Hunters Point Naval Shipyard, Parcel G, RSY Data Report

Contract No. N62473-17-D-006 CTO N6247318F5065 RSY Pad Data Report	
RSY Pad: RSY 15 Use 2	Soil Origin: TU-098B SFU
Data attached and submitted by: Amy Mangel	Data Report Submittal Date: 01/04/2021

Systematic Soil Sample Data: RSY 15 Use 2

Sample Identification	Sample Location	Type of Sample	Gamma Static 3x3 NaI Reading (CPM)	Gamma 3x3 Static Investigation Level (CPM)	^{226}Ra Final Analytical Results (pCi/g)	^{137}Cs Final Analytical Results (pCi/g)	Total Beta Sr Final Analytical Results (pCi/g)
Project Remediation Goals*					1.861	0.141	0.331
HPPG-SFU-TU098B-001	1	Systematic	11,662	15,658	0.346	-0.0671	-0.0367
HPPG-SFU-TU098B-002	2	Systematic	12,334	15,658	0.321	-0.0356	N/A
HPPG-SFU-TU098B-003	3	Systematic	12,135	15,658	0.108	0.0262	N/A
HPPG-SFU-TU098B-004	4	Systematic	12,192	15,658	0.329	0.0154	N/A
HPPG-SFU-TU098B-005	5	Systematic	12,220	15,658	0.0968	0.0250	N/A
HPPG-SFU-TU098B-006	6	Systematic	12,400	15,658	0.253	0.00474	N/A
HPPG-SFU-TU098B-007	7	Systematic	12,498	15,658	0.406	0.0229	N/A
HPPG-SFU-TU098B-008	8	Systematic	12,709	15,658	0.357	-0.0349	N/A
HPPG-SFU-TU098B-009	9	Systematic	13,016	15,658	0.307	0.00195	N/A
HPPG-SFU-TU098B-010	10	Systematic	12,751	15,658	0.680	0.109	N/A
HPPG-SFU-TU098B-011	11	Systematic	12,606	15,658	0.370	0.0226	0.0517
HPPG-SFU-TU098B-012	12	Systematic	12,374	15,658	0.490	0.000	N/A
HPPG-SFU-TU098B-013	13	Systematic	12,749	15,658	0.310	-0.0346	N/A
HPPG-SFU-TU098B-014	14	Systematic	12,544	15,658	0.453	0.00265	N/A
HPPG-SFU-TU098B-015	15	Systematic	13,036	15,658	0.352	-0.00846	N/A
HPPG-SFU-TU098B-016	16	Systematic	12,990	15,658	0.284	0.0134	N/A
HPPG-SFU-TU098B-017	17	Systematic	12,187	15,658	0.366	0.0169	N/A
HPPG-SFU-TU098B-018	18	Systematic	12,165	15,658	0.426	0.0182	N/A
HPPG-SFU-TU098B-019	19	Systematic	12,442	15,658	0.413	-0.000545	N/A
HPPG-SFU-TU098B-020	20	Systematic	13,035	15,658	0.0411	-0.0490	N/A
HPPG-SFU-TU098B-021	21	Systematic	12,584	15,658	0.417	0.0113	0.00492
HPPG-SFU-TU098B-022	22	Systematic	12,862	15,658	0.255	-0.0306	N/A
HPPG-SFU-TU098B-023	23	Systematic	12,909	15,658	0.260	0.00244	N/A
HPPG-SFU-TU098B-024	24	Systematic	10,808	15,658	0.376	0.00159	N/A
HPPG-SFU-TU098B-025	25	Systematic	13,094	15,658	0.422	-0.0247	N/A
Soil Systematic Sample Statistics					^{226}Ra Final Analytical Results (pCi/g)	^{137}Cs Final Analytical Results (pCi/g)	Total Beta Sr Final Analytical Results (pCi/g)
				Maximum	0.680	0.109	0.0517
				Mean	0.3376	0.0004	0.0066
				Median	0.352	0.0024	0.0049
				Minimum	0.0411	-0.0671	-0.0367
				Standard Deviation	0.1312	0.0339	N/A

Biased Soil Sample Data: RSY 15 Use 2

Sample Identification	Sample Location	Type of Sample	Gamma Static 3x3 NaI Reading (CPM)	Gamma 3x3 Static Investigation Level (CPM)	^{226}Ra Final Analytical Results (pCi/g)	^{137}Cs Final Analytical Results (pCi/g)	Total ^{90}Sr Final Analytical Results (pCi/g)
Project Remediation Goals*					1.861	0.141	0.331
HPPG-SFU-TU098B-B-001	1	Biased	11,931	15,658	0.550	0.00289	-0.0194

CPM Counts per minute

pCi/g Picocuries per gram

* Note: Project Remediation goal (RG) is the Record of Decision RG or Offsite RBA value, whichever is higher

Instrument and Survey Summary					
Activity	**Survey #**	**Date**	**Meter**	**Calibration Due Date**	**Serial #**
Gamma Walkover Survey	HPRS-10292020-PG-ROV-255	10/29/2020	RS-700	03/31/2022	5447/5448
Follow-Up Static Survey	HPRS-10292020-PG-JSS-257	10/29/2020	RS-700	03/31/2022	5447/5448
Systematic Sample Survey	HPRS-10292020-PG-JSS-251	10/29/2020	3x3	08/06/2021	108853
Biased Sample Survey	HPRS-10302020-PG-JSS-259	10/30/2020	3x3	08/06/2021	108853

Region of Interest (ROI) Summary	
ROI	**Nuclide and Energy**
ROI 3	Ra-226 (1764 keV)
ROI 6	Ra-226 (609 keV)
ROI 7	Cs-137 (662 keV)
ROI 8	Ra-226 (351 keV)
ROI 10	Gross Gamma

Summary: RSY 15 Lift 2

1) Gamma walkover survey and data review—upon review of initial RS-700 scan data in accordance with Final Parcel G Work Plan Section 3.5.1.1, 25 follow-up static investigations were required. Gamma scan data summary statistics, normal Q-Q plots, histograms, and box plots are provided on pages 3-6. Contour maps of the scan data for the ROIs of interest are presented on page 7. The RSY scan data was lower than the background scan data. The exact same RS-700 and detectors were used for the background data collection and the RSY pad data collection.

2) One-minute static follow-up measurements with the RS-700 were collected at 25 gamma walkover investigation locations in accordance with Final Parcel G Work Plan Section 3.3.1. A map of the follow-up locations is presented on page 9. The net follow-up static spectra are presented on pages 14-38. The exact same RS-700 and detectors were used for the background data collection and the RSY pad data collection.

3) In accordance with Final Parcel G Work Plan Section 3.4.1, twenty-five systematic soil samples (001-025) were obtained and submitted for gamma spectroscopy analysis. Sample locations are shown on the Systematic Sample Survey map (page 10). TestAmerica sample results are attached (pages 39-73). Ten percent of the systematic soil samples (three samples in total -001, -011, & -021) were also analyzed for total strontium. Total Strontium results are also included in the TestAmerica sample results report (pages 39-73). Samples HPPG-F-025 and HPPG-F-026 are field duplicates, correlating to systematic samples -011 and -025. The Data Quality Assessment which will be included in the RACR will provide an analysis and discussion of field duplicates for the project. The Instrument and Survey Summary table above lists the 3x3 NaI detector used for the gamma static measurements collected during sampling activities, and the instrument-specific gamma static IL listed in the sample tables on page one is developed from that instrument's RBA data.

Systematic sample histograms, box plots, Q-Q plots, and power curves are provided on pages 12-13. All sample results were below the applicable RGs. The number of samples collected was sufficient to meet project DQOs.

4) In accordance with Final Parcel G Work Plan Section 3.3.1 and 3.4.1, one biased sample was collected since all follow-up static measurements were below the ROC-specific critical levels. The biased sample was collected from the location of the highest gross gamma scan measurement. TestAmerica sample results are attached (pages 74-88). A map of the biased sample location is presented on page 11. Biased sample results were all below the applicable RGs.

Conclusions:

In accordance with the DQOs in Section 3.1 of the Final Parcel G Work Plan, final analytical results for all samples from the RSY pad were shown by a point by point comparison to meet the RGs. Graphical comparisons demonstrated that ROC concentrations were consistent with background.

RSY 15 Lift 2 contains soil from Hunters Point Naval Shipyard Parcel G Phase 1 excavation TU-098B SFU.

APTIM requests RASO concurrence to release this soil as Non-LLRW.
Disposition: This soil shall be used as backfill for TU-098.

Soil Scan Statistics

Statistical Summary

Dataset	PG-RSY-15-U2				
ROI	Minimum (cps)	Maximum (cps)	Mean (cps)	Median (cps)	Standard Deviation (cps)
ROI-03	6.01	36.09	18.60	18.04	4.36
ROI-06	71.15	154.35	110.85	110.28	11.96
ROI-07	54.11	116.26	83.11	83.18	10.00
ROI-08	95.20	184.37	138.42	138.33	12.97
ROI-10	2,461.33	3,093.70	2,824.11	2,844.88	117.37

Statistical Summary Reference Background

TYPE	Scan RBA (Bldg 809)				
ROI	Minimum (cps)	Maximum (cps)	Mean (cps)	Median (cps)	Standard Deviation (cps)
ROI-03	2.00	33.08	16.21	16.04	4.13
ROI-06	68.15	177.45	117.58	117.26	15.50
ROI-07	51.11	141.33	92.34	91.24	13.43
ROI-08	93.19	221.48	146.24	145.30	18.21
ROI-10	2,354.11	3,845.31	2,995.57	2,989.64	255.66

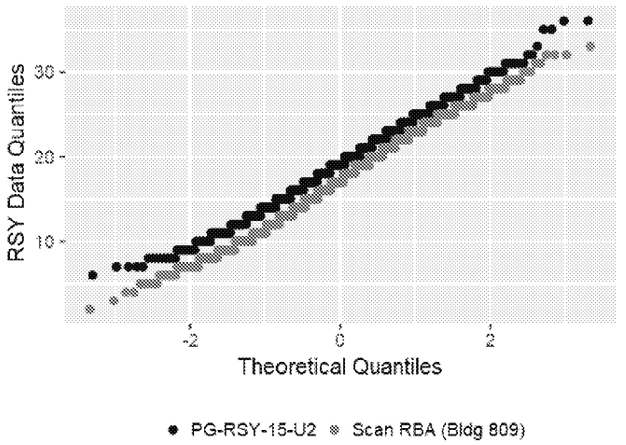
cps = counts per second

Dataset	Number of Data Points
PG-RSY-15-U2	2479
Scan RBA (Bldg 809)	4632

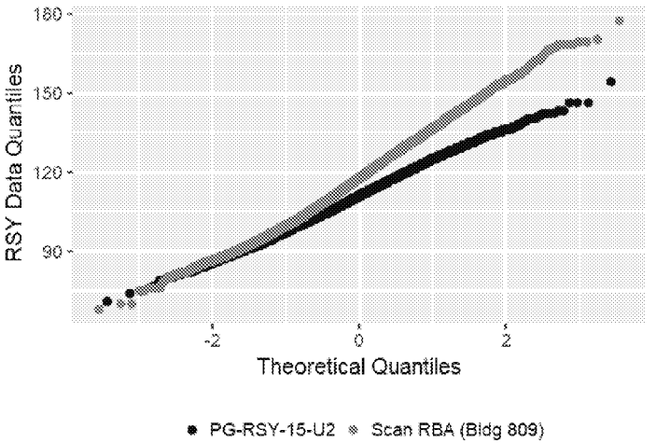
Soil Scan Statistics

Normal Q-Q Plots

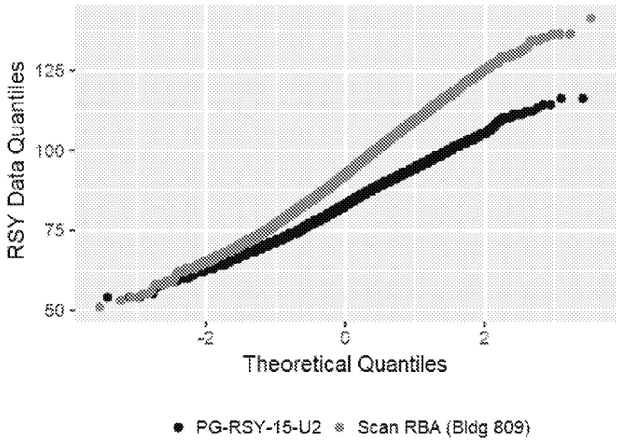
ROI 03



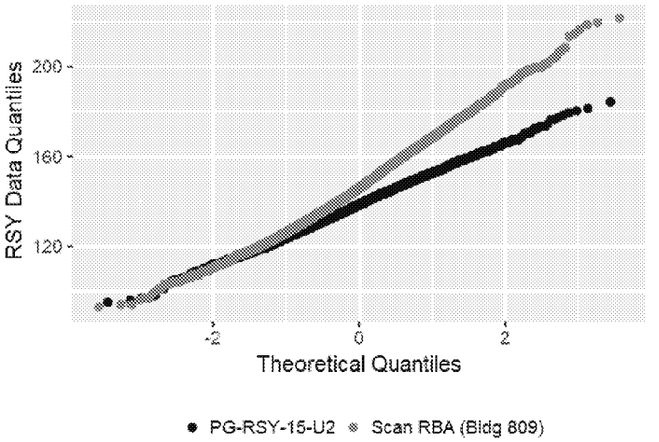
ROI 06



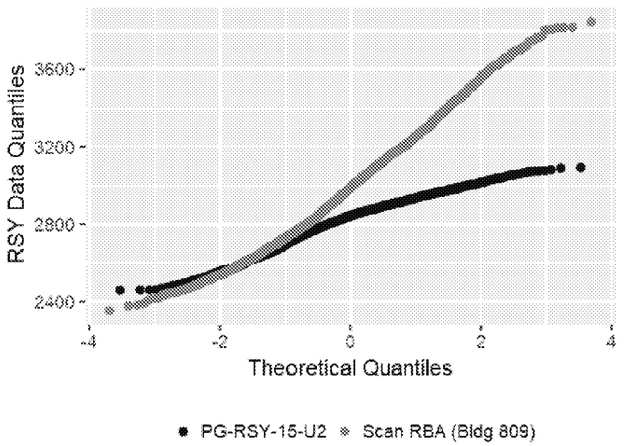
ROI 07



ROI 08



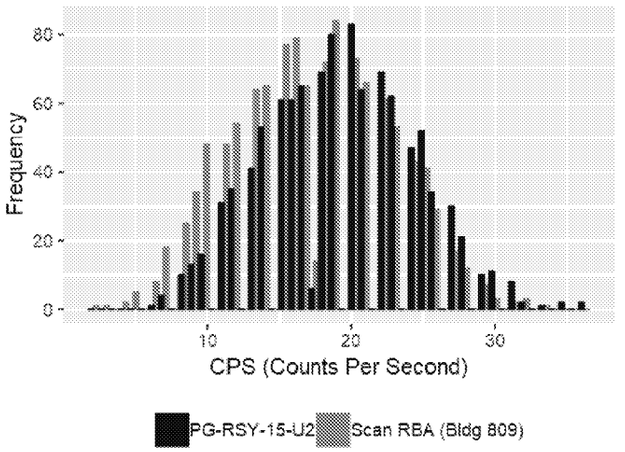
ROI 10



Soil Scan Statistics

Histograms

ROI 03



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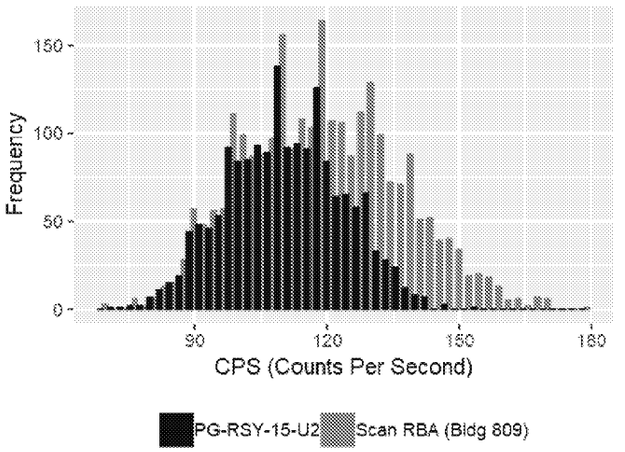

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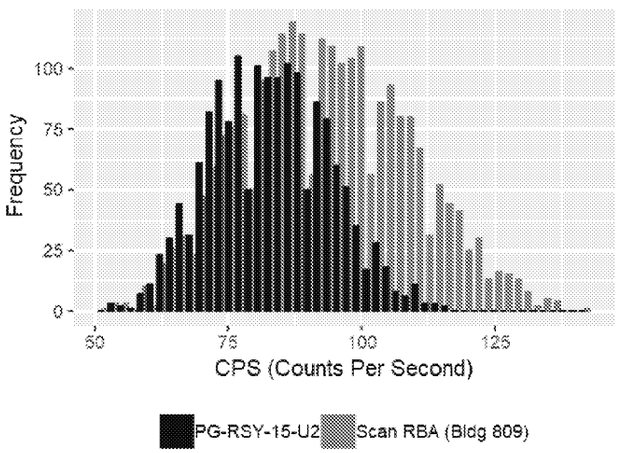

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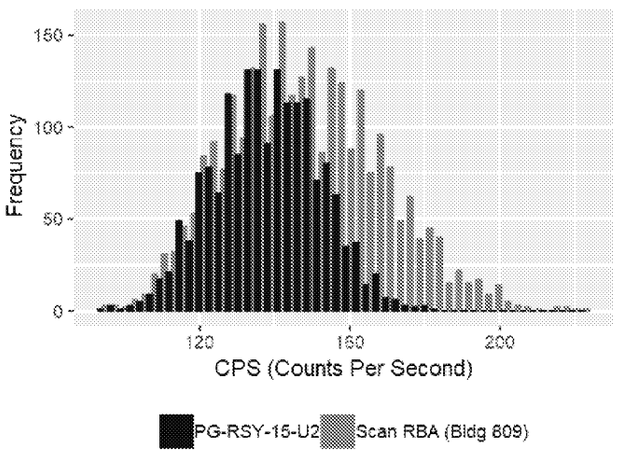
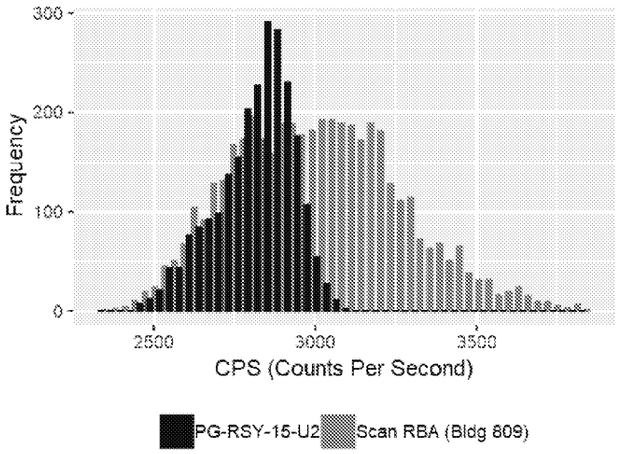
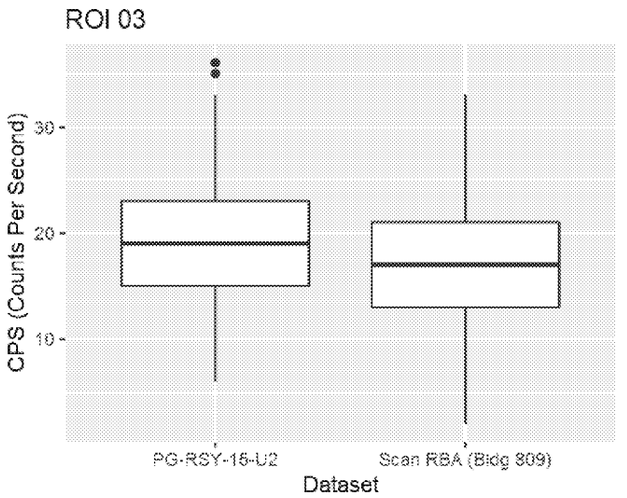


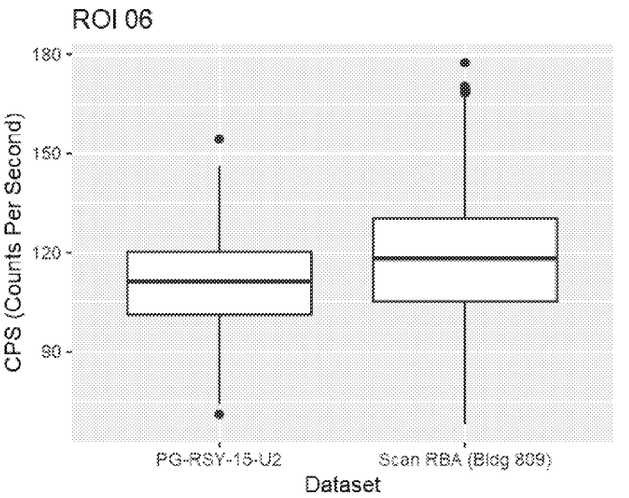
ROI 10

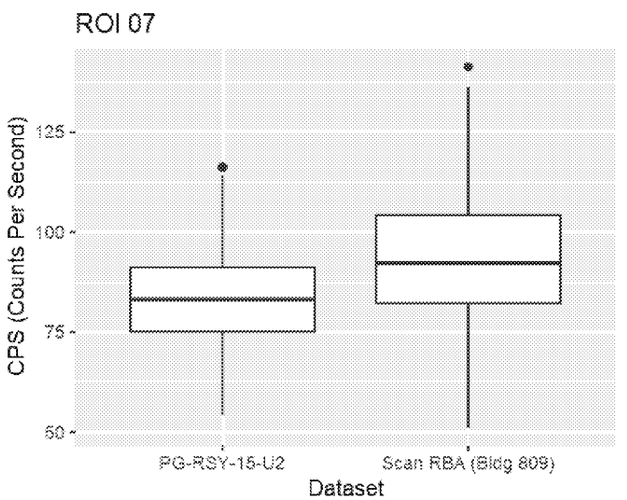


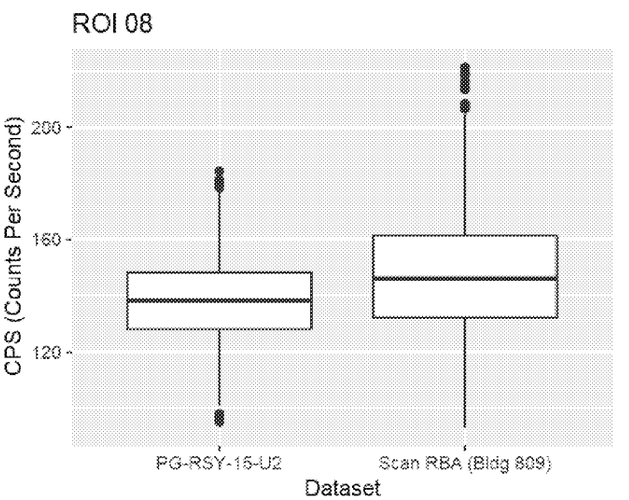
Soil Scan Statistics

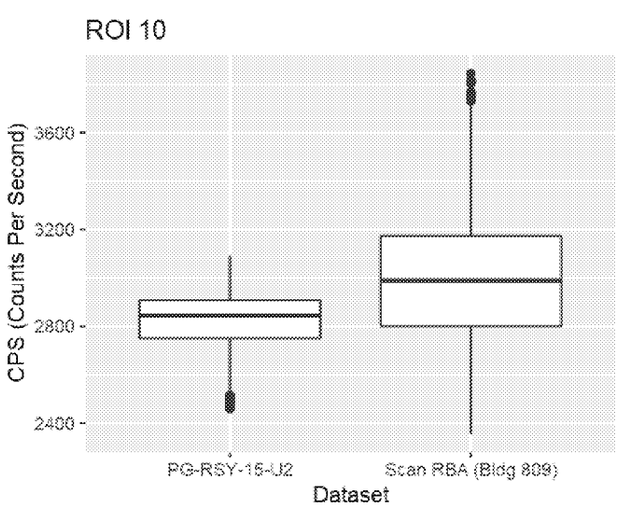
Box Plots





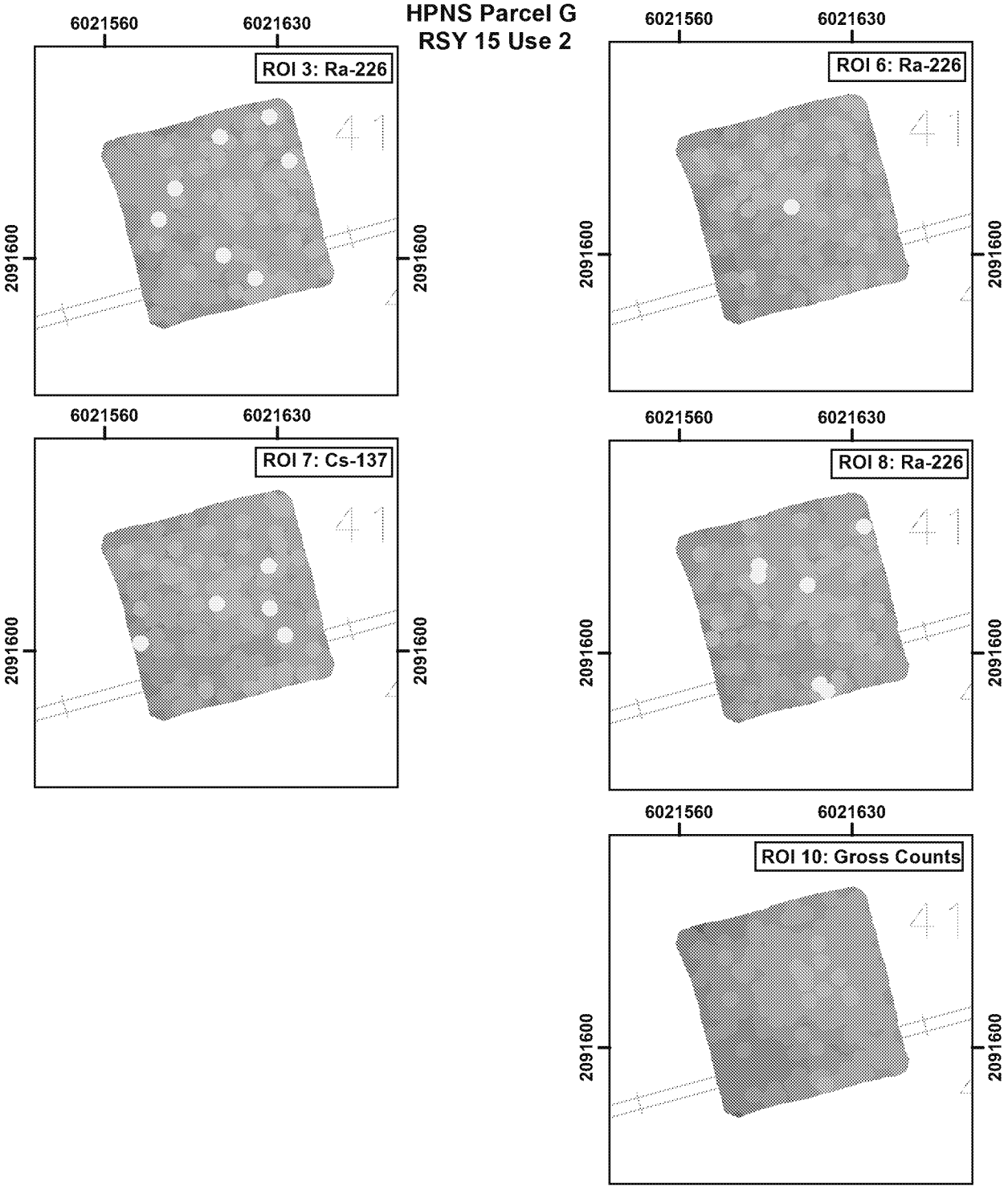






TU-098B SFU

RSI Data Plots
HPNS Parcel G
RSY 15 Use 2



RS 700 Gamma Walkover Survey Data (VD1)

- > 3 std dev
- > 2 to < 3 std dev
- > 1 to < 2 std dev
- > 0 to < 1 std dev
- > -1 to < 0 std dev
- > -2 to < -1 std dev
- > -3 to < -2 std dev
- < -3 std dev

0 25 50 100 Feet

Coordinate system: CSP Zone III. NAD83, US Survey Foot

N

APTIM

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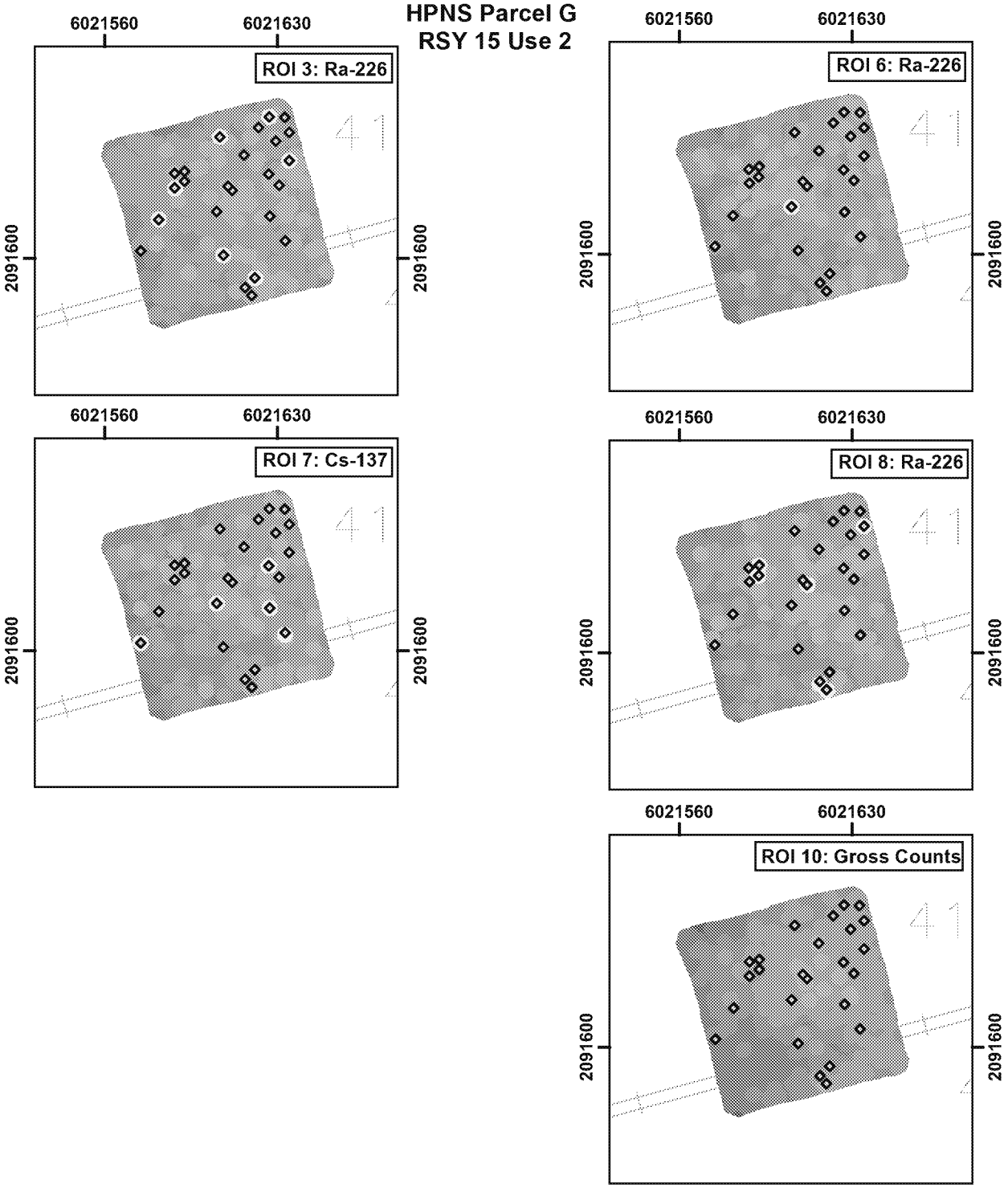
TU-098B SFU

RSI Data Plots
HPNS Parcel G
RSY 15 Use 2



RS 700 Gamma Walkover Survey Data (VD1)

- Follow-Up Location
- > 3 std dev
- > 2 to < 3 std dev
- > 1 to < 2 std dev
- > 0 to < 1 std dev
- > -1 to < 0 std dev
- > -2 to < -1 std dev
- > -3 to < -2 std dev
- < -3 std dev

0 25 50 100 Feet

Coordinate system: CSP Zone III. NAD83, US Survey Foot

N

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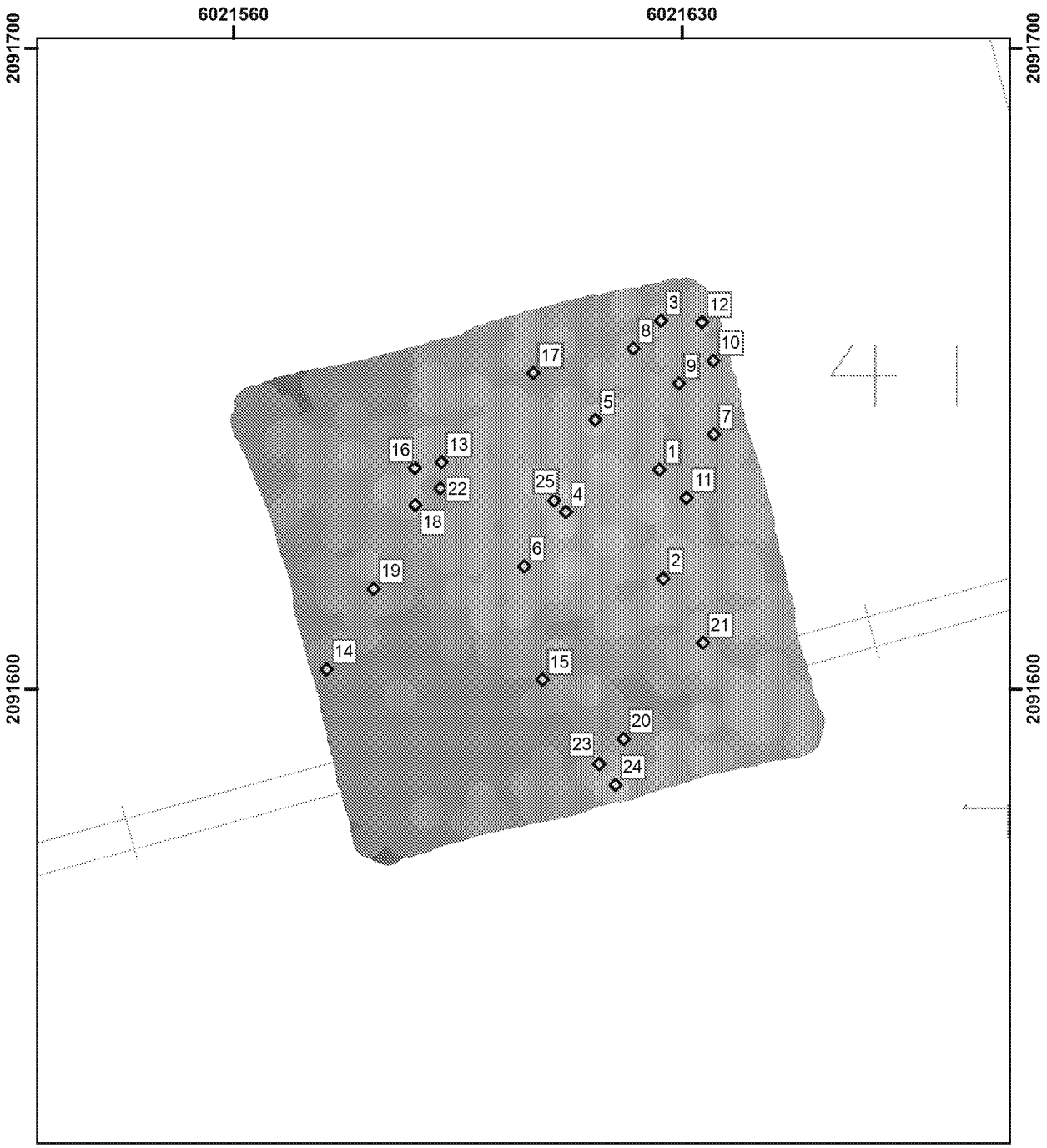
TU-098B SFU

Follow-Up Static Survey
HPNS Parcel G
RSY 15 Use 2



RSY 15 Use 2 (VD1, ROI 10 Gross Gamma)

- Follow-Up Location
- > 3 std dev
- > 2 to < 3 std dev
- > 1 to < 2 std dev
- > 0 to < 1 std dev
- > -1 to < 0 std dev
- > -2 to < -1 std dev
- > -3 to < -2 std dev
- < -3 std dev

25 12.5 0 25 Feet

Coordinate system: CSP Zone III. NAD83, US Survey Foot

N

APTIM

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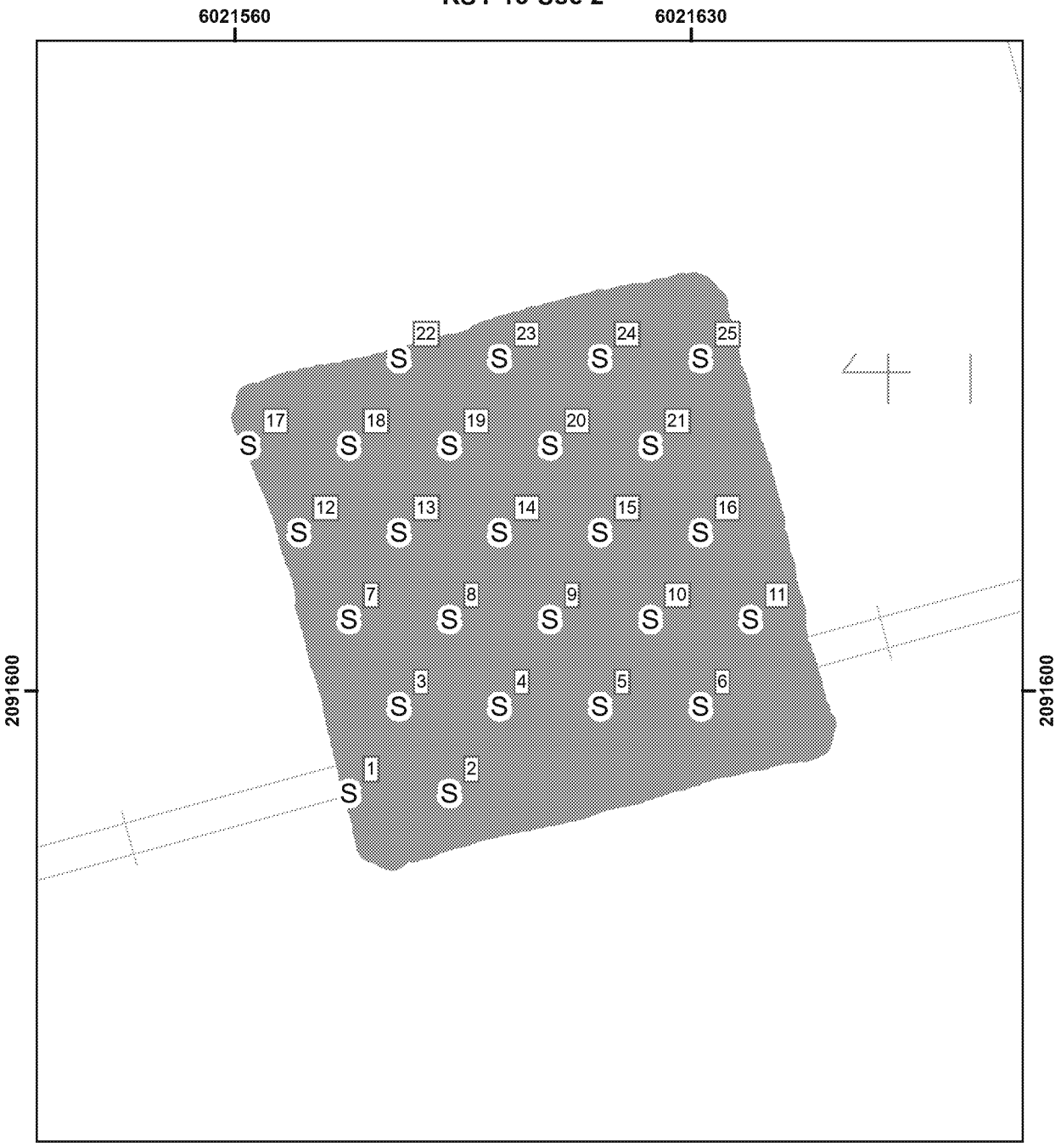
TU-098B SFU

Systematic Sampling
HPNS Parcel G
RSY 15 Use 2



RSY 15 Use 2

S Systematic Sample Locations

RS-700 GWS Coverage

0 10 20 40 Feet

Coordinate system: CSP Zone III. NAD83, US Survey Foot

APTIM

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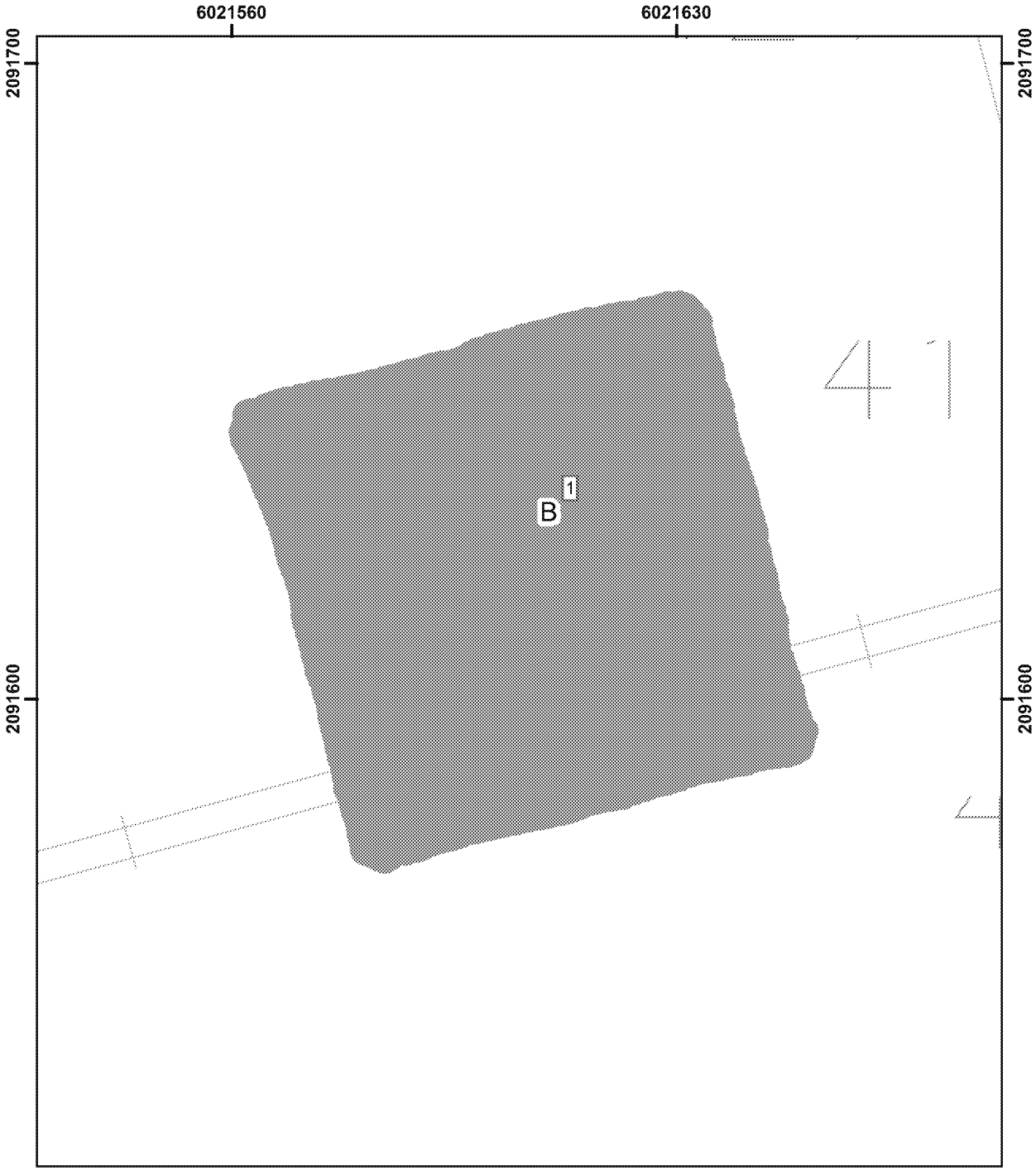
TU-098B SFU

Biased Sampling
HPNS Parcel G
RSY 15 Use 2



RSY 15 Use 2

B Biased Sample Location

RS-700 GWS Coverage

25 12.5 0 25 Feet

Coordinate system: CSP Zone III. NAD83, US Survey Foot

N

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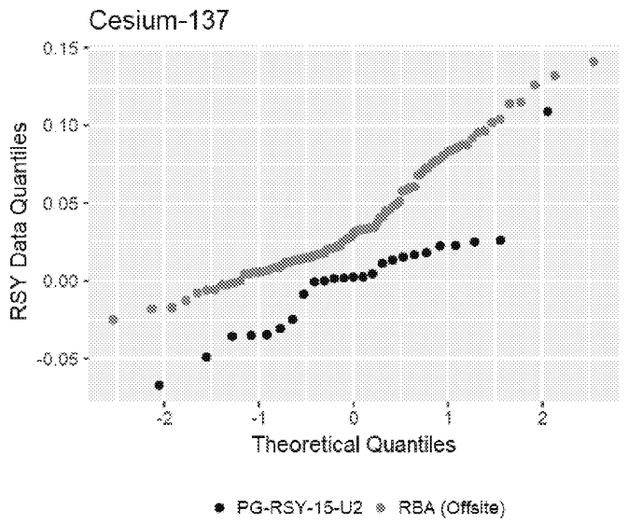
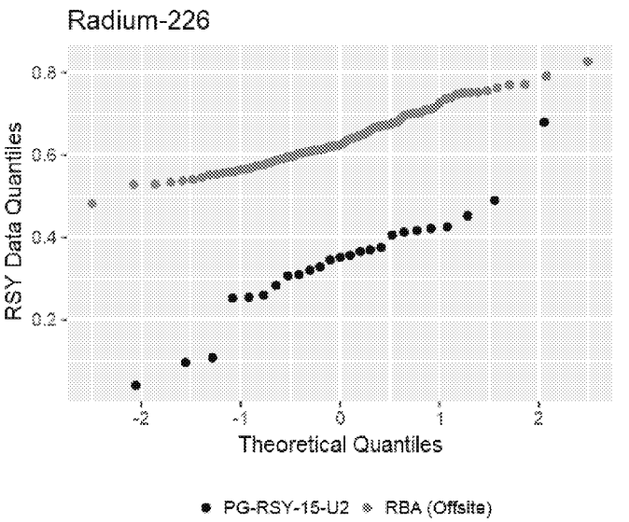
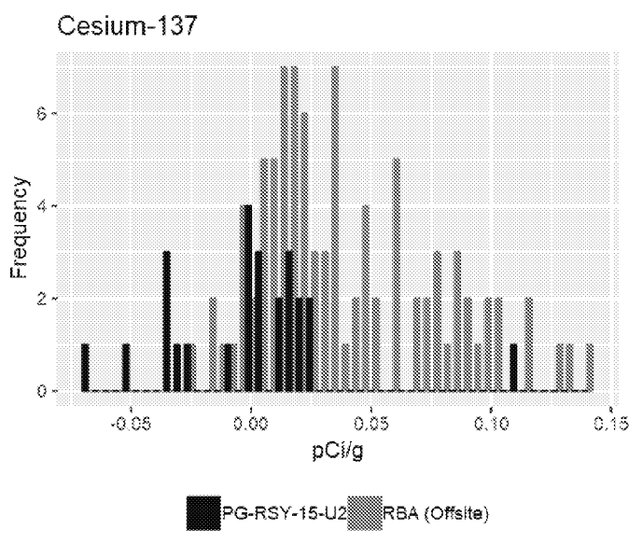
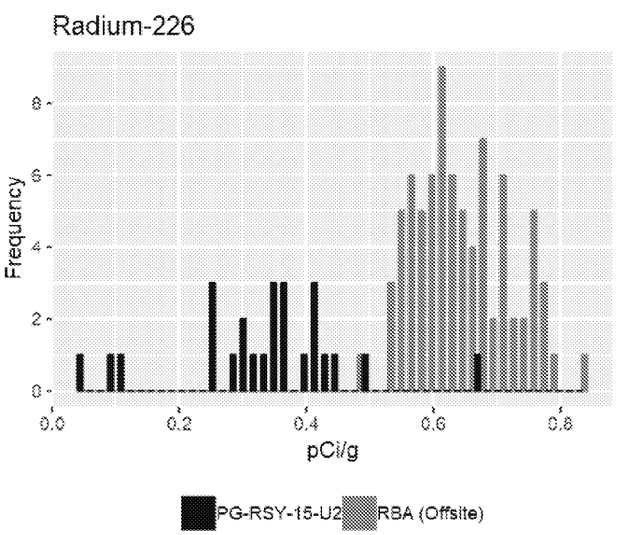
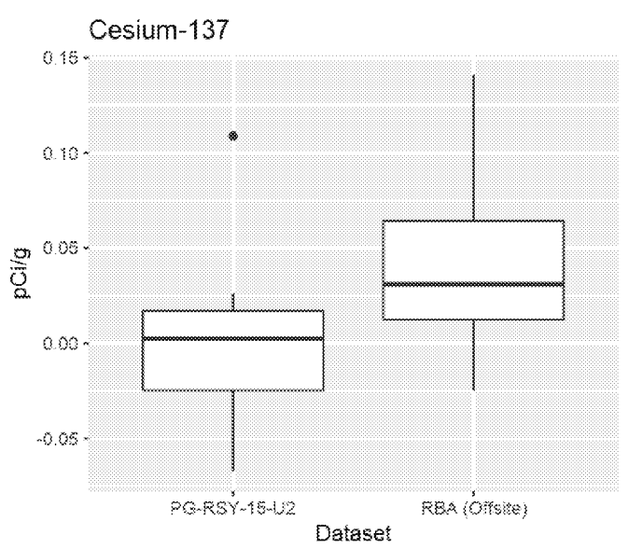
Soil Sample Statistics

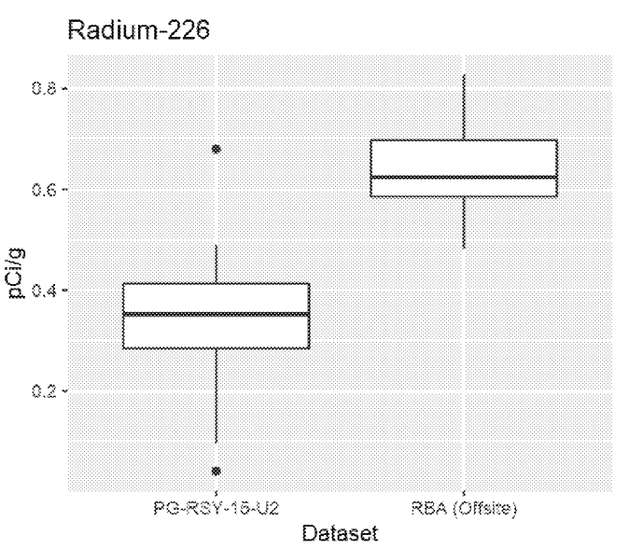












WILCOXON RANK SUM TEST

Nuclide: [redacted] Location: [redacted]

LBGR: [redacted] pCi/g

DCGL [redacted]

LBGR = [redacted]

LBGR = [redacted]

DATA	AREA	ADJUSTED DATA	RANKS	SURVEY UNIT RANKS	Sorted Ranks	Location Associated with Sorted Rank
[redacted]						
0.346						
0.321						
0.108						
0.329						
0.0468						
0.253						
0.408						
0.367						
0.207						
0.68						
0.37						
0.49						
0.31						
0.483						
0.352						
0.284						
0.398						
0.428						
0.413						
0.0411						
0.417						
0.286						
0.26						
0.378						
0.422						
	Sum =			325	7875	

	SU Stats	
Count	26	m
SD	0.131	
Median	0.352	

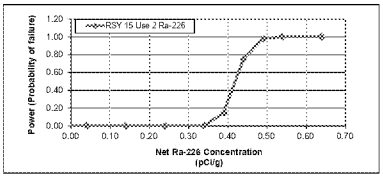
	Ref Stats	
Count	120	n
SD	0.673	

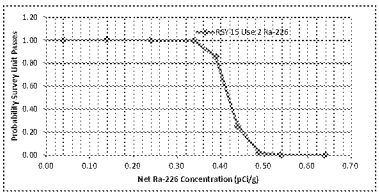
Critical Value [redacted]

Number of Samples	
n	0.025
LBGR	0.352
Δ/σ	0.52
Pr	1
N	25.21
N/2	13
Actual N	26
SU σ	0.131
Z(1-alpha)	1.96
Z(1-beta)	0.84

POWER CURVE CALCULATION

Concentration	above Background (C)	(C-LBGR)/SD	p1	p2	E(Wmw)	Var(Wmw)	SD(Wmw)	z	Power	Probability of passing
[redacted]										





QUANTILE TEST

From NUREG 1505, Table A.7b Values of r and k for the Quantile Test When α Is Approximately 0.025

[redacted] n (number of survey unit measurements)

[redacted] m (number of reference area measurements)

User

m = [redacted]

n = [redacted]

[redacted] r

[redacted] k

0.025 alpha

If k or more of the r largest measurements in the combined ranked data set are from the survey unit, the null hypothesis of the Quantile test (that there is no residual radioactivity above the LBGR in any part of the survey unit) is rejected.

[redacted]	The null hypothesis is accepted

# of R: [redacted] n

# of S: [redacted] m

Avg Rank R: [redacted]

Avg Rank S: [redacted]

For *m* or *n* greater than 20, the critical value (k) can be calculated from

$$\frac{m(n+m+1)}{2} + z\sqrt{\frac{mn(n+m+1)}{12}}$$

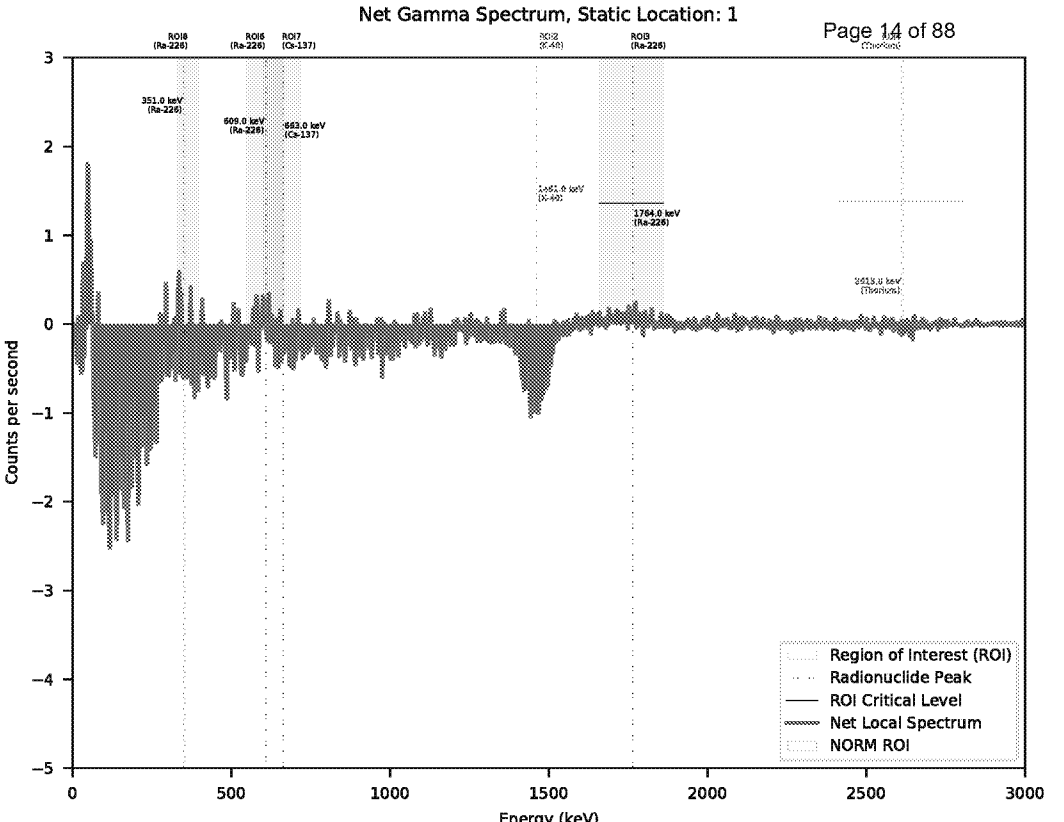
[redacted]

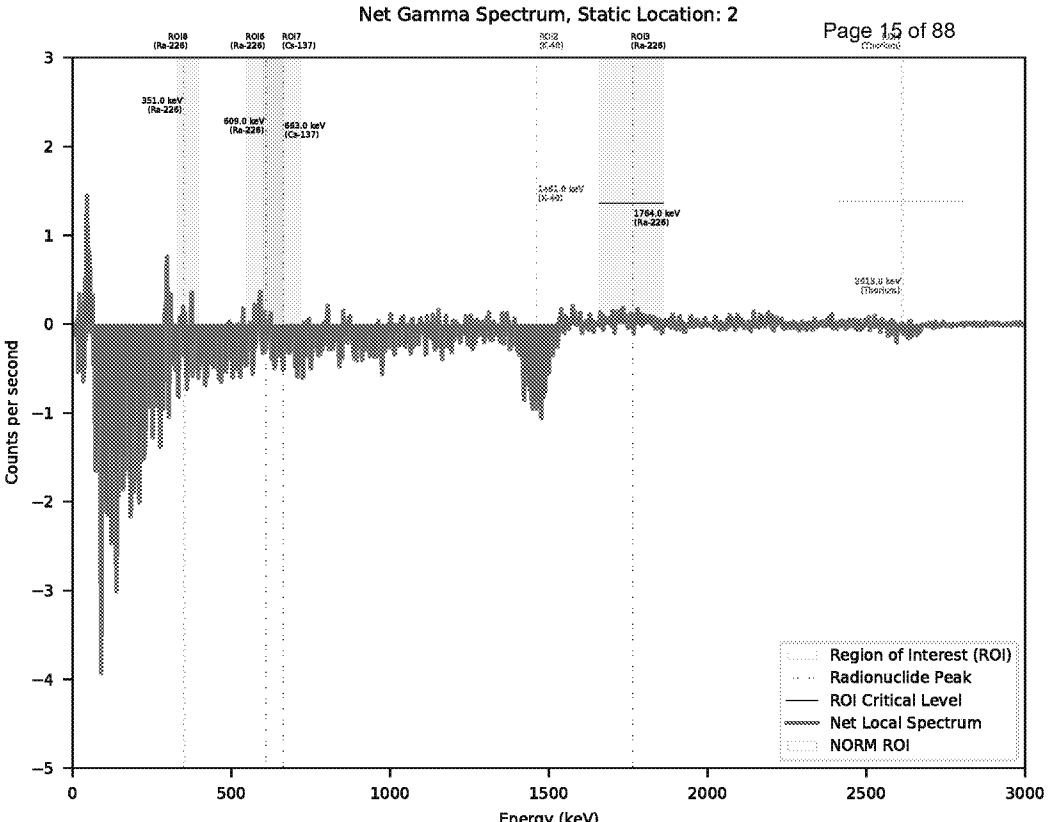
k = [redacted]

$\alpha_W = \alpha/2 =$ [redacted]

β = [redacted]

[redacted]


Net Gamma Spectrum, Static Location: 1
ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI3 (Ra-226)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
663.0 keV (Cs-137)
1764.0 keV (Ra-226)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
Local Dataset(s): \Static_2020-10-29_0537\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv
Local Coordinates (Longitude, Latitude): -122.36736523768121, 37.72443104202896



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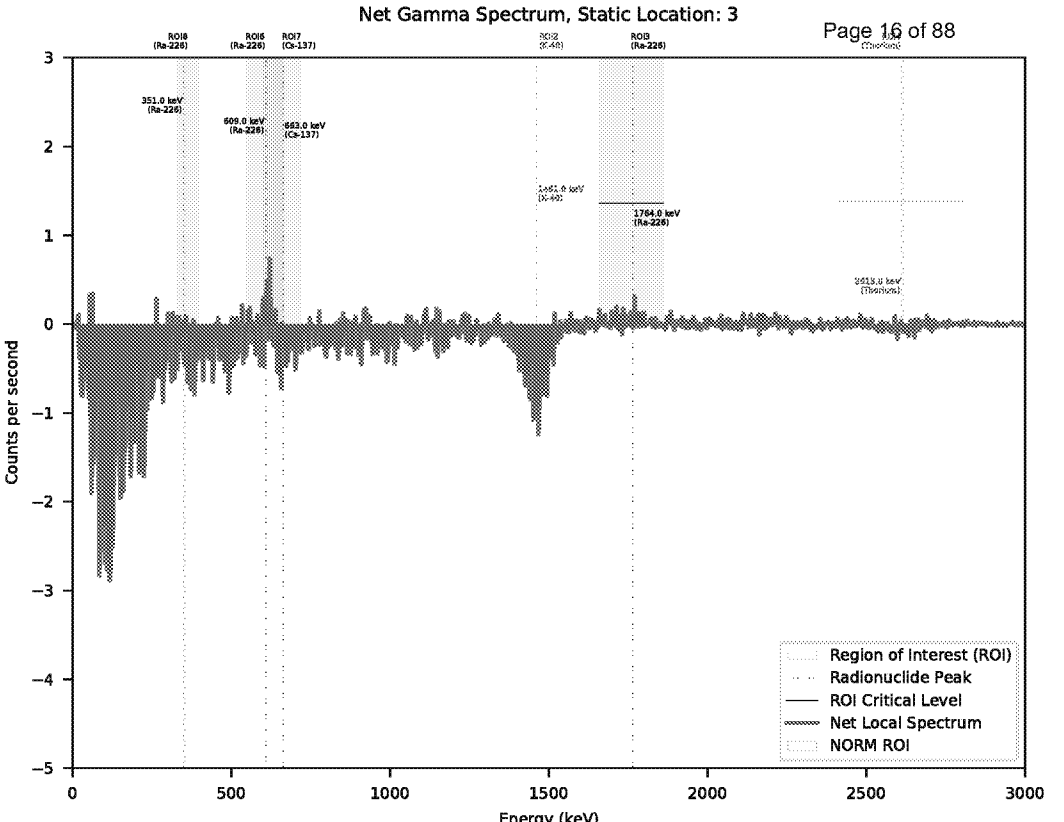

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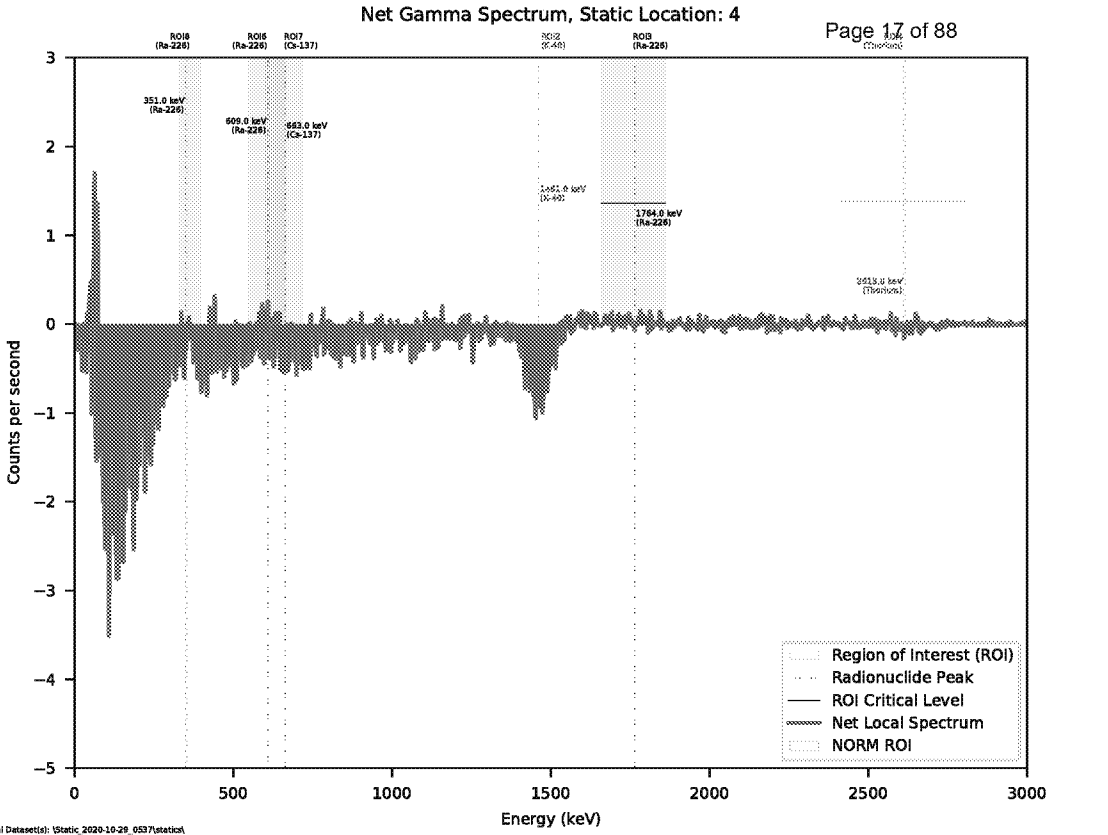
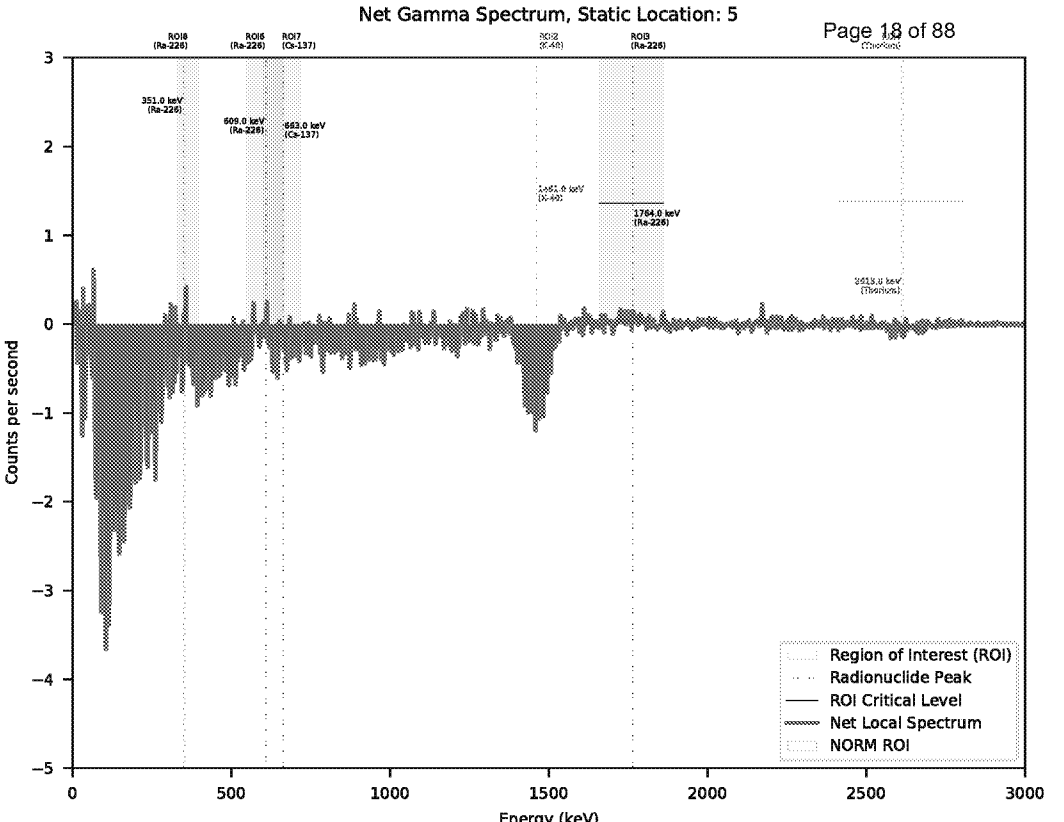

Net Gamma Spectrum, Static Location: 4
ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
663.0 keV (Cs-137)
1461.0 keV (K-40)
1764.0 keV (Ra-226)
2615.0 keV (Th-232)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
Local Dataset(s): \Static_2020-10-29_0537\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv
Local Coordinates (Longitude, Latitude): -122.36741460540536, 37.72442032972976



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Background Dataset(s): RSI2_SoilRBA_Static.csv

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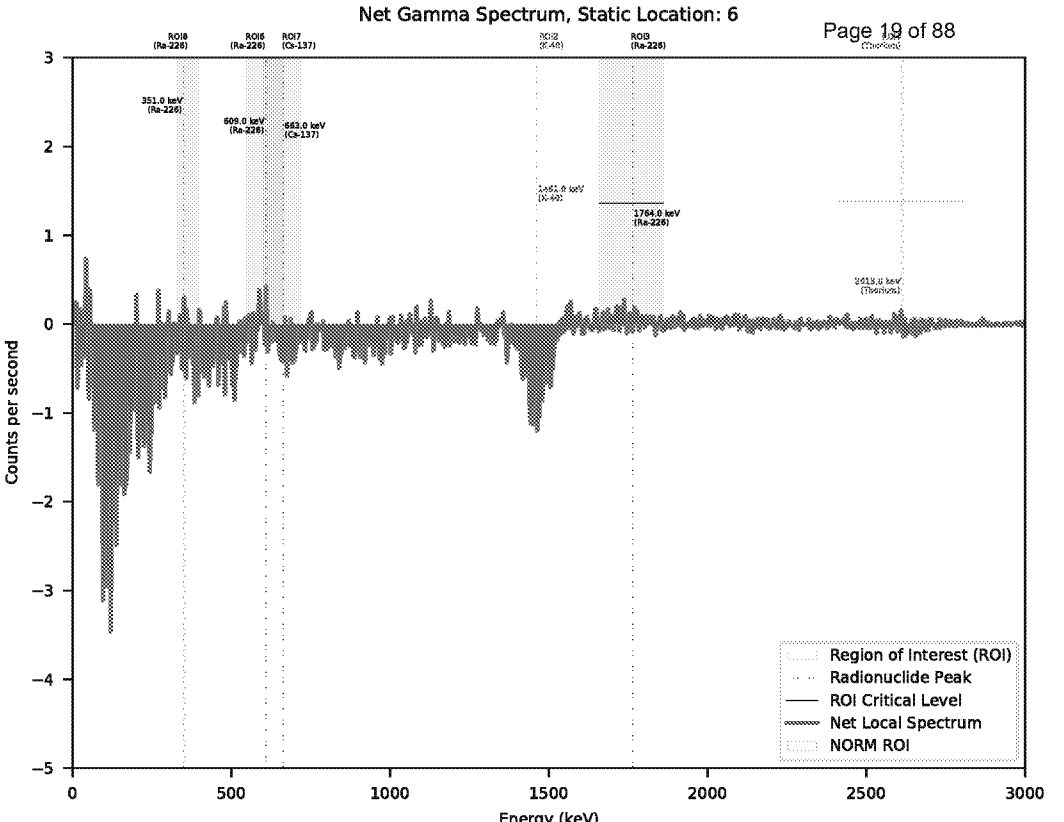

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Background Dataset(s): RSI2_SoilRBA_Static.csv

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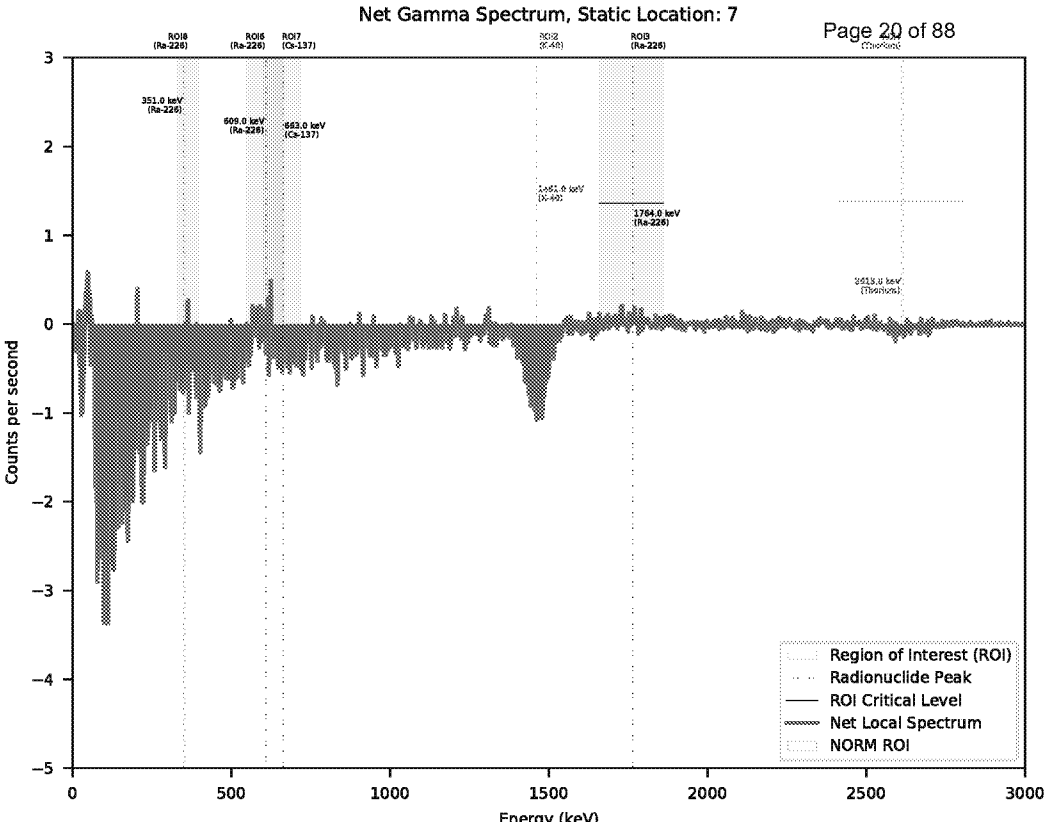

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Background Dataset(s): RSI2_SoilRBA_Static.csv

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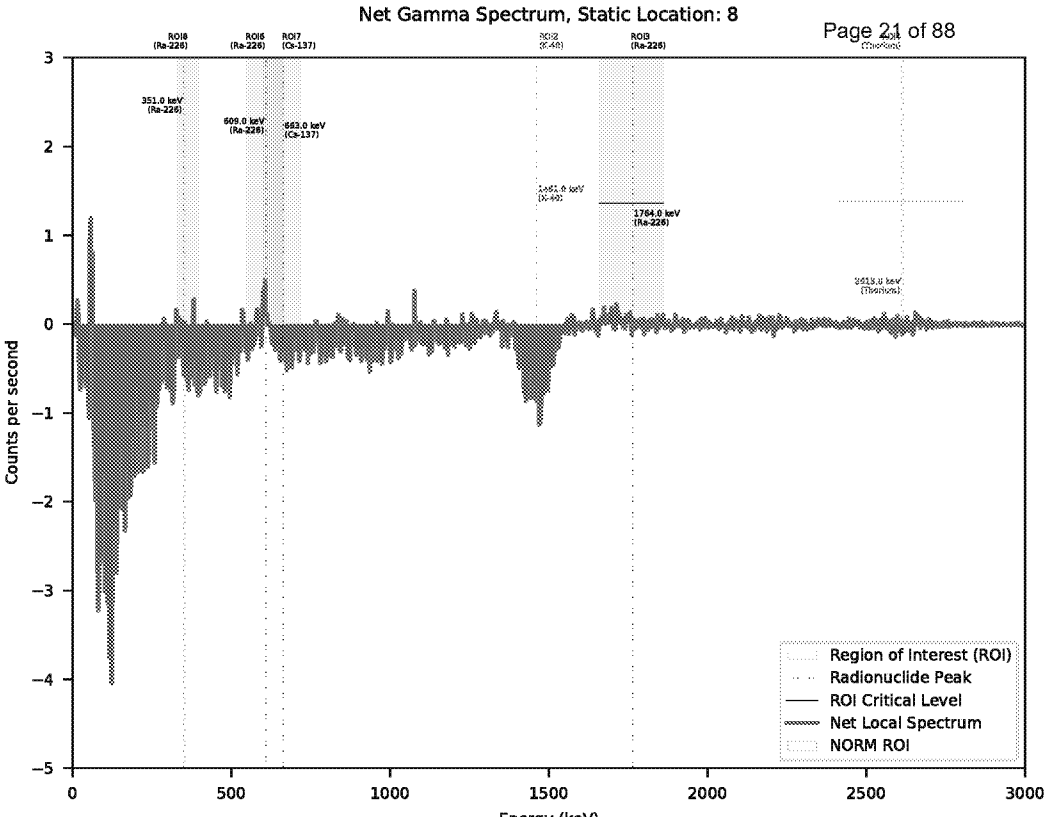

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Background Dataset(s): RSI2_SoilRBA_Static.csv

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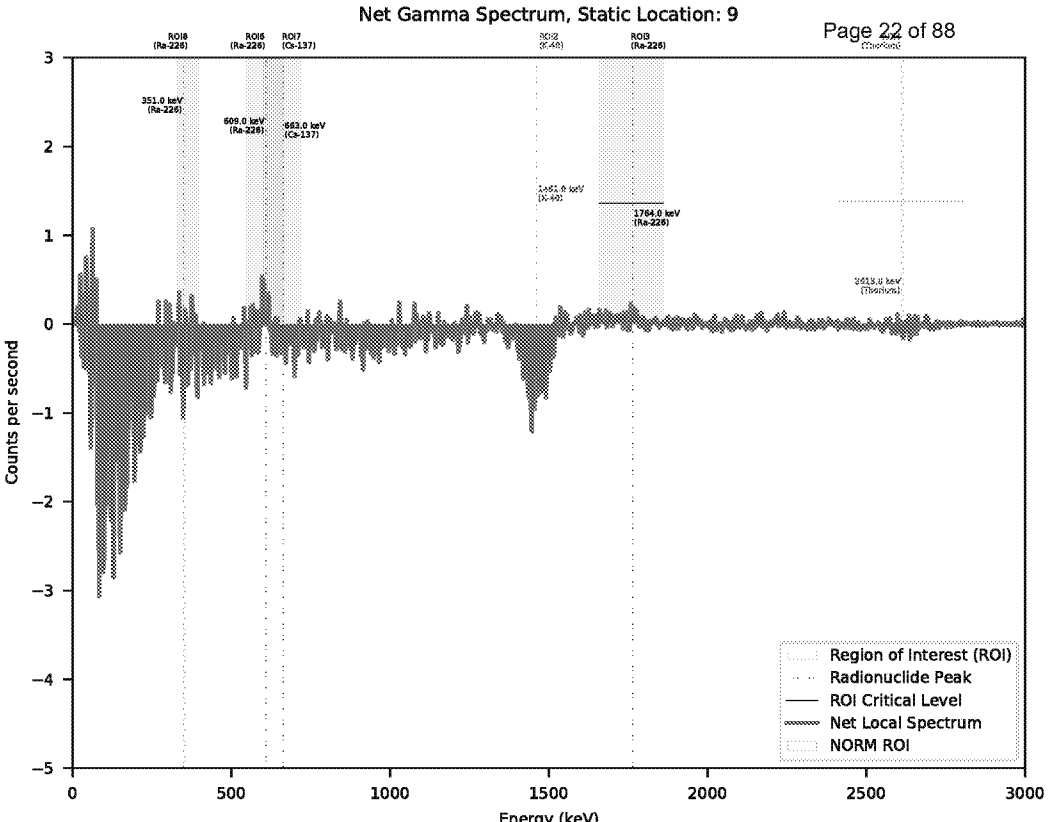

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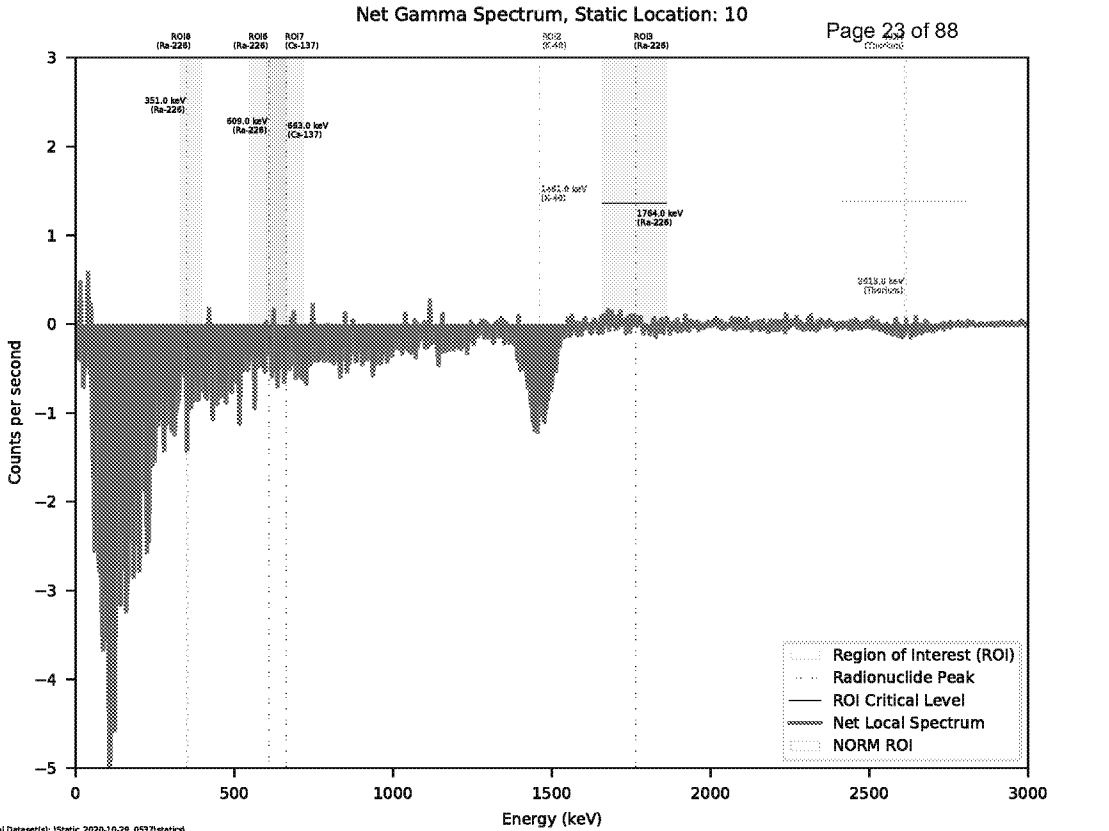
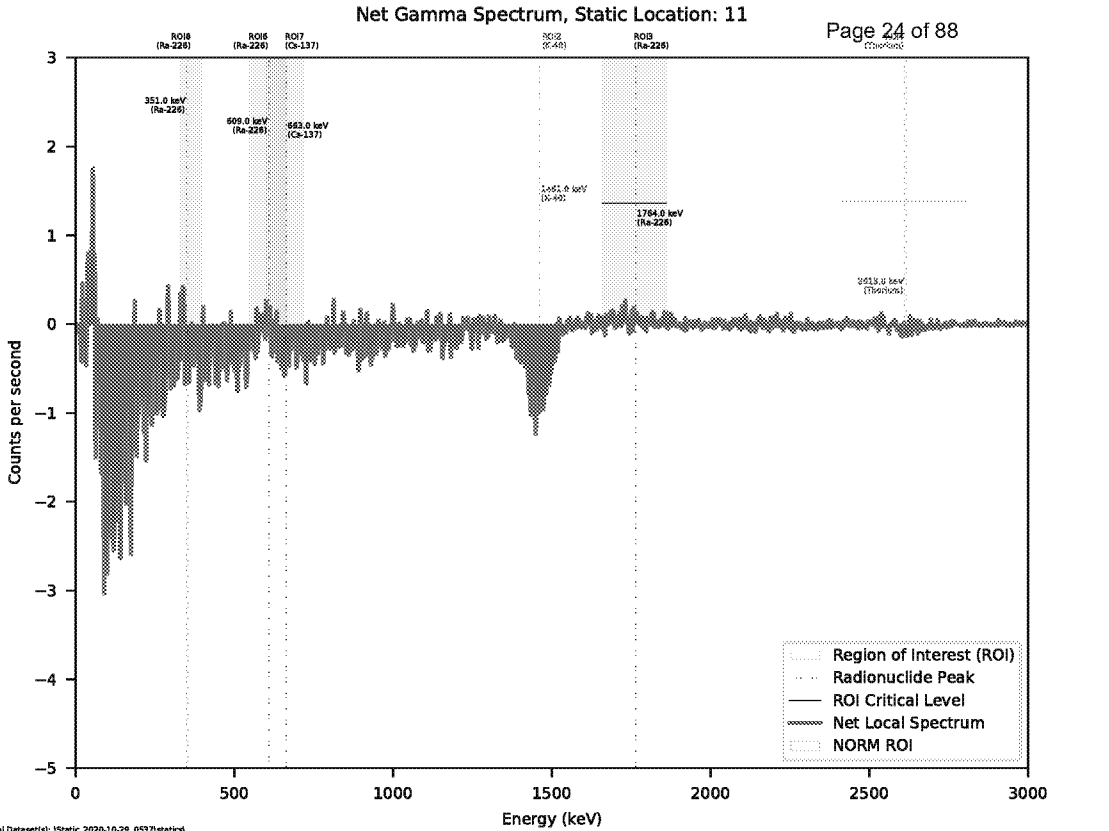

Net Gamma Spectrum, Static Location: 10
ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
663.0 keV (Cs-137)
1461.0 keV (K-40)
1764.0 keV (Ra-226)
2615.0 keV (Thorium)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
Local Dataset(s): \Static_2020-10-29_0537\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv
Local Coordinates (Longitude, Latitude): -122.3673400796874, 37.72448255937502


Net Gamma Spectrum, Static Location: 11
ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI3 (Ra-226)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
663.0 keV (Cs-137)
1764.0 keV (Ra-226)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
Local Dataset(s): \Static_2020-10-29_0537\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv
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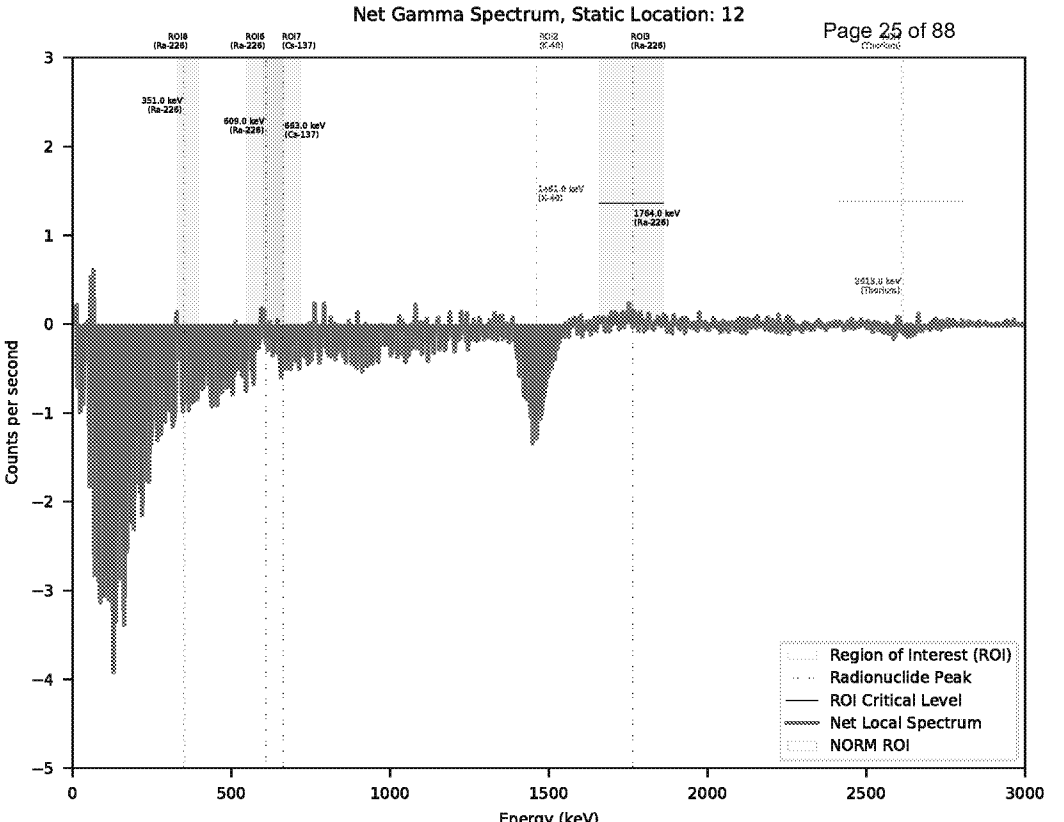
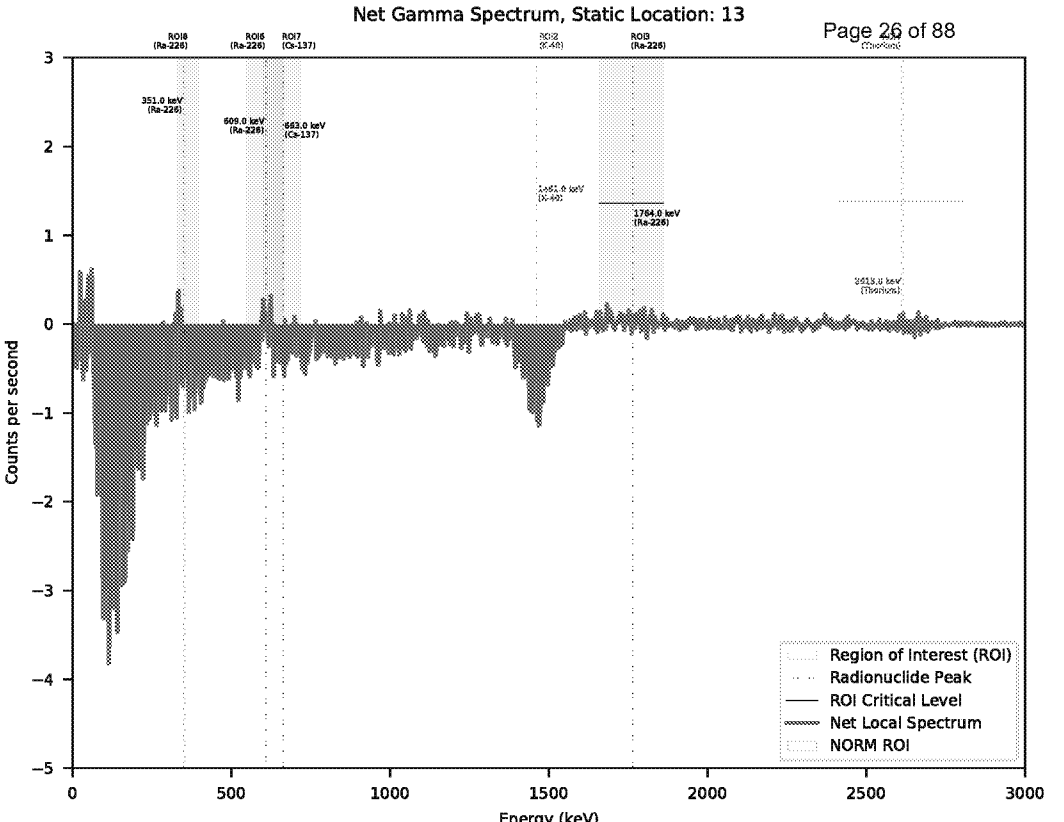

Net Gamma Spectrum, Static Location: 12
ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI3 (Ra-226)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
663.0 keV (Cs-137)
1764.0 keV (Ra-226)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
Local Dataset(s): \Static_2020-10-29_0537\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv
Local Coordinates (Longitude, Latitude): -122.3673459106061, 37.72449586030304


Net Gamma Spectrum, Static Location: 13
ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI3 (Ra-226)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
663.0 keV (Cs-137)
1764.0 keV (Ra-226)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
Local Dataset(s): \Static_2020-10-29_0537\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv
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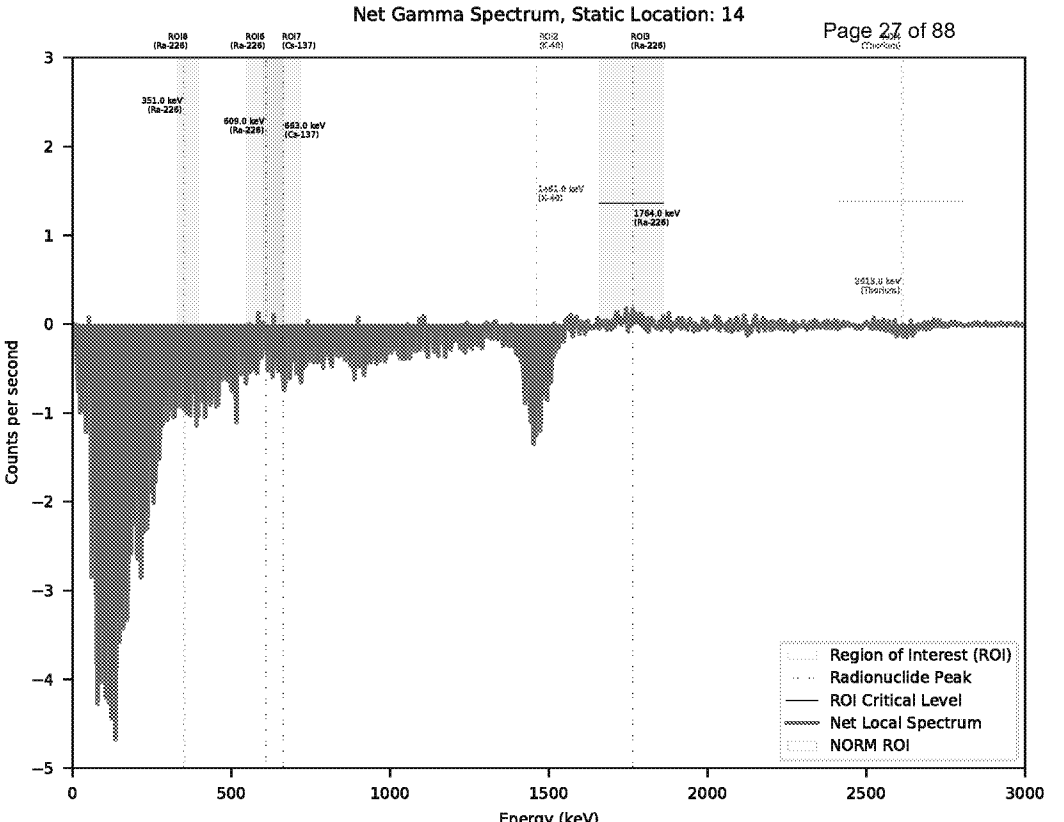
Net Gamma Spectrum, Static Location: 14
ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
663.0 keV (Cs-137)
1764.0 keV (Ra-226)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
Local Dataset(s): \Static_2020-10-29_0537\static\
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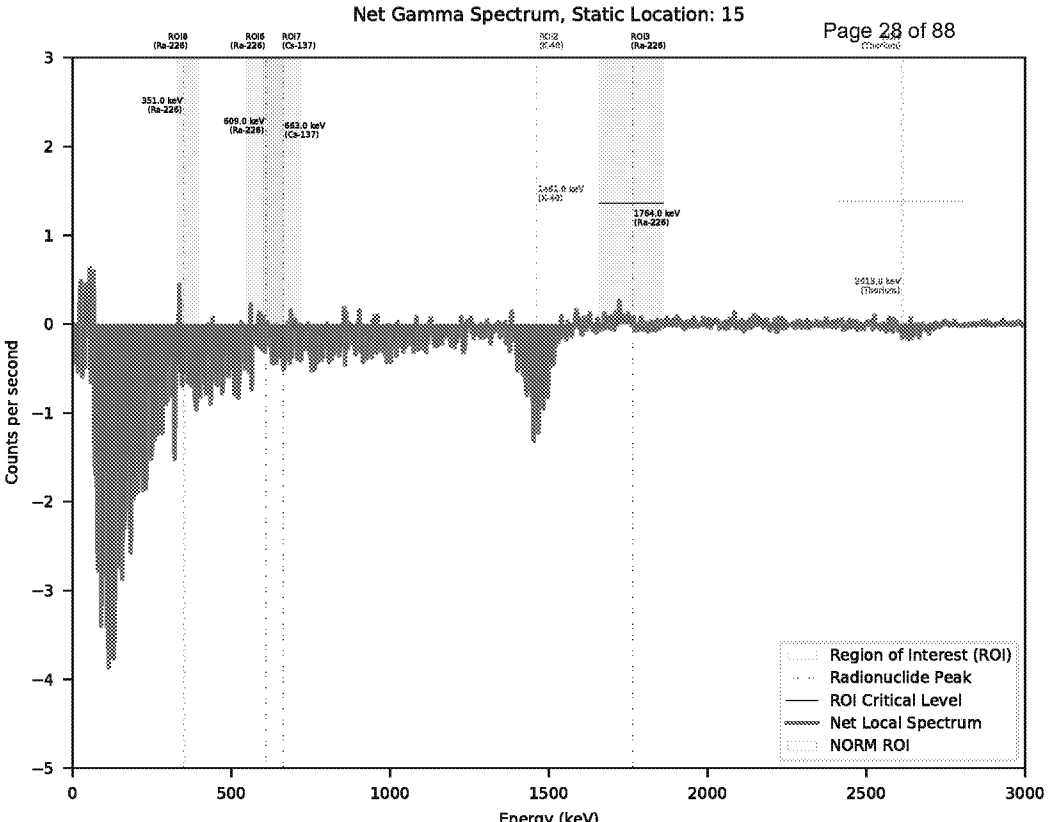
Net Gamma Spectrum, Static Location: 15
ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
663.0 keV (Cs-137)
1461.0 keV (K-40)
1764.0 keV (Ra-226)
2615.0 keV (Thorium)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
Local Dataset(s): \Static_2020-10-29_0537\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv
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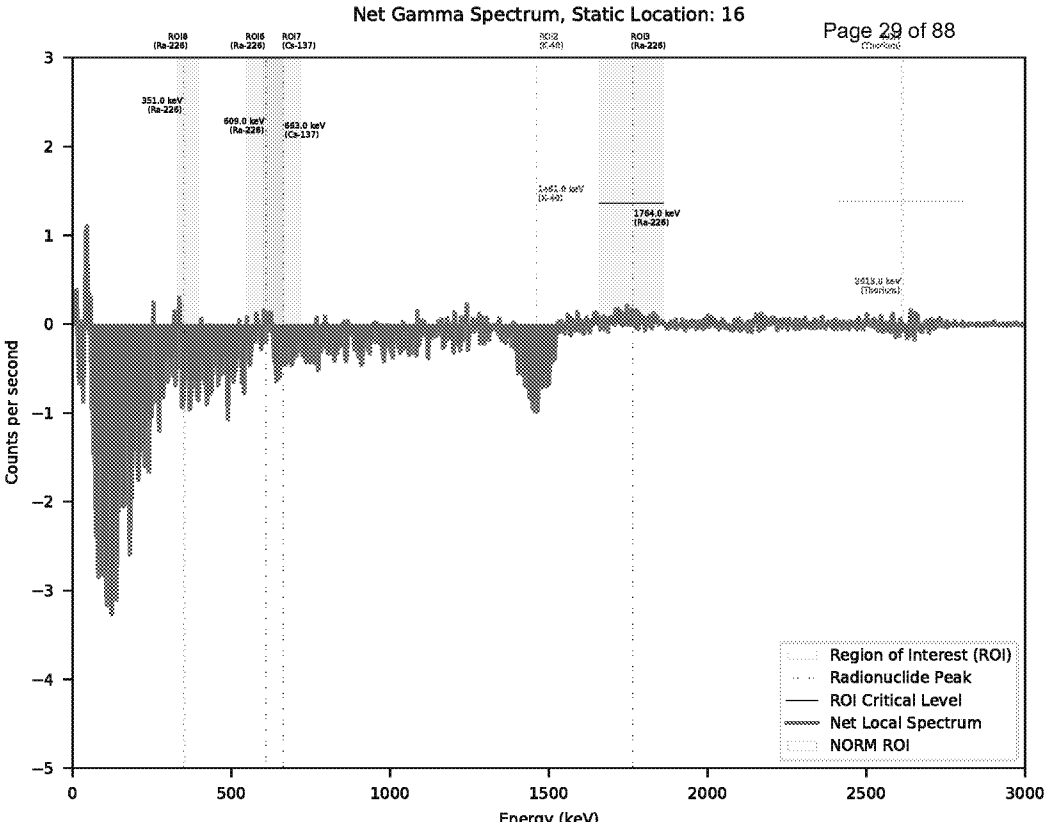
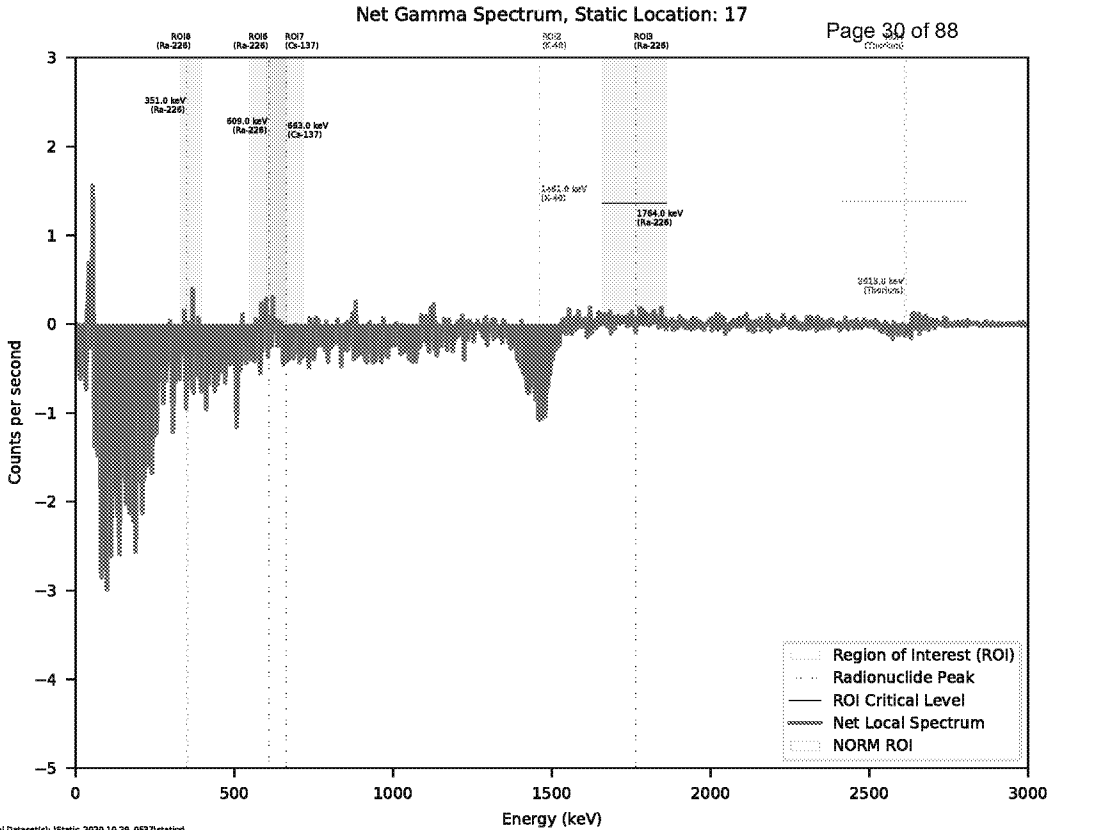

Net Gamma Spectrum, Static Location: 16
ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI3 (Ra-226)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
663.0 keV (Cs-137)
1764.0 keV (Ra-226)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
Local Dataset(s): \Static_2020-10-29_0537\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv
Local Coordinates (Longitude, Latitude): -122.3674949394366, 37.72443936619717


Net Gamma Spectrum, Static Location: 17
ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI3 (Ra-226)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
663.0 keV (Cs-137)
1764.0 keV (Ra-226)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
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Background Dataset(s): RSI2_SoilRBA_Static.csv
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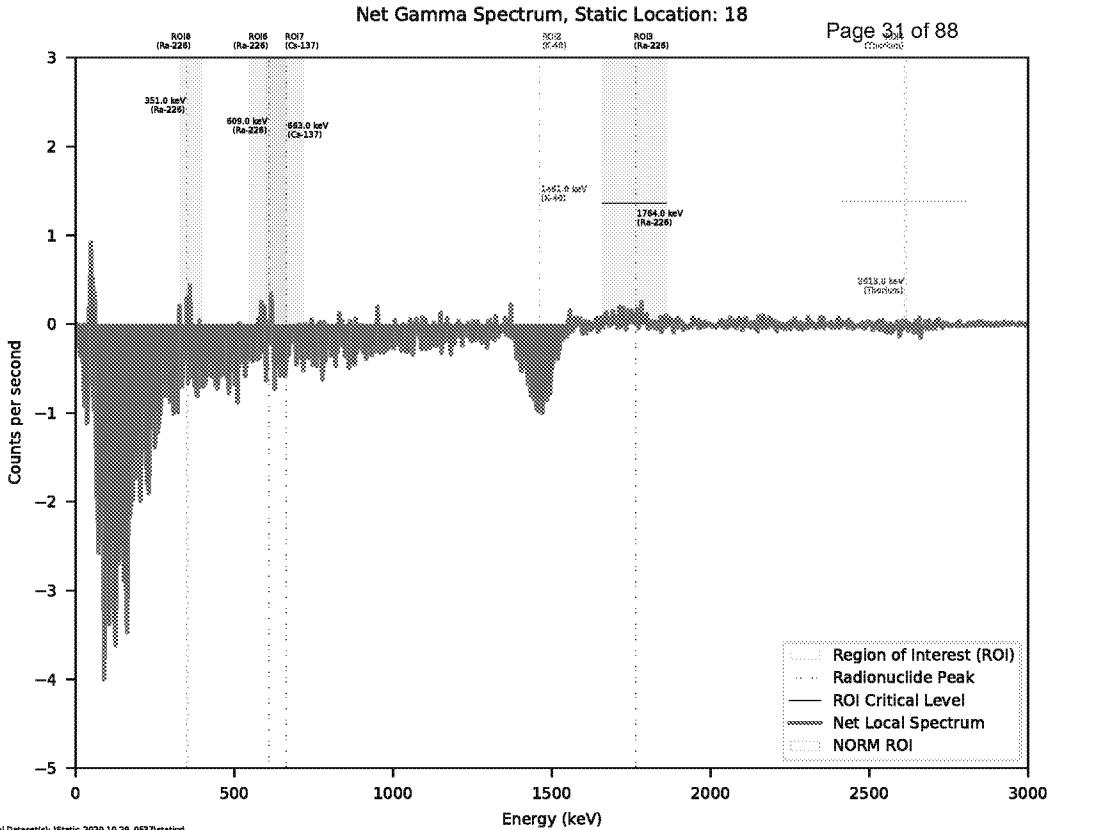
Net Gamma Spectrum, Static Location: 18
ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
663.0 keV (Cs-137)
1461.0 keV (K-40)
1764.0 keV (Ra-226)
2615.0 keV (Thorium)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
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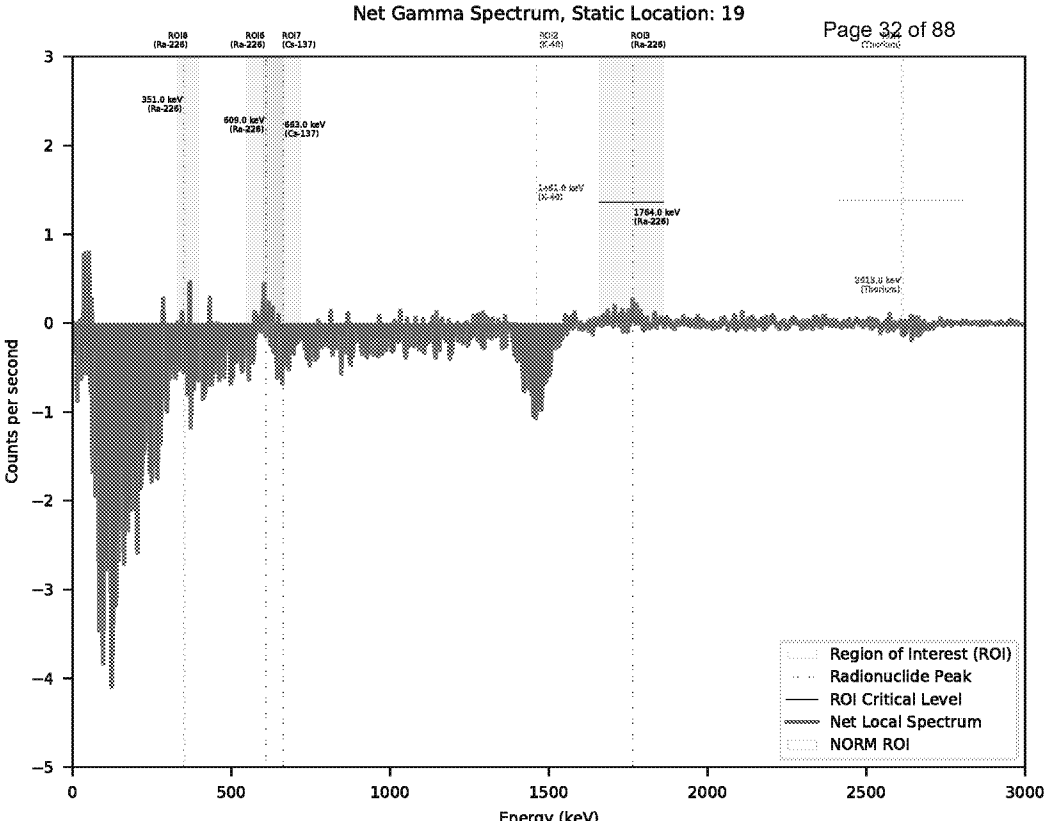

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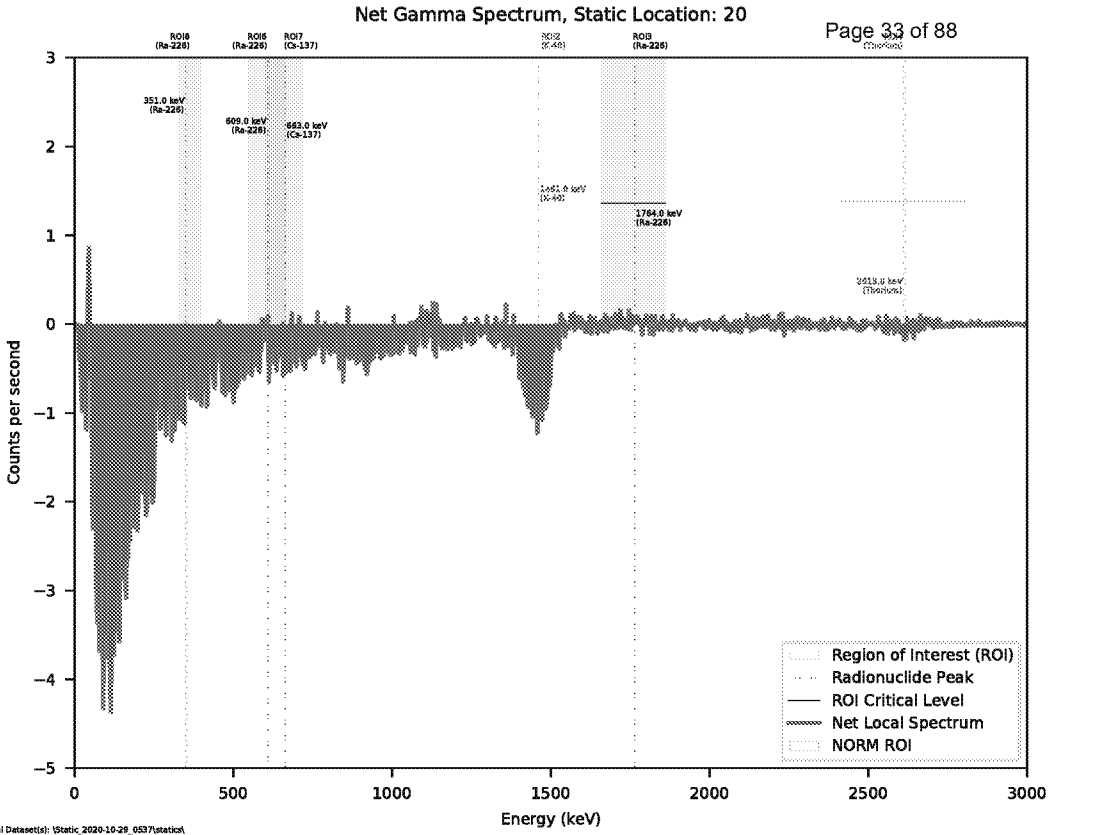
Net Gamma Spectrum, Static Location: 20
ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
663.0 keV (Cs-137)
1461.0 keV (K-40)
1764.0 keV (Ra-226)
2615.0 keV (Th-232)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
Local Dataset(s): \Static_2020-10-29_0537\static\
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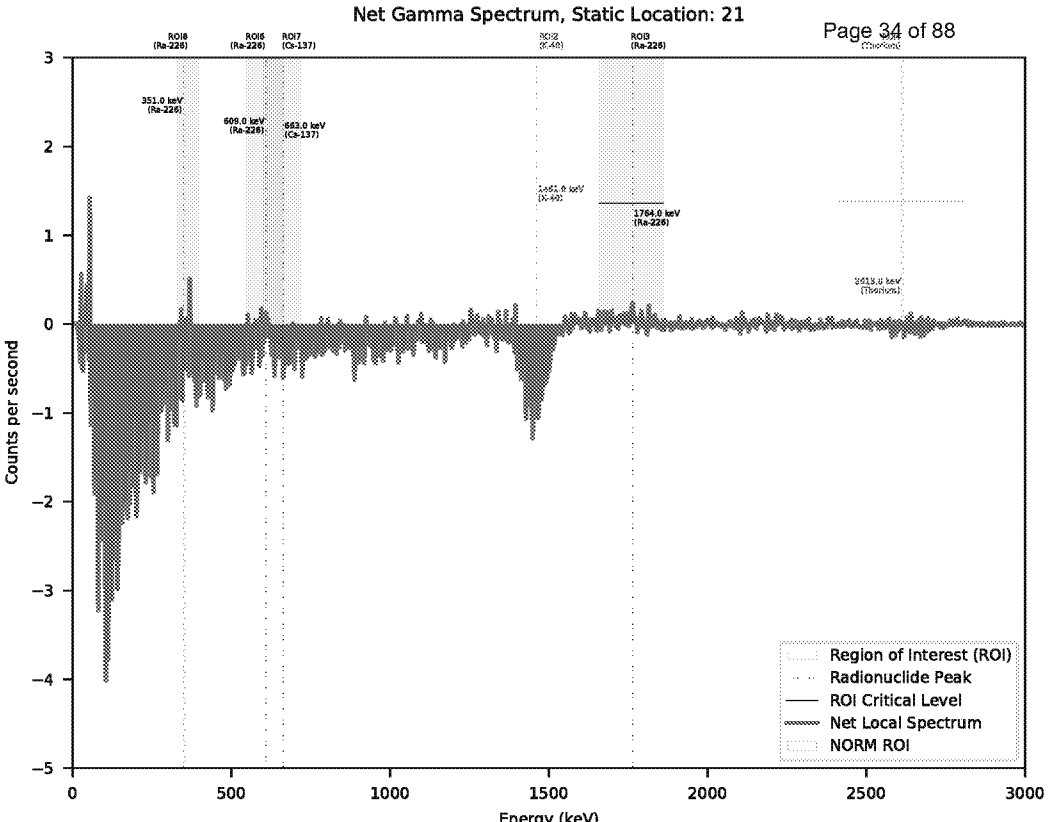
Net Gamma Spectrum, Static Location: 21
ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
663.0 keV (Cs-137)
1461.0 keV (K-40)
1764.0 keV (Ra-226)
2615.0 keV (Th-232)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
Local Dataset(s): \Static_2020-10-29_0537\static\
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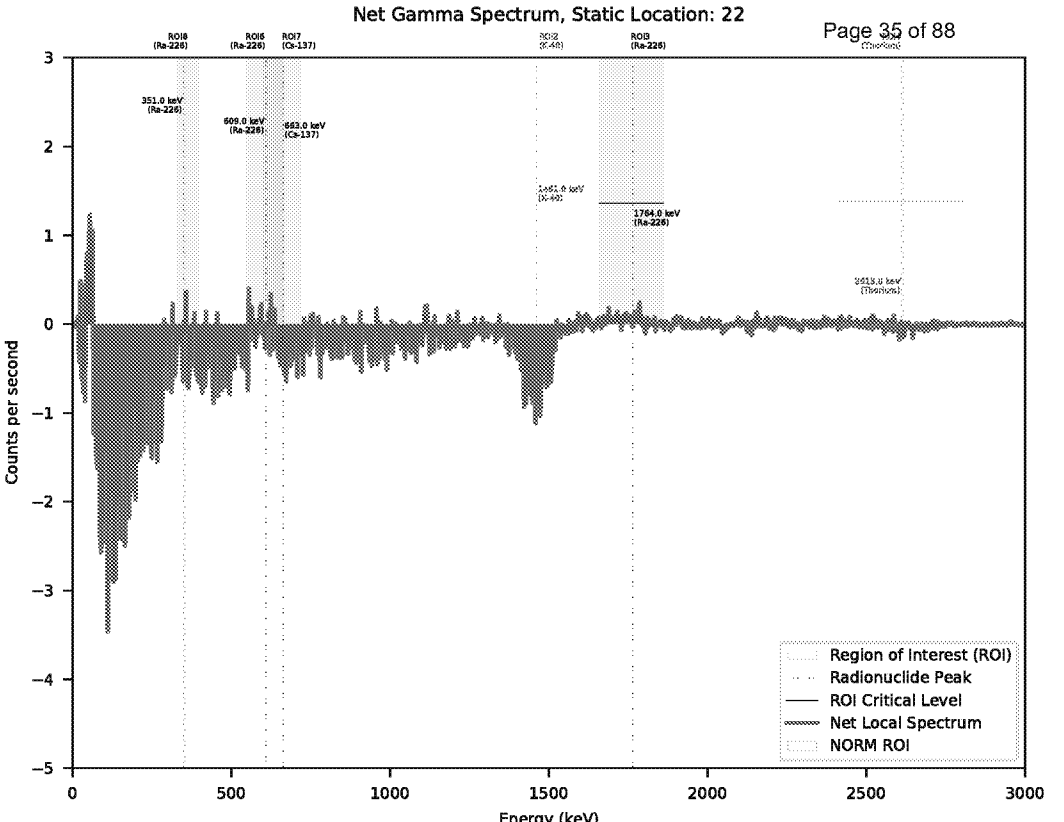

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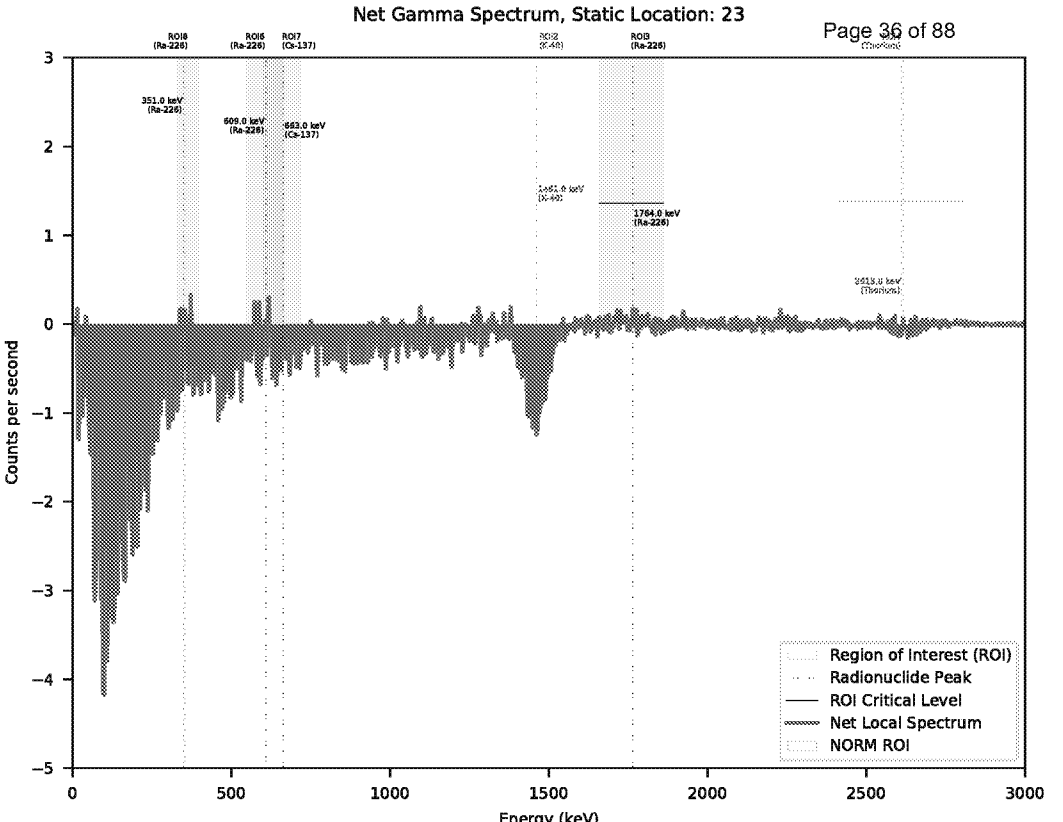

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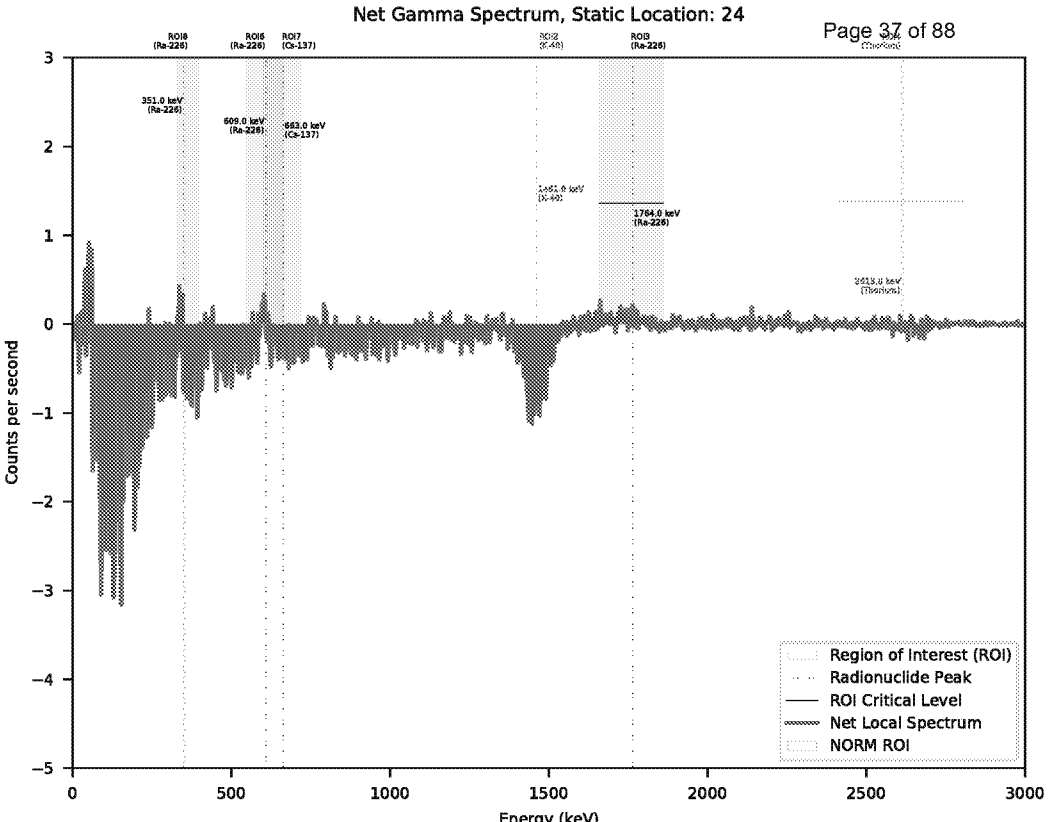

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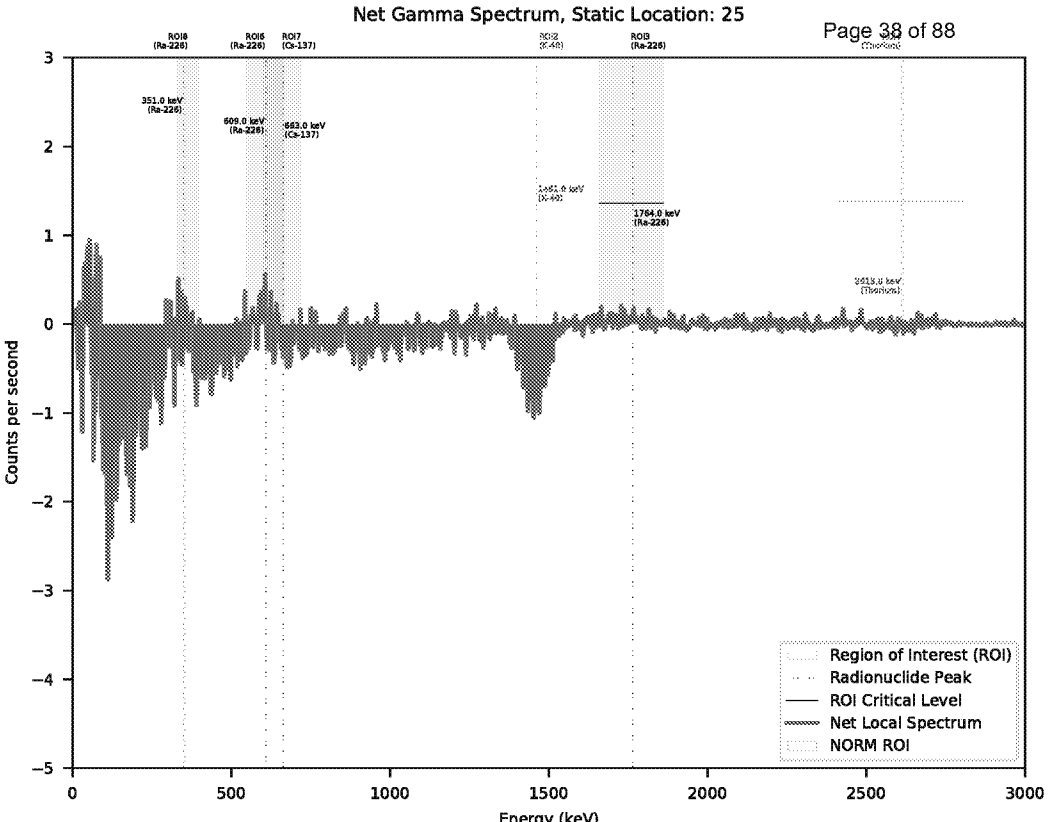

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Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.36742127887322, 37.72442839295774

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ANALYTICAL REPORT

Eurofins TestAmerica, St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

Laboratory Job ID: 160-40217-1
Laboratory Sample Delivery Group: GJ46599774
Client Project/Site: HPNS-Parcel G 501197
Revision: 1

For:
Aptim Federal Services LLC
4005 Port Chicago Hwy, Suite 200
Concord, California 94520

Attn: Rose Condit

Rhonda Ridenhower

Authorized for release by:
4/8/2021 11:56:53 AM

Rhonda Ridenhower, Client Service Manager
(314)298-8566
Rhonda.Ridenhower@Eurofinset.com

LINKS

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Cover Page 1
Table of Contents 2
Case Narrative 3
Chain of Custody 6
Receipt Checklists 10
Definitions/Glossary 11
Method Summary 12
Sample Summary 13
Client Sample Results 14
QC Sample Results 29
QC Association Summary 33
Tracer Carrier Summary 35

Job ID: 160-40217-1

Laboratory: Eurofins TestAmerica, St. Louis

Narrative

CASE NARRATIVE

Client: Aptim Federal Services LLC

Project: HPNS-Parcel G 501197

Report Number: 160-40217-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

Eurofins TestAmerica, St. Louis attests to the validity of the laboratory data generated by Eurofins TestAmerica facilities reported herein. All analyses performed by Eurofins TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. Eurofins TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an ""as received"" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.

The matrix for the Method Blank and LCS is as close to the following samples as can be reasonably achieved. Detailed information can be found in the most current revision of the associated SOP.

This laboratory report is confidential and is intended for the sole use of Eurofins TestAmerica and its client.

Revision 1- Additional information requested in case narrative for total strontium

Job ID: 160-40217-1 (Continued)

Laboratory: Eurofins TestAmerica, St. Louis (Continued)

RECEIPT
The samples were received on 11/02/2020; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 16.9 C.

TOTAL BETA STRONTIUM (GFPC)
Samples HPPG-F-025 (160-40217-1), HPPG-SFU-TU098B-001 (160-40217-3), HPPG-SFU-TU098B-011 (160-40217-13) and HPPG-SFU-TU098B-021 (160-40217-23) were analyzed for Total Beta Strontium (GFPC) in accordance with EPA 905. The samples were dried on 11/04/2020, prepared on 11/25/2020 and analyzed on 12/11/2020.

When taking small mass aliquots from dried/disaggregated sample, the laboratory avoids large rocks/pebbles (as well as sticks, etc) which may constitute a larger than representative portion of the aliquot. Smaller rocks may be included. This is consistent with QSM and Laboratory SOP: HPPG-SFU-TU098B-011 (160-40217-13), HPPG-SFU-TU098B-021 (160-40217-23), (160-40217-A-13-A DU), HPPG-F-025 (160-40217-1) and HPPG-SFU-TU098B-001 (160-40217-3).

The method blank (MB) Z-score is within limits and is located in the level IV raw data.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)
Samples HPPG-F-025 (160-40217-1), HPPG-F-026 (160-40217-2), HPPG-SFU-TU098B-001 (160-40217-3), HPPG-SFU-TU098B-002 (160-40217-4), HPPG-SFU-TU098B-003 (160-40217-5), HPPG-SFU-TU098B-004 (160-40217-6), HPPG-SFU-TU098B-005 (160-40217-7), HPPG-SFU-TU098B-006 (160-40217-8), HPPG-SFU-TU098B-007 (160-40217-9), HPPG-SFU-TU098B-008 (160-40217-10), HPPG-SFU-TU098B-009 (160-40217-11), HPPG-SFU-TU098B-010 (160-40217-12), HPPG-SFU-TU098B-011 (160-40217-13), HPPG-SFU-TU098B-012 (160-40217-14), HPPG-SFU-TU098B-013 (160-40217-15), HPPG-SFU-TU098B-014 (160-40217-16), HPPG-SFU-TU098B-015 (160-40217-17), HPPG-SFU-TU098B-016 (160-40217-18), HPPG-SFU-TU098B-017 (160-40217-19), HPPG-SFU-TU098B-018 (160-40217-20), HPPG-SFU-TU098B-019 (160-40217-21), HPPG-SFU-TU098B-020 (160-40217-22), HPPG-SFU-TU098B-021 (160-40217-23), HPPG-SFU-TU098B-022 (160-40217-24), HPPG-SFU-TU098B-023 (160-40217-25), HPPG-SFU-TU098B-024 (160-40217-26) and HPPG-SFU-TU098B-025 (160-40217-27) were analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA_01_R. The samples were dried on 11/04/2020, prepared on 11/06/2020 and analyzed on 11/29/2020.

Many isotopes requested for analysis do not have any gamma emissions, or the gamma emissions they do have are very poor. Often, such analytes are reported by gamma spectrometry assuming secular equilibrium with a longer-lived parent. The client should ensure that such inference is acceptable for their sample based upon process knowledge. The following assumptions were made for this report:

Inferred from	Reported to Analyte
Th-234	Pa-234
Th-234	U-238
Pb-210	Po-210
Pb-210	Bi-210
Cs-137	Ba-137m
Pb-212	Po-216
Xe-131m	Xe-131
Sb-125	Te-125m
Ag-108m	Ag-108
Rh-106	Ru-106
Pb-212	Th-228
Pb-212	Ra-224
U-235	Th-231
Ac-228	Th-232
Ac-228	Ra-228
Th-227	Ra-223
Th-227	Ac-227
Th-227	Bi-211
Th-227	Pb-211

Job ID: 160-40217-1 (Continued)

Laboratory: Eurofins TestAmerica, St. Louis (Continued)

Bi-214 Ra-226

Gamma Prep Batch 488492
The cesium-137 detection goal of 0.0700 pCi/g was not met. This is caused by statistical fluctuations in the Compton background due to low level activity in the samples in conjunction with the software attempting to fit a peak into the noise of this baseline. HPPG-SFU-TU098B-022 (160-40217-24).

The method blank (MB) Z-score is within limits and is located in the level IV raw data. (MB 160-488492/1-A)

Gamma prep batch 488491
The method blank (MB) z-score is within limits and is stored in the level IV raw data. (MB 160-488491/1-A)

The cesium-137 detection goal of 0.0700 pCi/g was not met. This is caused by statistical fluctuations in the Compton background due to low level activity in the samples in conjunction with the software attempting to fit a peak into the noise of this baseline. HPPG-SFU-TU098B-001 (160-40217-3), (HPPG-SFU-TU098B-016 (160-40217-18).

The replicate precision for Bi-212 associated with Prep Batch 160-488207 and 160-488491 does not meet QC criteria. This appears to be random in nature, and limited deviations such as this are statistically expected when larger analyte lists are reported. Such excursions are often caused by fluctuations in Compton background, force-fitting of peaks that are not found by the software peak-search algorithm, and inclusion of inferior peak results by the software in weighted averages. The laboratory SOP allows for such statistical exceedances. (160-40217-A-20-C DU).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

APTIM

CHAIN OF CUSTODY

Ref. Document # 501197RSY-023

APTIM Federal Services, LLC
4005 Port Chicago Hwy
Concord, CA 94520

Project Manager: Lisa Bercik
Phone #: (619)213-3389

Send Report to: Rose Condit
Phone/Fax Number: 415-987-0760
Address: 4005 Port Chicago Hwy

Sample Lead: Lewis, Devin

Sample Tech(s): Andrew Murri
Paul LeBlanc

Project Number: 501197
Project Name: Hunters Point Naval Shipyard: Parcel G Remedial Action
Project Location: San Francisco, CA
Purchase Order #: 1159058
Shipment/Pickup Date: 10/30/2020
Waybill Number: 4957 0225 ~~4307~~ 5851
Lab Destination: Test America (St. Louis Lab) 13715 Rider Trail North Earth City, MO 63046 10/30/20
Lab Contact Name/ph #: Rhoeda Ridenbower (314)298-8566

160-40217 Chain of Custody

Sample ID	Collection Information: Date	Time	Method	Matrix	# of Containers	Preservatives (water) / Preservatives (soil) / Container Type	Analysis Requested: Gamma Spec (EPA 901.1 M) - Full 21 day in growth gamma		Strontium-90 (EPA 905 MOD)				Dose Rate uR/Hr	Evidence Bag ID	Comment
HPPG-F-025	10/29/2020	14:29	G	SO	1	16 oz. plastic jar	X		X				5	GJ46599774	
HPPG-F-026	10/29/2020	14:57	G	SO	1	16 oz. plastic jar	X						5	GJ46599774	
HPPG-SFU-TU0988-001	10/29/2020	13:52	G	SO	1	16 oz. plastic jar	X		X				5	GJ46599774	
HPPG-SFU-TU0988-002	10/29/2020	13:56	G	SO	1	16 oz. plastic jar	X						5	GJ46599774	
HPPG-SFU-TU0988-003	10/29/2020	14:01	G	SO	1	16 oz. plastic jar	X						5	GJ46599774	
HPPG-SFU-TU0988-004	10/29/2020	14:05	G	SO	1	16 oz. plastic jar	X						5	GJ46599774	
HPPG-SFU-TU0988-005	10/29/2020	14:08	G	SO	1	16 oz. plastic jar	X						5	GJ46599774	
HPPG-SFU-TU0988-006	10/29/2020	14:11	G	SO	1	16 oz. plastic jar	X						5	GJ46599774	

Special Instructions:
21 day ingrowth results only
Analyze for Total Strontium as a screening step, and isotopic Sr-90 only if Total Strontium is above project action limit of 0.331 pCi/g

Turanaround Time: 3-day ☐ 10-Day ☐ 28-day ☐ Other ☐

Level of QC Required: I II III Project Specific

Method Codes C = Composite G = Grab **Matrix Codes:** DW = Drinking Water ; So = Soil; GW = Ground Water; SL = Sludge; WW = Waste Water; CP = Chip Samples; A = Air ; ABS = Asbestos; PO = Pipe Opening

Relinquished By:	Relinquisher Signature:	Relinquish Date Time:	Received By:	Received Signature:	Receive Date Time:
Lewis, Devin	[signature]	10/29/2020 15:55	Locked Storage (RKillpack)	[signature]	10/29/2020 15:55
Locked Storage (RKillpack)	[signature]	10/30/2020 15:39	Devin Lewis	[signature]	10/30/2020 15:39
Devin Lewis	[signature]	10/30/2020 15:42	SHIPPEDTOLAB	FED EX	

*** Last 3 transfers shown above - Complete list of transfers on last page ***

FED EX

Micha Korrinhizer NOV 02 2020 08:50
MICHA KORRINHIZER

APTIM

CHAIN OF CUSTODY

Ref. Document # 501197RSY-023

APTIM Federal Services, LLC
4005 Port Chicago Hwy
Concord, CA 94520

Project Manager: Lisa Bercik
Phone #: (619)213-3389

Send Report to: Rose Condit
Phone/Fax Number: 415-987-0760
Address: 4005 Port Chicago Hwy
City: Concord, CA 94520

Sample Lead: Lewis, Devin

Sample Tech(s): Andrew Murri
Paul LeBlanc

Project Number: 501197
Project Name: Hunters Point Naval Shipyard: Parcel G Remedial Action
Project Location: San Francisco, CA
Purchase Order #: 1159058
Shipment/Pickup Date: 10/30/2020
Waybill Number: 4957 0225 4397 5451
Lab Destination: Test America (St. Louis Lab) 13715 Rider Trail North Earth City, MO 63046
Lab Contact Name/ph # Rhoeda Ridenbower (314)298-8566

	Collection Information						Analysis Requested								
Sample ID	Date	Time	Method	Matrix	# of Containers	Preservatives (water) / Preservatives (soil) / Container Type	Gamma Spec (EPA 901.1 M) - Full 21 day in growth gamma		Strontium-90 (EPA 905 MOD)				Dose Rate uR/Hr	Evidence Bag ID	Comment
HPPG-SFU-TU098B-007	10/29/2020	14:14	G	SO	1	16 oz. plastic jar	X						5	GJ46599774	
HPPG-SFU-TU098B-008	10/29/2020	14:18	G	SO	1	16 oz. plastic jar	X						5	GJ46599774	
HPPG-SFU-TU098B-009	10/29/2020	14:22	G	SO	1	16 oz. plastic jar	X						5	GJ46599774	
HPPG-SFU-TU098B-010	10/29/2020	14:26	G	SO	1	16 oz. plastic jar	X						5	GJ46599774	
HPPG-SFU-TU098B-011	10/29/2020	14:29	G	SO	1	16 oz. plastic jar	X		X				5	GJ46599774	
HPPG-SFU-TU098B-012	10/29/2020	14:32	G	SO	1	16 oz. plastic jar	X						5	GJ46599774	
HPPG-SFU-TU098B-013	10/29/2020	14:34	G	SO	1	16 oz. plastic jar	X						5	GJ46599774	
HPPG-SFU-TU098B-014	10/29/2020	14:36	G	SO	1	16 oz. plastic jar	X						5	GJ46599774	
HPPG-SFU-TU098B-015	10/29/2020	14:38	G	SO	1	16 oz. plastic jar	X						5	GJ46599774	
HPPG-SFU-TU098B-016	10/29/2020	14:41	G	SO	1	16 oz. plastic jar	X						5	GJ46599774	
HPPG-SFU-TU098B-017	10/29/2020	14:42	G	SO	1	16 oz. plastic jar	X						5	GJ46599774	
HPPG-SFU-TU098B-018	10/29/2020	14:44	G	SO	1	16 oz. plastic jar	X						5	GJ46599774	
HPPG-SFU-TU098B-019	10/29/2020	14:46	G	SO	1	16 oz. plastic jar	X						5	GJ46599774	
HPPG-SFU-TU098B-020	10/29/2020	14:46	G	SO	1	16 oz. plastic jar	X						5	GJ46599774	
HPPG-SFU-TU098B-021	10/29/2020	14:48	G	SO	1	16 oz. plastic jar	X		X				5	GJ46599774	
HPPG-SFU-TU098B-022	10/29/2020	14:50	G	SO	1	16 oz. plastic jar	X						5	GJ46599774	
HPPG-SFU-TU098B-023	10/29/2020	14:53	G	SO	1	16 oz. plastic jar	X						5	GJ46599774	

APTIM

CHAIN OF CUSTODY

Ref. Document # 501197RSY-023

APTIM Federal Services, LLC
4005 Port Chicago Hwy
Concord, CA 94520

Project Manager: Lisa Bercik
Phone #: (619)213-3389

Send Report to: Rose Condit
Phone/Fax Number: 415-987-0760
Address: 4005 Port Chicago Hwy
City: Concord, CA 94520

Sample Lead: Lewis, Devin

Sample Tech(s): Andrew Murri
Paul LeBlanc

Project Number: 501197
Project Name: Hunters Point Naval Shipyard: Parcel G Remedial Action
Project Location: San Francisco, CA
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Shipment/Pickup Date: 10/30/2020
Waybill Number: 4957 0225 4307 5451
Lab Destination: Test America (St. Louis Lab) 13715 Rider Trail North Earth City, MO 63046
Lab Contact Name/ph #: Rhoeda Ridenbower (314)298-8566

	Collection Information						Analysis Requested								
Sample ID	Date	Time	Method	Matrix	# of Containers	Preservatives (water) / Preservatives (soil) / Container Type	Gamma Spec (EPA 901.1 M) - Full 21 day in growth gamma		Strontium-90 (EPA 905 MOD)				Dose Rate uR/Hr	Evidence Bag ID	Comment
HPPG-SFU-TU098B-024	10/29/2020	14:54	G	SO	1	16 oz. plastic jar	X						5	GJ46599774	
HPPG-SFU-TU098B-025	10/29/2020	14:57	G	SO	1	16 oz. plastic jar	X						5	GJ46599774	

All Transfers for COC 501197RSY-023

Relinquished By:	Relinquisher Signature:	Relinquish Date Time:	Received By:	Received Signature:	Receive Date Time:
Lewis, Devin		10/29/2020 15:55	Locked Storage (RKillpack)		10/29/2020 15:55
Locked Storage (RKillpack)		10/30/2020 15:39	Devin Lewis		10/30/2020 15:39
Devin Lewis	FED EX	10/30/2020 15:42	SHIPPEDTOLAB	FED EX	

Micha Koninhinger
MICHA KORRINHINGER

NOV 02 2020
08:50

Login Sample Receipt Checklist

Client: Aptim Federal Services LLC

Job Number: 160-40217-1
SDG Number: GJ46599774

Login Number: 40217
List Number: 1
Creator: Hoerchler, Elizabeth M

List Source: Eurofins TestAmerica, St. Louis

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40217-1
SDG: GJ46599774

Qualifiers

Rad

Qualifier	Qualifier Description
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Method Summary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40217-1
SDG: GJ46599774

Method	Method Description	Protocol	Laboratory
905.0	Total Beta Strontium (GFPC)	DOE	TAL SL
GA-01-R	Radium-226 & Other Gamma Emitters (GS)	DOE	TAL SL
DPS-0	Preparation, Digestion/ Precipitate	None	TAL SL
Dry and Grind	Preparation, Dry and Grind	None	TAL SL
Fill_Geo-21	Fill Geometry, 21-Day In-Growth	None	TAL SL

Protocol References:

DOE = U.S. Department of Energy
None = None

Laboratory References:

TAL SL = Eurofins TestAmerica, St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40217-1
SDG: GJ46599774

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
160-40217-1	HPPG-F-025	Solid	10/29/20 14:29	11/02/20 08:50	
160-40217-2	HPPG-F-026	Solid	10/29/20 14:57	11/02/20 08:50	
160-40217-3	HPPG-SFU-TU098B-001	Solid	10/29/20 13:52	11/02/20 08:50	
160-40217-4	HPPG-SFU-TU098B-002	Solid	10/29/20 13:56	11/02/20 08:50	
160-40217-5	HPPG-SFU-TU098B-003	Solid	10/29/20 14:01	11/02/20 08:50	
160-40217-6	HPPG-SFU-TU098B-004	Solid	10/29/20 14:05	11/02/20 08:50	
160-40217-7	HPPG-SFU-TU098B-005	Solid	10/29/20 14:08	11/02/20 08:50	
160-40217-8	HPPG-SFU-TU098B-006	Solid	10/29/20 14:11	11/02/20 08:50	
160-40217-9	HPPG-SFU-TU098B-007	Solid	10/29/20 14:14	11/02/20 08:50	
160-40217-10	HPPG-SFU-TU098B-008	Solid	10/29/20 14:18	11/02/20 08:50	
160-40217-11	HPPG-SFU-TU098B-009	Solid	10/29/20 14:22	11/02/20 08:50	
160-40217-12	HPPG-SFU-TU098B-010	Solid	10/29/20 14:26	11/02/20 08:50	
160-40217-13	HPPG-SFU-TU098B-011	Solid	10/29/20 14:29	11/02/20 08:50	
160-40217-14	HPPG-SFU-TU098B-012	Solid	10/29/20 14:32	11/02/20 08:50	
160-40217-15	HPPG-SFU-TU098B-013	Solid	10/29/20 14:34	11/02/20 08:50	
160-40217-16	HPPG-SFU-TU098B-014	Solid	10/29/20 14:36	11/02/20 08:50	
160-40217-17	HPPG-SFU-TU098B-015	Solid	10/29/20 14:38	11/02/20 08:50	
160-40217-18	HPPG-SFU-TU098B-016	Solid	10/29/20 14:41	11/02/20 08:50	
160-40217-19	HPPG-SFU-TU098B-017	Solid	10/29/20 14:42	11/02/20 08:50	
160-40217-20	HPPG-SFU-TU098B-018	Solid	10/29/20 14:44	11/02/20 08:50	
160-40217-21	HPPG-SFU-TU098B-019	Solid	10/29/20 14:46	11/02/20 08:50	
160-40217-22	HPPG-SFU-TU098B-020	Solid	10/29/20 14:46	11/02/20 08:50	
160-40217-23	HPPG-SFU-TU098B-021	Solid	10/29/20 14:48	11/02/20 08:50	
160-40217-24	HPPG-SFU-TU098B-022	Solid	10/29/20 14:50	11/02/20 08:50	
160-40217-25	HPPG-SFU-TU098B-023	Solid	10/29/20 14:53	11/02/20 08:50	
160-40217-26	HPPG-SFU-TU098B-024	Solid	10/29/20 14:54	11/02/20 08:50	
160-40217-27	HPPG-SFU-TU098B-025	Solid	10/29/20 14:57	11/02/20 08:50	

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40217-1
SDG: GJ46599774

Client Sample ID: HPPG-F-025

Lab Sample ID: 160-40217-1
Matrix: Solid

Date Collected: 10/29/20 14:29
Date Received: 11/02/20 08:50

Method: 905.0 - Total Beta Strontium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Total Beta Strontium	-0.00509	U	0.0524	0.0524	0.160	0.0435	pCi/g	11/25/20 14:30	12/11/20 07:06	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*105*		*40 - 110*	*11/25/20 14:30*	*12/11/20 07:06*	*1*

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.411**		0.185	0.190		0.127	pCi/g	11/06/20 18:15	11/29/20 15:26	1
Actinium-227	0.113	U	0.542	0.543		0.333	pCi/g	11/06/20 18:15	11/29/20 15:26	1
Bismuth-212	0.000	U	0.454	0.454		0.635	pCi/g	11/06/20 18:15	11/29/20 15:26	1
Bismuth-214	0.0764	U	0.154	0.155		0.148	pCi/g	11/06/20 18:15	11/29/20 15:26	1
Cesium-137	-0.0392	U	0.0679	0.0680	0.0700	0.0528	pCi/g	11/06/20 18:15	11/29/20 15:26	1
Lead-210	**1.05**		1.50	1.51		0.947	pCi/g	11/06/20 18:15	11/29/20 15:26	1
Lead-212	0.00942	U	0.126	0.126		0.103	pCi/g	11/06/20 18:15	11/29/20 15:26	1
Lead-214	**0.303**		0.0991	0.104		0.0817	pCi/g	11/06/20 18:15	11/29/20 15:26	1
Potassium-40	**7.63**		1.25	1.47		0.287	pCi/g	11/06/20 18:15	11/29/20 15:26	1
Protactinium-231	0.216	U	2.58	2.58		2.12	pCi/g	11/06/20 18:15	11/29/20 15:26	1
Protactinium-234	0.0386	U	0.0614	0.0615		0.184	pCi/g	11/06/20 18:15	11/29/20 15:26	1
Radium-226	0.0764	U	0.154	0.155	0.200	0.148	pCi/g	11/06/20 18:15	11/29/20 15:26	1
Radium-228	**0.411**		0.185	0.190		0.127	pCi/g	11/06/20 18:15	11/29/20 15:26	1
Thallium-208	**0.161**		0.0532	0.0557		0.0213	pCi/g	11/06/20 18:15	11/29/20 15:26	1
Thorium 228	0.00942	U	0.126	0.126		0.103	pCi/g	11/06/20 18:15	11/29/20 15:26	1
Thorium-232	**0.411**		0.185	0.190		0.127	pCi/g	11/06/20 18:15	11/29/20 15:26	1
Thorium-234	-0.0504	U	0.985	0.985		0.812	pCi/g	11/06/20 18:15	11/29/20 15:26	1
Uranium-235	-0.00941	U	0.227	0.227		0.187	pCi/g	11/06/20 18:15	11/29/20 15:26	1
Uranium-238	-0.0504	U	0.985	0.985		0.812	pCi/g	11/06/20 18:15	11/29/20 15:26	1

Client Sample ID: HPPG-F-026

Lab Sample ID: 160-40217-2
Matrix: Solid

Date Collected: 10/29/20 14:57
Date Received: 11/02/20 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.569**		0.306	0.312		0.129	pCi/g	11/06/20 18:15	11/29/20 15:24	1
Actinium-227	0.000	U	0.387	0.387		0.393	pCi/g	11/06/20 18:15	11/29/20 15:24	1
Bismuth-212	0.277	U	0.740	0.740		0.574	pCi/g	11/06/20 18:15	11/29/20 15:24	1
Bismuth-214	**0.434**		0.156	0.163		0.0633	pCi/g	11/06/20 18:15	11/29/20 15:24	1
Cesium-137	0.00867	U	0.0642	0.0642	0.0700	0.0515	pCi/g	11/06/20 18:15	11/29/20 15:24	1
Lead-210	0.647	U	1.25	1.26		0.854	pCi/g	11/06/20 18:15	11/29/20 15:24	1
Lead-212	**0.479**		0.104	0.121		0.0472	pCi/g	11/06/20 18:15	11/29/20 15:24	1
Lead-214	**0.425**		0.129	0.136		0.0535	pCi/g	11/06/20 18:15	11/29/20 15:24	1
Potassium-40	**6.58**		1.41	1.57		0.278	pCi/g	11/06/20 18:15	11/29/20 15:24	1
Protactinium-231	0.000	U	0.634	0.634		2.02	pCi/g	11/06/20 18:15	11/29/20 15:24	1
Protactinium-234	0.105	U	0.236	0.237		0.176	pCi/g	11/06/20 18:15	11/29/20 15:24	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40217-1
SDG: GJ46599774

Client Sample ID: HPPG-F-026

Lab Sample ID: 160-40217-2

Date Collected: 10/29/20 14:57
Matrix: Solid
Date Received: 11/02/20 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.434**		0.156	0.163	0.200	0.0633	pCi/g	11/06/20 18:15	11/29/20 15:24	1
Radium-228	**0.569**		0.306	0.312		0.129	pCi/g	11/06/20 18:15	11/29/20 15:24	1
Thallium-208	**0.225**		0.0722	0.0758		0.0203	pCi/g	11/06/20 18:15	11/29/20 15:24	1
Thorium 228	**0.479**		0.104	0.121		0.0472	pCi/g	11/06/20 18:15	11/29/20 15:24	1
Thorium-232	**0.569**		0.306	0.312		0.129	pCi/g	11/06/20 18:15	11/29/20 15:24	1
Thorium-234	-0.711	U	0.717	0.721		0.824	pCi/g	11/06/20 18:15	11/29/20 15:24	1
Uranium-235	0.0148	U	0.353	0.353		0.290	pCi/g	11/06/20 18:15	11/29/20 15:24	1
Uranium-238	-0.711	U	0.717	0.721		0.824	pCi/g	11/06/20 18:15	11/29/20 15:24	1

Client Sample ID: HPPG-SFU-TU098B-001

Lab Sample ID: 160-40217-3

Date Collected: 10/29/20 13:52
Matrix: Solid
Date Received: 11/02/20 08:50

Method: 905.0 - Total Beta Strontium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Total Beta Strontium	-0.0367	U	0.0488	0.0489	0.160	0.0435	pCi/g	11/25/20 14:30	12/11/20 07:07	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*96.8*		*40 - 110*	*11/25/20 14:30*	*12/11/20 07:07*	*1*

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.304**		0.210	0.213		0.0868	pCi/g	11/06/20 18:15	11/29/20 15:21	1
Actinium-227	0.203	U	0.416	0.416		0.288	pCi/g	11/06/20 18:15	11/29/20 15:21	1
Bismuth-212	0.307	U	0.908	0.908		0.720	pCi/g	11/06/20 18:15	11/29/20 15:21	1
Bismuth-214	**0.346**		0.112	0.118		0.0427	pCi/g	11/06/20 18:15	11/29/20 15:21	1
Cesium-137	-0.0671	U	0.103	0.103	0.0700	0.0805	pCi/g	11/06/20 18:15	11/29/20 15:21	1
Lead-210	0.838	U	1.39	1.39		1.08	pCi/g	11/06/20 18:15	11/29/20 15:21	1
Lead-212	**0.375**		0.103	0.114		0.0594	pCi/g	11/06/20 18:15	11/29/20 15:21	1
Lead-214	**0.499**		0.152	0.161		0.0548	pCi/g	11/06/20 18:15	11/29/20 15:21	1
Potassium-40	**7.22**		1.36	1.55		0.150	pCi/g	11/06/20 18:15	11/29/20 15:21	1
Protactinium-231	-0.930	U	2.41	2.41		1.94	pCi/g	11/06/20 18:15	11/29/20 15:21	1
Protactinium-234	0.0815	U	0.176	0.176		0.245	pCi/g	11/06/20 18:15	11/29/20 15:21	1
Radium-226	**0.346**		0.112	0.118	0.200	0.0427	pCi/g	11/06/20 18:15	11/29/20 15:21	1
Radium-228	**0.304**		0.210	0.213		0.0868	pCi/g	11/06/20 18:15	11/29/20 15:21	1
Thallium-208	**0.0795**		0.104	0.105		0.0556	pCi/g	11/06/20 18:15	11/29/20 15:21	1
Thorium 228	**0.375**		0.103	0.114		0.0594	pCi/g	11/06/20 18:15	11/29/20 15:21	1
Thorium-232	**0.304**		0.210	0.213		0.0868	pCi/g	11/06/20 18:15	11/29/20 15:21	1
Thorium-234	-0.582	U	0.813	0.816		0.807	pCi/g	11/06/20 18:15	11/29/20 15:21	1
Uranium-235	0.0360	U	0.465	0.465		0.463	pCi/g	11/06/20 18:15	11/29/20 15:21	1
Uranium-238	-0.582	U	0.813	0.816		0.807	pCi/g	11/06/20 18:15	11/29/20 15:21	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40217-1
SDG: GJ46599774

Client Sample ID: HPPG-SFU-TU098B-002

Lab Sample ID: 160-40217-4
Matrix: Solid

Date Collected: 10/29/20 13:56
Date Received: 11/02/20 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.328**		0.198	0.201		0.0952	pCi/g	11/06/20 18:15	11/29/20 15:21	1
Actinium-227	-0.154	U	0.535	0.536		0.353	pCi/g	11/06/20 18:15	11/29/20 15:21	1
Bismuth-212	-0.400	U	0.776	0.777		0.608	pCi/g	11/06/20 18:15	11/29/20 15:21	1
Bismuth-214	**0.321**		0.0993	0.105		0.0408	pCi/g	11/06/20 18:15	11/29/20 15:21	1
Cesium-137	-0.0356	U	0.0622	0.0623	0.0700	0.0484	pCi/g	11/06/20 18:15	11/29/20 15:21	1
Lead-210	0.504	U	1.15	1.15		0.771	pCi/g	11/06/20 18:15	11/29/20 15:21	1
Lead-212	**0.299**		0.0820	0.0907		0.0477	pCi/g	11/06/20 18:15	11/29/20 15:21	1
Lead-214	**0.295**		0.111	0.115		0.0638	pCi/g	11/06/20 18:15	11/29/20 15:21	1
Potassium-40	**6.14**		1.15	1.31		0.332	pCi/g	11/06/20 18:15	11/29/20 15:21	1
Protactinium-231	-0.732	U	2.52	2.52		2.05	pCi/g	11/06/20 18:15	11/29/20 15:21	1
Protactinium-234	0.177	U	0.102	0.104		0.207	pCi/g	11/06/20 18:15	11/29/20 15:21	1
Radium-226	**0.321**		0.0993	0.105	0.200	0.0408	pCi/g	11/06/20 18:15	11/29/20 15:21	1
Radium-228	**0.328**		0.198	0.201		0.0952	pCi/g	11/06/20 18:15	11/29/20 15:21	1
Thallium-208	**0.125**		0.0489	0.0506		0.0214	pCi/g	11/06/20 18:15	11/29/20 15:21	1
Thorium 228	**0.299**		0.0820	0.0907		0.0477	pCi/g	11/06/20 18:15	11/29/20 15:21	1
Thorium-232	**0.328**		0.198	0.201		0.0952	pCi/g	11/06/20 18:15	11/29/20 15:21	1
Thorium-234	-0.326	U	0.823	0.824		0.687	pCi/g	11/06/20 18:15	11/29/20 15:21	1
Uranium-235	0.00536	U	0.333	0.333		0.274	pCi/g	11/06/20 18:15	11/29/20 15:21	1
Uranium-238	-0.326	U	0.823	0.824		0.687	pCi/g	11/06/20 18:15	11/29/20 15:21	1

Client Sample ID: HPPG-SFU-TU098B-003

Lab Sample ID: 160-40217-5
Matrix: Solid

Date Collected: 10/29/20 14:01
Date Received: 11/02/20 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.371**		0.224	0.228		0.0997	pCi/g	11/06/20 18:15	11/29/20 15:23	1
Actinium-227	0.113	U	0.386	0.386		0.376	pCi/g	11/06/20 18:15	11/29/20 15:23	1
Bismuth-212	0.413	U	0.950	0.951		0.747	pCi/g	11/06/20 18:15	11/29/20 15:23	1
Bismuth-214	0.108	U	0.200	0.201		0.198	pCi/g	11/06/20 18:15	11/29/20 15:23	1
Cesium-137	0.0262	U	0.0565	0.0566	0.0700	0.0433	pCi/g	11/06/20 18:15	11/29/20 15:23	1
Lead-210	0.778	U	1.56	1.56		1.02	pCi/g	11/06/20 18:15	11/29/20 15:23	1
Lead-212	**0.379**		0.101	0.111		0.0566	pCi/g	11/06/20 18:15	11/29/20 15:23	1
Lead-214	**0.373**		0.129	0.136		0.0580	pCi/g	11/06/20 18:15	11/29/20 15:23	1
Potassium-40	**7.10**		1.34	1.56		0.285	pCi/g	11/06/20 18:15	11/29/20 15:23	1
Protactinium-231	-1.01	U	3.40	3.40		2.77	pCi/g	11/06/20 18:15	11/29/20 15:23	1
Protactinium-234	0.115	U	0.250	0.251		0.239	pCi/g	11/06/20 18:15	11/29/20 15:23	1
Radium-226	0.108	U	0.200	0.201	0.200	0.198	pCi/g	11/06/20 18:15	11/29/20 15:23	1
Radium-228	**0.371**		0.224	0.228		0.0997	pCi/g	11/06/20 18:15	11/29/20 15:23	1
Thallium-208	**0.201**		0.0666	0.0705		0.0235	pCi/g	11/06/20 18:15	11/29/20 15:23	1
Thorium 228	**0.379**		0.101	0.111		0.0566	pCi/g	11/06/20 18:15	11/29/20 15:23	1
Thorium-232	**0.371**		0.224	0.228		0.0997	pCi/g	11/06/20 18:15	11/29/20 15:23	1
Thorium-234	-0.336	U	0.959	0.959		0.799	pCi/g	11/06/20 18:15	11/29/20 15:23	1
Uranium-235	-0.211	U	0.508	0.508		0.495	pCi/g	11/06/20 18:15	11/29/20 15:23	1
Uranium-238	-0.336	U	0.959	0.959		0.799	pCi/g	11/06/20 18:15	11/29/20 15:23	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40217-1
SDG: GJ46599774

Client Sample ID: HPPG-SFU-TU098B-004

Lab Sample ID: 160-40217-6
Date Collected: 10/29/20 14:05
Matrix: Solid
Date Received: 11/02/20 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.229**		0.124	0.126		0.145	pCi/g	11/06/20 18:15	11/29/20 16:04	1
Actinium-227	**0.652**		0.263	0.272		0.0868	pCi/g	11/06/20 18:15	11/29/20 16:04	1
Bismuth-212	-0.639	U	1.04	1.04		0.807	pCi/g	11/06/20 18:15	11/29/20 16:04	1
Bismuth-214	**0.329**		0.103	0.109		0.0350	pCi/g	11/06/20 18:15	11/29/20 16:04	1
Cesium-137	0.0154	U	0.0427	0.0427	0.0700	0.0328	pCi/g	11/06/20 18:15	11/29/20 16:04	1
Lead-210	**1.24**		1.23	1.24		0.801	pCi/g	11/06/20 18:15	11/29/20 16:04	1
Lead-212	0.0217	U	0.110	0.110		0.0893	pCi/g	11/06/20 18:15	11/29/20 16:04	1
Lead-214	**0.467**		0.126	0.134		0.0517	pCi/g	11/06/20 18:15	11/29/20 16:04	1
Potassium-40	**8.44**		1.44	1.67		0.208	pCi/g	11/06/20 18:15	11/29/20 16:04	1
Protactinium-231	0.000	U	0.793	0.793		2.05	pCi/g	11/06/20 18:15	11/29/20 16:04	1
Protactinium-234	-0.0217	U	0.0555	0.0555		0.216	pCi/g	11/06/20 18:15	11/29/20 16:04	1
Radium-226	**0.329**		0.103	0.109	0.200	0.0350	pCi/g	11/06/20 18:15	11/29/20 16:04	1
Radium-228	**0.229**		0.124	0.126		0.145	pCi/g	11/06/20 18:15	11/29/20 16:04	1
Thallium-208	**0.167**		0.0485	0.0514		0.00823	pCi/g	11/06/20 18:15	11/29/20 16:04	1
Thorium 228	0.0217	U	0.110	0.110		0.0893	pCi/g	11/06/20 18:15	11/29/20 16:04	1
Thorium-232	**0.229**		0.124	0.126		0.145	pCi/g	11/06/20 18:15	11/29/20 16:04	1
Thorium-234	0.322	U	0.418	0.419		0.355	pCi/g	11/06/20 18:15	11/29/20 16:04	1
Uranium-235	-0.00518	U	0.0120	0.0120		0.381	pCi/g	11/06/20 18:15	11/29/20 16:04	1
Uranium-238	0.322	U	0.418	0.419		0.355	pCi/g	11/06/20 18:15	11/29/20 16:04	1

Client Sample ID: HPPG-SFU-TU098B-005

Lab Sample ID: 160-40217-7
Date Collected: 10/29/20 14:08
Matrix: Solid
Date Received: 11/02/20 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.311**		0.226	0.228		0.115	pCi/g	11/06/20 18:15	11/29/20 16:07	1
Actinium-227	0.0720	U	0.453	0.453		0.278	pCi/g	11/06/20 18:15	11/29/20 16:07	1
Bismuth-212	0.00587	U	0.621	0.621		0.511	pCi/g	11/06/20 18:15	11/29/20 16:07	1
Bismuth-214	0.0968	U	0.166	0.166		0.106	pCi/g	11/06/20 18:15	11/29/20 16:07	1
Cesium-137	0.0250	U	0.0423	0.0424	0.0700	0.0319	pCi/g	11/06/20 18:15	11/29/20 16:07	1
Lead-210	-0.592	U	1.44	1.44		1.20	pCi/g	11/06/20 18:15	11/29/20 16:07	1
Lead-212	**0.358**		0.0814	0.0937		0.0420	pCi/g	11/06/20 18:15	11/29/20 16:07	1
Lead-214	**0.426**		0.0826	0.0938		0.0354	pCi/g	11/06/20 18:15	11/29/20 16:07	1
Potassium-40	**6.04**		1.06	1.23		0.259	pCi/g	11/06/20 18:15	11/29/20 16:07	1
Protactinium-231	0.295	U	1.23	1.23		1.85	pCi/g	11/06/20 18:15	11/29/20 16:07	1
Protactinium-234	-0.0194	U	0.0343	0.0343		0.176	pCi/g	11/06/20 18:15	11/29/20 16:07	1
Radium-226	0.0968	U	0.166	0.166	0.200	0.106	pCi/g	11/06/20 18:15	11/29/20 16:07	1
Radium-228	**0.311**		0.226	0.228		0.115	pCi/g	11/06/20 18:15	11/29/20 16:07	1
Thallium-208	**0.141**		0.0471	0.0493		0.0194	pCi/g	11/06/20 18:15	11/29/20 16:07	1
Thorium 228	**0.358**		0.0814	0.0937		0.0420	pCi/g	11/06/20 18:15	11/29/20 16:07	1
Thorium-232	**0.311**		0.226	0.228		0.115	pCi/g	11/06/20 18:15	11/29/20 16:07	1
Thorium-234	-0.643	U	0.846	0.849		0.710	pCi/g	11/06/20 18:15	11/29/20 16:07	1
Uranium-235	0.0768	U	0.169	0.169		0.246	pCi/g	11/06/20 18:15	11/29/20 16:07	1
Uranium-238	-0.643	U	0.846	0.849		0.710	pCi/g	11/06/20 18:15	11/29/20 16:07	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40217-1
SDG: GJ46599774

Client Sample ID: HPPG-SFU-TU098B-006

Lab Sample ID: 160-40217-8
Matrix: Solid

Date Collected: 10/29/20 14:11
Date Received: 11/02/20 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.545**		0.197	0.205		0.0402	pCi/g	11/06/20 18:15	11/29/20 15:57	1
Actinium-227	0.116	U	0.369	0.369		0.293	pCi/g	11/06/20 18:15	11/29/20 15:57	1
Bismuth-212	0.000	U	0.380	0.380		0.677	pCi/g	11/06/20 18:15	11/29/20 15:57	1
Bismuth-214	**0.253**		0.121	0.124		0.0610	pCi/g	11/06/20 18:15	11/29/20 15:57	1
Cesium-137	0.00474	U	0.0635	0.0635	0.0700	0.0391	pCi/g	11/06/20 18:15	11/29/20 15:57	1
Lead-210	**0.733**		1.09	1.10		0.722	pCi/g	11/06/20 18:15	11/29/20 15:57	1
Lead-212	**0.426**		0.0927	0.108		0.0379	pCi/g	11/06/20 18:15	11/29/20 15:57	1
Lead-214	**0.167**		0.0730	0.0750		0.118	pCi/g	11/06/20 18:15	11/29/20 15:57	1
Potassium-40	**7.34**		1.47	1.65		0.272	pCi/g	11/06/20 18:15	11/29/20 15:57	1
Protactinium-231	0.328	U	1.34	1.34		2.13	pCi/g	11/06/20 18:15	11/29/20 15:57	1
Protactinium-234	0.103	U	0.202	0.202		0.161	pCi/g	11/06/20 18:15	11/29/20 15:57	1
Radium-226	**0.253**		0.121	0.124	0.200	0.0610	pCi/g	11/06/20 18:15	11/29/20 15:57	1
Radium-228	**0.545**		0.197	0.205		0.0402	pCi/g	11/06/20 18:15	11/29/20 15:57	1
Thallium-208	**0.184**		0.0631	0.0659		0.0187	pCi/g	11/06/20 18:15	11/29/20 15:57	1
Thorium 228	**0.426**		0.0927	0.108		0.0379	pCi/g	11/06/20 18:15	11/29/20 15:57	1
Thorium-232	**0.545**		0.197	0.205		0.0402	pCi/g	11/06/20 18:15	11/29/20 15:57	1
Thorium-234	-0.493	U	0.495	0.498		0.753	pCi/g	11/06/20 18:15	11/29/20 15:57	1
Uranium-235	0.00901	U	0.0373	0.0373		0.294	pCi/g	11/06/20 18:15	11/29/20 15:57	1
Uranium-238	-0.493	U	0.495	0.498		0.753	pCi/g	11/06/20 18:15	11/29/20 15:57	1

Client Sample ID: HPPG-SFU-TU098B-007

Lab Sample ID: 160-40217-9
Matrix: Solid

Date Collected: 10/29/20 14:14
Date Received: 11/02/20 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.429**		0.146	0.153		0.0945	pCi/g	11/06/20 18:15	11/29/20 15:53	1
Actinium-227	0.0993	U	0.326	0.327		0.268	pCi/g	11/06/20 18:15	11/29/20 15:53	1
Bismuth-212	0.234	U	0.388	0.389		0.289	pCi/g	11/06/20 18:15	11/29/20 15:53	1
Bismuth-214	**0.406**		0.0973	0.106		0.0373	pCi/g	11/06/20 18:15	11/29/20 15:53	1
Cesium-137	0.0229	U	0.0391	0.0392	0.0700	0.0298	pCi/g	11/06/20 18:15	11/29/20 15:53	1
Lead-210	-0.658	U	1.42	1.42		1.15	pCi/g	11/06/20 18:15	11/29/20 15:53	1
Lead-212	**0.455**		0.0742	0.0947		0.0301	pCi/g	11/06/20 18:15	11/29/20 15:53	1
Lead-214	**0.417**		0.0827	0.0933		0.0373	pCi/g	11/06/20 18:15	11/29/20 15:53	1
Potassium-40	**7.81**		1.06	1.33		0.0834	pCi/g	11/06/20 18:15	11/29/20 15:53	1
Protactinium-231	0.000	U	0.281	0.281		1.65	pCi/g	11/06/20 18:15	11/29/20 15:53	1
Protactinium-234	0.0642	U	0.187	0.187		0.190	pCi/g	11/06/20 18:15	11/29/20 15:53	1
Radium-226	**0.406**		0.0973	0.106	0.200	0.0373	pCi/g	11/06/20 18:15	11/29/20 15:53	1
Radium-228	**0.429**		0.146	0.153		0.0945	pCi/g	11/06/20 18:15	11/29/20 15:53	1
Thallium-208	**0.175**		0.0466	0.0500		0.0137	pCi/g	11/06/20 18:15	11/29/20 15:53	1
Thorium 228	**0.455**		0.0742	0.0947		0.0301	pCi/g	11/06/20 18:15	11/29/20 15:53	1
Thorium-232	**0.429**		0.146	0.153		0.0945	pCi/g	11/06/20 18:15	11/29/20 15:53	1
Thorium-234	-0.0629	U	0.128	0.129		0.845	pCi/g	11/06/20 18:15	11/29/20 15:53	1
Uranium-235	-0.0254	U	0.0396	0.0397		0.324	pCi/g	11/06/20 18:15	11/29/20 15:53	1
Uranium-238	-0.0629	U	0.128	0.129		0.845	pCi/g	11/06/20 18:15	11/29/20 15:53	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40217-1
SDG: GJ46599774

Client Sample ID: HPPG-SFU-TU098B-008

Lab Sample ID: 160-40217-10
Matrix: Solid

Date Collected: 10/29/20 14:18
Date Received: 11/02/20 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.220**		0.279	0.280		0.176	pCi/g	11/06/20 18:15	11/29/20 15:54	1
Actinium-227	0.102	U	0.368	0.369		0.344	pCi/g	11/06/20 18:15	11/29/20 15:54	1
Bismuth-212	0.000	U	0.329	0.329		0.563	pCi/g	11/06/20 18:15	11/29/20 15:54	1
Bismuth-214	**0.357**		0.151	0.156		0.0677	pCi/g	11/06/20 18:15	11/29/20 15:54	1
Cesium-137	-0.0349	U	0.0616	0.0617	0.0700	0.0470	pCi/g	11/06/20 18:15	11/29/20 15:54	1
Lead-210	-1.25	U	1.76	1.77		1.42	pCi/g	11/06/20 18:15	11/29/20 15:54	1
Lead-212	**0.483**		0.103	0.121		0.0521	pCi/g	11/06/20 18:15	11/29/20 15:54	1
Lead-214	**0.423**		0.129	0.136		0.0590	pCi/g	11/06/20 18:15	11/29/20 15:54	1
Potassium-40	**8.85**		1.47	1.73		0.143	pCi/g	11/06/20 18:15	11/29/20 15:54	1
Protactinium-231	0.000	U	0.388	0.388		2.31	pCi/g	11/06/20 18:15	11/29/20 15:54	1
Protactinium-234	-0.130	U	0.345	0.345		0.280	pCi/g	11/06/20 18:15	11/29/20 15:54	1
Radium-226	**0.357**		0.151	0.156	0.200	0.0677	pCi/g	11/06/20 18:15	11/29/20 15:54	1
Radium-228	**0.220**		0.279	0.280		0.176	pCi/g	11/06/20 18:15	11/29/20 15:54	1
Thallium-208	**0.160**		0.0586	0.0609		0.0225	pCi/g	11/06/20 18:15	11/29/20 15:54	1
Thorium 228	**0.483**		0.103	0.121		0.0521	pCi/g	11/06/20 18:15	11/29/20 15:54	1
Thorium-232	**0.220**		0.279	0.280		0.176	pCi/g	11/06/20 18:15	11/29/20 15:54	1
Thorium-234	-0.0734	U	0.887	0.887		0.729	pCi/g	11/06/20 18:15	11/29/20 15:54	1
Uranium-235	0.211	U	0.416	0.416		0.427	pCi/g	11/06/20 18:15	11/29/20 15:54	1
Uranium-238	-0.0734	U	0.887	0.887		0.729	pCi/g	11/06/20 18:15	11/29/20 15:54	1

Client Sample ID: HPPG-SFU-TU098B-009

Lab Sample ID: 160-40217-11
Matrix: Solid

Date Collected: 10/29/20 14:22
Date Received: 11/02/20 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.354**		0.158	0.162		0.0778	pCi/g	11/06/20 18:15	11/29/20 15:55	1
Actinium-227	-0.290	U	0.520	0.521		0.334	pCi/g	11/06/20 18:15	11/29/20 15:55	1
Bismuth-212	**0.962**		0.437	0.448		0.139	pCi/g	11/06/20 18:15	11/29/20 15:55	1
Bismuth-214	**0.307**		0.101	0.106		0.0422	pCi/g	11/06/20 18:15	11/29/20 15:55	1
Cesium-137	0.00195	U	0.0538	0.0538	0.0700	0.0442	pCi/g	11/06/20 18:15	11/29/20 15:55	1
Lead-210	-0.0954	U	1.35	1.35		1.11	pCi/g	11/06/20 18:15	11/29/20 15:55	1
Lead-212	**0.262**		0.0796	0.0865		0.0478	pCi/g	11/06/20 18:15	11/29/20 15:55	1
Lead-214	**0.351**		0.105	0.111		0.0473	pCi/g	11/06/20 18:15	11/29/20 15:55	1
Potassium-40	**5.09**		0.986	1.12		0.257	pCi/g	11/06/20 18:15	11/29/20 15:55	1
Protactinium-231	0.0863	U	0.317	0.317		1.87	pCi/g	11/06/20 18:15	11/29/20 15:55	1
Protactinium-234	0.0767	U	0.244	0.245		0.199	pCi/g	11/06/20 18:15	11/29/20 15:55	1
Radium-226	**0.307**		0.101	0.106	0.200	0.0422	pCi/g	11/06/20 18:15	11/29/20 15:55	1
Radium-228	**0.354**		0.158	0.162		0.0778	pCi/g	11/06/20 18:15	11/29/20 15:55	1
Thallium-208	**0.149**		0.0555	0.0577		0.0224	pCi/g	11/06/20 18:15	11/29/20 15:55	1
Thorium 228	**0.262**		0.0796	0.0865		0.0478	pCi/g	11/06/20 18:15	11/29/20 15:55	1
Thorium-232	**0.354**		0.158	0.162		0.0778	pCi/g	11/06/20 18:15	11/29/20 15:55	1
Thorium-234	-0.706	U	0.741	0.745		0.571	pCi/g	11/06/20 18:15	11/29/20 15:55	1
Uranium-235	0.0881	U	0.202	0.202		0.346	pCi/g	11/06/20 18:15	11/29/20 15:55	1
Uranium-238	-0.706	U	0.741	0.745		0.571	pCi/g	11/06/20 18:15	11/29/20 15:55	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40217-1
SDG: GJ46599774

Client Sample ID: HPPG-SFU-TU098B-010

Lab Sample ID: 160-40217-12
Matrix: Solid

Date Collected: 10/29/20 14:26
Date Received: 11/02/20 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.351**		0.300	0.302		0.174	pCi/g	11/06/20 18:15	11/29/20 16:27	1
Actinium-227	0.0472	U	0.129	0.129		0.531	pCi/g	11/06/20 18:15	11/29/20 16:27	1
Bismuth-212	0.146	U	0.961	0.961		0.777	pCi/g	11/06/20 18:15	11/29/20 16:27	1
Bismuth-214	**0.680**		0.160	0.178		0.0451	pCi/g	11/06/20 18:15	11/29/20 16:27	1
Cesium-137	**0.109**		0.0586	0.0599	0.0700	0.0304	pCi/g	11/06/20 18:15	11/29/20 16:27	1
Lead-210	**1.24**		1.56	1.57		1.07	pCi/g	11/06/20 18:15	11/29/20 16:27	1
Lead-212	**0.510**		0.118	0.133		0.0602	pCi/g	11/06/20 18:15	11/29/20 16:27	1
Lead-214	**0.391**		0.148	0.155		0.0681	pCi/g	11/06/20 18:15	11/29/20 16:27	1
Potassium-40	**7.76**		1.51	1.76		0.334	pCi/g	11/06/20 18:15	11/29/20 16:27	1
Protactinium-231	0.912	U	2.78	2.78		2.25	pCi/g	11/06/20 18:15	11/29/20 16:27	1
Protactinium-234	0.204	U	0.0989	0.102		0.337	pCi/g	11/06/20 18:15	11/29/20 16:27	1
Radium-226	**0.680**		0.160	0.178	0.200	0.0451	pCi/g	11/06/20 18:15	11/29/20 16:27	1
Radium-228	**0.351**		0.300	0.302		0.174	pCi/g	11/06/20 18:15	11/29/20 16:27	1
Thallium-208	**0.208**		0.0680	0.0721		0.0239	pCi/g	11/06/20 18:15	11/29/20 16:27	1
Thorium 228	**0.510**		0.118	0.133		0.0602	pCi/g	11/06/20 18:15	11/29/20 16:27	1
Thorium-232	**0.351**		0.300	0.302		0.174	pCi/g	11/06/20 18:15	11/29/20 16:27	1
Thorium-234	**0.860**		0.714	0.722		0.540	pCi/g	11/06/20 18:15	11/29/20 16:27	1
Uranium-235	-0.0136	U	0.798	0.798		0.593	pCi/g	11/06/20 18:15	11/29/20 16:27	1
Uranium-238	**0.860**		0.714	0.722		0.540	pCi/g	11/06/20 18:15	11/29/20 16:27	1

Client Sample ID: HPPG-SFU-TU098B-011

Lab Sample ID: 160-40217-13
Matrix: Solid

Date Collected: 10/29/20 14:29
Date Received: 11/02/20 08:50

Method: 905.0 - Total Beta Strontium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Total Beta Strontium	**0.0517**		0.0519	0.0520	0.160	0.0382	pCi/g	11/25/20 15:25	12/11/20 07:10	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*107*		*40 - 110*	*11/25/20 15:25*	*12/11/20 07:10*	*1*

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.519**		0.183	0.191		0.0659	pCi/g	11/06/20 18:15	11/29/20 16:35	1
Actinium-227	0.100	U	0.392	0.392		0.351	pCi/g	11/06/20 18:15	11/29/20 16:35	1
Bismuth-212	0.304	U	0.835	0.836		0.662	pCi/g	11/06/20 18:15	11/29/20 16:35	1
Bismuth-214	**0.370**		0.151	0.156		0.0646	pCi/g	11/06/20 18:15	11/29/20 16:35	1
Cesium-137	0.0226	U	0.0483	0.0484	0.0700	0.0370	pCi/g	11/06/20 18:15	11/29/20 16:35	1
Lead-210	0.428	U	1.32	1.33		0.928	pCi/g	11/06/20 18:15	11/29/20 16:35	1
Lead-212	**0.351**		0.0951	0.105		0.0541	pCi/g	11/06/20 18:15	11/29/20 16:35	1
Lead-214	**0.464**		0.138	0.146		0.0634	pCi/g	11/06/20 18:15	11/29/20 16:35	1
Potassium-40	**6.36**		1.20	1.37		0.308	pCi/g	11/06/20 18:15	11/29/20 16:35	1
Protactinium-231	-0.838	U	3.00	3.00		2.44	pCi/g	11/06/20 18:15	11/29/20 16:35	1
Protactinium-234	-0.108	U	0.330	0.330		0.269	pCi/g	11/06/20 18:15	11/29/20 16:35	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40217-1
SDG: GJ46599774

Client Sample ID: HPPG-SFU-TU098B-011

Lab Sample ID: 160-40217-13
Date Collected: 10/29/20 14:29
Matrix: Solid
Date Received: 11/02/20 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.370**		0.151	0.156	0.200	0.0646	pCi/g	11/06/20 18:15	11/29/20 16:35	1
Radium-228	**0.519**		0.183	0.191		0.0659	pCi/g	11/06/20 18:15	11/29/20 16:35	1
Thallium-208	**0.179**		0.0694	0.0719		0.0269	pCi/g	11/06/20 18:15	11/29/20 16:35	1
Thorium 228	**0.351**		0.0951	0.105		0.0541	pCi/g	11/06/20 18:15	11/29/20 16:35	1
Thorium-232	**0.519**		0.183	0.191		0.0659	pCi/g	11/06/20 18:15	11/29/20 16:35	1
Thorium-234	-1.13	U	0.856	0.865		0.974	pCi/g	11/06/20 18:15	11/29/20 16:35	1
Uranium-235	-0.204	U	0.658	0.659		0.538	pCi/g	11/06/20 18:15	11/29/20 16:35	1
Uranium-238	-1.13	U	0.856	0.865		0.974	pCi/g	11/06/20 18:15	11/29/20 16:35	1

Client Sample ID: HPPG-SFU-TU098B-012

Lab Sample ID: 160-40217-14
Date Collected: 10/29/20 14:32
Matrix: Solid
Date Received: 11/02/20 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.647**		0.210	0.220		0.0379	pCi/g	11/06/20 18:15	11/29/20 16:36	1
Actinium-227	0.197	U	0.448	0.448		0.374	pCi/g	11/06/20 18:15	11/29/20 16:36	1
Bismuth-212	0.291	U	0.602	0.602		0.453	pCi/g	11/06/20 18:15	11/29/20 16:36	1
Bismuth-214	**0.490**		0.191	0.198		0.0793	pCi/g	11/06/20 18:15	11/29/20 16:36	1
Cesium-137	0.000	U	0.0120	0.0120	0.0700	0.0530	pCi/g	11/06/20 18:15	11/29/20 16:36	1
Lead-210	-0.234	U	1.66	1.66		1.37	pCi/g	11/06/20 18:15	11/29/20 16:36	1
Lead-212	**0.419**		0.110	0.122		0.0621	pCi/g	11/06/20 18:15	11/29/20 16:36	1
Lead-214	**0.475**		0.119	0.129		0.0319	pCi/g	11/06/20 18:15	11/29/20 16:36	1
Potassium-40	**7.49**		1.41	1.61		0.156	pCi/g	11/06/20 18:15	11/29/20 16:36	1
Protactinium-231	0.915	U	2.67	2.67		2.16	pCi/g	11/06/20 18:15	11/29/20 16:36	1
Protactinium-234	0.192	U	0.135	0.137		0.253	pCi/g	11/06/20 18:15	11/29/20 16:36	1
Radium-226	**0.490**		0.191	0.198	0.200	0.0793	pCi/g	11/06/20 18:15	11/29/20 16:36	1
Radium-228	**0.647**		0.210	0.220		0.0379	pCi/g	11/06/20 18:15	11/29/20 16:36	1
Thallium-208	**0.265**		0.0799	0.0845		0.0268	pCi/g	11/06/20 18:15	11/29/20 16:36	1
Thorium 228	**0.419**		0.110	0.122		0.0621	pCi/g	11/06/20 18:15	11/29/20 16:36	1
Thorium-232	**0.647**		0.210	0.220		0.0379	pCi/g	11/06/20 18:15	11/29/20 16:36	1
Thorium-234	0.320	U	0.529	0.530		0.463	pCi/g	11/06/20 18:15	11/29/20 16:36	1
Uranium-235	-0.266	U	0.319	0.320		0.527	pCi/g	11/06/20 18:15	11/29/20 16:36	1
Uranium-238	0.320	U	0.529	0.530		0.463	pCi/g	11/06/20 18:15	11/29/20 16:36	1

Client Sample ID: HPPG-SFU-TU098B-013

Lab Sample ID: 160-40217-15
Date Collected: 10/29/20 14:34
Matrix: Solid
Date Received: 11/02/20 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.312**		0.199	0.202		0.0879	pCi/g	11/06/20 18:15	11/29/20 16:36	1
Actinium-227	-0.208	U	0.513	0.514		0.298	pCi/g	11/06/20 18:15	11/29/20 16:36	1
Bismuth-212	0.251	U	0.447	0.448		0.338	pCi/g	11/06/20 18:15	11/29/20 16:36	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40217-1
SDG: GJ46599774

Client Sample ID: HPPG-SFU-TU098B-013

Lab Sample ID: 160-40217-15

Date Collected: 10/29/20 14:34
Matrix: Solid
Date Received: 11/02/20 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Bismuth-214	**0.310**		0.0847	0.0906		0.0356	pCi/g	11/06/20 18:15	11/29/20 16:36	1
Cesium-137	-0.0346	U	0.0651	0.0652	0.0700	0.0513	pCi/g	11/06/20 18:15	11/29/20 16:36	1
Lead-210	0.546	U	1.00	1.00		0.792	pCi/g	11/06/20 18:15	11/29/20 16:36	1
Lead-212	**0.451**		0.0790	0.0983		0.0350	pCi/g	11/06/20 18:15	11/29/20 16:36	1
Lead-214	**0.428**		0.0909	0.101		0.0387	pCi/g	11/06/20 18:15	11/29/20 16:36	1
Potassium-40	**7.96**		1.11	1.37		0.0896	pCi/g	11/06/20 18:15	11/29/20 16:36	1
Protactinium-231	0.000	U	0.578	0.578		1.88	pCi/g	11/06/20 18:15	11/29/20 16:36	1
Protactinium-234	-0.00953	U	0.0202	0.0203		0.210	pCi/g	11/06/20 18:15	11/29/20 16:36	1
Radium-226	**0.310**		0.0847	0.0906	0.200	0.0356	pCi/g	11/06/20 18:15	11/29/20 16:36	1
Radium-228	**0.312**		0.199	0.202		0.0879	pCi/g	11/06/20 18:15	11/29/20 16:36	1
Thallium-208	**0.166**		0.0530	0.0558		0.0175	pCi/g	11/06/20 18:15	11/29/20 16:36	1
Thorium 228	**0.451**		0.0790	0.0983		0.0350	pCi/g	11/06/20 18:15	11/29/20 16:36	1
Thorium-232	**0.312**		0.199	0.202		0.0879	pCi/g	11/06/20 18:15	11/29/20 16:36	1
Thorium-234	0.269	U	0.766	0.767		0.623	pCi/g	11/06/20 18:15	11/29/20 16:36	1
Uranium-235	0.0852	U	0.157	0.158		0.367	pCi/g	11/06/20 18:15	11/29/20 16:36	1
Uranium-238	0.269	U	0.766	0.767		0.623	pCi/g	11/06/20 18:15	11/29/20 16:36	1

Client Sample ID: HPPG-SFU-TU098B-014

Lab Sample ID: 160-40217-16

Date Collected: 10/29/20 14:36
Matrix: Solid
Date Received: 11/02/20 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.437**		0.211	0.215		0.128	pCi/g	11/06/20 18:15	11/29/20 16:37	1
Actinium-227	0.298	U	0.593	0.594		0.354	pCi/g	11/06/20 18:15	11/29/20 16:37	1
Bismuth-212	0.294	U	0.797	0.798		0.628	pCi/g	11/06/20 18:15	11/29/20 16:37	1
Bismuth-214	**0.453**		0.143	0.151		0.0629	pCi/g	11/06/20 18:15	11/29/20 16:37	1
Cesium-137	0.00265	U	0.0592	0.0592	0.0700	0.0485	pCi/g	11/06/20 18:15	11/29/20 16:37	1
Lead-210	0.721	U	1.70	1.70		1.16	pCi/g	11/06/20 18:15	11/29/20 16:37	1
Lead-212	0.0506	U	0.138	0.138		0.112	pCi/g	11/06/20 18:15	11/29/20 16:37	1
Lead-214	**0.537**		0.129	0.140		0.0690	pCi/g	11/06/20 18:15	11/29/20 16:37	1
Potassium-40	**7.56**		1.29	1.50		0.129	pCi/g	11/06/20 18:15	11/29/20 16:37	1
Protactinium-231	0.000	U	0.399	0.399		2.47	pCi/g	11/06/20 18:15	11/29/20 16:37	1
Protactinium-234	-0.0419	U	0.134	0.134		0.314	pCi/g	11/06/20 18:15	11/29/20 16:37	1
Radium-226	**0.453**		0.143	0.151	0.200	0.0629	pCi/g	11/06/20 18:15	11/29/20 16:37	1
Radium-228	**0.437**		0.211	0.215		0.128	pCi/g	11/06/20 18:15	11/29/20 16:37	1
Thallium-208	**0.233**		0.0574	0.0621		0.00823	pCi/g	11/06/20 18:15	11/29/20 16:37	1
Thorium 228	0.0506	U	0.138	0.138		0.112	pCi/g	11/06/20 18:15	11/29/20 16:37	1
Thorium-232	**0.437**		0.211	0.215		0.128	pCi/g	11/06/20 18:15	11/29/20 16:37	1
Thorium-234	-0.614	U	0.723	0.726		1.43	pCi/g	11/06/20 18:15	11/29/20 16:37	1
Uranium-235	0.422	U	0.304	0.307		0.456	pCi/g	11/06/20 18:15	11/29/20 16:37	1
Uranium-238	-0.614	U	0.723	0.726		1.43	pCi/g	11/06/20 18:15	11/29/20 16:37	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40217-1
SDG: GJ46599774

Client Sample ID: HPPG-SFU-TU098B-015

Lab Sample ID: 160-40217-17
Matrix: Solid

Date Collected: 10/29/20 14:38
Date Received: 11/02/20 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.504**		0.135	0.144		0.0854	pCi/g	11/06/20 18:15	11/29/20 16:39	1
Actinium-227	0.145	U	0.312	0.312		0.247	pCi/g	11/06/20 18:15	11/29/20 16:39	1
Bismuth-212	0.000	U	0.525	0.525		0.541	pCi/g	11/06/20 18:15	11/29/20 16:39	1
Bismuth-214	**0.352**		0.110	0.116		0.0436	pCi/g	11/06/20 18:15	11/29/20 16:39	1
Cesium-137	-0.00846	U	0.0627	0.0628	0.0700	0.0511	pCi/g	11/06/20 18:15	11/29/20 16:39	1
Lead-210	0.634	U	1.30	1.31		1.04	pCi/g	11/06/20 18:15	11/29/20 16:39	1
Lead-212	**0.505**		0.0837	0.106		0.0344	pCi/g	11/06/20 18:15	11/29/20 16:39	1
Lead-214	**0.431**		0.0860	0.0970		0.0465	pCi/g	11/06/20 18:15	11/29/20 16:39	1
Potassium-40	**6.75**		1.09	1.29		0.263	pCi/g	11/06/20 18:15	11/29/20 16:39	1
Protactinium-231	-0.833	U	2.68	2.68		2.18	pCi/g	11/06/20 18:15	11/29/20 16:39	1
Protactinium-234	0.0790	U	0.165	0.165		0.197	pCi/g	11/06/20 18:15	11/29/20 16:39	1
Radium-226	**0.352**		0.110	0.116	0.200	0.0436	pCi/g	11/06/20 18:15	11/29/20 16:39	1
Radium-228	**0.504**		0.135	0.144		0.0854	pCi/g	11/06/20 18:15	11/29/20 16:39	1
Thallium-208	**0.164**		0.0527	0.0554		0.0183	pCi/g	11/06/20 18:15	11/29/20 16:39	1
Thorium 228	**0.505**		0.0837	0.106		0.0344	pCi/g	11/06/20 18:15	11/29/20 16:39	1
Thorium-232	**0.504**		0.135	0.144		0.0854	pCi/g	11/06/20 18:15	11/29/20 16:39	1
Thorium-234	-0.331	U	0.376	0.378		0.850	pCi/g	11/06/20 18:15	11/29/20 16:39	1
Uranium-235	-0.154	U	0.410	0.411		0.333	pCi/g	11/06/20 18:15	11/29/20 16:39	1
Uranium-238	-0.331	U	0.376	0.378		0.850	pCi/g	11/06/20 18:15	11/29/20 16:39	1

Client Sample ID: HPPG-SFU-TU098B-016

Lab Sample ID: 160-40217-18
Matrix: Solid

Date Collected: 10/29/20 14:41
Date Received: 11/02/20 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.492**		0.176	0.184		0.0962	pCi/g	11/06/20 18:15	11/29/20 16:40	1
Actinium-227	0.0885	U	0.379	0.379		0.370	pCi/g	11/06/20 18:15	11/29/20 16:40	1
Bismuth-212	-0.123	U	0.917	0.917		0.742	pCi/g	11/06/20 18:15	11/29/20 16:40	1
Bismuth-214	**0.284**		0.136	0.139		0.0691	pCi/g	11/06/20 18:15	11/29/20 16:40	1
Cesium-137	0.0134	U	0.0961	0.0961	0.0700	0.0778	pCi/g	11/06/20 18:15	11/29/20 16:40	1
Lead-210	**1.54**		1.40	1.41		0.788	pCi/g	11/06/20 18:15	11/29/20 16:40	1
Lead-212	**0.422**		0.102	0.115		0.0489	pCi/g	11/06/20 18:15	11/29/20 16:40	1
Lead-214	**0.445**		0.112	0.121		0.0628	pCi/g	11/06/20 18:15	11/29/20 16:40	1
Potassium-40	**8.36**		1.61	1.82		0.288	pCi/g	11/06/20 18:15	11/29/20 16:40	1
Protactinium-231	0.636	U	2.02	2.02		2.22	pCi/g	11/06/20 18:15	11/29/20 16:40	1
Protactinium-234	0.0677	U	0.109	0.109		0.188	pCi/g	11/06/20 18:15	11/29/20 16:40	1
Radium-226	**0.284**		0.136	0.139	0.200	0.0691	pCi/g	11/06/20 18:15	11/29/20 16:40	1
Radium-228	**0.492**		0.176	0.184		0.0962	pCi/g	11/06/20 18:15	11/29/20 16:40	1
Thallium-208	**0.188**		0.0752	0.0777		0.0285	pCi/g	11/06/20 18:15	11/29/20 16:40	1
Thorium 228	**0.422**		0.102	0.115		0.0489	pCi/g	11/06/20 18:15	11/29/20 16:40	1
Thorium-232	**0.492**		0.176	0.184		0.0962	pCi/g	11/06/20 18:15	11/29/20 16:40	1
Thorium-234	**0.436**		0.440	0.443		0.372	pCi/g	11/06/20 18:15	11/29/20 16:40	1
Uranium-235	-0.0400	U	0.0788	0.0789		0.304	pCi/g	11/06/20 18:15	11/29/20 16:40	1
Uranium-238	**0.436**		0.440	0.443		0.372	pCi/g	11/06/20 18:15	11/29/20 16:40	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40217-1
SDG: GJ46599774

Client Sample ID: HPPG-SFU-TU098B-017

Lab Sample ID: 160-40217-19

Date Collected: 10/29/20 14:42
Matrix: Solid
Date Received: 11/02/20 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.456**		0.180	0.186		0.0608	pCi/g	11/06/20 18:15	11/29/20 16:40	1
Actinium-227	0.124	U	0.352	0.352		0.336	pCi/g	11/06/20 18:15	11/29/20 16:40	1
Bismuth-212	-0.0417	U	0.726	0.726		0.595	pCi/g	11/06/20 18:15	11/29/20 16:40	1
Bismuth-214	**0.366**		0.107	0.113		0.0398	pCi/g	11/06/20 18:15	11/29/20 16:40	1
Cesium-137	0.0169	U	0.0528	0.0529	0.0700	0.0419	pCi/g	11/06/20 18:15	11/29/20 16:40	1
Lead-210	0.642	U	1.12	1.12		0.772	pCi/g	11/06/20 18:15	11/29/20 16:40	1
Lead-212	**0.295**		0.0768	0.0857		0.0412	pCi/g	11/06/20 18:15	11/29/20 16:40	1
Lead-214	**0.323**		0.0975	0.103		0.0764	pCi/g	11/06/20 18:15	11/29/20 16:40	1
Potassium-40	**7.64**		1.19	1.43		0.263	pCi/g	11/06/20 18:15	11/29/20 16:40	1
Protactinium-231	0.000	U	0.890	0.890		1.96	pCi/g	11/06/20 18:15	11/29/20 16:40	1
Protactinium-234	0.0490	U	0.0931	0.0932		0.149	pCi/g	11/06/20 18:15	11/29/20 16:40	1
Radium-226	**0.366**		0.107	0.113	0.200	0.0398	pCi/g	11/06/20 18:15	11/29/20 16:40	1
Radium-228	**0.456**		0.180	0.186		0.0608	pCi/g	11/06/20 18:15	11/29/20 16:40	1
Thallium-208	**0.0927**		0.0913	0.0918		0.0405	pCi/g	11/06/20 18:15	11/29/20 16:40	1
Thorium 228	**0.295**		0.0768	0.0857		0.0412	pCi/g	11/06/20 18:15	11/29/20 16:40	1
Thorium-232	**0.456**		0.180	0.186		0.0608	pCi/g	11/06/20 18:15	11/29/20 16:40	1
Thorium-234	-0.258	U	0.834	0.834		0.694	pCi/g	11/06/20 18:15	11/29/20 16:40	1
Uranium-235	0.0876	U	0.265	0.265		0.213	pCi/g	11/06/20 18:15	11/29/20 16:40	1
Uranium-238	-0.258	U	0.834	0.834		0.694	pCi/g	11/06/20 18:15	11/29/20 16:40	1

Client Sample ID: HPPG-SFU-TU098B-018

Lab Sample ID: 160-40217-20

Date Collected: 10/29/20 14:44
Matrix: Solid
Date Received: 11/02/20 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.444**		0.121	0.129		0.0395	pCi/g	11/06/20 18:15	11/29/20 15:19	1
Actinium-227	0.180	U	0.333	0.334		0.259	pCi/g	11/06/20 18:15	11/29/20 15:19	1
Bismuth-212	0.000	U	0.154	0.154		0.421	pCi/g	11/06/20 18:15	11/29/20 15:19	1
Bismuth-214	**0.426**		0.121	0.129		0.0452	pCi/g	11/06/20 18:15	11/29/20 15:19	1
Cesium-137	0.0182	U	0.0418	0.0419	0.0700	0.0326	pCi/g	11/06/20 18:15	11/29/20 15:19	1
Lead-210	0.569	U	1.06	1.07		0.843	pCi/g	11/06/20 18:15	11/29/20 15:19	1
Lead-212	**0.389**		0.0799	0.0945		0.0411	pCi/g	11/06/20 18:15	11/29/20 15:19	1
Lead-214	**0.332**		0.0861	0.0928		0.0433	pCi/g	11/06/20 18:15	11/29/20 15:19	1
Potassium-40	**7.58**		1.37	1.58		0.456	pCi/g	11/06/20 18:15	11/29/20 15:19	1
Protactinium-231	-0.729	U	2.23	2.23		1.81	pCi/g	11/06/20 18:15	11/29/20 15:19	1
Protactinium-234	-0.0511	U	0.236	0.236		0.193	pCi/g	11/06/20 18:15	11/29/20 15:19	1
Radium-226	**0.426**		0.121	0.129	0.200	0.0452	pCi/g	11/06/20 18:15	11/29/20 15:19	1
Radium-228	**0.444**		0.121	0.129		0.0395	pCi/g	11/06/20 18:15	11/29/20 15:19	1
Thallium-208	**0.133**		0.0570	0.0586		0.0250	pCi/g	11/06/20 18:15	11/29/20 15:19	1
Thorium 228	**0.389**		0.0799	0.0945		0.0411	pCi/g	11/06/20 18:15	11/29/20 15:19	1
Thorium-232	**0.444**		0.121	0.129		0.0395	pCi/g	11/06/20 18:15	11/29/20 15:19	1
Thorium-234	-0.349	U	0.362	0.364		0.948	pCi/g	11/06/20 18:15	11/29/20 15:19	1
Uranium-235	0.0182	U	0.211	0.211		0.333	pCi/g	11/06/20 18:15	11/29/20 15:19	1
Uranium-238	-0.349	U	0.362	0.364		0.948	pCi/g	11/06/20 18:15	11/29/20 15:19	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40217-1
SDG: GJ46599774

Client Sample ID: HPPG-SFU-TU098B-019

Lab Sample ID: 160-40217-21

Date Collected: 10/29/20 14:46
Date Received: 11/02/20 08:50

Matrix: Solid

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.607**		0.182	0.195		0.0991	pCi/g	11/06/20 19:32	11/29/20 14:07	1
Actinium-227	0.137	U	0.519	0.519		0.434	pCi/g	11/06/20 19:32	11/29/20 14:07	1
Bismuth-212	0.400	U	0.757	0.759		0.575	pCi/g	11/06/20 19:32	11/29/20 14:07	1
Bismuth-214	**0.413**		0.151	0.158		0.0643	pCi/g	11/06/20 19:32	11/29/20 14:07	1
Cesium-137	-0.000545	U	0.0678	0.0678	0.0700	0.0391	pCi/g	11/06/20 19:32	11/29/20 14:07	1
Lead-210	-0.801	U	1.96	1.96		1.65	pCi/g	11/06/20 19:32	11/29/20 14:07	1
Lead-212	**0.531**		0.124	0.139		0.0681	pCi/g	11/06/20 19:32	11/29/20 14:07	1
Lead-214	**0.467**		0.123	0.135		0.0653	pCi/g	11/06/20 19:32	11/29/20 14:07	1
Potassium-40	**7.97**		1.49	1.75		0.318	pCi/g	11/06/20 19:32	11/29/20 14:07	1
Protactinium-231	-1.29	U	3.65	3.66		2.97	pCi/g	11/06/20 19:32	11/29/20 14:07	1
Protactinium-234	-0.134	U	0.407	0.407		0.331	pCi/g	11/06/20 19:32	11/29/20 14:07	1
Radium-226	**0.413**		0.151	0.158	0.200	0.0643	pCi/g	11/06/20 19:32	11/29/20 14:07	1
Radium-228	**0.607**		0.182	0.195		0.0991	pCi/g	11/06/20 19:32	11/29/20 14:07	1
Thallium-208	**0.212**		0.0631	0.0676		0.0175	pCi/g	11/06/20 19:32	11/29/20 14:07	1
Thorium 228	**0.531**		0.124	0.139		0.0681	pCi/g	11/06/20 19:32	11/29/20 14:07	1
Thorium-232	**0.607**		0.182	0.195		0.0991	pCi/g	11/06/20 19:32	11/29/20 14:07	1
Thorium-234	-0.595	U	0.833	0.836		1.08	pCi/g	11/06/20 19:32	11/29/20 14:07	1
Uranium-235	-0.0373	U	0.0771	0.0772		0.554	pCi/g	11/06/20 19:32	11/29/20 14:07	1
Uranium-238	-0.595	U	0.833	0.836		1.08	pCi/g	11/06/20 19:32	11/29/20 14:07	1

Client Sample ID: HPPG-SFU-TU098B-020

Lab Sample ID: 160-40217-22

Date Collected: 10/29/20 14:46
Date Received: 11/02/20 08:50

Matrix: Solid

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.564**		0.141	0.152		0.0271	pCi/g	11/06/20 19:32	11/29/20 14:48	1
Actinium-227	0.219	U	0.456	0.456		0.272	pCi/g	11/06/20 19:32	11/29/20 14:48	1
Bismuth-212	0.0748	U	0.731	0.731		0.596	pCi/g	11/06/20 19:32	11/29/20 14:48	1
Bismuth-214	0.0411	U	0.204	0.204		0.166	pCi/g	11/06/20 19:32	11/29/20 14:48	1
Cesium-137	-0.0490	U	0.0844	0.0846	0.0700	0.0665	pCi/g	11/06/20 19:32	11/29/20 14:48	1
Lead-210	0.324	U	1.12	1.12		0.817	pCi/g	11/06/20 19:32	11/29/20 14:48	1
Lead-212	**0.438**		0.0881	0.105		0.0412	pCi/g	11/06/20 19:32	11/29/20 14:48	1
Lead-214	**0.438**		0.0994	0.109		0.0428	pCi/g	11/06/20 19:32	11/29/20 14:48	1
Potassium-40	**7.84**		1.24	1.48		0.278	pCi/g	11/06/20 19:32	11/29/20 14:48	1
Protactinium-231	0.317	U	1.34	1.34		2.08	pCi/g	11/06/20 19:32	11/29/20 14:48	1
Protactinium-234	0.0661	U	0.0981	0.0983		0.164	pCi/g	11/06/20 19:32	11/29/20 14:48	1
Radium-226	0.0411	U	0.204	0.204	0.200	0.166	pCi/g	11/06/20 19:32	11/29/20 14:48	1
Radium-228	**0.564**		0.141	0.152		0.0271	pCi/g	11/06/20 19:32	11/29/20 14:48	1
Thallium-208	**0.192**		0.0615	0.0647		0.0249	pCi/g	11/06/20 19:32	11/29/20 14:48	1
Thorium 228	**0.438**		0.0881	0.105		0.0412	pCi/g	11/06/20 19:32	11/29/20 14:48	1
Thorium-232	**0.564**		0.141	0.152		0.0271	pCi/g	11/06/20 19:32	11/29/20 14:48	1
Thorium-234	0.345	U	0.450	0.451		0.402	pCi/g	11/06/20 19:32	11/29/20 14:48	1
Uranium-235	0.131	U	0.325	0.325		0.259	pCi/g	11/06/20 19:32	11/29/20 14:48	1
Uranium-238	0.345	U	0.450	0.451		0.402	pCi/g	11/06/20 19:32	11/29/20 14:48	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40217-1
SDG: GJ46599774

Client Sample ID: HPPG-SFU-TU098B-021

Lab Sample ID: 160-40217-23
Date Collected: 10/29/20 14:48
Matrix: Solid
Date Received: 11/02/20 08:50

Method: 905.0 - Total Beta Strontium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Total Beta Strontium	0.00492	U	0.0580	0.0580	0.160	0.0473	pCi/g	11/25/20 15:25	12/11/20 08:10	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*99.1*		*40 - 110*	*11/25/20 15:25*	*12/11/20 08:10*	*1*

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.467**		0.201	0.206		0.0482	pCi/g	11/06/20 19:32	11/29/20 14:39	1
Actinium-227	0.0723	U	0.164	0.164		0.479	pCi/g	11/06/20 19:32	11/29/20 14:39	1
Bismuth-212	0.325	U	1.02	1.03		0.809	pCi/g	11/06/20 19:32	11/29/20 14:39	1
Bismuth-214	**0.417**		0.163	0.168		0.0710	pCi/g	11/06/20 19:32	11/29/20 14:39	1
Cesium-137	0.0113	U	0.0731	0.0731	0.0700	0.0584	pCi/g	11/06/20 19:32	11/29/20 14:39	1
Lead-210	**0.939**		1.32	1.32		0.865	pCi/g	11/06/20 19:32	11/29/20 14:39	1
Lead-212	**0.451**		0.107	0.122		0.0469	pCi/g	11/06/20 19:32	11/29/20 14:39	1
Lead-214	**0.450**		0.141	0.148		0.0596	pCi/g	11/06/20 19:32	11/29/20 14:39	1
Potassium-40	**8.64**		1.75	1.96		0.326	pCi/g	11/06/20 19:32	11/29/20 14:39	1
Protactinium-231	0.790	U	2.02	2.02		2.22	pCi/g	11/06/20 19:32	11/29/20 14:39	1
Protactinium-234	-0.105	U	0.117	0.117		0.218	pCi/g	11/06/20 19:32	11/29/20 14:39	1
Radium-226	**0.417**		0.163	0.168	0.200	0.0710	pCi/g	11/06/20 19:32	11/29/20 14:39	1
Radium-228	**0.467**		0.201	0.206		0.0482	pCi/g	11/06/20 19:32	11/29/20 14:39	1
Thallium-208	**0.124**		0.0995	0.100		0.0518	pCi/g	11/06/20 19:32	11/29/20 14:39	1
Thorium 228	**0.451**		0.107	0.122		0.0469	pCi/g	11/06/20 19:32	11/29/20 14:39	1
Thorium-232	**0.467**		0.201	0.206		0.0482	pCi/g	11/06/20 19:32	11/29/20 14:39	1
Thorium-234	**0.507**		0.554	0.557		0.474	pCi/g	11/06/20 19:32	11/29/20 14:39	1
Uranium-235	0.138	U	0.339	0.340		0.347	pCi/g	11/06/20 19:32	11/29/20 14:39	1
Uranium-238	**0.507**		0.554	0.557		0.474	pCi/g	11/06/20 19:32	11/29/20 14:39	1

Client Sample ID: HPPG-SFU-TU098B-022

Lab Sample ID: 160-40217-24
Date Collected: 10/29/20 14:50
Matrix: Solid
Date Received: 11/02/20 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.642**		0.192	0.203		0.0330	pCi/g	11/06/20 19:32	11/29/20 14:41	1
Actinium-227	-0.365	U	0.717	0.718		0.432	pCi/g	11/06/20 19:32	11/29/20 14:41	1
Bismuth-212	-0.323	U	0.929	0.929		0.738	pCi/g	11/06/20 19:32	11/29/20 14:41	1
Bismuth-214	**0.255**		0.109	0.112		0.123	pCi/g	11/06/20 19:32	11/29/20 14:41	1
Cesium-137	-0.0306	U	0.0932	0.0933	0.0700	0.0747	pCi/g	11/06/20 19:32	11/29/20 14:41	1
Lead-210	**1.27**		1.55	1.56		1.05	pCi/g	11/06/20 19:32	11/29/20 14:41	1
Lead-212	**0.549**		0.109	0.123		0.0526	pCi/g	11/06/20 19:32	11/29/20 14:41	1
Lead-214	**0.636**		0.159	0.171		0.0603	pCi/g	11/06/20 19:32	11/29/20 14:41	1
Potassium-40	**8.51**		1.37	1.61		0.128	pCi/g	11/06/20 19:32	11/29/20 14:41	1
Protactinium-231	-0.843	U	3.09	3.09		2.52	pCi/g	11/06/20 19:32	11/29/20 14:41	1
Protactinium-234	0.0659	U	0.320	0.320		0.274	pCi/g	11/06/20 19:32	11/29/20 14:41	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40217-1
SDG: GJ46599774

Client Sample ID: HPPG-SFU-TU098B-022

Lab Sample ID: 160-40217-24
Date Collected: 10/29/20 14:50
Matrix: Solid
Date Received: 11/02/20 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.255**		0.109	0.112	0.200	0.123	pCi/g	11/06/20 19:32	11/29/20 14:41	1
Radium-228	**0.642**		0.192	0.203		0.0330	pCi/g	11/06/20 19:32	11/29/20 14:41	1
Thallium-208	**0.258**		0.0914	0.0951		0.0322	pCi/g	11/06/20 19:32	11/29/20 14:41	1
Thorium 228	**0.549**		0.109	0.123		0.0526	pCi/g	11/06/20 19:32	11/29/20 14:41	1
Thorium-232	**0.642**		0.192	0.203		0.0330	pCi/g	11/06/20 19:32	11/29/20 14:41	1
Thorium-234	-0.734	U	0.721	0.726		0.984	pCi/g	11/06/20 19:32	11/29/20 14:41	1
Uranium-235	-0.180	U	0.561	0.561		0.456	pCi/g	11/06/20 19:32	11/29/20 14:41	1
Uranium-238	-0.734	U	0.721	0.726		0.984	pCi/g	11/06/20 19:32	11/29/20 14:41	1

Client Sample ID: HPPG-SFU-TU098B-023

Lab Sample ID: 160-40217-25
Date Collected: 10/29/20 14:53
Matrix: Solid
Date Received: 11/02/20 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.343**		0.138	0.143		0.0826	pCi/g	11/06/20 19:32	11/29/20 14:43	1
Actinium-227	-0.283	U	0.542	0.543		0.313	pCi/g	11/06/20 19:32	11/29/20 14:43	1
Bismuth-212	-0.409	U	0.713	0.714		0.559	pCi/g	11/06/20 19:32	11/29/20 14:43	1
Bismuth-214	**0.260**		0.0926	0.0964		0.0447	pCi/g	11/06/20 19:32	11/29/20 14:43	1
Cesium-137	0.00244	U	0.0462	0.0462	0.0700	0.0379	pCi/g	11/06/20 19:32	11/29/20 14:43	1
Lead-210	0.528	U	1.15	1.15		0.920	pCi/g	11/06/20 19:32	11/29/20 14:43	1
Lead-212	**0.437**		0.0719	0.0915		0.0277	pCi/g	11/06/20 19:32	11/29/20 14:43	1
Lead-214	**0.396**		0.0762	0.0866		0.0258	pCi/g	11/06/20 19:32	11/29/20 14:43	1
Potassium-40	**5.20**		0.867	1.02		0.0842	pCi/g	11/06/20 19:32	11/29/20 14:43	1
Protactinium-231	0.470	U	1.37	1.37		1.50	pCi/g	11/06/20 19:32	11/29/20 14:43	1
Protactinium-234	0.0534	U	0.0689	0.0691		0.198	pCi/g	11/06/20 19:32	11/29/20 14:43	1
Radium-226	**0.260**		0.0926	0.0964	0.200	0.0447	pCi/g	11/06/20 19:32	11/29/20 14:43	1
Radium-228	**0.343**		0.138	0.143		0.0826	pCi/g	11/06/20 19:32	11/29/20 14:43	1
Thallium-208	**0.170**		0.0465	0.0498		0.0119	pCi/g	11/06/20 19:32	11/29/20 14:43	1
Thorium 228	**0.437**		0.0719	0.0915		0.0277	pCi/g	11/06/20 19:32	11/29/20 14:43	1
Thorium-232	**0.343**		0.138	0.143		0.0826	pCi/g	11/06/20 19:32	11/29/20 14:43	1
Thorium-234	0.199	U	0.429	0.430		0.290	pCi/g	11/06/20 19:32	11/29/20 14:43	1
Uranium-235	0.130	U	0.234	0.234		0.363	pCi/g	11/06/20 19:32	11/29/20 14:43	1
Uranium-238	0.199	U	0.429	0.430		0.290	pCi/g	11/06/20 19:32	11/29/20 14:43	1

Client Sample ID: HPPG-SFU-TU098B-024

Lab Sample ID: 160-40217-26
Date Collected: 10/29/20 14:54
Matrix: Solid
Date Received: 11/02/20 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.293**		0.123	0.127		0.132	pCi/g	11/06/20 19:32	11/29/20 14:45	1
Actinium-227	-0.268	U	0.759	0.760		0.462	pCi/g	11/06/20 19:32	11/29/20 14:45	1
Bismuth-212	0.459	U	0.800	0.802		0.609	pCi/g	11/06/20 19:32	11/29/20 14:45	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40217-1
SDG: GJ46599774

Client Sample ID: HPPG-SFU-TU098B-024

Lab Sample ID: 160-40217-26

Date Collected: 10/29/20 14:54
Matrix: Solid
Date Received: 11/02/20 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Bismuth-214	**0.376**		0.159	0.165		0.0733	pCi/g	11/06/20 19:32	11/29/20 14:45	1
Cesium-137	0.00159	U	0.0592	0.0592	0.0700	0.0485	pCi/g	11/06/20 19:32	11/29/20 14:45	1
Lead-210	0.965	U	1.49	1.50		1.01	pCi/g	11/06/20 19:32	11/29/20 14:45	1
Lead-212	**0.443**		0.107	0.119		0.0561	pCi/g	11/06/20 19:32	11/29/20 14:45	1
Lead-214	**0.383**		0.144	0.151		0.0684	pCi/g	11/06/20 19:32	11/29/20 14:45	1
Potassium-40	**7.54**		1.41	1.65		0.298	pCi/g	11/06/20 19:32	11/29/20 14:45	1
Protactinium-231	0.412	U	1.83	1.83		2.00	pCi/g	11/06/20 19:32	11/29/20 14:45	1
Protactinium-234	0.0441	U	0.0783	0.0785		0.291	pCi/g	11/06/20 19:32	11/29/20 14:45	1
Radium-226	**0.376**		0.159	0.165	0.200	0.0733	pCi/g	11/06/20 19:32	11/29/20 14:45	1
Radium-228	**0.293**		0.123	0.127		0.132	pCi/g	11/06/20 19:32	11/29/20 14:45	1
Thallium-208	**0.187**		0.0739	0.0770		0.0315	pCi/g	11/06/20 19:32	11/29/20 14:45	1
Thorium 228	**0.443**		0.107	0.119		0.0561	pCi/g	11/06/20 19:32	11/29/20 14:45	1
Thorium-232	**0.293**		0.123	0.127		0.132	pCi/g	11/06/20 19:32	11/29/20 14:45	1
Thorium-234	-0.878	U	0.941	0.947		0.945	pCi/g	11/06/20 19:32	11/29/20 14:45	1
Uranium-235	0.0688	U	0.153	0.153		0.392	pCi/g	11/06/20 19:32	11/29/20 14:45	1
Uranium-238	-0.878	U	0.941	0.947		0.945	pCi/g	11/06/20 19:32	11/29/20 14:45	1

Client Sample ID: HPPG-SFU-TU098B-025

Lab Sample ID: 160-40217-27

Date Collected: 10/29/20 14:57
Matrix: Solid
Date Received: 11/02/20 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.555**		0.167	0.176		0.0403	pCi/g	11/06/20 19:32	11/29/20 15:18	1
Actinium-227	0.285	U	0.507	0.508		0.341	pCi/g	11/06/20 19:32	11/29/20 15:18	1
Bismuth-212	-0.472	U	1.00	1.01		0.784	pCi/g	11/06/20 19:32	11/29/20 15:18	1
Bismuth-214	**0.422**		0.120	0.128		0.0328	pCi/g	11/06/20 19:32	11/29/20 15:18	1
Cesium-137	-0.0247	U	0.0605	0.0605	0.0700	0.0449	pCi/g	11/06/20 19:32	11/29/20 15:18	1
Lead-210	**1.28**		1.64	1.65		1.08	pCi/g	11/06/20 19:32	11/29/20 15:18	1
Lead-212	**0.517**		0.106	0.119		0.0519	pCi/g	11/06/20 19:32	11/29/20 15:18	1
Lead-214	**0.432**		0.135	0.142		0.0547	pCi/g	11/06/20 19:32	11/29/20 15:18	1
Potassium-40	**8.03**		1.54	1.74		0.250	pCi/g	11/06/20 19:32	11/29/20 15:18	1
Protactinium-231	-0.912	U	3.17	3.17		2.58	pCi/g	11/06/20 19:32	11/29/20 15:18	1
Protactinium-234	0.112	U	0.296	0.296		0.214	pCi/g	11/06/20 19:32	11/29/20 15:18	1
Radium-226	**0.422**		0.120	0.128	0.200	0.0328	pCi/g	11/06/20 19:32	11/29/20 15:18	1
Radium-228	**0.555**		0.167	0.176		0.0403	pCi/g	11/06/20 19:32	11/29/20 15:18	1
Thallium-208	**0.214**		0.0773	0.0803		0.0279	pCi/g	11/06/20 19:32	11/29/20 15:18	1
Thorium 228	**0.517**		0.106	0.119		0.0519	pCi/g	11/06/20 19:32	11/29/20 15:18	1
Thorium-232	**0.555**		0.167	0.176		0.0403	pCi/g	11/06/20 19:32	11/29/20 15:18	1
Thorium-234	**0.510**		0.562	0.564		0.503	pCi/g	11/06/20 19:32	11/29/20 15:18	1
Uranium-235	-0.0478	U	0.338	0.338		0.400	pCi/g	11/06/20 19:32	11/29/20 15:18	1
Uranium-238	**0.510**		0.562	0.564		0.503	pCi/g	11/06/20 19:32	11/29/20 15:18	1

QC Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40217-1
SDG: GJ46599774

Method: 905.0 - Total Beta Strontium (GFPC)

Lab Sample ID: MB 160-490265/23-A
Matrix: Solid
Analysis Batch: 491588

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 490265

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Total Beta Strontium	-0.02016	U	0.0539	0.0539	0.160	0.0460	pCi/g	11/25/20 14:30	12/11/20 07:07	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*96.3*		*40 - 110*	*11/25/20 14:30*	*12/11/20 07:07*	*1*

Lab Sample ID: LCS 160-490265/1-A
Matrix: Solid
Analysis Batch: 491444

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 490265

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Total Beta Strontium	7.76	6.013		0.491	0.160	0.0470	pCi/g	77	75 - 125

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Sr Carrier	*109*		*40 - 110*

Lab Sample ID: MB 160-490272/10-B
Matrix: Solid
Analysis Batch: 491589

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 490272

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Total Beta Strontium	-0.02855	U	0.0589	0.0589	0.160	0.0506	pCi/g	11/25/20 15:25	12/11/20 08:11	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*99.4*		*40 - 110*	*11/25/20 15:25*	*12/11/20 08:11*	*1*

Lab Sample ID: LCS 160-490272/1-A
Matrix: Solid
Analysis Batch: 491588

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 490272

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Total Beta Strontium	7.76	6.091		0.497	0.160	0.0387	pCi/g	78	75 - 125

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Sr Carrier	*106*		*40 - 110*

QC Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40217-1
SDG: GJ46599774

Method: 905.0 - Total Beta Strontium (GFPC) (Continued)

Lab Sample ID: 160-40217-13 DU — **Client Sample ID: HPPG-SFU-TU098B-011**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 491589 — **Prep Batch: 490272**

Analyte	Sample Result	Sample Qual		DU Result	DU Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit			RER	RER Limit
Total Beta Strontium	0.0517			0.006533	U	0.0547	0.160	0.0445	pCi/g			0.42	1

Carrier	*DU %Yield*	*DU Qualifier*	*Limits*
Sr Carrier	*107*		*40 - 110*

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-488491/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 490469 — **Prep Batch: 488491**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	-0.06306	U	0.102	0.103		0.140	pCi/g	11/06/20 18:15	11/29/20 15:51	1
Actinium-227	0.08022	U	0.174	0.174		0.273	pCi/g	11/06/20 18:15	11/29/20 15:51	1
Bismuth-212	-0.2634	U	0.741	0.741		0.586	pCi/g	11/06/20 18:15	11/29/20 15:51	1
Bismuth-214	-0.09586	U	0.0828	0.0834		0.107	pCi/g	11/06/20 18:15	11/29/20 15:51	1
Cesium-137	0.0000	U	0.00669	0.00669	0.0700	0.0258	pCi/g	11/06/20 18:15	11/29/20 15:51	1
Lead-210	0.4000	U	0.906	0.907		0.711	pCi/g	11/06/20 18:15	11/29/20 15:51	1
Lead-212	-0.01314	U	0.0721	0.0721		0.0600	pCi/g	11/06/20 18:15	11/29/20 15:51	1
Lead-214	-0.0001236	U	0.0765	0.0765		0.0621	pCi/g	11/06/20 18:15	11/29/20 15:51	1
Potassium-40	0.1543	U	0.439	0.440		0.324	pCi/g	11/06/20 18:15	11/29/20 15:51	1
Protactinium-231	0.0000	U	0.357	0.357		1.35	pCi/g	11/06/20 18:15	11/29/20 15:51	1
Protactinium-234	0.08717	U	0.149	0.149		0.122	pCi/g	11/06/20 18:15	11/29/20 15:51	1
Radium-226	-0.09586	U	0.0828	0.0834	0.200	0.107	pCi/g	11/06/20 18:15	11/29/20 15:51	1
Radium-228	-0.06306	U	0.102	0.103		0.140	pCi/g	11/06/20 18:15	11/29/20 15:51	1
Thallium-208	0.01082	U	0.0325	0.0325		0.0179	pCi/g	11/06/20 18:15	11/29/20 15:51	1
Thorium 228	-0.01314	U	0.0721	0.0721		0.0600	pCi/g	11/06/20 18:15	11/29/20 15:51	1
Thorium-232	-0.06306	U	0.102	0.103		0.140	pCi/g	11/06/20 18:15	11/29/20 15:51	1
Thorium-234	0.09568	U	0.238	0.238		0.506	pCi/g	11/06/20 18:15	11/29/20 15:51	1
Uranium-235	0.1032	U	0.213	0.213		0.226	pCi/g	11/06/20 18:15	11/29/20 15:51	1
Uranium-238	0.09568	U	0.238	0.238		0.506	pCi/g	11/06/20 18:15	11/29/20 15:51	1

Lab Sample ID: LCS 160-488491/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 490472 — **Prep Batch: 488491**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Americium-241	96.4	101.6		10.6		0.434	pCi/g	105	87 - 116
Cesium-137	26.7	24.99		2.66	0.0700	0.100	pCi/g	93	87 - 120
Cobalt-60	9.51	9.107		0.958		0.0551	pCi/g	96	87 - 115

QC Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40217-1
SDG: GJ46599774

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: 160-40217-20 DU — **Client Sample ID: HPPG-SFU-TU098B-018**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 490471 — **Prep Batch: 488491**

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	RER	RER Limit
Actinium 228	0.444		0.4339		0.197		0.100	pCi/g	0.03	1
Actinium-227	0.180	U	-0.3416	U	0.653		0.391	pCi/g	0.53	1
Bismuth-212	0.000	U	0.7989		0.385		0.103	pCi/g	1.48	1
Bismuth-214	0.426		0.4747		0.211		0.0851	pCi/g	0.14	1
Cesium-137	0.0182	U	-0.03296	U	0.0677	0.0700	0.0526	pCi/g	0.47	1
Lead-210	0.569	U	1.272		1.50		0.992	pCi/g	0.27	1
Lead-212	0.389		0.4700		0.107		0.0434	pCi/g	0.40	1
Lead-214	0.332		0.4481		0.123		0.0694	pCi/g	0.54	1
Potassium-40	7.58		6.434		1.60		0.426	pCi/g	0.36	1
Protactinium-231	-0.729	U	-0.9130	U	3.14		2.56	pCi/g	0.03	1
Protactinium-234	-0.0511	U	-0.1148	U	0.348		0.283	pCi/g	0.11	1
Radium-226	0.426		0.4747		0.211	0.200	0.0851	pCi/g	0.14	1
Radium-228	0.444		0.4339		0.197		0.100	pCi/g	0.03	1
Thallium-208	0.133		0.1878		0.0721		0.0249	pCi/g	0.42	1
Thorium 228	0.389		0.4700		0.107		0.0434	pCi/g	0.40	1
Thorium-232	0.444		0.4339		0.197		0.100	pCi/g	0.03	1
Thorium-234	-0.349	U	0.4530	U	0.550		0.496	pCi/g	0.88	1
Uranium-235	0.0182	U	0.1711	U	0.283		0.222	pCi/g	0.31	1
Uranium-238	-0.349	U	0.4530	U	0.550		0.496	pCi/g	0.88	1

Lab Sample ID: MB 160-488492/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 490476 — **Prep Batch: 488492**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.01626	U	0.0459	0.0459		0.137	pCi/g	11/06/20 19:32	11/29/20 14:44	1
Actinium-227	-0.01301	U	0.0606	0.0606		0.351	pCi/g	11/06/20 19:32	11/29/20 14:44	1
Bismuth-212	0.3809	U	0.888	0.889		0.695	pCi/g	11/06/20 19:32	11/29/20 14:44	1
Bismuth-214	-0.006734	U	0.00897	0.00899		0.200	pCi/g	11/06/20 19:32	11/29/20 14:44	1
Cesium-137	-0.03088	U	0.0639	0.0640	0.0700	0.0492	pCi/g	11/06/20 19:32	11/29/20 14:44	1
Lead-210	0.3962	U	1.59	1.59		1.26	pCi/g	11/06/20 19:32	11/29/20 14:44	1
Lead-212	0.002141	U	0.103	0.103		0.0845	pCi/g	11/06/20 19:32	11/29/20 14:44	1
Lead-214	-0.009276	U	0.0382	0.0382		0.106	pCi/g	11/06/20 19:32	11/29/20 14:44	1
Potassium-40	0.1423	U	0.494	0.494		0.369	pCi/g	11/06/20 19:32	11/29/20 14:44	1
Protactinium-231	0.3230	U	1.20	1.20		1.88	pCi/g	11/06/20 19:32	11/29/20 14:44	1
Protactinium-234	-0.08694	U	0.278	0.278		0.225	pCi/g	11/06/20 19:32	11/29/20 14:44	1
Radium-226	-0.006734	U	0.00897	0.00899	0.200	0.200	pCi/g	11/06/20 19:32	11/29/20 14:44	1
Radium-228	0.01626	U	0.0459	0.0459		0.137	pCi/g	11/06/20 19:32	11/29/20 14:44	1
Thallium-208	0.006815	U	0.00678	0.00682		0.0456	pCi/g	11/06/20 19:32	11/29/20 14:44	1
Thorium 228	0.002141	U	0.103	0.103		0.0845	pCi/g	11/06/20 19:32	11/29/20 14:44	1
Thorium-232	0.01626	U	0.0459	0.0459		0.137	pCi/g	11/06/20 19:32	11/29/20 14:44	1
Thorium-234	0.06867	U	0.555	0.555		0.412	pCi/g	11/06/20 19:32	11/29/20 14:44	1
Uranium-235	0.1572	U	0.325	0.326		0.353	pCi/g	11/06/20 19:32	11/29/20 14:44	1
Uranium-238	0.06867	U	0.555	0.555		0.412	pCi/g	11/06/20 19:32	11/29/20 14:44	1

QC Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40217-1
SDG: GJ46599774

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: LCS 160-488492/2-A
Matrix: Solid
Analysis Batch: 490621

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 488492

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Americium-241	96.4	93.86		9.84		0.491	pCi/g	97	87 - 116
Cesium-137	26.7	25.46		2.71	0.0700	0.0750	pCi/g	95	87 - 120
Cobalt-60	9.51	9.160		0.960		0.0395	pCi/g	96	87 - 115

QC Association Summary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40217-1
SDG: GJ46599774

Rad

Leach Batch: 488198

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40217-1	HPPG-F-025	Total/NA	Solid	Dry and Grind	
160-40217-2	HPPG-F-026	Total/NA	Solid	Dry and Grind	
160-40217-3	HPPG-SFU-TU098B-001	Total/NA	Solid	Dry and Grind	
160-40217-4	HPPG-SFU-TU098B-002	Total/NA	Solid	Dry and Grind	
160-40217-5	HPPG-SFU-TU098B-003	Total/NA	Solid	Dry and Grind	
160-40217-6	HPPG-SFU-TU098B-004	Total/NA	Solid	Dry and Grind	
160-40217-7	HPPG-SFU-TU098B-005	Total/NA	Solid	Dry and Grind	
160-40217-8	HPPG-SFU-TU098B-006	Total/NA	Solid	Dry and Grind	
160-40217-9	HPPG-SFU-TU098B-007	Total/NA	Solid	Dry and Grind	
160-40217-10	HPPG-SFU-TU098B-008	Total/NA	Solid	Dry and Grind	
160-40217-11	HPPG-SFU-TU098B-009	Total/NA	Solid	Dry and Grind	

Leach Batch: 488207

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40217-12	HPPG-SFU-TU098B-010	Total/NA	Solid	Dry and Grind	
160-40217-13	HPPG-SFU-TU098B-011	Total/NA	Solid	Dry and Grind	
160-40217-14	HPPG-SFU-TU098B-012	Total/NA	Solid	Dry and Grind	
160-40217-15	HPPG-SFU-TU098B-013	Total/NA	Solid	Dry and Grind	
160-40217-16	HPPG-SFU-TU098B-014	Total/NA	Solid	Dry and Grind	
160-40217-17	HPPG-SFU-TU098B-015	Total/NA	Solid	Dry and Grind	
160-40217-18	HPPG-SFU-TU098B-016	Total/NA	Solid	Dry and Grind	
160-40217-19	HPPG-SFU-TU098B-017	Total/NA	Solid	Dry and Grind	
160-40217-20	HPPG-SFU-TU098B-018	Total/NA	Solid	Dry and Grind	
160-40217-21	HPPG-SFU-TU098B-019	Total/NA	Solid	Dry and Grind	
160-40217-22	HPPG-SFU-TU098B-020	Total/NA	Solid	Dry and Grind	
160-40217-23	HPPG-SFU-TU098B-021	Total/NA	Solid	Dry and Grind	
160-40217-24	HPPG-SFU-TU098B-022	Total/NA	Solid	Dry and Grind	
160-40217-25	HPPG-SFU-TU098B-023	Total/NA	Solid	Dry and Grind	
160-40217-26	HPPG-SFU-TU098B-024	Total/NA	Solid	Dry and Grind	
160-40217-27	HPPG-SFU-TU098B-025	Total/NA	Solid	Dry and Grind	
160-40217-13 DU	HPPG-SFU-TU098B-011	Total/NA	Solid	Dry and Grind	
160-40217-20 DU	HPPG-SFU-TU098B-018	Total/NA	Solid	Dry and Grind	

Prep Batch: 488491

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40217-1	HPPG-F-025	Total/NA	Solid	Fill_Geo-21	488198
160-40217-2	HPPG-F-026	Total/NA	Solid	Fill_Geo-21	488198
160-40217-3	HPPG-SFU-TU098B-001	Total/NA	Solid	Fill_Geo-21	488198
160-40217-4	HPPG-SFU-TU098B-002	Total/NA	Solid	Fill_Geo-21	488198
160-40217-5	HPPG-SFU-TU098B-003	Total/NA	Solid	Fill_Geo-21	488198
160-40217-6	HPPG-SFU-TU098B-004	Total/NA	Solid	Fill_Geo-21	488198
160-40217-7	HPPG-SFU-TU098B-005	Total/NA	Solid	Fill_Geo-21	488198
160-40217-8	HPPG-SFU-TU098B-006	Total/NA	Solid	Fill_Geo-21	488198
160-40217-9	HPPG-SFU-TU098B-007	Total/NA	Solid	Fill_Geo-21	488198
160-40217-10	HPPG-SFU-TU098B-008	Total/NA	Solid	Fill_Geo-21	488198
160-40217-11	HPPG-SFU-TU098B-009	Total/NA	Solid	Fill_Geo-21	488198
160-40217-12	HPPG-SFU-TU098B-010	Total/NA	Solid	Fill_Geo-21	488207
160-40217-13	HPPG-SFU-TU098B-011	Total/NA	Solid	Fill_Geo-21	488207
160-40217-14	HPPG-SFU-TU098B-012	Total/NA	Solid	Fill_Geo-21	488207
160-40217-15	HPPG-SFU-TU098B-013	Total/NA	Solid	Fill_Geo-21	488207
160-40217-16	HPPG-SFU-TU098B-014	Total/NA	Solid	Fill_Geo-21	488207

QC Association Summary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40217-1
SDG: GJ46599774

Rad (Continued)

Prep Batch: 488491 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40217-17	HPPG-SFU-TU098B-015	Total/NA	Solid	Fill_Geo-21	488207
160-40217-18	HPPG-SFU-TU098B-016	Total/NA	Solid	Fill_Geo-21	488207
160-40217-19	HPPG-SFU-TU098B-017	Total/NA	Solid	Fill_Geo-21	488207
160-40217-20	HPPG-SFU-TU098B-018	Total/NA	Solid	Fill_Geo-21	488207
MB 160-488491/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-488491/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
160-40217-20 DU	HPPG-SFU-TU098B-018	Total/NA	Solid	Fill_Geo-21	488207

Prep Batch: 488492

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40217-21	HPPG-SFU-TU098B-019	Total/NA	Solid	Fill_Geo-21	488207
160-40217-22	HPPG-SFU-TU098B-020	Total/NA	Solid	Fill_Geo-21	488207
160-40217-23	HPPG-SFU-TU098B-021	Total/NA	Solid	Fill_Geo-21	488207
160-40217-24	HPPG-SFU-TU098B-022	Total/NA	Solid	Fill_Geo-21	488207
160-40217-25	HPPG-SFU-TU098B-023	Total/NA	Solid	Fill_Geo-21	488207
160-40217-26	HPPG-SFU-TU098B-024	Total/NA	Solid	Fill_Geo-21	488207
160-40217-27	HPPG-SFU-TU098B-025	Total/NA	Solid	Fill_Geo-21	488207
MB 160-488492/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-488492/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	

Prep Batch: 490265

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40217-1	HPPG-F-025	Total/NA	Solid	DPS-0	488198
160-40217-3	HPPG-SFU-TU098B-001	Total/NA	Solid	DPS-0	488198
MB 160-490265/23-A	Method Blank	Total/NA	Solid	DPS-0	
LCS 160-490265/1-A	Lab Control Sample	Total/NA	Solid	DPS-0	

Prep Batch: 490272

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40217-13	HPPG-SFU-TU098B-011	Total/NA	Solid	DPS-0	488207
160-40217-23	HPPG-SFU-TU098B-021	Total/NA	Solid	DPS-0	488207
MB 160-490272/10-B	Method Blank	Total/NA	Solid	DPS-0	
LCS 160-490272/1-A	Lab Control Sample	Total/NA	Solid	DPS-0	
160-40217-13 DU	HPPG-SFU-TU098B-011	Total/NA	Solid	DPS-0	488207

Tracer/Carrier Summary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40217-1
SDG: GJ46599774

Method: 905.0 - Total Beta Strontium (GFPC)

Matrix: Solid **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)
Lab Sample ID	**Client Sample ID**	**Sr (40-110)**
160-40217-1	HPPG-F-025	105
160-40217-3	HPPG-SFU-TU098B-001	96.8
160-40217-13	HPPG-SFU-TU098B-011	107
160-40217-13 DU	HPPG-SFU-TU098B-011	107
160-40217-23	HPPG-SFU-TU098B-021	99.1
LCS 160-490265/1-A	Lab Control Sample	109
LCS 160-490272/1-A	Lab Control Sample	106
MB 160-490265/23-A	Method Blank	96.3
MB 160-490272/10-B	Method Blank	99.4

Tracer/Carrier Legend

Sr = Sr Carrier

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ANALYTICAL REPORT

Eurofins TestAmerica, St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

Laboratory Job ID: 160-40219-1
Laboratory Sample Delivery Group: D11589464
Client Project/Site: HPNS-Parcel G 501197
Revision: 1

For:
Aptim Federal Services LLC
4005 Port Chicago Hwy, Suite 200
Concord, California 94520

Attn: Rose Condit

Rhonda Ridenhower

Authorized for release by:
4/8/2021 12:35:52 PM

Rhonda Ridenhower, Client Service Manager
(314)298-8566
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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Cover Page 1
Table of Contents 2
Case Narrative 3
Chain of Custody 5
Receipt Checklists 7
Definitions/Glossary 8
Method Summary 9
Sample Summary 10
Client Sample Results 11
QC Sample Results 12
QC Association Summary 14
Tracer Carrier Summary 15

Job ID: 160-40219-1

Laboratory: Eurofins TestAmerica, St. Louis

Narrative

CASE NARRATIVE

Client: Aptim Federal Services LLC

Project: HPNS-Parcel G 501197

Report Number: 160-40219-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

Eurofins TestAmerica, St. Louis attests to the validity of the laboratory data generated by Eurofins TestAmerica facilities reported herein. All analyses performed by Eurofins TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. Eurofins TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an ""as received"" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.

The matrix for the Method Blank and LCS is as close to the following samples as can be reasonably achieved. Detailed information can be found in the most current revision of the associated SOP.

This laboratory report is confidential and is intended for the sole use of Eurofins TestAmerica and its client.

Revision 1- Additional information requested in case narrative for total strontium

Job ID: 160-40219-1 (Continued)

Laboratory: Eurofins TestAmerica, St. Louis (Continued)

RECEIPT
The samples were received on 11/02/2020; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 16.9 C.

TOTAL BETA STRONTIUM (GFPC)
Sample HPPG-SFU-TU098B-B-001 (160-40219-1) was analyzed for Total Beta Strontium (GFPC) in accordance with EPA 905. The samples were dried on 11/04/2020, prepared on 11/25/2020 and analyzed on 12/11/2020.

When taking small mass aliquots from dried/disaggregated sample, the laboratory avoids large rocks/pebbles (as well as sticks, etc) which may constitute a larger than representative portion of the aliquot. Smaller rocks may be included. This is consistent with QSM and Laboratory SOP: HPPG-SFU-TU098B-B-001 (160-40219-1).

The method blank (MB) Z-score is within limits and is located in the level IV raw data.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)
Sample HPPG-SFU-TU098B-B-001 (160-40219-1) was analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA_01_R. The samples were dried on 11/04/2020, prepared on 11/06/2020 and analyzed on 11/29/2020.

Many isotopes requested for analysis do not have any gamma emissions, or the gamma emissions they do have are very poor. Often, such analytes are reported by gamma spectrometry assuming secular equilibrium with a longer-lived parent. The client should ensure that such inference is acceptable for their sample based upon process knowledge. The following assumptions were made for this report:

Inferred from	Reported to Analyte
Th-234	Pa-234
Th-234	U-238
Pb-210	Po-210
Pb-210	Bi-210
Cs-137	Ba-137m
Pb-212	Po-216
Xe-131m	Xe-131
Sb-125	Te-125m
Ag-108m	Ag-108
Rh-106	Ru-106
Pb-212	Th-228
Pb-212	Ra-224
U-235	Th-231
Ac-228	Th-232
Ac-228	Ra-228
Th-227	Ra-223
Th-227	Ac-227
Th-227	Bi-211
Th-227	Pb-211
Bi-214	Ra-226

The method blank (MB) Z-score is within limits and is located in the level IV raw data.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

APTIM

CHAIN OF CUSTODY

Ref. Document # 501197RSY-024

APTIM Federal Services, LLC
4005 Port Chicago Hwy
Concord, CA 94520

Project Manager: Lisa Bercik
Phone #: (619)213-3389

Send Report to: Rose Condit
Phone/Fax Number: 415-987-0760
Address: 4005 Port Chicago Hwy

Sample Lead: Lewis, Devin

Sample Tech(s):

Project Number: 501197
Project Name: Hunters Point Naval Shipyard: Parcel G Remedial Action
Project Location: San Francisco, CA
Purchase Order #: 1159058
Shipment/Pickup Date: 10/30/2020
Waybill Number: 4957 0225 4351 4352
Lab Destination: Test America (St. Louis Lab) 13715 Rider Trail North Earth City, MO 63046
Lab Contact Name/ph #: Rhoeda Ridenbower (314)298-8566

Sample ID	Collection Information: Date	Time	Method	Matrix	# of Containers	Preservatives (water) / Preservatives (soil) / Container Type	Gamma Spec (EPA 901.1 M) - Full 21 day in growth gamma		Strontium-90 (EPA 905 MOD)				Dose Rate uR/Hr	Evidence Bag ID	Comment
HPPG-SFU-TU098B-B-001	10/30/2020	13:16	G	SO	1	16 oz. plastic jar	X		X				5	D1189464	

Special Instructions: 21 day ingrowth results only
Analyze for Total Strontium as a screening step, and isotopic Sr-90 only if Total Strontium is above project action limit of 0.331 pCi/g

Turanaround Time: 3-day ☐ 10-Day ☐ 28-day ☐ Other ☐

Level of QC Required: I | II | III | Project Specific

Method Codes C = Composite G = Grab **Matrix Codes:** DW = Drinking Water ; So = Soil; GW = Ground Water; SL = Sludge; WW = Waste Water; CP = Chip Samples; A = Air ; ABS = Asbestos; PO = Pipe Opening

Relinquished By:	Relinquisher Signature:	Relinquish Date Time:	Received By:	Received Signature:	Receive Date Time:
Lewis, Devin		10/30/2020 15:43	SHIPPEDTOLAB	FED EX	

FED EX

*** Last 3 transfers shown above - Complete list of transfers on last page ***

MICHA KORRINHYER NOV 02 2020 08:50

160-40219 Chain of Custody

All Transfers for COC 501197RSY-024

Relinquished By:	Relinquisher Signature:	Relinquish Date Time:	Received By:	Received Signature:	Receive Date Time:
Lewis, Devin		10/30/2020 15:43	SHIPPEDTOLAB	FED EX	

FED EX

Micha Korrinizer

MICHA KORRINIZER NOV 02 2020 08:50

Login Sample Receipt Checklist

Client: Aptim Federal Services LLC

Job Number: 160-40219-1
SDG Number: D11589464

Login Number: 40219
List Number: 1
Creator: Hoerchler, Elizabeth M

List Source: Eurofins TestAmerica, St. Louis

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40219-1
SDG: D11589464

Qualifiers

Rad

Qualifier	Qualifier Description
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Method Summary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40219-1
SDG: D11589464

Method	Method Description	Protocol	Laboratory
905.0	Total Beta Strontium (GFPC)	DOE	TAL SL
GA-01-R	Radium-226 & Other Gamma Emitters (GS)	DOE	TAL SL
DPS-0	Preparation, Digestion/ Precipitate	None	TAL SL
Dry and Grind	Preparation, Dry and Grind	None	TAL SL
Fill_Geo-21	Fill Geometry, 21-Day In-Growth	None	TAL SL

Protocol References:

DOE = U.S. Department of Energy
None = None

Laboratory References:

TAL SL = Eurofins TestAmerica, St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40219-1
SDG: D11589464

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
160-40219-1	HPPG-SFU-TU098B-B-001	Solid	10/30/20 13:16	11/02/20 08:50	

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40219-1
SDG: D11589464

Client Sample ID: HPPG-SFU-TU098B-B-001

Lab Sample ID: 160-40219-1

Date Collected: 10/30/20 13:16
Date Received: 11/02/20 08:50

Matrix: Solid

Method: 905.0 - Total Beta Strontium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Total Beta Strontium	-0.0194	U	0.0576	0.0576	0.160	0.0488	pCi/g	11/25/20 15:25	12/11/20 08:10	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*106*		*40 - 110*	*11/25/20 15:25*	*12/11/20 08:10*	*1*

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.631**		0.165	0.177		0.0440	pCi/g	11/06/20 19:32	11/29/20 14:40	1
Actinium-227	-0.215	U	0.655	0.655		0.382	pCi/g	11/06/20 19:32	11/29/20 14:40	1
Bismuth-212	0.257	U	0.667	0.668		0.527	pCi/g	11/06/20 19:32	11/29/20 14:40	1
Bismuth-214	**0.550**		0.123	0.135		0.0433	pCi/g	11/06/20 19:32	11/29/20 14:40	1
Cesium-137	0.00289	U	0.0575	0.0575	0.0700	0.0472	pCi/g	11/06/20 19:32	11/29/20 14:40	1
Lead-210	0.632	U	1.40	1.40		1.12	pCi/g	11/06/20 19:32	11/29/20 14:40	1
Lead-212	**0.558**		0.0909	0.116		0.0374	pCi/g	11/06/20 19:32	11/29/20 14:40	1
Lead-214	**0.434**		0.102	0.111		0.0542	pCi/g	11/06/20 19:32	11/29/20 14:40	1
Potassium-40	**7.94**		1.22	1.46		0.281	pCi/g	11/06/20 19:32	11/29/20 14:40	1
Protactinium-231	0.000	U	0.338	0.338		2.09	pCi/g	11/06/20 19:32	11/29/20 14:40	1
Protactinium-234	-0.105	U	0.294	0.294		0.239	pCi/g	11/06/20 19:32	11/29/20 14:40	1
Radium-226	**0.550**		0.123	0.135	0.200	0.0433	pCi/g	11/06/20 19:32	11/29/20 14:40	1
Radium-228	**0.631**		0.165	0.177		0.0440	pCi/g	11/06/20 19:32	11/29/20 14:40	1
Thallium-208	**0.172**		0.0779	0.0799		0.0362	pCi/g	11/06/20 19:32	11/29/20 14:40	1
Thorium 228	**0.558**		0.0909	0.116		0.0374	pCi/g	11/06/20 19:32	11/29/20 14:40	1
Thorium-232	**0.631**		0.165	0.177		0.0440	pCi/g	11/06/20 19:32	11/29/20 14:40	1
Thorium-234	-0.389	U	0.445	0.448		1.04	pCi/g	11/06/20 19:32	11/29/20 14:40	1
Uranium-235	0.214	U	0.205	0.206		0.428	pCi/g	11/06/20 19:32	11/29/20 14:40	1
Uranium-238	-0.389	U	0.445	0.448		1.04	pCi/g	11/06/20 19:32	11/29/20 14:40	1

QC Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40219-1
SDG: D11589464

Method: 905.0 - Total Beta Strontium (GFPC)

Lab Sample ID: MB 160-490272/10-B
Matrix: Solid
Analysis Batch: 491589

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 490272

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Total Beta Strontium	-0.02855	U	0.0589	0.0589	0.160	0.0506	pCi/g	11/25/20 15:25	12/11/20 08:11	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*99.4*		*40 - 110*	*11/25/20 15:25*	*12/11/20 08:11*	*1*

Lab Sample ID: LCS 160-490272/1-A
Matrix: Solid
Analysis Batch: 491588

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 490272

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Total Beta Strontium	7.76	6.091		0.497	0.160	0.0387	pCi/g	78	75 - 125

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Sr Carrier	*106*		*40 - 110*

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-488492/1-A
Matrix: Solid
Analysis Batch: 490476

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 488492

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.01626	U	0.0459	0.0459		0.137	pCi/g	11/06/20 19:32	11/29/20 14:44	1
Actinium-227	-0.01301	U	0.0606	0.0606		0.351	pCi/g	11/06/20 19:32	11/29/20 14:44	1
Bismuth-212	0.3809	U	0.888	0.889		0.695	pCi/g	11/06/20 19:32	11/29/20 14:44	1
Bismuth-214	-0.006734	U	0.00897	0.00899		0.200	pCi/g	11/06/20 19:32	11/29/20 14:44	1
Cesium-137	-0.03088	U	0.0639	0.0640	0.0700	0.0492	pCi/g	11/06/20 19:32	11/29/20 14:44	1
Lead-210	0.3962	U	1.59	1.59		1.26	pCi/g	11/06/20 19:32	11/29/20 14:44	1
Lead-212	0.002141	U	0.103	0.103		0.0845	pCi/g	11/06/20 19:32	11/29/20 14:44	1
Lead-214	-0.009276	U	0.0382	0.0382		0.106	pCi/g	11/06/20 19:32	11/29/20 14:44	1
Potassium-40	0.1423	U	0.494	0.494		0.369	pCi/g	11/06/20 19:32	11/29/20 14:44	1
Protactinium-231	0.3230	U	1.20	1.20		1.88	pCi/g	11/06/20 19:32	11/29/20 14:44	1
Protactinium-234	-0.08694	U	0.278	0.278		0.225	pCi/g	11/06/20 19:32	11/29/20 14:44	1
Radium-226	-0.006734	U	0.00897	0.00899	0.200	0.200	pCi/g	11/06/20 19:32	11/29/20 14:44	1
Radium-228	0.01626	U	0.0459	0.0459		0.137	pCi/g	11/06/20 19:32	11/29/20 14:44	1
Thallium-208	0.006815	U	0.00678	0.00682		0.0456	pCi/g	11/06/20 19:32	11/29/20 14:44	1
Thorium 228	0.002141	U	0.103	0.103		0.0845	pCi/g	11/06/20 19:32	11/29/20 14:44	1
Thorium-232	0.01626	U	0.0459	0.0459		0.137	pCi/g	11/06/20 19:32	11/29/20 14:44	1
Thorium-234	0.06867	U	0.555	0.555		0.412	pCi/g	11/06/20 19:32	11/29/20 14:44	1
Uranium-235	0.1572	U	0.325	0.326		0.353	pCi/g	11/06/20 19:32	11/29/20 14:44	1
Uranium-238	0.06867	U	0.555	0.555		0.412	pCi/g	11/06/20 19:32	11/29/20 14:44	1

QC Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40219-1
SDG: D11589464

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: LCS 160-488492/2-A
Matrix: Solid
Analysis Batch: 490621

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 488492

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Americium-241	96.4	93.86		9.84		0.491	pCi/g	97	87 - 116
Cesium-137	26.7	25.46		2.71	0.0700	0.0750	pCi/g	95	87 - 120
Cobalt-60	9.51	9.160		0.960		0.0395	pCi/g	96	87 - 115

Lab Sample ID: 160-40219-1 DU
Matrix: Solid
Analysis Batch: 490471

Client Sample ID: HPPG-SFU-TU098B-B-001
Prep Type: Total/NA
Prep Batch: 488492

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	RER	RER Limit
Actinium 228	0.631		0.4877		0.176		0.134	pCi/g	0.41	1
Actinium-227	-0.215	U	0.3144	U	0.526		0.321	pCi/g	0.45	1
Bismuth-212	0.257	U	-0.3402	U	1.06		0.847	pCi/g	0.35	1
Bismuth-214	0.550		0.4330		0.155		0.0790	pCi/g	0.40	1
Cesium-137	0.00289	U	-0.05512	U	0.0899	0.0700	0.0697	pCi/g	0.39	1
Lead-210	0.632	U	-1.013	U	2.00		1.68	pCi/g	0.48	1
Lead-212	0.558		0.5703		0.122		0.0450	pCi/g	0.05	1
Lead-214	0.434		0.6093		0.156		0.0553	pCi/g	0.66	1
Potassium-40	7.94		9.122		1.72		0.135	pCi/g	0.37	1
Protactinium-231	0.000	U	-1.165	U	3.78		3.08	pCi/g	0.28	1
Protactinium-234	-0.105	U	-0.1171	U	0.355		0.289	pCi/g	0.02	1
Radium-226	0.550		0.4330		0.155	0.200	0.0790	pCi/g	0.40	1
Radium-228	0.631		0.4877		0.176		0.134	pCi/g	0.41	1
Thallium-208	0.172		0.2624		0.0677		0.00861	pCi/g	0.61	1
Thorium 228	0.558		0.5703		0.122		0.0450	pCi/g	0.05	1
Thorium-232	0.631		0.4877		0.176		0.134	pCi/g	0.41	1
Thorium-234	-0.389	U	0.3060	U	0.556		0.463	pCi/g	0.69	1
Uranium-235	0.214	U	0.1681	U	0.317		0.588	pCi/g	0.09	1
Uranium-238	-0.389	U	0.3060	U	0.556		0.463	pCi/g	0.69	1

QC Association Summary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40219-1
SDG: D11589464

Rad

Leach Batch: 488207

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40219-1	HPPG-SFU-TU098B-B-001	Total/NA	Solid	Dry and Grind	
160-40219-1 DU	HPPG-SFU-TU098B-B-001	Total/NA	Solid	Dry and Grind	

Prep Batch: 488492

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40219-1	HPPG-SFU-TU098B-B-001	Total/NA	Solid	Fill_Geo-21	488207
MB 160-488492/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-488492/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
160-40219-1 DU	HPPG-SFU-TU098B-B-001	Total/NA	Solid	Fill_Geo-21	488207

Prep Batch: 490272

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40219-1	HPPG-SFU-TU098B-B-001	Total/NA	Solid	DPS-0	488207
MB 160-490272/10-B	Method Blank	Total/NA	Solid	DPS-0	
LCS 160-490272/1-A	Lab Control Sample	Total/NA	Solid	DPS-0	

Tracer/Carrier Summary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40219-1
SDG: D11589464

Method: 905.0 - Total Beta Strontium (GFPC)

Matrix: Solid **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)
Lab Sample ID	**Client Sample ID**	**Sr (40-110)**
160-40219-1	HPPG-SFU-TU098B-B-001	106
LCS 160-490272/1-A	Lab Control Sample	106
MB 160-490272/10-B	Method Blank	99.4

Tracer/Carrier Legend

Sr = Sr Carrier