



Paragon Analytics

Radiochemistry Case Narrative

Isotopic Thorium

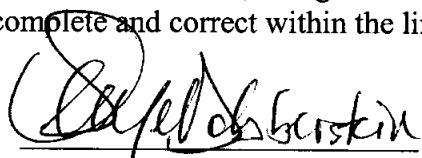
New Horizons

CSMRI / 2135

PA WO 0405063

1. This report consists of the analytical results for six soil samples received by Paragon on 05/06/04.
2. These samples were prepared according to Paragon Analytics procedures PA SOP773R8, PA SOP777R7, and PA SOP721R10.
3. The samples were analyzed for the presence of isotopic thorium according to Paragon Analytics procedure PA SOP714R8. The analyses were completed on 06/02/04.
4. The isotopic analysis results for these samples are reported on a dry weight basis in units of pCi/gram.
5. Samples HSDA and H256S (PA IDs 0405025-3 and -11) did not meet the requested MDC of 0.1 pCi/g for Th-228 and Th-230, however the reported activities exceed the achieved MDC values. These samples are flagged with an "M3" flag on the final reports.
6. No anomalous situations were encountered during the preparation or analysis of these samples. All quality control criteria were met.

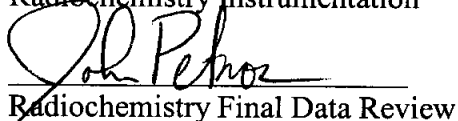
The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, Paragon Analytics certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.


Skye Dobberstein

Radiochemistry Instrumentation

6/11/04

Date


Radiochemistry Final Data Review

6/11/04

Date

000001

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 8

Method Blank Results

Lab Name: Paragon Analytics

Work Order Number: 0405063

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Lab ID: AS040518-3MB	Sample Matrix: SOIL	Prep Batch: AS040518-3	Final Aliquot: 2.00 g
	Prep SOP: PAI 777 Rev 7	QCBatchID: AS040518-3-1	Result Units: pCi/g
	Date Collected: 18-May-04	Run ID: AS040518-3a	File Name: T5183B
	Date Prepared: 18-May-04	Count Time: 300 minutes	
	Date Analyzed: 02-Jun-04		

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	0.026 +/- 0.031	0.059	U
14269-63-7	Th-230	0.029 +/- 0.039	0.077	U
7440-29-1	Th-232	0.028 +/- 0.022	0.028	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	2.252	1.54	pCi/g	68.6	30 - 110 %	

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)
- BDL - Below Detection Limit

- M - Requested MDC not met.
- B - Analyte concentration greater than MDC.
- B3 - Analyte concentration greater than MDC but less than Requested MDC.

Data Package ID: TH0405063-1

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 8

Laboratory Control Sample(s)

Lab Name: Paragon Analytics

Work Order Number: 0405063

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Lab ID: AS040518-3LCS

Sample Matrix: SOIL
Prep SOP: PAI 777 Rev 7
Date Collected: 18-May-04
Date Prepared: 18-May-04
Date Analyzed: 02-Jun-04

Prep Batch: AS040518-3
QCBatchID: AS040518-3-1
Run ID: AS040518-3a
Count Time: 300 minutes

Final Aliquot: 2.00 g
Result Units: pCi/g
File Name: T5183L

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
14269-63-7	Th-230	2.43 +/- 0.45	0.08	2.30	106	85 - 121	P

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	2.252	1.43	pCi/g	63.7	30 - 110 %	

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 is in control at 100-110%. Quantitative Yield is assumed.
Y2 - Chemical Yield outside default limits.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS Recovery within control limits.
M - The requested MDC was not met.
M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Abbreviations:

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

Data Package ID: TH0405063-1

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 8

Duplicate Sample Results (DER)

Lab Name: Paragon Analytics

Work Order Number: 0405063

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: H107-117 Lab ID: 0405063-2DUP	Sample Matrix: SOIL Prep SOP: PAI 777 Rev 7 Date Collected: 28-Apr-04 Date Prepared: 18-May-04 Date Analyzed: 02-Jun-04	Prep Batch: AS040518-3 QCBatchID: AS040518-3-1 Run ID: AS040518-3a Count Time: 300 minutes Report Basis: Dry Weight	Final Aliquot: 2.04 g Prep Basis: Dry Weight Moisture(%): NA Result Units: pCi/g File Name: T50632D
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CASNO	Analyte	Sample Result +/- 2s TPU	Duplicate Result +/- 2s TPU	DER	Control Limit	Lab Qualifiers
14274-82-9	Th-228	2.18 +/- 0.42	2.22 +/- 0.42	0.06	2.13	
14269-63-7	Th-230	3.19 +/- 0.59	3.39 +/- 0.62	0.24	2.13	
7440-29-1	Th-232	2.23 +/- 0.42	2.17 +/- 0.41	0.10	2.13	

Comments:

Duplicate 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.
- W - DER is greater than Warning Limit of 1.42
- D - DER is greater than Control Limit of 2.13
- LT - Result is less than Request MDC, greater than sample specific MDC
- M - Requested MDC not met.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
- L - LCS Recovery below lower control limit.
- H - LCS Recovery above upper control limit.
- P - LCS, Matrix Spike Recovery within control limits.
- N - Matrix Spike Recovery outside control limits

Abbreviations:

- TPU - Total Propagated Uncertainty (see PAI SOP 743)
- DER - Duplicate Error Ratio
- BDL - Below Detection Limit
- NR - Not Reported

Data Package ID: TH0405063-1

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 8

Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0405063

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: H107-117	Sample Matrix: SOIL	Prep Batch: AS040518-3	Final Aliquot: 2.07 g
Lab ID: 0405063-2	Prep SOP: PAI 777 Rev 7	QCBatchID: AS040518-3-1	Prep Basis: Dry Weight
	Date Collected: 28-Apr-04	Run ID: AS040518-3a	Moisture(%): NA
	Date Prepared: 18-May-04	Count Time: 300 minutes	Result Units: pCi/g
	Date Analyzed: 02-Jun-04	Report Basis: Dry Weight	File Name: T50632

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	2.18 +/- 0.42	0.08	
14269-63-7	Th-230	3.19 +/- 0.59	0.08	
7440-29-1	Th-232	2.23 +/- 0.42	0.04	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	2.174	1.32	pCi/g	60.8	30 - 110 %	

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.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: TH0405063-1

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 8

Sample Duplicate Results

Lab Name: Paragon Analytics

Work Order Number: 0405063

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: H107-117	Sample Matrix: SOIL	Prep Batch: AS040518-3	Final Aliquot: 2.04 g
Lab ID: 0405063-2DUP	Prep SOP: PAI 777 Rev 7	QCBatchID: AS040518-3-1	Prep Basis: Dry Weight
	Date Collected: 28-Apr-04	Run ID: AS040518-3a	Moisture(%): NA
	Date Prepared: 18-May-04	Count Time: 300 minutes	Result Units: pCi/g
	Date Analyzed: 02-Jun-04	Report Basis: Dry Weight	File Name: T50632D

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	2.22 +/- 0.42	0.07	
14269-63-7	Th-230	3.39 +/- 0.62	0.08	
7440-29-1	Th-232	2.17 +/- 0.41	0.02	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	2.206	1.35	pCi/g	61.3	30 - 110 %	

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.
- M - The requested MDC was not met.
- M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.
- W - DER is greater than Warning Limit of 1.42
- D - DER is greater than Control Limit of 2.13

Abbreviations:

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

Data Package ID: TH0405063-1

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 8
Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0405063

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: HSDA
Lab ID: 0405063-3

Sample Matrix: SOIL
Prep SOP: PAI 777 Rev 7
Date Collected: 30-Apr-04
Date Prepared: 18-May-04
Date Analyzed: 02-Jun-04

Prep Batch: AS040518-3
QCBatchID: AS040518-3-1
Run ID: AS040518-3a
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 1.10 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: T50633

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	4.95 +/- 0.90	0.13	M3
14269-63-7	Th-230	1.96 +/- 0.40	0.14	M3
7440-29-1	Th-232	4.68 +/- 0.85	0.05	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	4.102	2.96	pCi/g	72.1	30 - 110 %	

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.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
- M - The requested MDC was not met.

Abbreviations:

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

Data Package ID: TH0405063-1

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 8
Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0405063

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: IC1014
Lab ID: 0405063-5

Sample Matrix: SOIL
Prep SOP: PAI 777 Rev 7
Date Collected: 04-May-04
Date Prepared: 18-May-04
Date Analyzed: 02-Jun-04

Prep Batch: AS040518-3
QCBatchID: AS040518-3-1
Run ID: AS040518-3a
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 2.11 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: T50635

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	1.52 +/- 0.30	0.06	
14269-63-7	Th-230	0.98 +/- 0.21	0.08	
7440-29-1	Th-232	1.32 +/- 0.27	0.02	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	2.136	1.43	pCi/g	67.1	30 - 110 %	

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.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
- M - The requested MDC was not met.

Abbreviations:

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

Data Package ID: TH0405063-1

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 8
Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0405063

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: IC1017	Sample Matrix: SOIL	Prep Batch: AS040518-3	Final Aliquot: 2.03 g
Lab ID: 0405063-7	Prep SOP: PAI 777 Rev 7	QCBatchID: AS040518-3-1	Prep Basis: Dry Weight
	Date Collected: 04-May-04	Run ID: AS040518-3a	Moisture(%): NA
	Date Prepared: 18-May-04	Count Time: 300 minutes	Result Units: pCi/g
	Date Analyzed: 02-Jun-04	Report Basis: Dry Weight	File Name: T50637

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	2.13 +/- 0.40	0.06	
14269-63-7	Th-230	5.25 +/- 0.93	0.08	
7440-29-1	Th-232	2.01 +/- 0.38	0.01	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	2.220	1.47	pCi/g	66.4	30 - 110 %	

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.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
- M - The requested MDC was not met.

Abbreviations:

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

Data Package ID: TH0405063-1

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 8 Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0405063

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: H256	Sample Matrix: SOIL	Prep Batch: AS040518-3	Final Aliquot: 2.02 g
Lab ID: 0405063-9	Prep SOP: PAI 777 Rev 7	QC Batch ID: AS040518-3-1	Prep Basis: Dry Weight
	Date Collected: 05-May-04	Run ID: AS040518-3a	Moisture(%): NA
	Date Prepared: 18-May-04	Count Time: 300 minutes	Result Units: pCi/g
	Date Analyzed: 02-Jun-04	Report Basis: Dry Weight	File Name: T50639

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	1.68 +/- 0.32	0.09	
14269-63-7	Th-230	23.3 +/- 3.9	0.1	
7440-29-1	Th-232	1.79 +/- 0.34	0.03	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	2.225	1.45	pCi/g	65.1	30 - 110 %	

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.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
- M - The requested MDC was not met.

Abbreviations:

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

Data Package ID: TH0405063-1

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 8 Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0405063
Client Name: New Horizons
ClientProject ID: CSMRI 2135

Field ID: H256S	Sample Matrix: SOIL	Prep Batch: AS040518-3	Final Aliquot: 1.06 g
Lab ID: 0405063-11	Prep SOP: PAI 777 Rev 7	QCBatchID: AS040518-3-1	Prep Basis: Dry Weight
	Date Collected: 04-May-04	Run ID: AS040518-3a	Moisture(%): NA
	Date Prepared: 18-May-04	Count Time: 300 minutes	Result Units: pCi/g
	Date Analyzed: 02-Jun-04	Report Basis: Dry Weight	File Name: T506311

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	1.45 +/- 0.31	0.12	M3
14269-63-7	Th-230	24.1 +/- 4.1	0.1	M3
7440-29-1	Th-232	1.63 +/- 0.34	0.05	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	4.259	2.90	pCi/g	68.0	30 - 110 %	

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.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
- M - The requested MDC was not met.

Abbreviations:

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

Data Package ID: TH0405063-1