: New Horizons

Client Project Name: CSMRI

Client Project Number: 2112

Laboratory Name: Paragon Analytics, Inc.

PAI Work Order: 0212096

Field ID:		Prep Date	Analysis Date	Prep Batch	Final Aliquot
Lab ID:	RE00103LCS1	12/23/02	1/8/03	RE00103	0.2500
DUP ID:	RE00103LCS1-D1	12/23/02	1/8/03	RE00103	0.2500

Sample Matrix: Filter
Date Collected: 23-Dec-02
Analytical SOP: PAI 783R3
Prep SOP: PAI 783R3
Aliquot Units: filter
Report Basis: As Received

Analyte	Sample Result +/- 2s TPU	Duplicate Result +/- 2s TPU	Units	DER	Warning Limit	Lab Qualifiers
Ra-226	202 +/- 20	201 +/- 20	pCi/filt	0.03	< 1.42	

Comments:

Qualifiers/Flags:

W - DER is greater than Warning Limit of 1.42

H - DER is Higher han Control Limit of 2.13

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

DER - Duplicate Error Ratio

Data Package ID: *RE2260212096-1*

Ra-226 by Radon Emanation - Method 903.1

Method PAI SOP 783R1

Sample Results

Client Name: New Horizons
Client Project Name: CSMRI
Client Project Number: 2112

Reported on: Wednesday, January 15, 2003 10:15:00
Laboratory Name: Paragon Analytics, Inc.
PAI Work Order: 0212096

Field ID: 11072002-2
Lab ID: 0212096-1

Sample Matrix: Filter
Date Prepared: 23-Dec-02
Prep SOP: PAI 783R3
Prep Batch: RE00103

Date Collected: 07-Nov-02
Date Analyzed: 07-Jan-03
Analytical SOP: PAI 783R3

Final Aliquot: 0.2500 filter
Report Basis: As Received
Count Time (min.): 60

Target Nuclide	Result +/- 2 s TPU	MDC	Reporting Units	Lab Qualifier
Ra-226	0.15 +/- 0.29	0.51	pCi/filt	U

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

Data Package ID: *RE2260212096-1*

Ra-226 by Radon Emanation - Method 903.1

Method PAI SOP 783R1

Sample Results

Reported on: Wednesday, January 15, 2003 10:15:00

Client Name: New Horizons
Client Project Name: CSMRI
Client Project Number: 2112

Laboratory Name: Paragon Analytics, Inc.
PAI Work Order: 0212096

Field ID: 11062002-1
Lab ID: 0212096-2

Sample Matrix: Filter
Date Prepared: 23-Dec-02
Prep SOP: PAI 783R3
Prep Batch: RE00103

Date Collected: 06-Nov-02
Date Analyzed: 07-Jan-03
Analytical SOP: PAI 783R3

Final Aliquot: 0.2500 filter
Report Basis: As Received
Count Time (min.): 60

Target Nuclide	Result +/- 2 s TPU	MDC	Reporting Units	Lab Qualifier
Ra-226	0.98 +/- 0.28	0.26	pCi/filt	Y1

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

Data Package ID: *RE2260212096-1*

Ra-226 by Radon Emanation - Method 903.1

Method PAI SOP 783R1

Sample Results

Reported on: Wednesday, January 15, 2003 10:15:00

Client Name: New Horizons
Client Project Name: CSMRI
Client Project Number: 2112

Laboratory Name: Paragon Analytics, Inc.
PAI Work Order: 0212096

Field ID: 10312002-2
Lab ID: 0212096-3

Sample Matrix: Filter
Date Prepared: 23-Dec-02
Prep SOP: PAI 783R3
Prep Batch: RE00103

Date Collected: 31-Oct-02
Date Analyzed: 08-Jan-03
Analytical SOP: PAI 783R3

Final Aliquot: 0.2500 filter
Report Basis: As Received
Count Time (min.): 60

Target Nuclide	Result +/- 2 s TPU	MDC	Reporting Units	Lab Qualifier
Ra-226	0.63 +/- 0.33	0.48	pCi/filt	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

Data Package ID: *RE2260212096-1*

Paragon Analytics, Inc.

QUALITY ASSURANCE SUMMARY SHEET

PAI W.O. # / BATCH 0212096 / RE 00103
TEST Ra-226
METHOD PREP
SOP/REV (PREP) 783R3
SOP/REV (ANAL) 783R3

253318

Briefly document any QA or other problems or deviations associated with the analysis of samples. Problems could result from: log-in, color, odor, dilution, consistency, scheduling, equipment, or instrumentation, or may include documentation of minor deviations necessary due to unique DQO's or sample characteristics. JDB 12/24/02

JDB 12/24/02

Samples were muffled and digested in accordance with SOP 773/R7. After step 8.3.8 (SOP 773/R7), the samples were brought to a volume of 1 Liter with DI water. The samples were treated as waters, and for the actinides tests SOP 776/R7 was followed; SOP 783/R3 was followed for Ra226 (903.1).

JDB 12/24/02

Aliquot sizes were determined according to project specified detection limits. The aliquot sizes taken for the required tests are as follows:

Ra226 (903.1)	250 mL
TH-ISO	250 mL
U-ISO	250 mL

The samples are to be reported on a per filter basis. The filter equivalents were calculated using the following equation:

$$\text{filter equivalent (x)} = \frac{\text{aliquot volume (mL)}}{\text{sample volume (mL)}}$$

Hence the filter equivalents entered into the bench sheets as "Sample Size" are:

Ra226 (903.1)	.250
TH-ISO	.250
U-ISO	.250

LCS duplicates were created due to limited sample volume.

Because the digestate solution is a common one for multiple analyses, the samples were traced and spiked after the aliquots were taken from the 1.0 L common digestate. Tracing and spiking at this stage reduced the potential for interferences caused by the different matrices used in the tracing and spiking solutions.

JDB 12/24/02

JDB 12/24/02

TECHNICIAN/ANALYST (JDB) DATE 12/24/02

DEPARTMENT MANAGER R Fowler DATE 12/24/02

FORM 302r5.FRM (04/30/01)

Paragon Analytics, Inc.

QUALITY ASSURANCE SUMMARY SHEET

PAI W.O. # / BATCH 0212096/RE000103
TEST Ra226
METHOD 903.1
SOP/REV (PREP) 783R3
SOP/REV (ANAL) 783R3

Briefly document any QA or other problems or deviations associated with the analysis of samples. Problems could result from: log-in, color, odor, dilution, consistency, scheduling, equipment, or instrumentation, or may include documentation of minor deviations necessary due to unique DQO's or sample characteristics.

DUE TO INSUFFICIENT VOLUME, NO SAMPLE DUPLICATE WAS PREPARED FOR THE BATCH. AN LCS DUPLICATE WAS PREPARED INSTEAD.

7/9/02
CW

TECHNICIAN/ANALYST Cheryl Waylon DATE 7/9/02
DEPARTMENT MANAGER [signature] DATE 07/09/02

FORM 302r5.FRM (04/30/01)

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