Hunters Point Naval Shipyard, Parcel G, RSY Data Report

Contract No. N62473-17-D-006 CTO N6247318F5065 RSY Pad Data Report	
RSY Pad: RSY 1 Use 2	Soil Origin: TU-077B ESU
Data attached and submitted by: Amy Mangel	Data Report Submittal Date: 01/22/2021

Systematic Soil Sample Data: RSY 1 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)	^{90}Sr Final Analytical Results (pCi/g)
Project Remediation Goals*					1.861	0.141	0.331
HPPG-ESU-TU077B-001	1	Systematic	9,645	14,627	0.482	0.0147	0.216
HPPG-ESU-TU077B-002	2	Systematic	8,855	14,627	0.187	-0.0538	N/A
HPPG-ESU-TU077B-003	3	Systematic	6,005	14,627	0.403	0.00587	N/A
HPPG-ESU-TU077B-004	4	Systematic	7,348	14,627	0.483	0.0164	N/A
HPPG-ESU-TU077B-005	5	Systematic	6,806	14,627	0.375	0.0225	N/A
HPPG-ESU-TU077B-006	6	Systematic	7,167	14,627	0.588	-0.0578	N/A
HPPG-ESU-TU077B-007	7	Systematic	6,379	14,627	0.282	0.0119	N/A
HPPG-ESU-TU077B-008	8	Systematic	6,113	14,627	0.413	0.0912	N/A
HPPG-ESU-TU077B-009	9	Systematic	5,687	14,627	0.218	-0.0048	N/A
HPPG-ESU-TU077B-010	10	Systematic	7,074	14,627	0.406	0.0128	N/A
HPPG-ESU-TU077B-011	11	Systematic	6,311	14,627	0.382	-0.0220	0.0144
HPPG-ESU-TU077B-012	12	Systematic	5,903	14,627	0.341	-0.00371	N/A
HPPG-ESU-TU077B-013	13	Systematic	7,539	14,627	0.0859	-0.0180	N/A
HPPG-ESU-TU077B-014	14	Systematic	6,560	14,627	0.110	-0.0315	N/A
HPPG-ESU-TU077B-015	15	Systematic	6,336	14,627	0.315	-0.0398	N/A
HPPG-ESU-TU077B-016	16	Systematic	6,336	14,627	0.427	0.0342	N/A
HPPG-ESU-TU077B-017	17	Systematic	6,541	14,627	0.318	0.0140	N/A
HPPG-ESU-TU077B-018	18	Systematic	7,565	14,627	0.587	-0.0598	N/A
HPPG-ESU-TU077B-019	19	Systematic	7,408	14,627	0.305	-0.0418	N/A
HPPG-ESU-TU077B-020	20	Systematic	7,930	14,627	0.375	-0.0748	N/A
HPPG-ESU-TU077B-021	21	Systematic	6,632	14,627	0.436	0.0219	0.174
HPPG-ESU-TU077B-022	22	Systematic	6,366	14,627	0.279	0.0729	N/A
HPPG-ESU-TU077B-023	23	Systematic	6,088	14,627	0.276	-0.0343	N/A
HPPG-ESU-TU077B-024	24	Systematic	6,918	14,627	0.540	-0.0642	N/A
HPPG-ESU-TU077B-025	25	Systematic	6,548	14,627	-0.0569	0.0430	N/A
Soil Systematic Sample Statistics					^{226}Ra Final Analytical Results (pCi/g)	^{137}Cs Final Analytical Results (pCi/g)	^{90}Sr Final Analytical Results (pCi/g)
Maximum					0.588	0.0912	0.216
Mean					0.3423	-0.0058	0.1348
Median					0.375	-0.0037	0.174
Minimum					-0.0569	-0.0748	0.0144
Standard Deviation					0.1534	0.0427	N/A

Biased Soil Sample Data: RSY 1 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)	^{90}Sr Final Analytical Results (pCi/g)
Project Remediation Goals*					1.861	0.141	0.331
HPPG-ESU-TU077B-B-001	1	Biased	12,688	15,658	0.248	-0.0378	-0.0157

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-11302020-PG-ROV-359	11/30/2020	RS-700	03/31/2022	5447/5448
Follow-Up Static Survey	HPRS-12022020-PG-JSS-365	12/02/2020	RS-700	03/31/2022	5447/5448
Systematic Sample Survey	HPRS-12012020-PG-JSS-362	12/01/2020	3x3	10/09/2021	117648
Biased Sample Survey	HPRS-12022020-PG-JSS-367	12/02/2020	3x3	10/09/2021	117648

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 1 Use 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, 33 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 33 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 14-46. 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 47-80). Ten percent of the systematic soil samples (three samples in total -001, -011, & -021) were also analyzed for ^{90}Strontium. Strontium-90 results are also included in the TestAmerica sample results report (pages 47-80). Samples HPPG-F-033 and HPPG-F-034 are field duplicates, correlating to systematic samples -001 and -017. 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, one biased sample was collected from the location of the highest gross gamma scan measurement, since all follow-up static measurements were below the ROC-specific critical levels. TestAmerica sample results are attached (pages 81-95). 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 1 Use 2 contains soil from Hunters Point Naval Shipyard Parcel G Phase 1 excavation TU-077B ESU.

APTIM requests RASO concurrence to release this soil as Non-LLRW.
Disposition: This soil shall be used as backfill for TU-077.

Soil Scan Statistics

Statistical Summary

Dataset	PG-RSY-01-U2				
ROI	Minimum (cps)	Maximum (cps)	Mean (cps)	Median (cps)	Standard Deviation (cps)
ROI-03	4.01	34.07	16.30	16.04	4.22
ROI-06	58.14	153.34	101.64	101.23	14.19
ROI-07	44.10	119.26	77.18	77.15	11.64
ROI-08	79.16	188.46	128.89	128.29	16.65
ROI-10	2,065.57	3,164.48	2,666.52	2,647.60	211.99

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

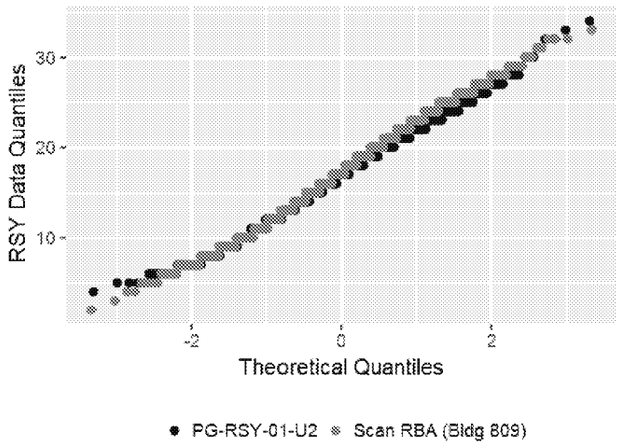
cps = counts per second

Dataset	Number of Data Points
PG-RSY-01-U2	2742
Scan RBA (Bldg 809)	4632

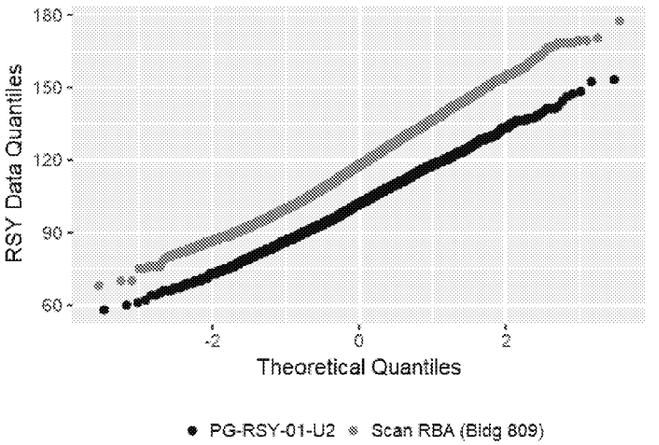
Soil Scan Statistics

Normal Q-Q Plots

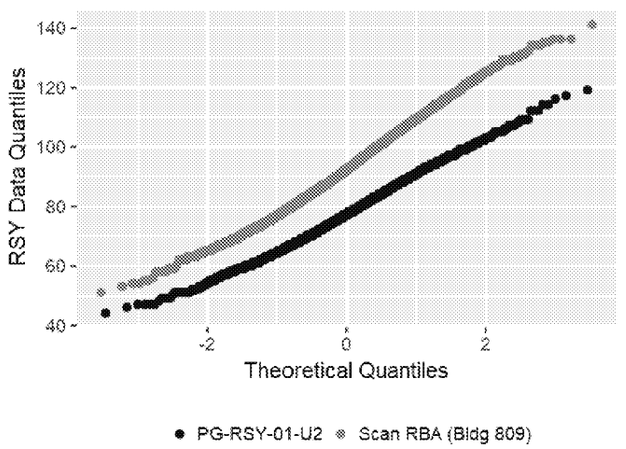
ROI 03



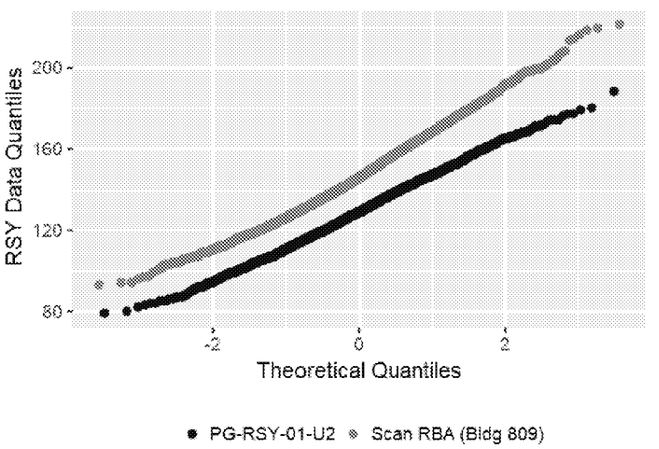
ROI 06



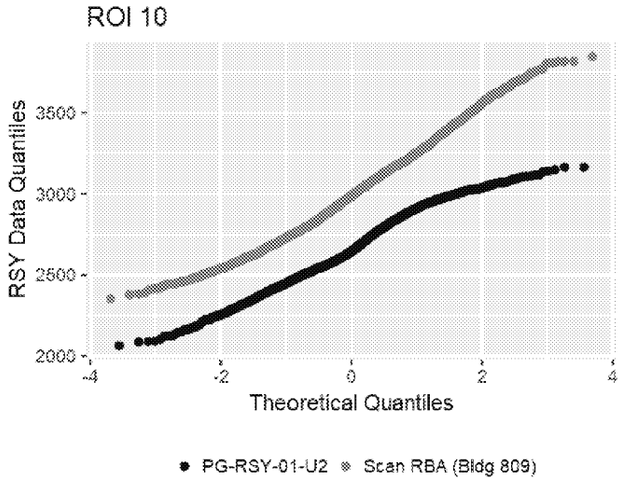
ROI 07



ROI 08



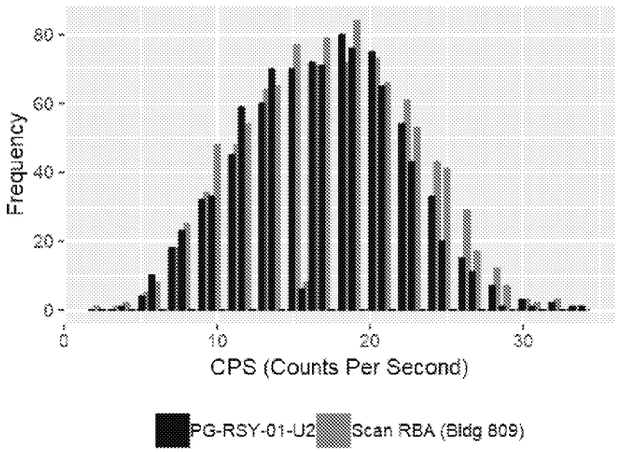
ROI 10



Soil Scan Statistics

Histograms

ROI 03



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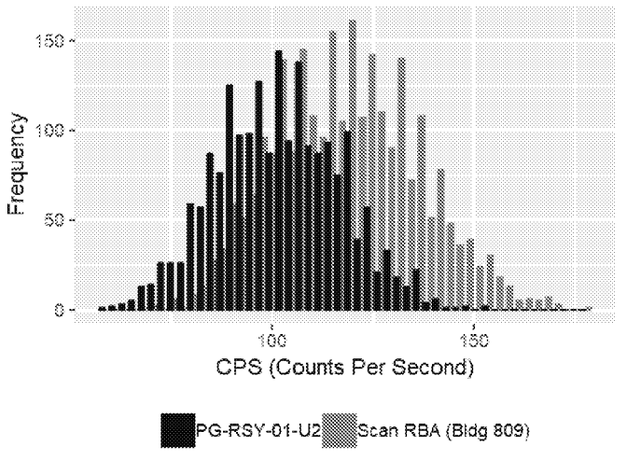

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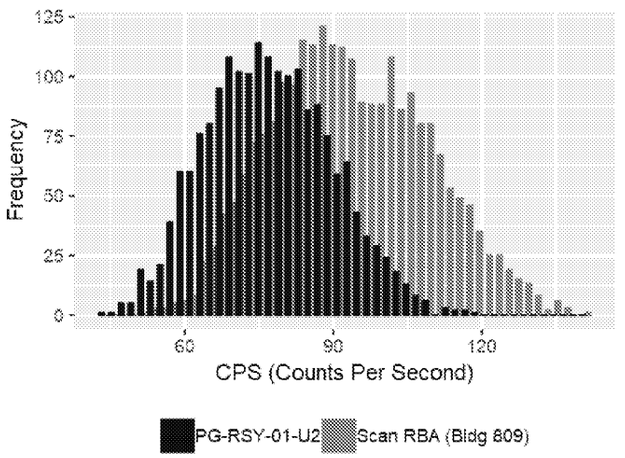

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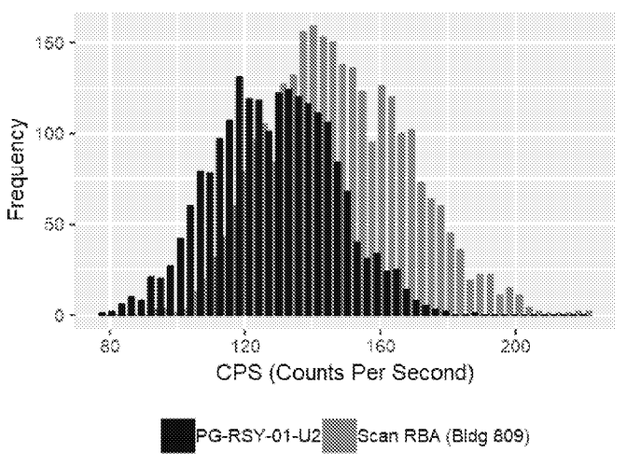

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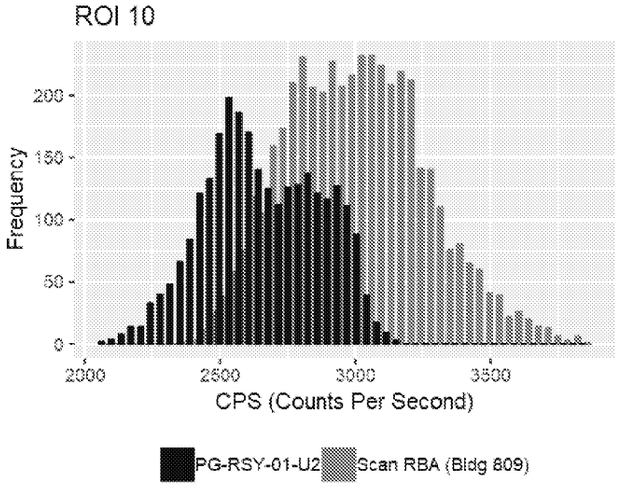
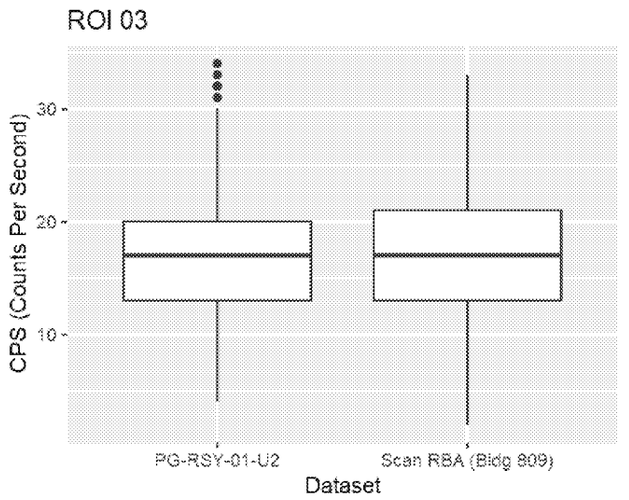
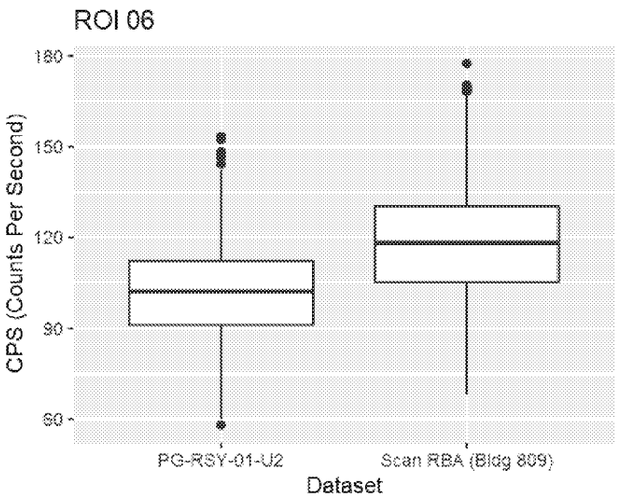
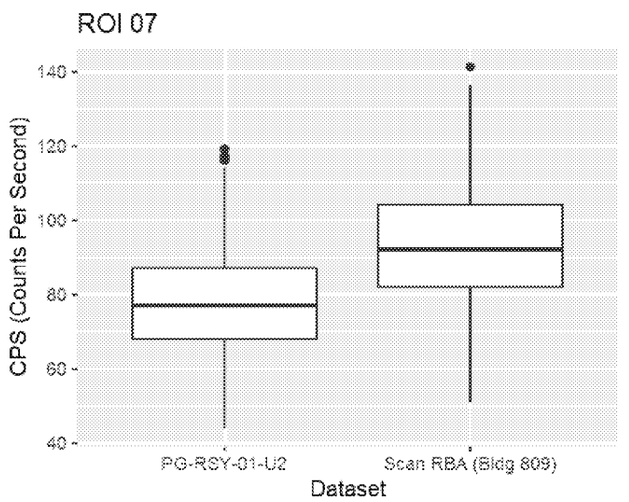


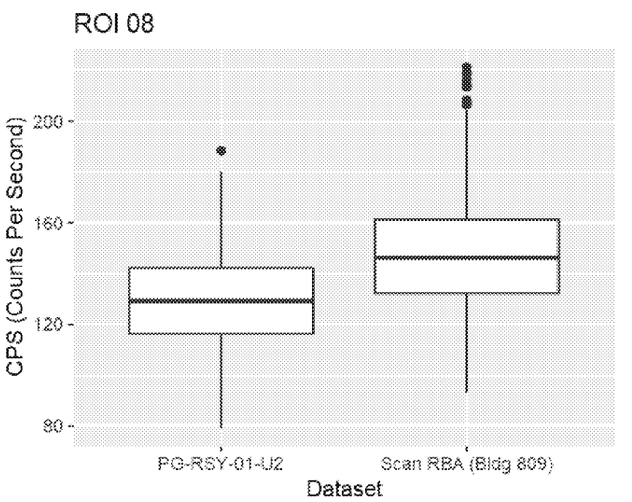
Soil Scan Statistics

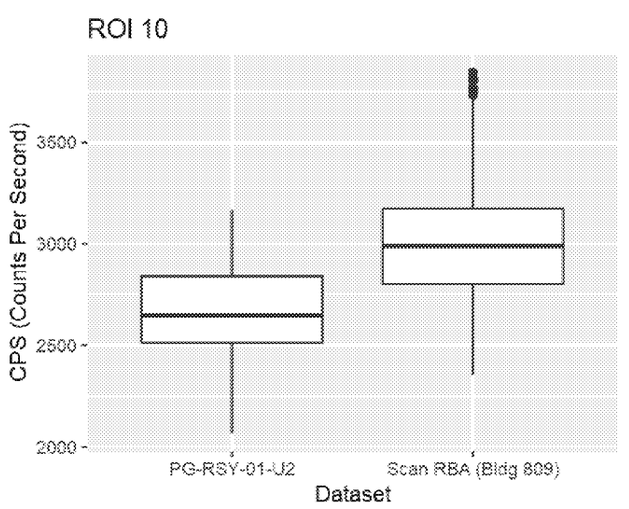
Box Plots





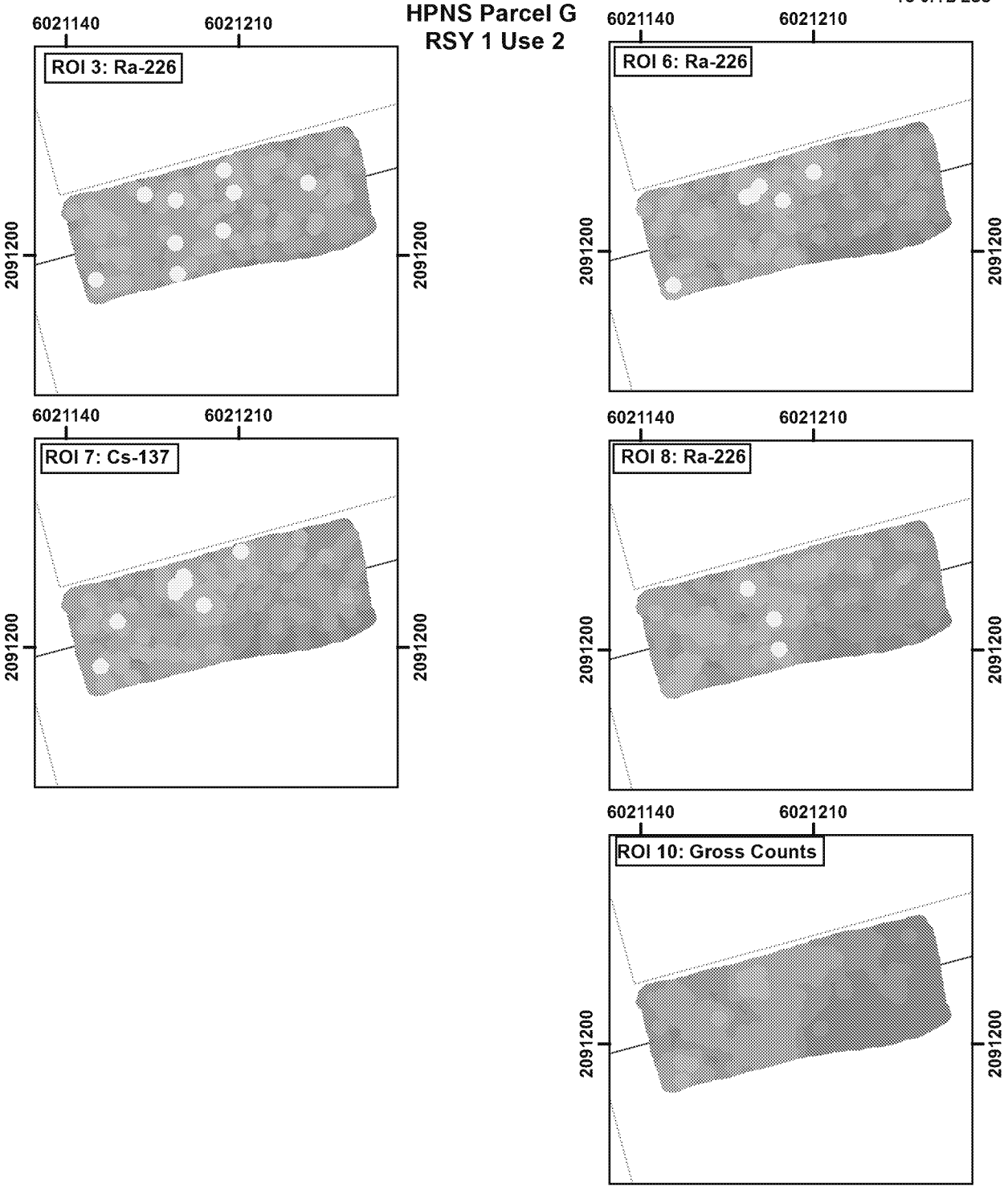






RSI Data Plots
HPNS Parcel G
RSY 1 Use 2

TU-077B ESU



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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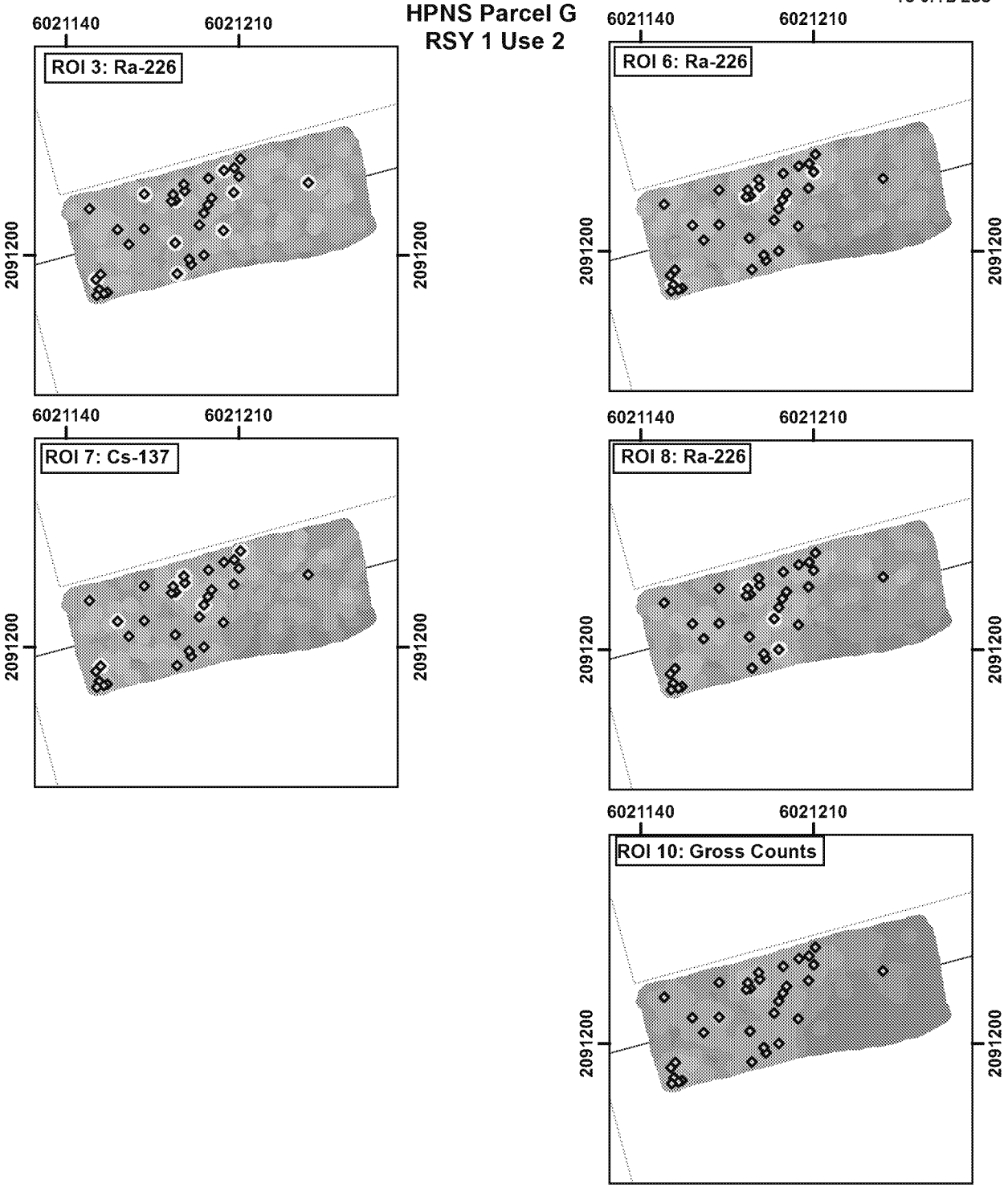
RSI Data Plots
HPNS Parcel G
RSY 1 Use 2

TU-077B ESU



RS 700 Gamma Walkover Survey Data (VD1)

- Follow-Up Locations
- > 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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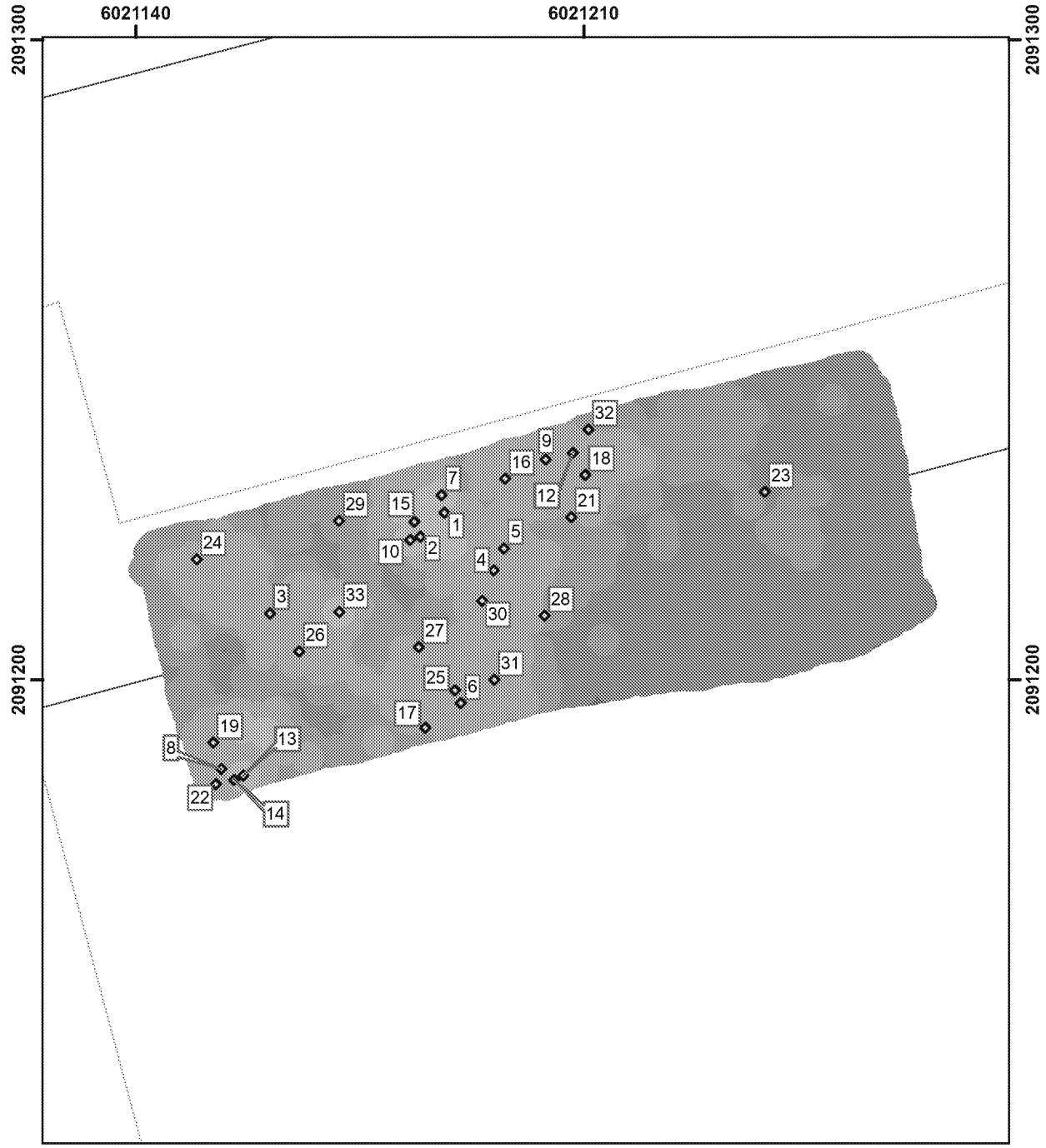
TU-077B ESU

Follow-Up Static Survey
HPNS Parcel G
RSY 1 Use 2



RSY 1 Use 2 (VD1, ROI 10 Gross Gamma)

- Follow-Up Locations
- > 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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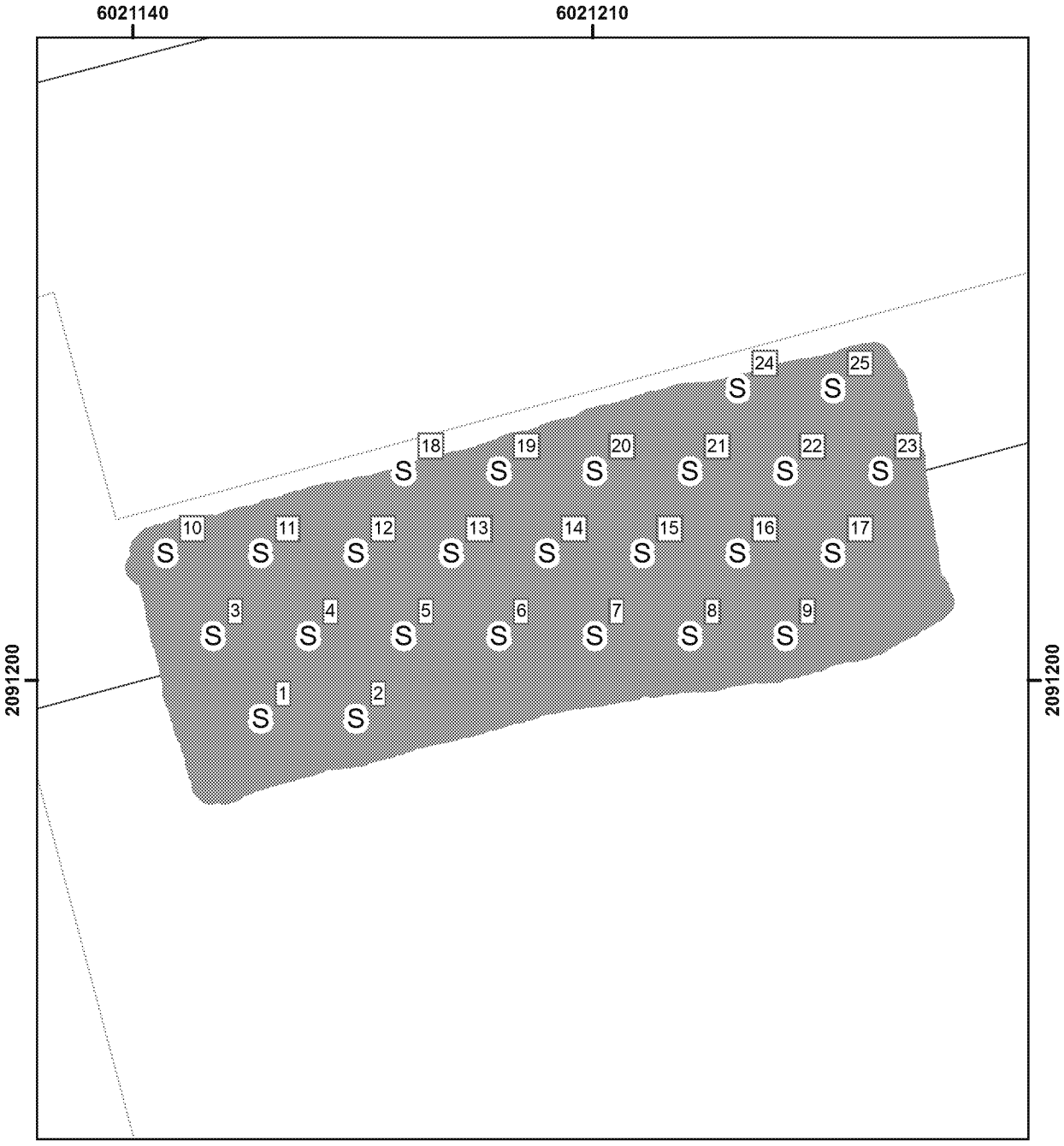
Systematic Sampling
HPNS Parcel G
RSY 1 Use 2

TU-077B ESU



RSY 1 Use 2

S Systematic Sample Locations

RS-700 GWS Coverage

0 10 20 40 Feet

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

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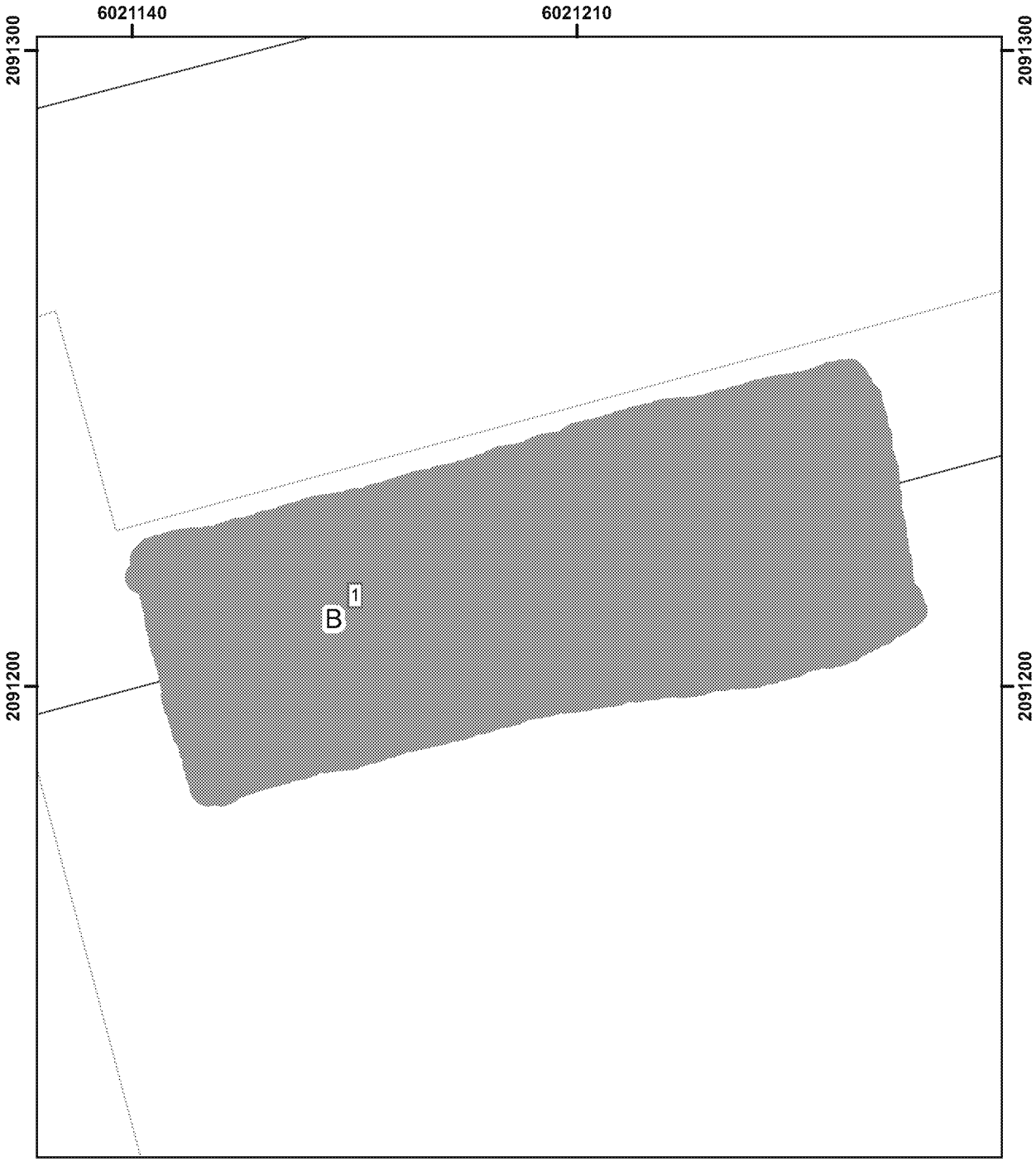
Biased Sampling
HPNS Parcel G
RSY 1 Use 2

TU-077B ESU



RSY 1 Use 2

B Biased Sample Location

RS-700 GWS Coverage

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

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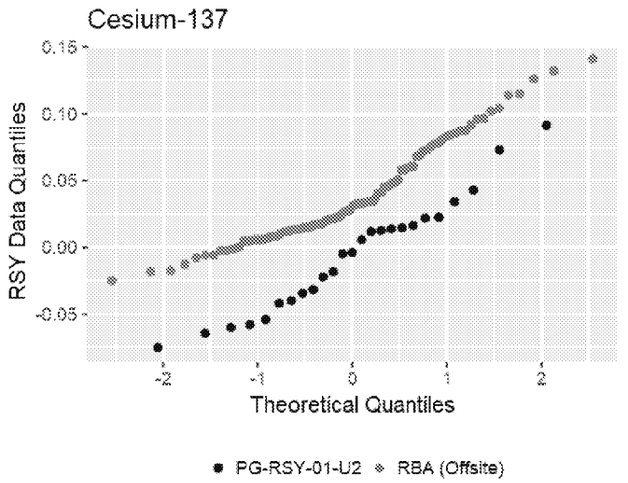
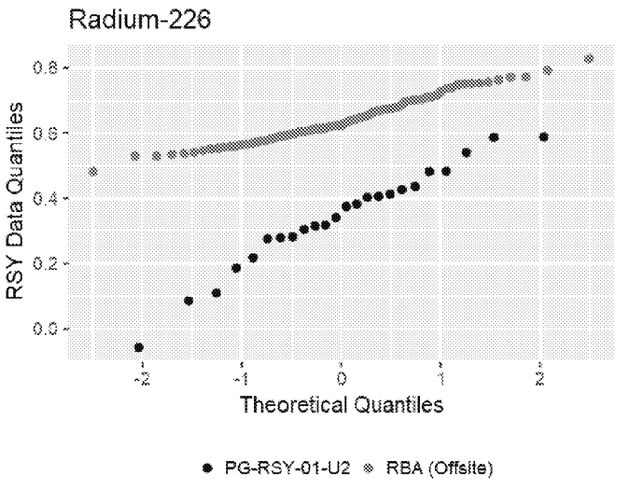
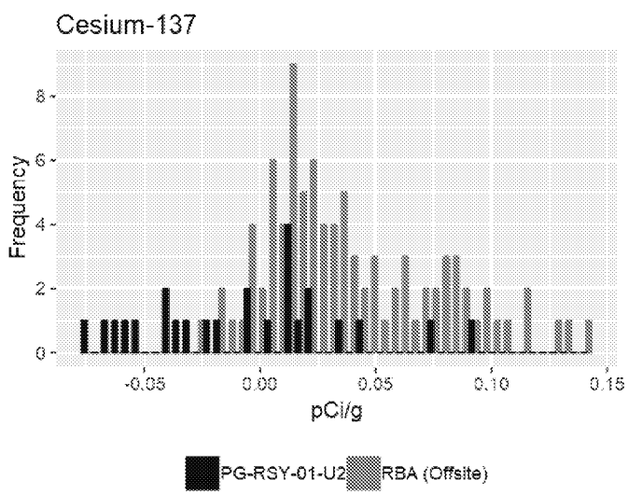
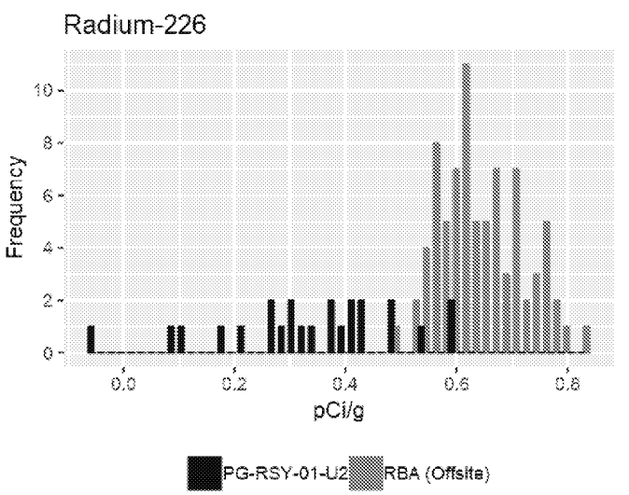
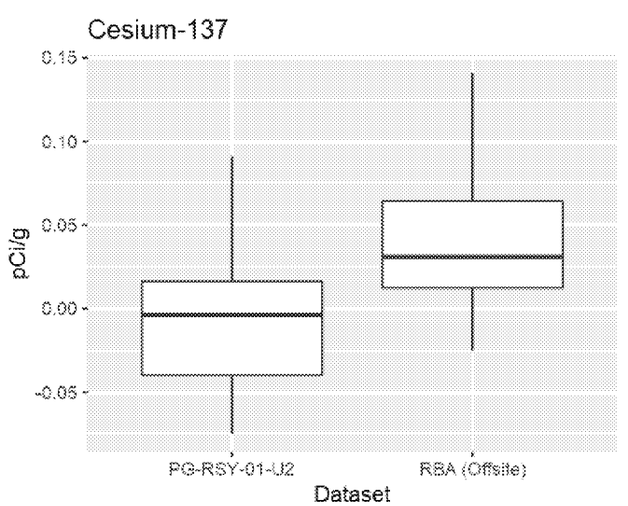
Soil Sample Statistics

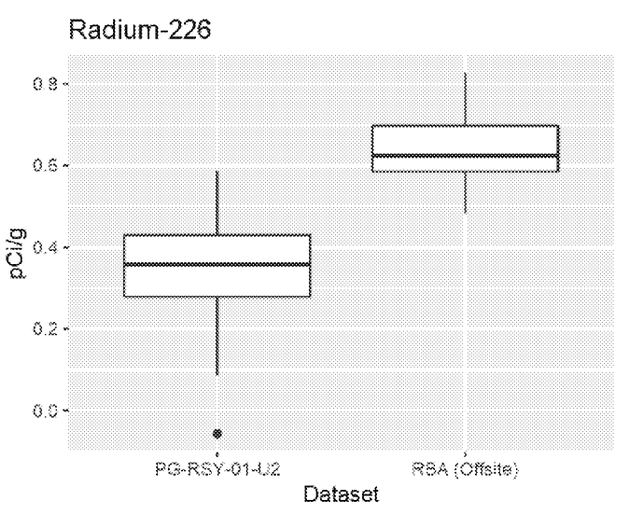












WILCOXON RANK SUM TEST

Nuclide: [illegible] Location: [illegible]
LBGR: [illegible] pCi/g

DCGL [illegible]
LBGR = [illegible]
LBGR = [illegible]

DATA	AREA	ADJUSTED DATA	RANKS	SURVEY UNIT RANKS	Sorted Ranks	Location Associated with Sorted Rank
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0.482	5	0.157	21	1	[illegible]	[illegible]
0.187	5	0.158	4	1	[illegible]	[illegible]
0.403	5	0.029	16	1	[illegible]	[illegible]
0.483	5	0.108	22	1	[illegible]	[illegible]
0.375	5	0	13.5	13.5	[illegible]	[illegible]
0.588	5	0.213	23	1	[illegible]	[illegible]
0.282	5	0.053	9	1	[illegible]	[illegible]
0.413	5	0.039	15	1	[illegible]	[illegible]
0.218	5	0.157	5	1	[illegible]	[illegible]
0.406	5	0.031	17	1	[illegible]	[illegible]
0.382	5	0.027	14	1	[illegible]	[illegible]
0.341	5	0.034	12	1	[illegible]	[illegible]
0.0889	5	0.2851	2	1	[illegible]	[illegible]
0.11	5	0.253	3	1	[illegible]	[illegible]
0.315	5	0.09	10	1	[illegible]	[illegible]
0.427	5	0.052	19	1	[illegible]	[illegible]
0.318	5	0.057	11	1	[illegible]	[illegible]
0.587	5	0.212	24	1	[illegible]	[illegible]
0.305	5	0.07	7	1	[illegible]	[illegible]
0.375	5	0	13.5	13.5	[illegible]	[illegible]
0.436	5	0.061	20	1	[illegible]	[illegible]
0.279	5	0.098	6	1	[illegible]	[illegible]
0.276	5	0.098	8	1	[illegible]	[illegible]
0.54	5	0.193	23	1	[illegible]	[illegible]
-0.0669	5	0.2915	1	1	[illegible]	[illegible]
		Sum =	7670	325		

SU Stats	
Count	25 m
SD	0.153
Median	0.375

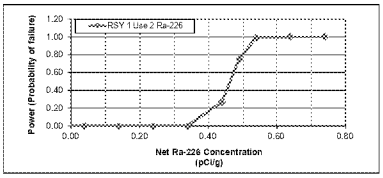
Ref Stats	
Count	100 n
SD	0.073

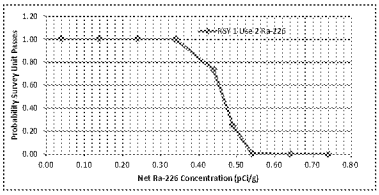
Critical Value [illegible]

Number of Samples	
α	0.153
LBGR	0.375
Δ/σ	4.06
Pr	1
N	25.23
N/2	12
Actual N	25
SU σ	0.153
Z(1-alpha)	[illegible]
Z(1-beta)	[illegible]

POWER CURVE CALCULATION

Concentration	above Background (C)	(C-LBGR)/ SD	p1	p2	E(Wmw)	Var(Wmw)	SD(Wmw)	z	Power	Probability of passing
[illegible]	0.16	3.3	0.00856	0.00074	16.88	229.8282	15.16005	108.16	0.00	1.00
[illegible]	0.11	3.2	0.01895	0.00289	42.3975	780.5103	27.93761	55.5973	0.00	1.00
[illegible]	0.06	3.0	0.01895	0.00289	42.3975	780.5103	27.93761	55.5973	0.00	1.00
[illegible]	0.04	2.9	0.07865	0.02207	98.625	5371.619	73.29267	19.5571	0.00	1.00
[illegible]	0.14	1.5	0.14442	0.09466	351.069	10701.86	103.4493	12.231	0.00	1.00
[illegible]	0.24	0.4	0.26226	0.12892	655.649	19976.81	137.2564	7.04696	0.00	1.00
[illegible]	0.34	0.2	0.44377	0.27899	1109.42	25931.81	160.7228	5.2163	0.00	1.00
[illegible]	0.44	0.4	0.61135	0.46189	1528.38	24617.43	156.5394	0.02446	0.27	0.73
[illegible]	0.46	0.7	0.68969	0.54407	1724.23	21367.81	146.8569	0.6664	0.75	0.25
[illegible]	0.54	1.1	0.78168	0.66222	1954.16	16176.36	127.1867	2.3773	1.00	0.00
[illegible]	0.64	1.7	0.86533	0.81052	2213.34	8910.205	94.18032	5.435	1.00	0.00
[illegible]	0.74	2.4	0.95516	0.92678	2387.89	3706.103	60.8201	14.639	1.00	0.00





QUANTILE TEST

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

25	n (number of survey unit measurements)
100	m (number of reference area measurements)

Use:
m = 100
n = 25
8 r
3 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.

[illegible] of the largest of adjusted measurements are from 3. The null hypothesis is accepted.

# of R:	100	n
# of S:	25	m
Avg Rank R:	75.5	
Avg Rank S:	13	

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

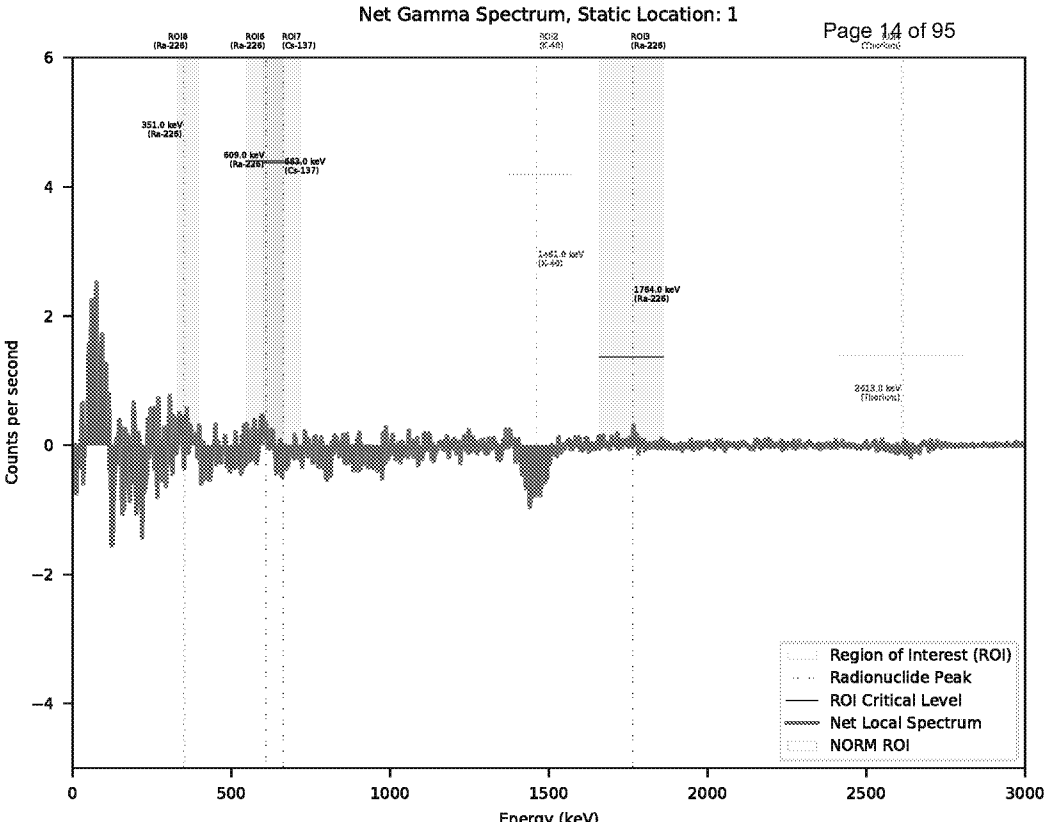
$$\frac{m(n+m+1)}{2} + z\sqrt{\frac{nm(n+m+1)}{12}}$$

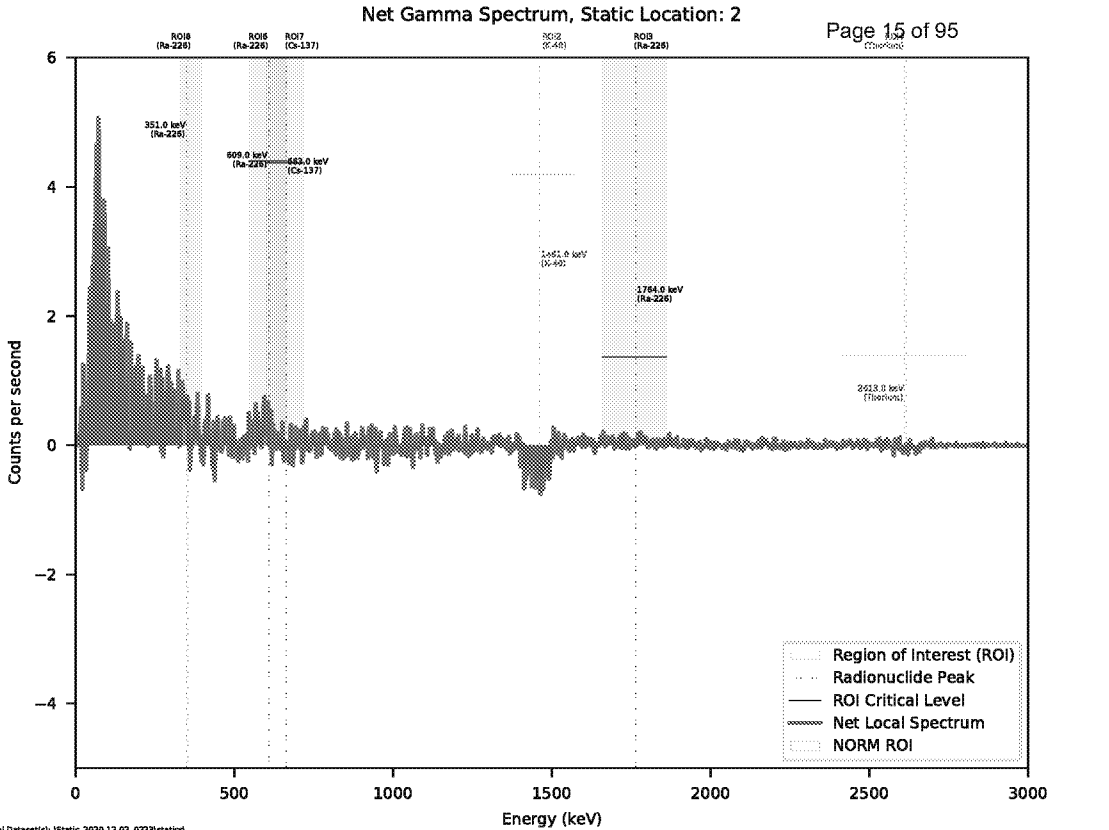
[illegible] of standard normal distribution = 2

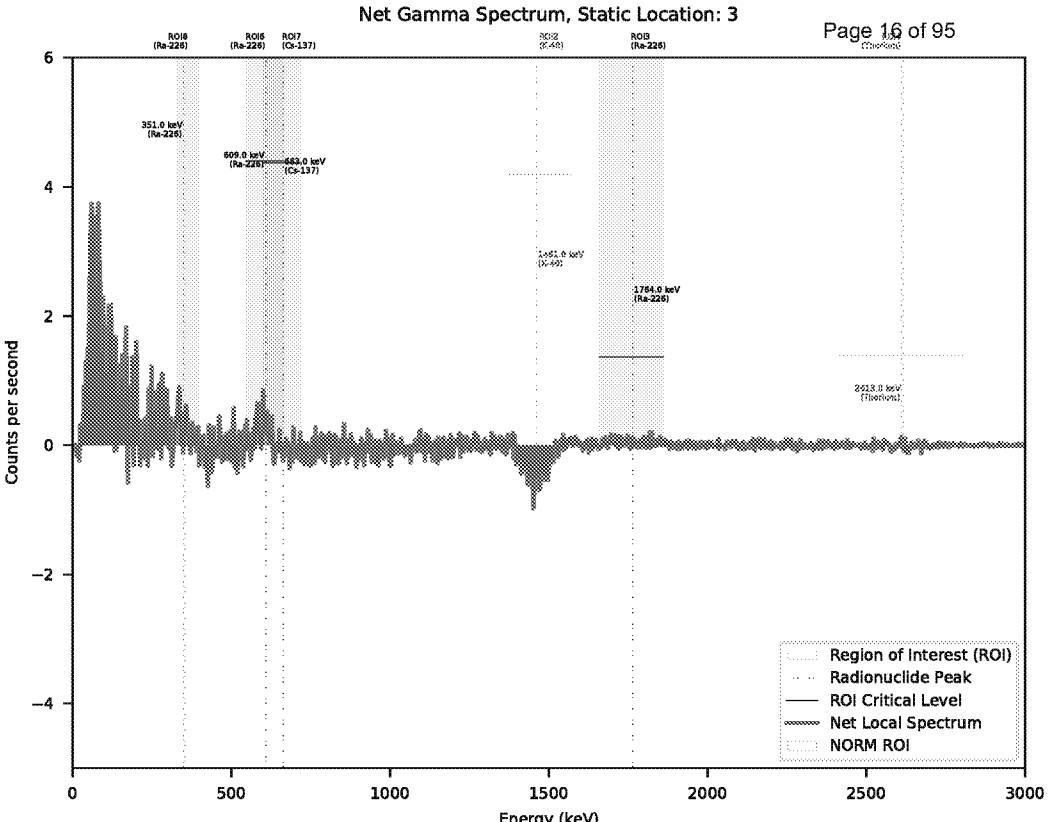
k = [illegible]

$\alpha_w = \alpha/2 =$ 0.01
β = 0.05

Since the sum of survey unit ranks is less than the critical value, the null hypothesis that the survey unit concentrations do not exceed the LBGR is accepted (i.e., survey unit passes).


Net Gamma Spectrum, Static Location: 1
ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
ROI4 (Th-232)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
661.0 keV (Cs-137)
1461.0 keV (K-40)
1764.0 keV (Ra-226)
2613.0 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_2020-12-02_0223\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv
Local Coordinates (Longitude, Latitude): -122.36885974057974, 37.72330058695651


Net Gamma Spectrum, Static Location: 2
ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
ROI4 (Th-232)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
662.0 keV (Cs-137)
1461.0 keV (K-40)
1764.0 keV (Ra-226)
2613.0 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_2020-12-02_0223\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv
Local Coordinates (Longitude, Latitude): -122.36887141044775, 37.72329085074629



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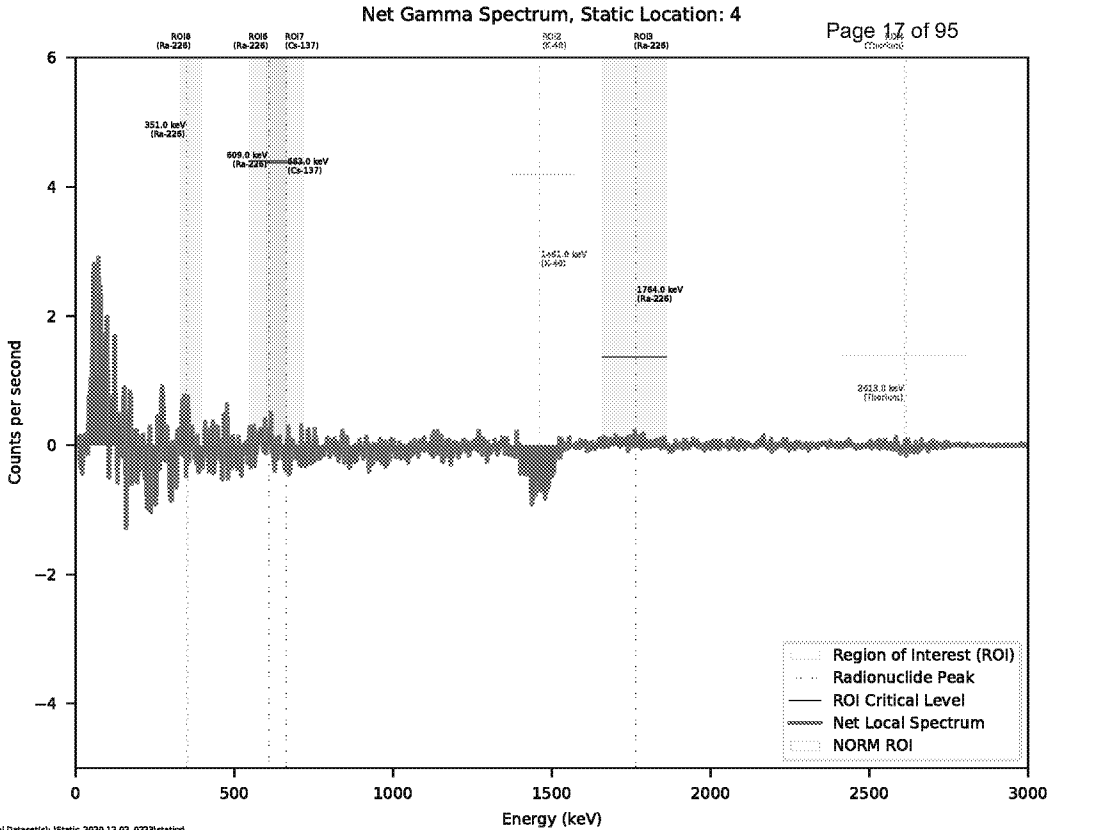
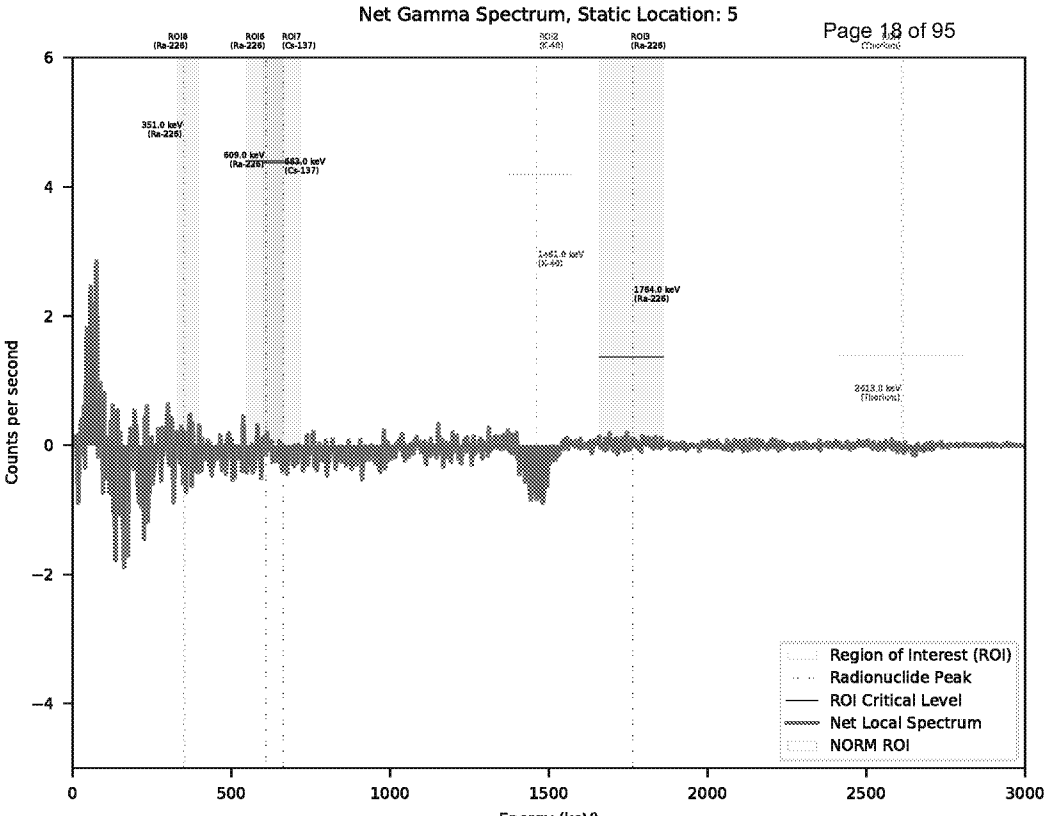
Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.368950657971, 37.72325744492754


Net Gamma Spectrum, Static Location: 4
ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
ROI4 (Th-232)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
662.0 keV (Cs-137)
1461.0 keV (K-40)
1764.0 keV (Ra-226)
2613.0 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_2020-12-02_0223\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv
Local Coordinates (Longitude, Latitude): -122.36882644507055, 37.72326776760565



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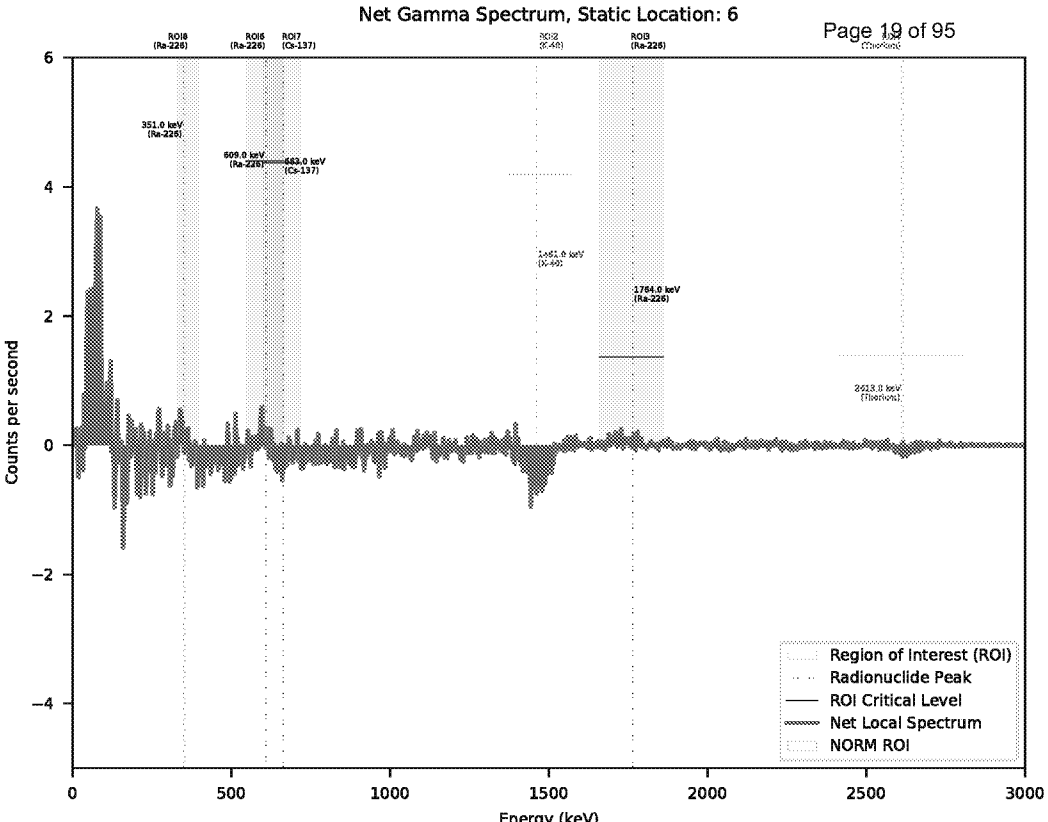
Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.3688224289855, 37.7232079565217



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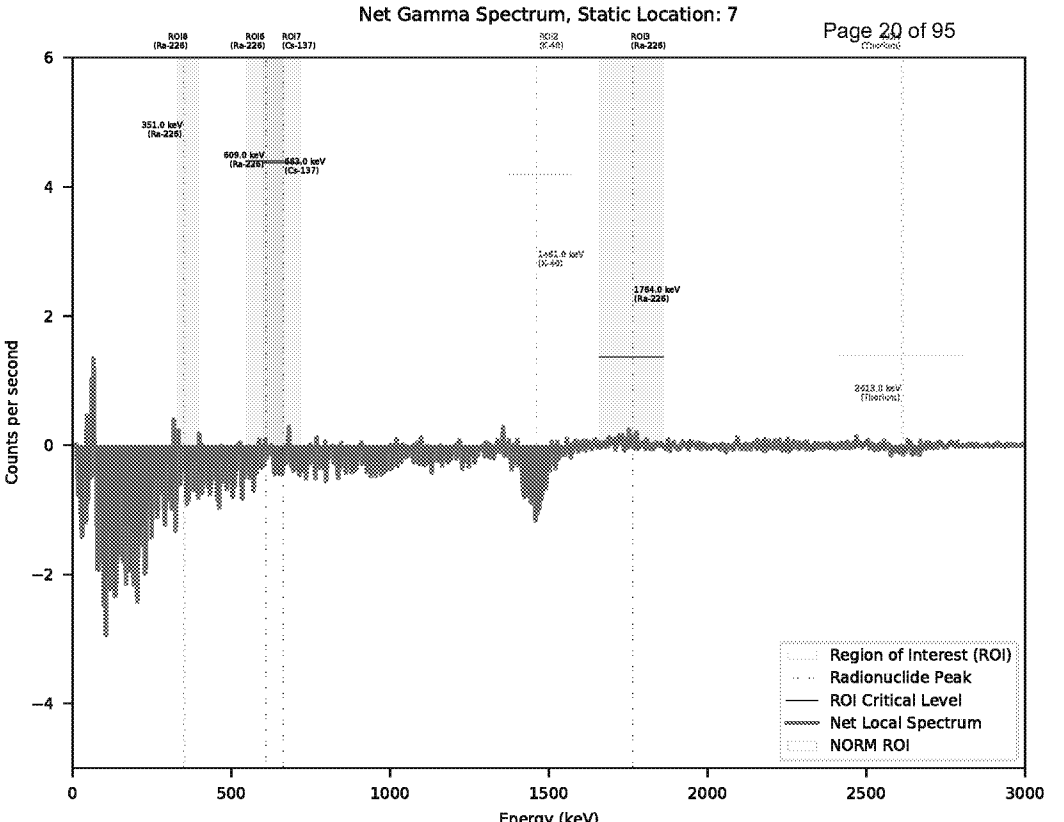
Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.36884224756092, 37.7232131546781



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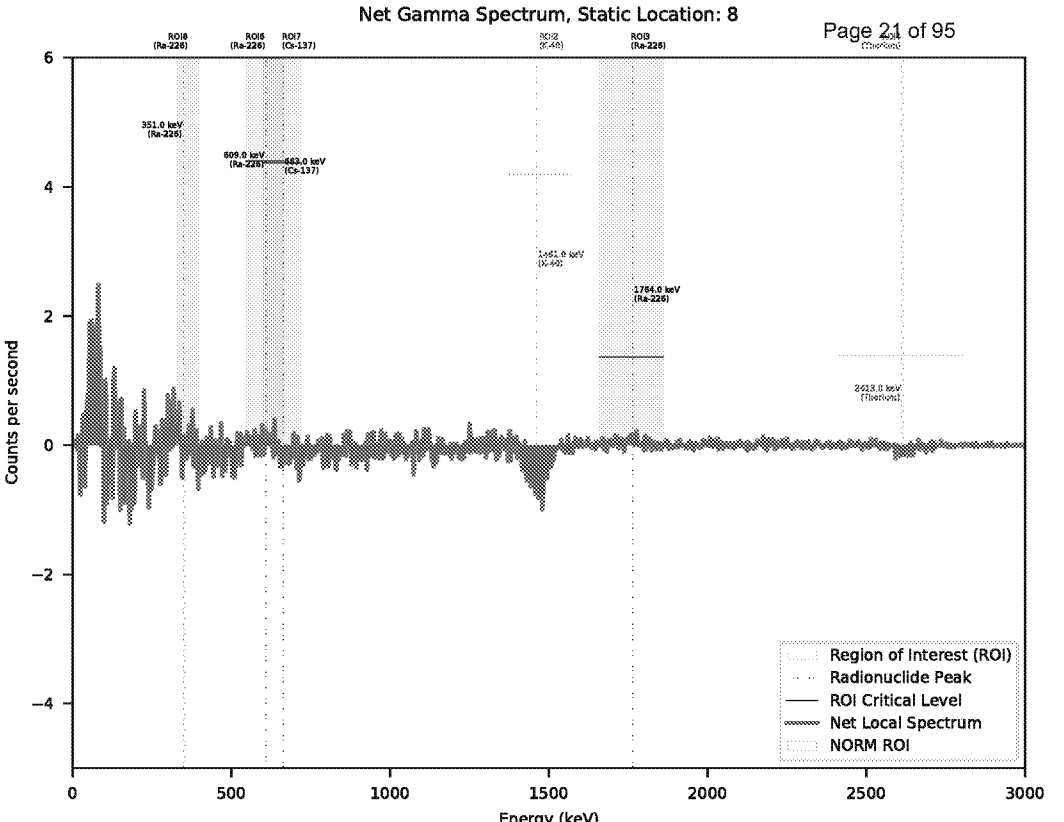
Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.3688592, 37.7293074462668656



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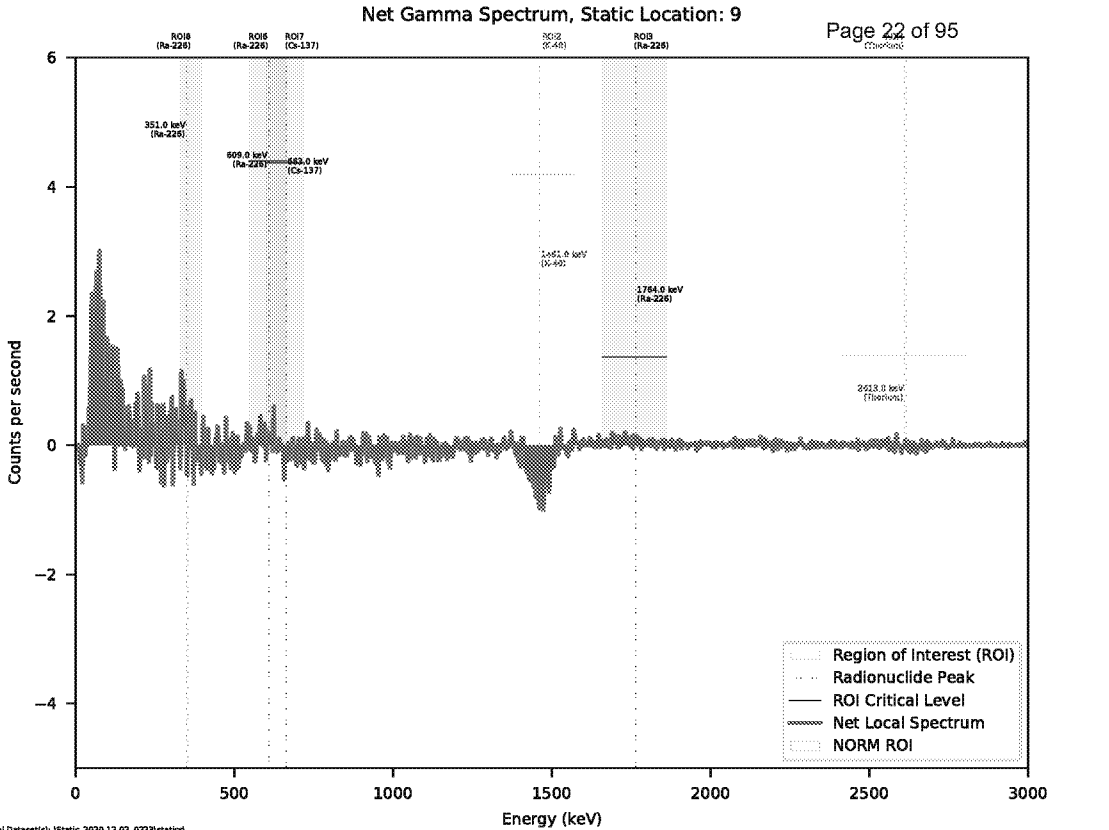
Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.36897312571432, 37.72316887426569



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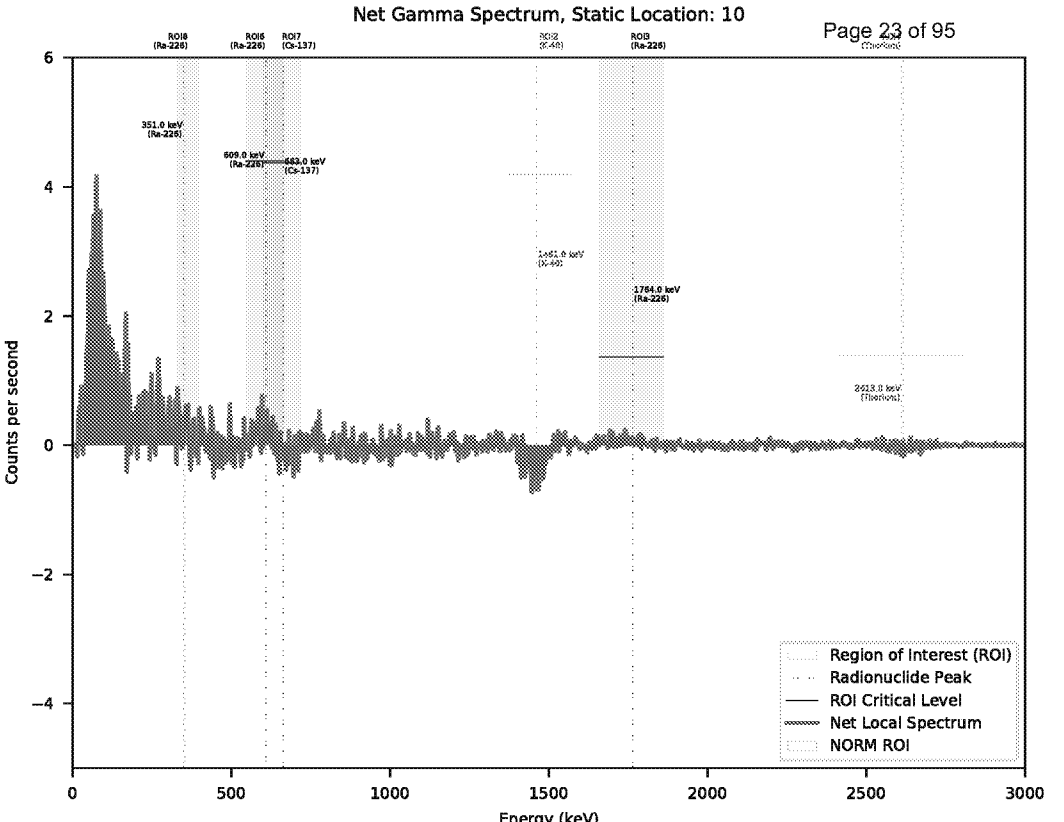
Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.36880093285714, 37.72331745571427



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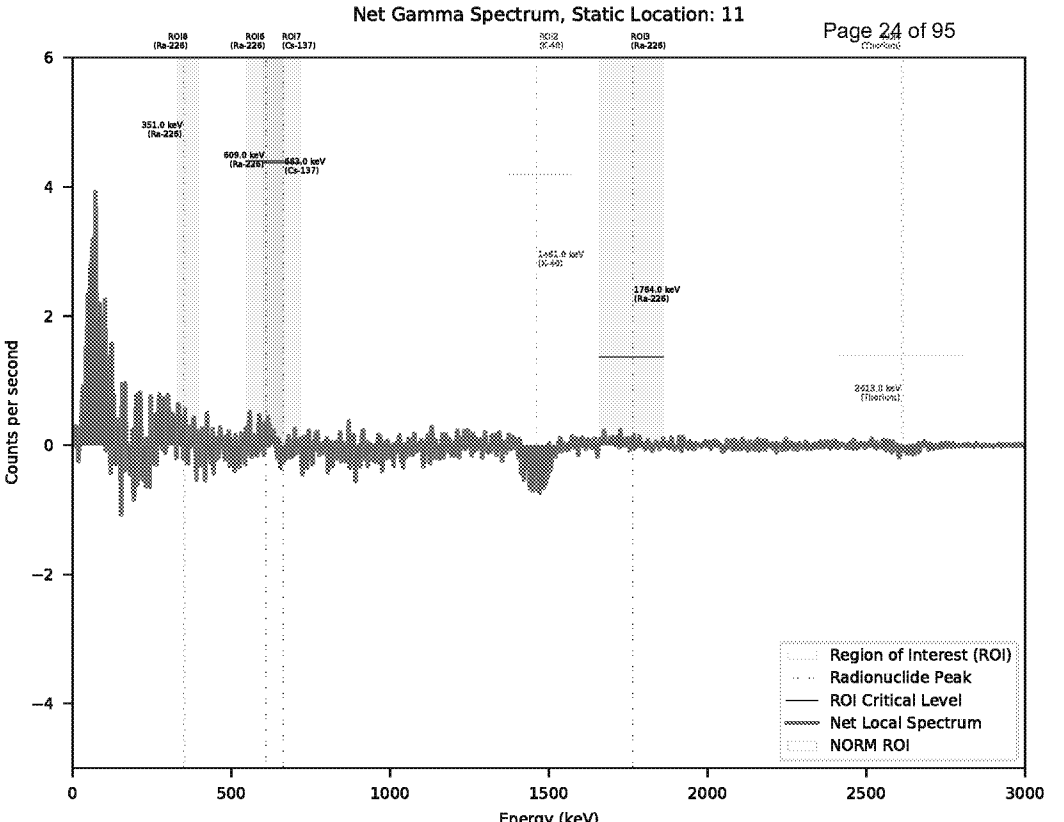
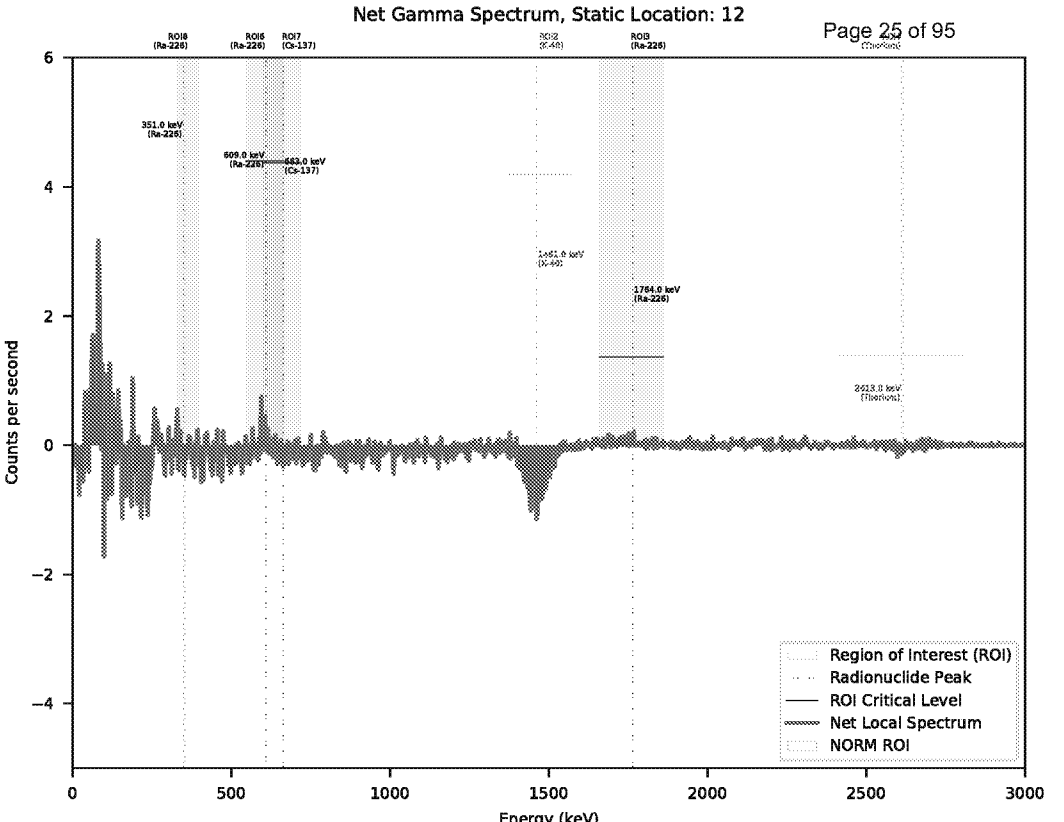
Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.36887397083336, 37.72326886527777



Local Dataset(s): \Static_2020-12-02_0223\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.36896763823536, 37.72320716362353



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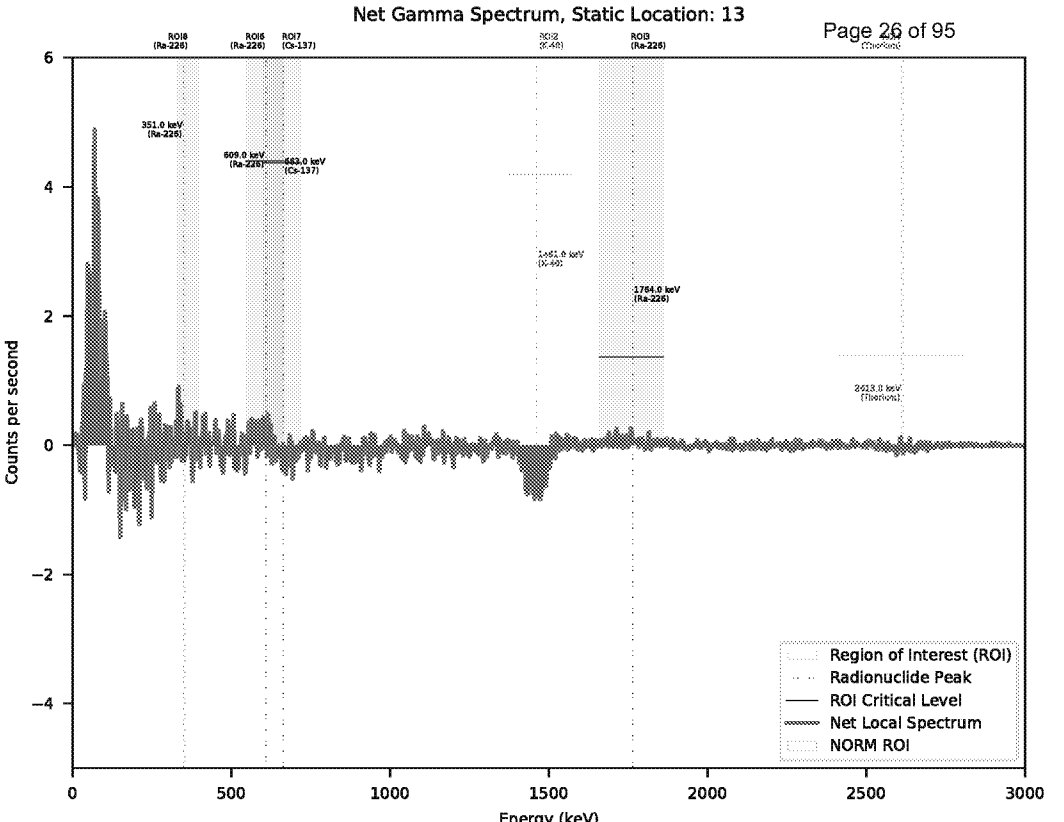
Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.36878856582278, 37.723320044303804



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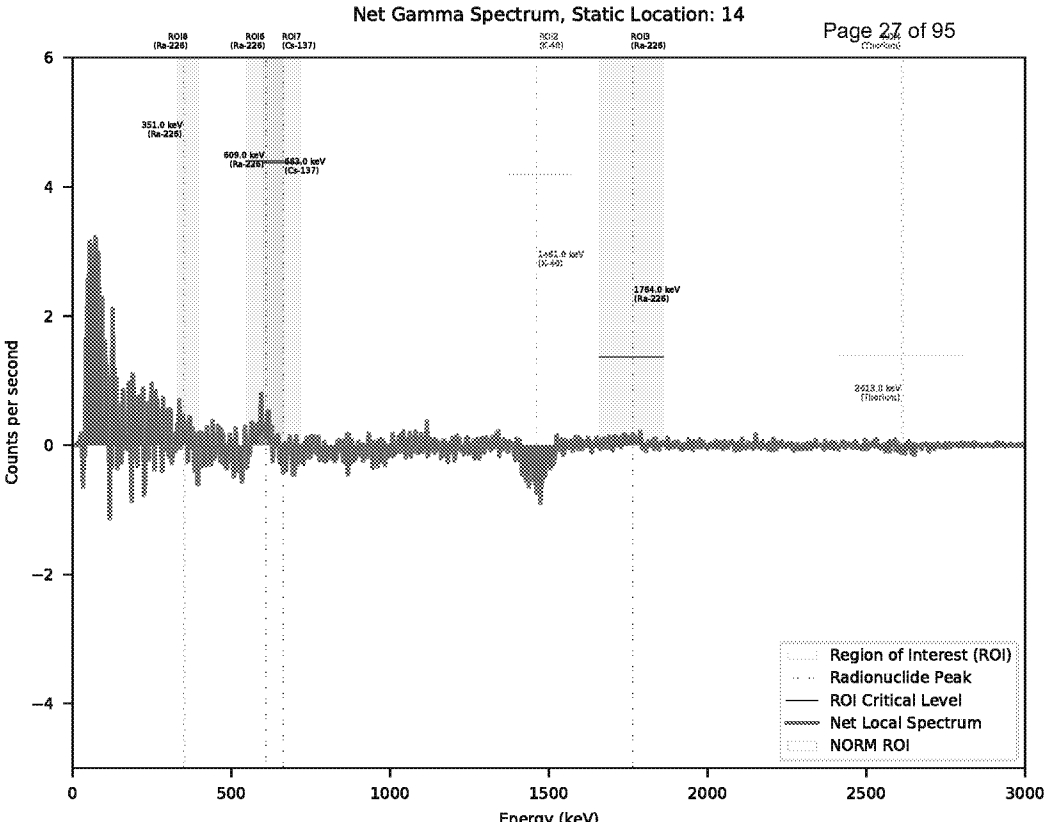
Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.36896681406253, 37.723188948437494



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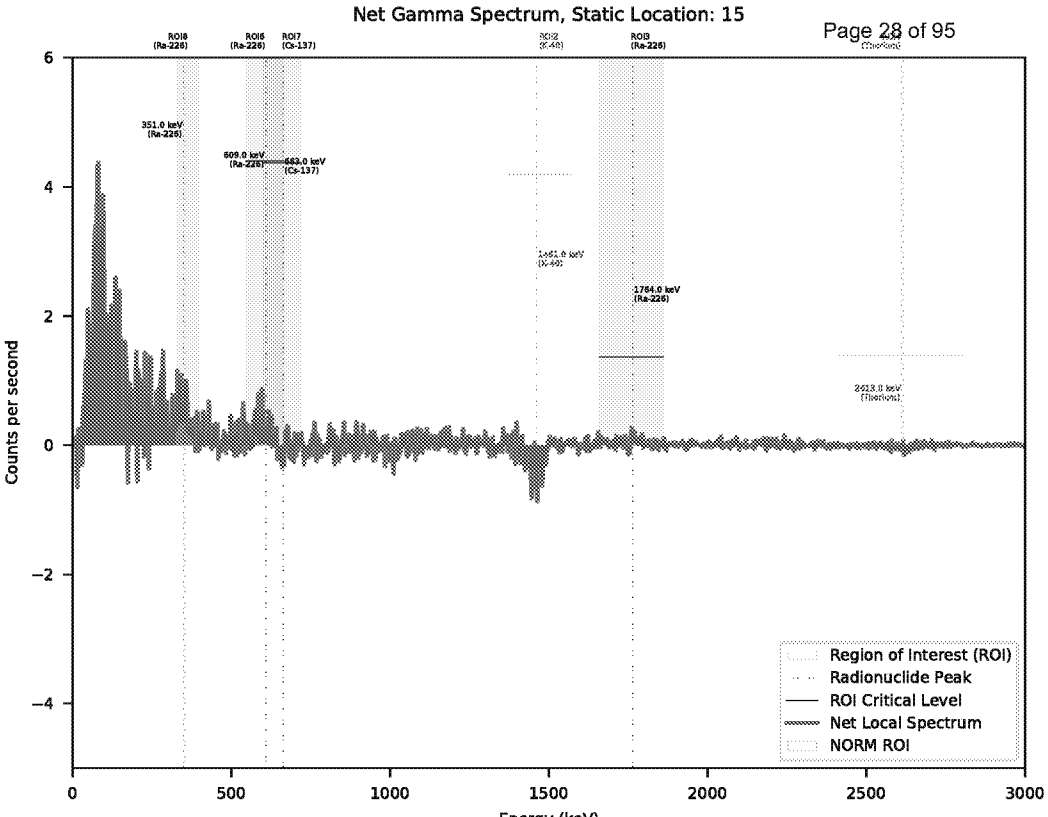
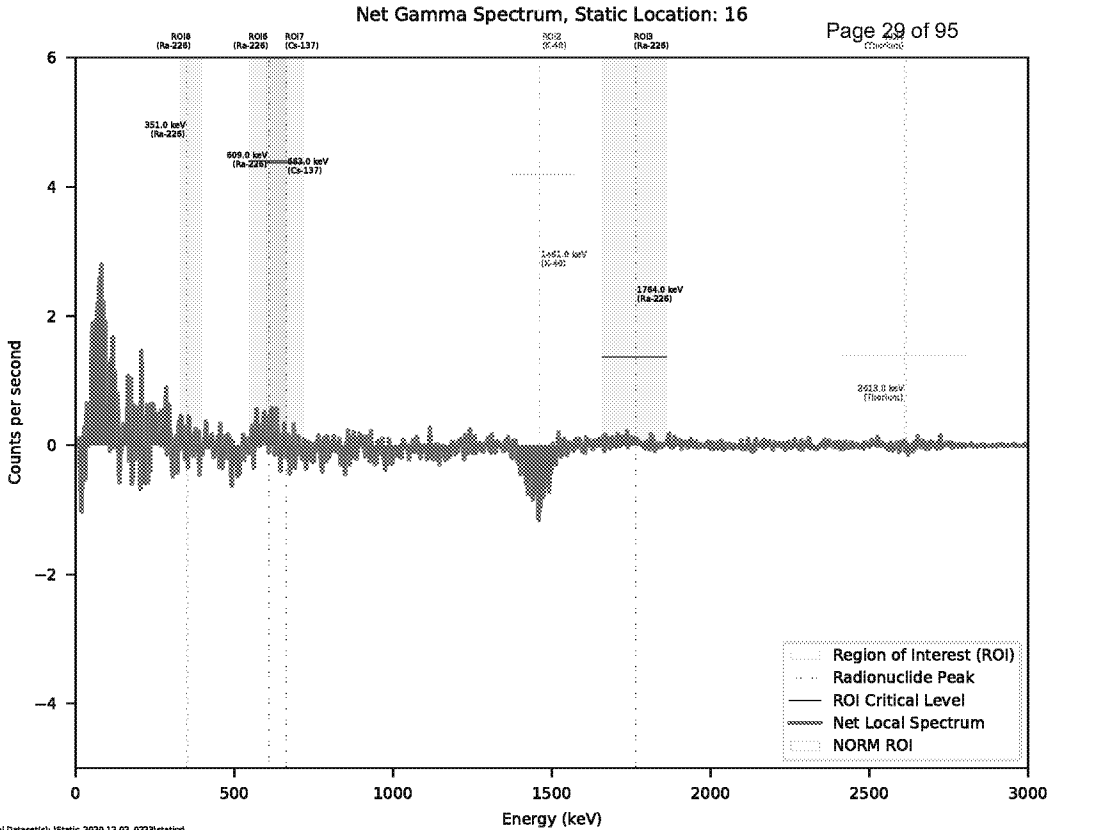
Background Dataset(s): RSI2_SoilRBA_Static.csv

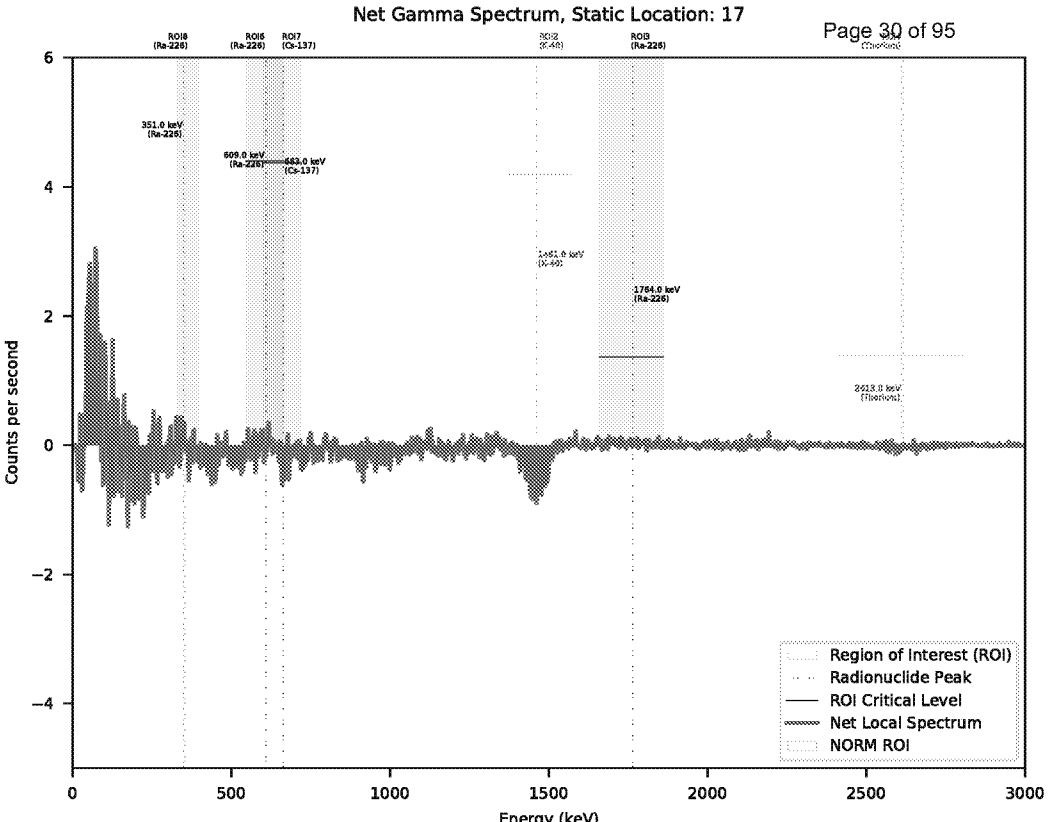
Local Coordinates (Longitude, Latitude): -122.3689898444445, 37.723183737500015



Local Dataset(s): \Static_2020-12-02_0223\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

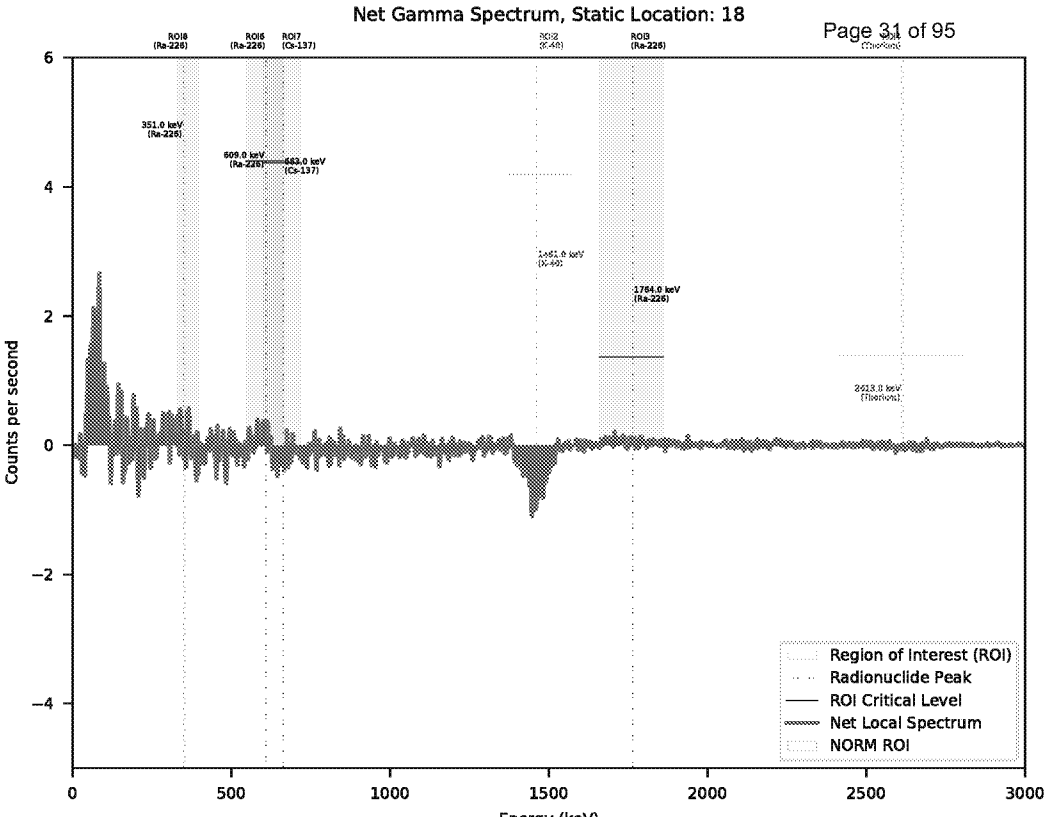
Local Coordinates (Longitude, Latitude): -122.36887616571428, 37.723298265714284


Net Gamma Spectrum, Static Location: 16
ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
ROI4 (Th-232)
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)
2613.0 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_2020-12-02_0223\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv
Local Coordinates (Longitude, Latitude): -122.3688216109588, 37.72331017260275



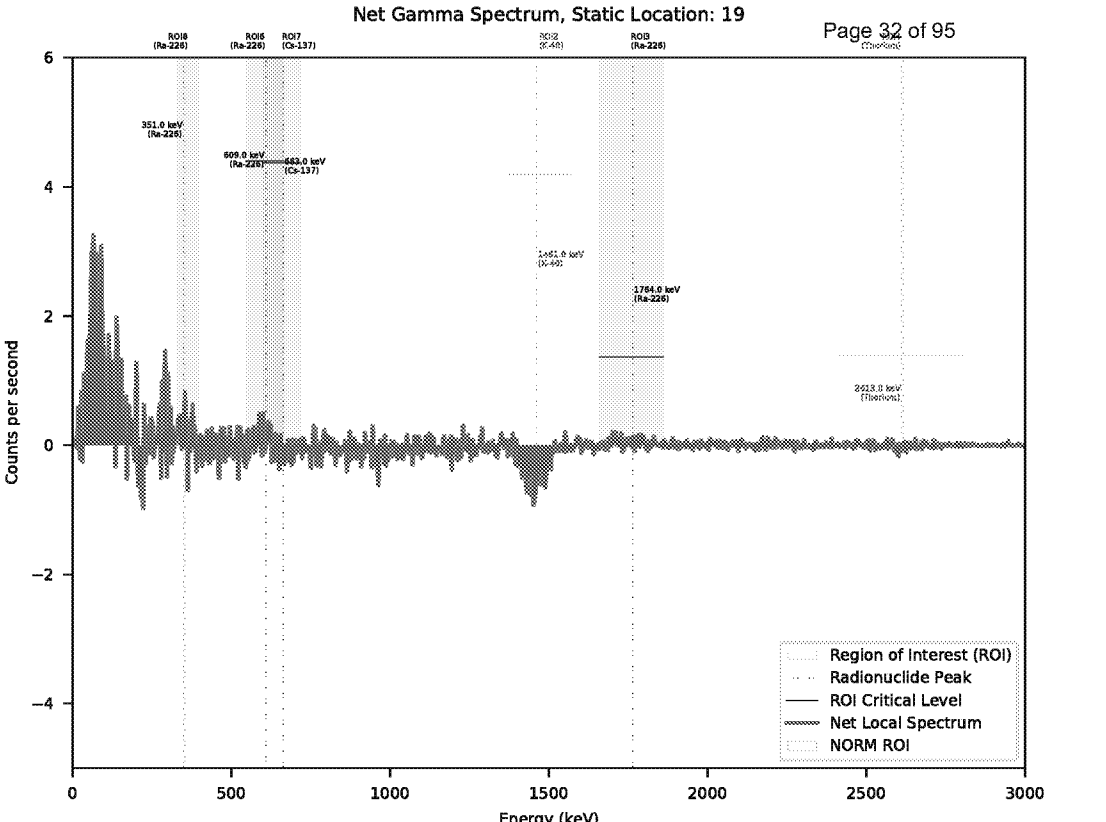
Local Dataset(s): \Static_2020-12-02_0223\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.36886595116272, 37.723203627907



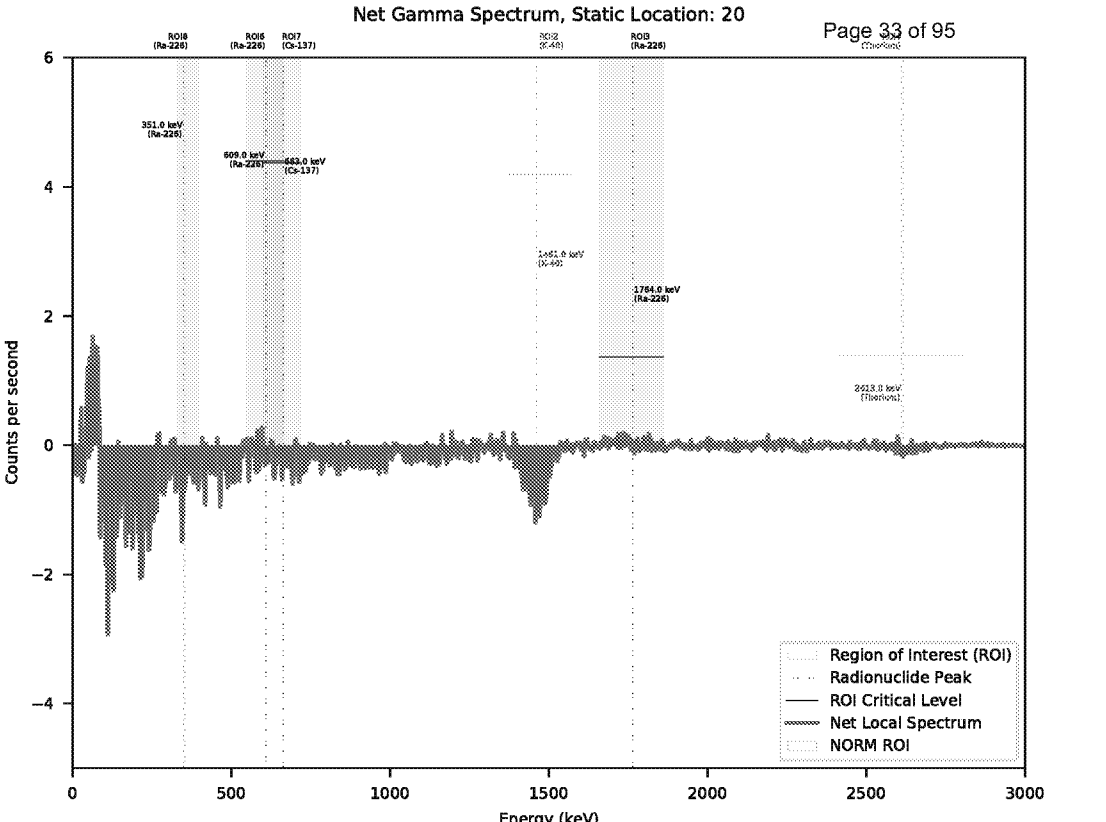
Local Dataset(s): \Static_2020-12-02_0223\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

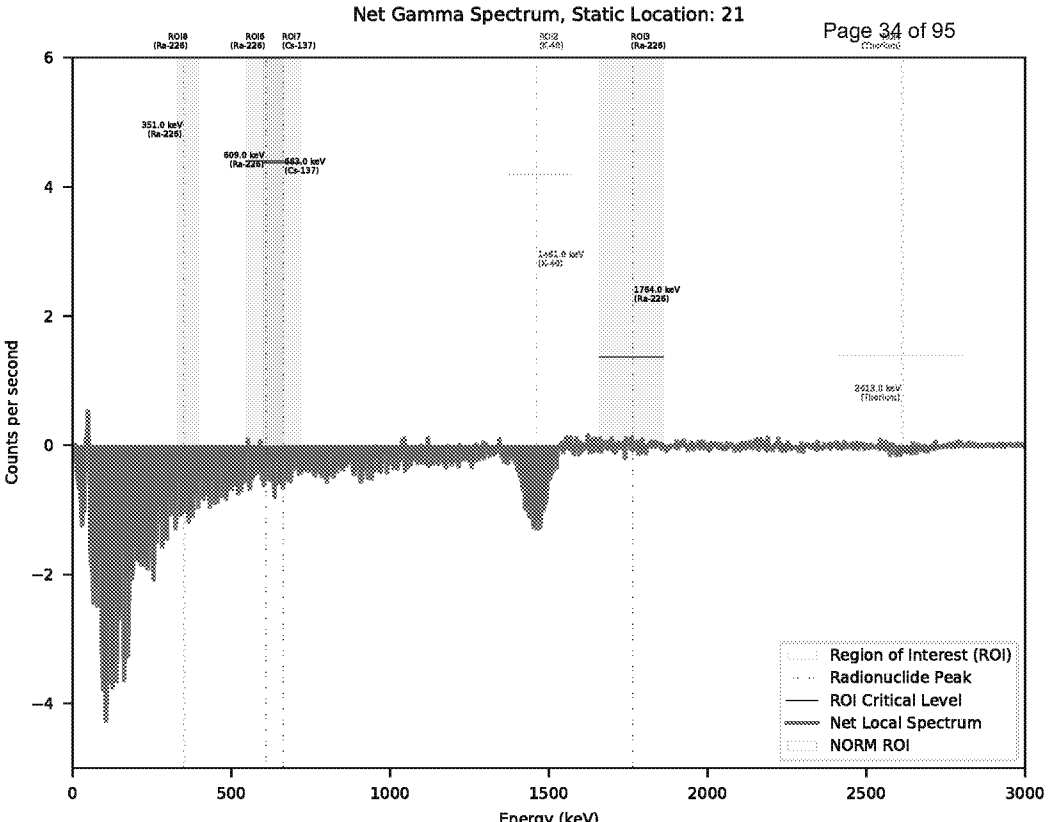
Local Coordinates (Longitude, Latitude): -122.36877676666671, 37.723912369444436



Local Dataset(s): \Static_2020-12-02_0223\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

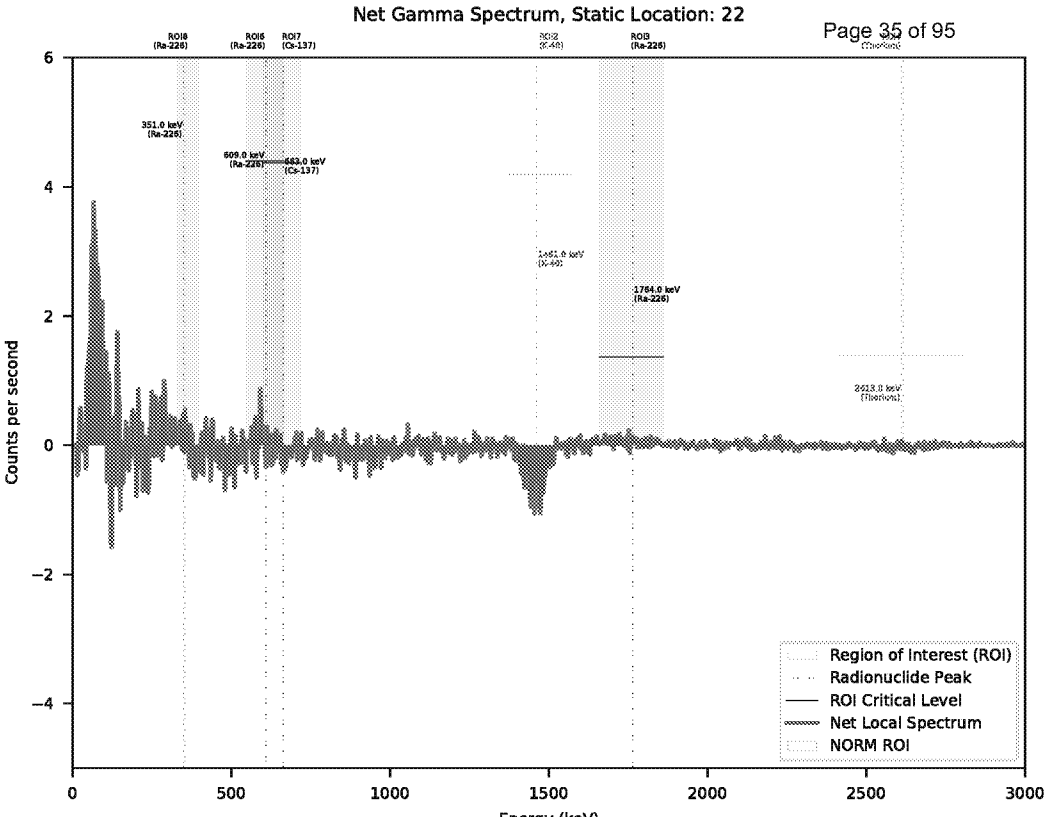
Local Coordinates (Longitude, Latitude): -122.36897776716414, 37.723203134326365


Net Gamma Spectrum, Static Location: 20
ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
ROI4 (Th-232)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
661.0 keV (Cs-137)
1461.0 keV (K-40)
1764.0 keV (Ra-226)
2613.0 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_2020-12-02_0223\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv
Local Coordinates (Longitude, Latitude): -122.36881772253513, 37.72326784647885



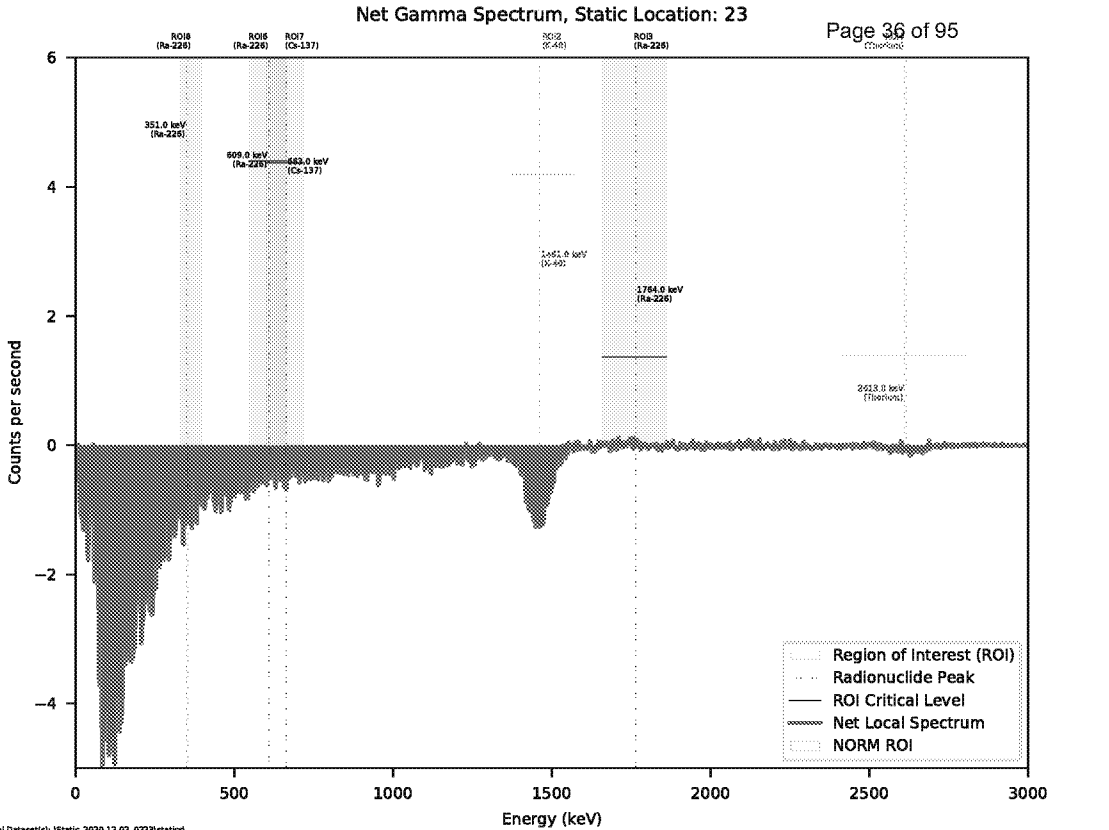
Local Dataset(s): \Static_2020-12-02_0223\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

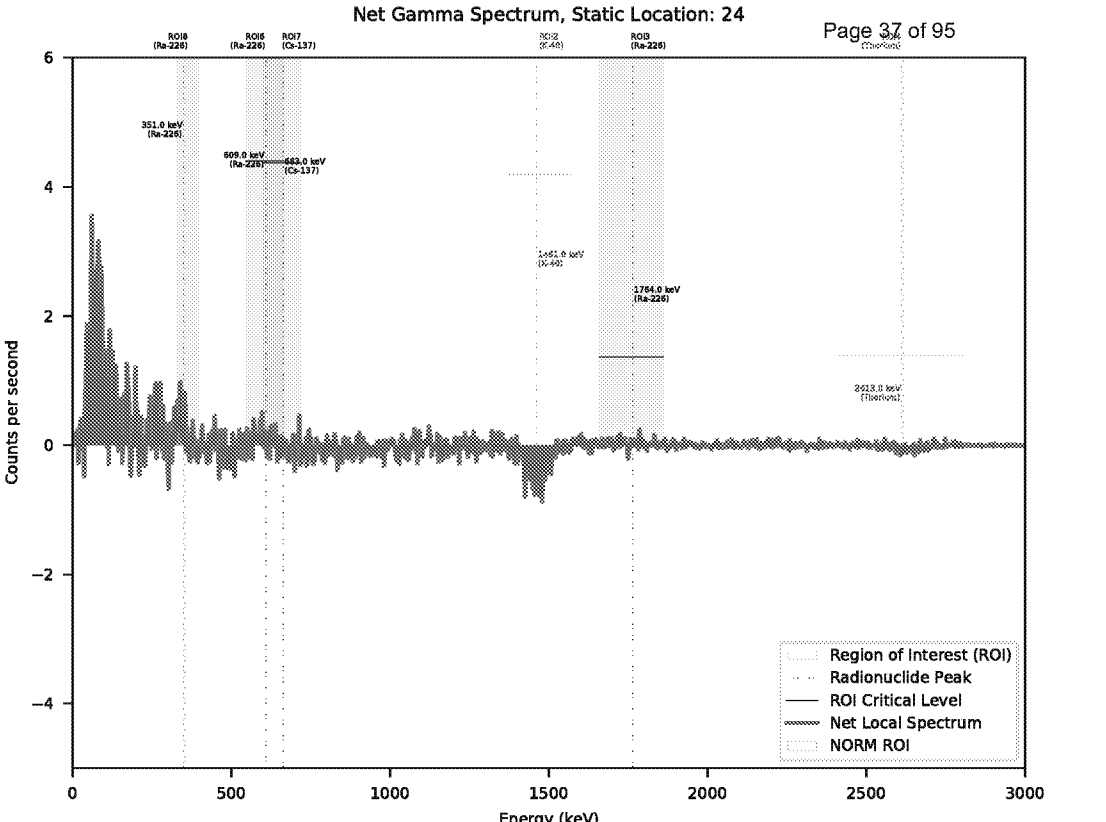
Local Coordinates (Longitude, Latitude): -122.36878844647883, 37.723293153521126

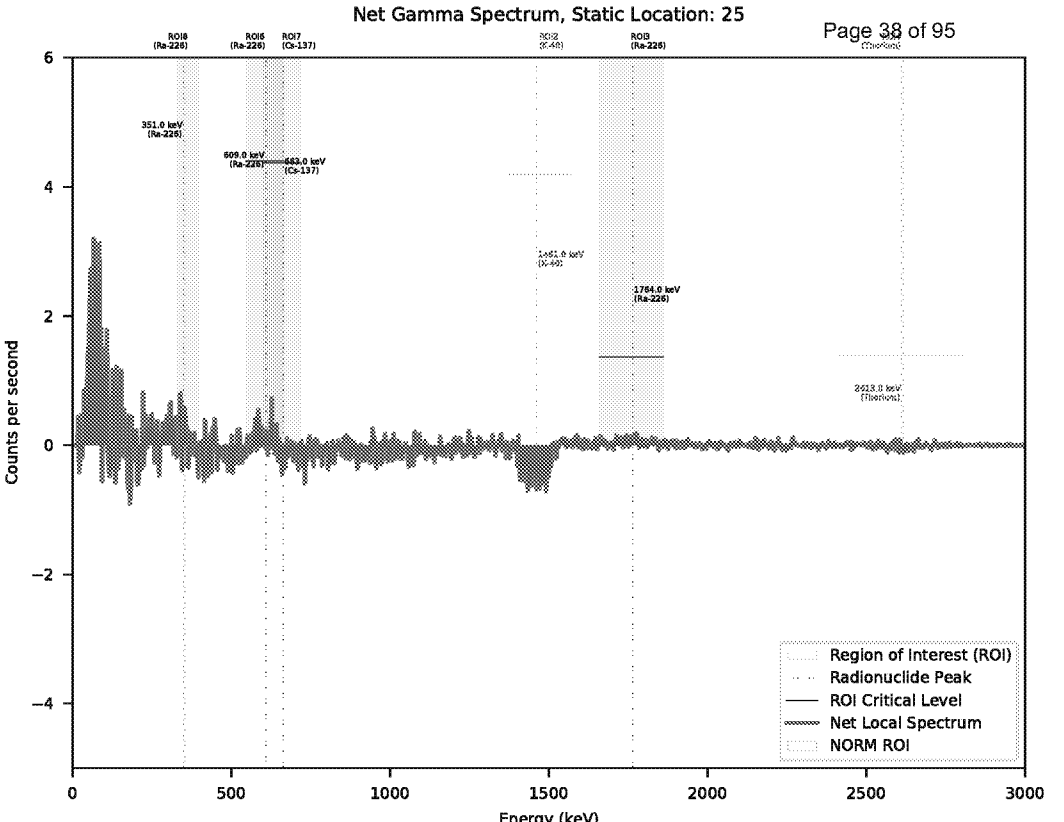


Local Dataset(s): \Static_2020-12-02_0223\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.36897770555548, 37.723186098611095

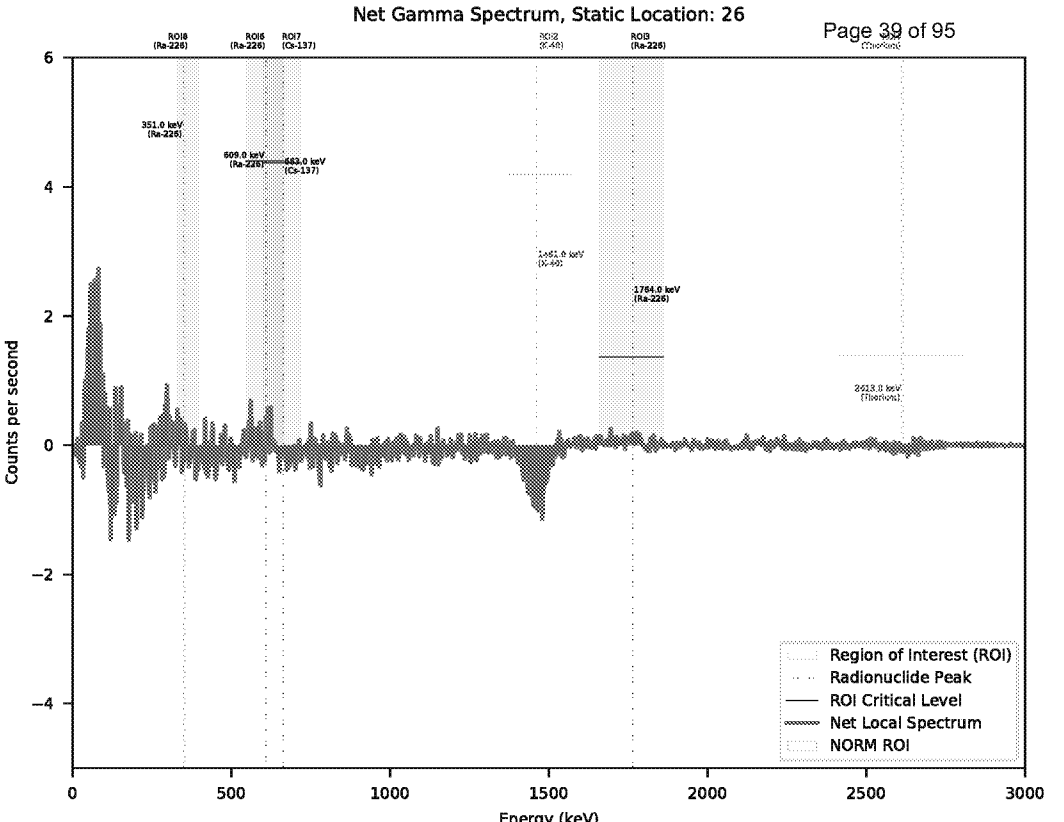

Net Gamma Spectrum, Static Location: 23
ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
ROI4 (Th-232)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
663.0 keV (Cs-137)
1461.0 keV (K-40)
1764.0 keV (Ra-226)
2613.0 keV (Th-232)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
Local Dataset(s): \Static_2020-12-02_0223\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv
Local Coordinates (Longitude, Latitude): -122.3686832953124 1, 37.7233033085937


Net Gamma Spectrum, Static Location: 24
ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
ROI4 (Thorium)
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)
2613.0 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_2020-12-02_0223\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv
Local Coordinates (Longitude, Latitude): -122.36899073529406, 37.72327883382355



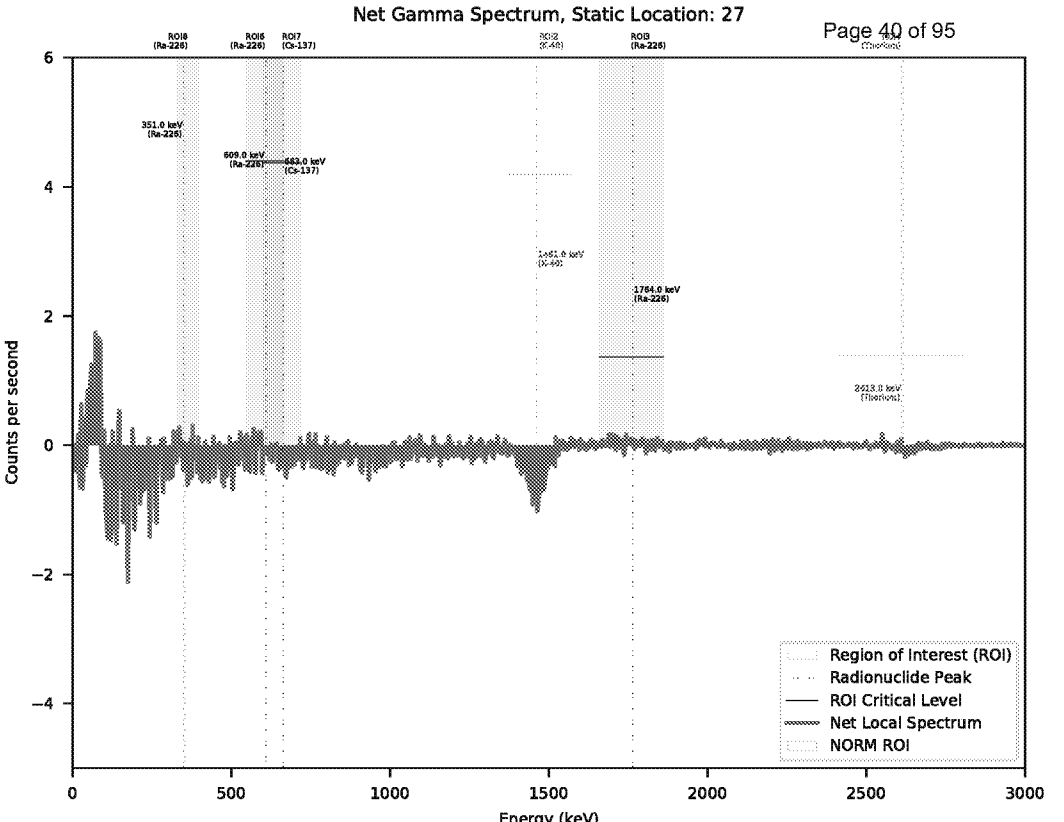
Local Dataset(s): \Static_2020-12-02_0223\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.36884971625, 37.72322084875



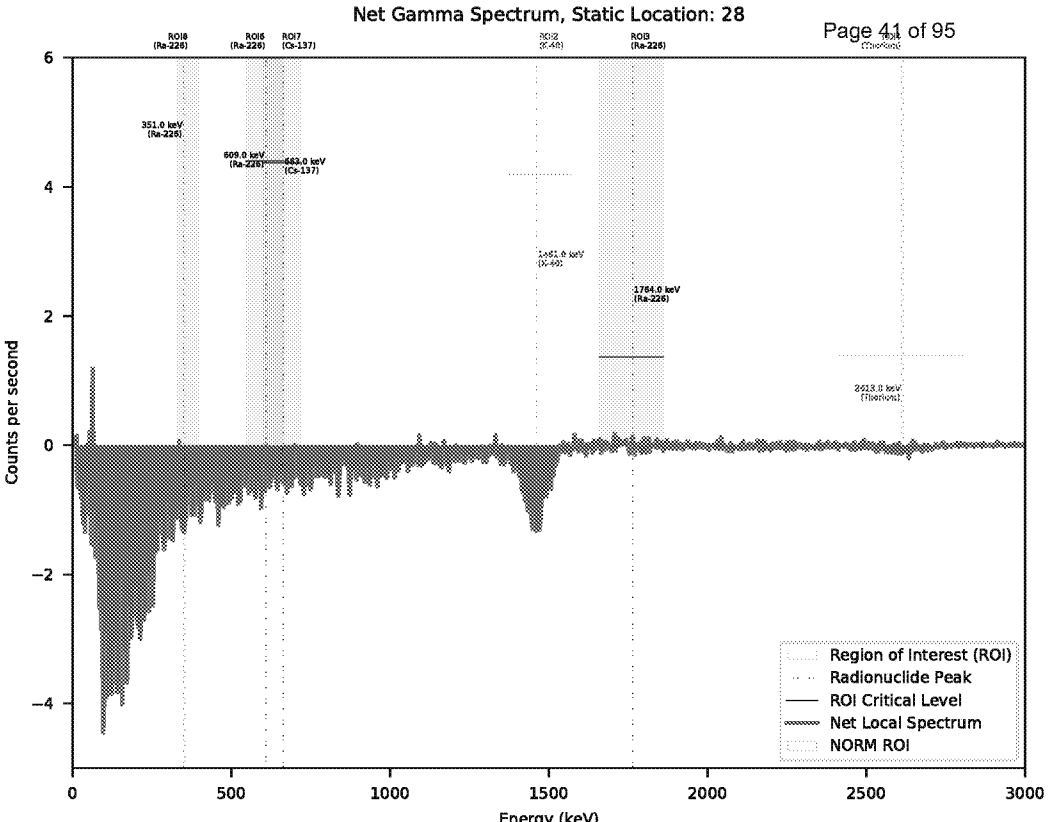
Local Dataset(s): \Static_2020-12-02_0223\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.36893548235294, 37.723239601470574



Local Dataset(s): \Static_2020-12-02_0223\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.36887207701152, 37.723247050574706



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Background Dataset(s): RSI2_SoilRBA_Static.csv

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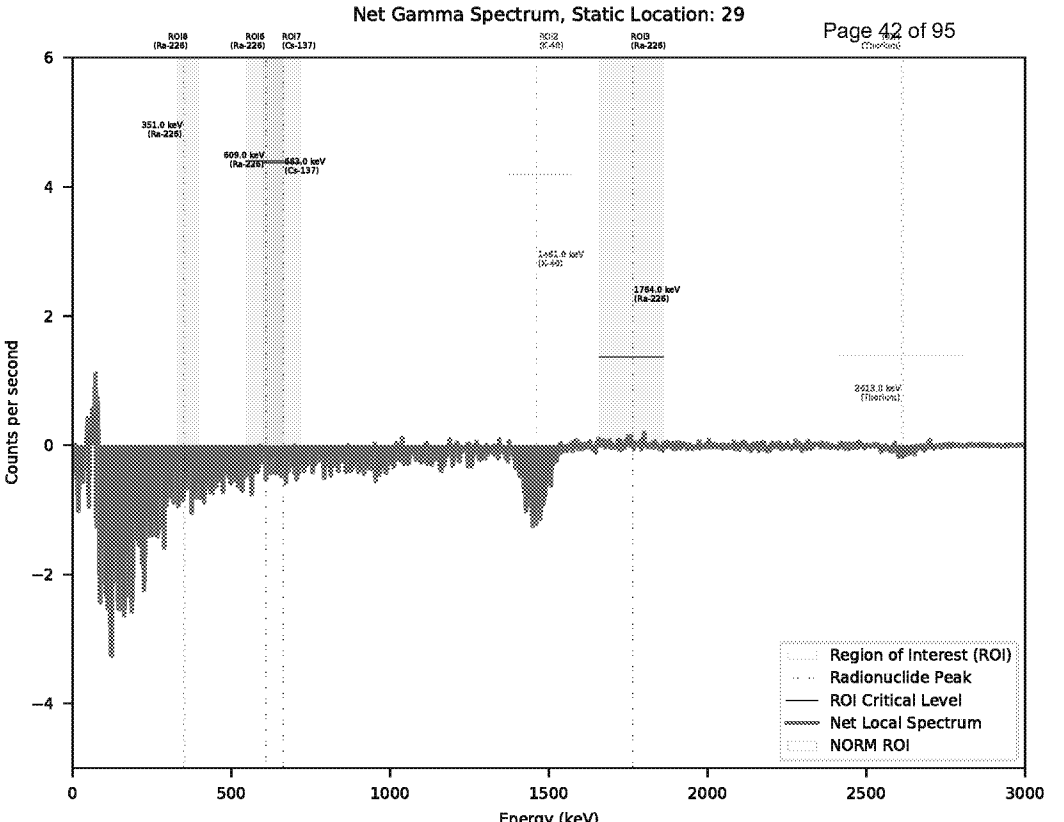

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Background Dataset(s): RSI2_SoilRBA_Static.csv

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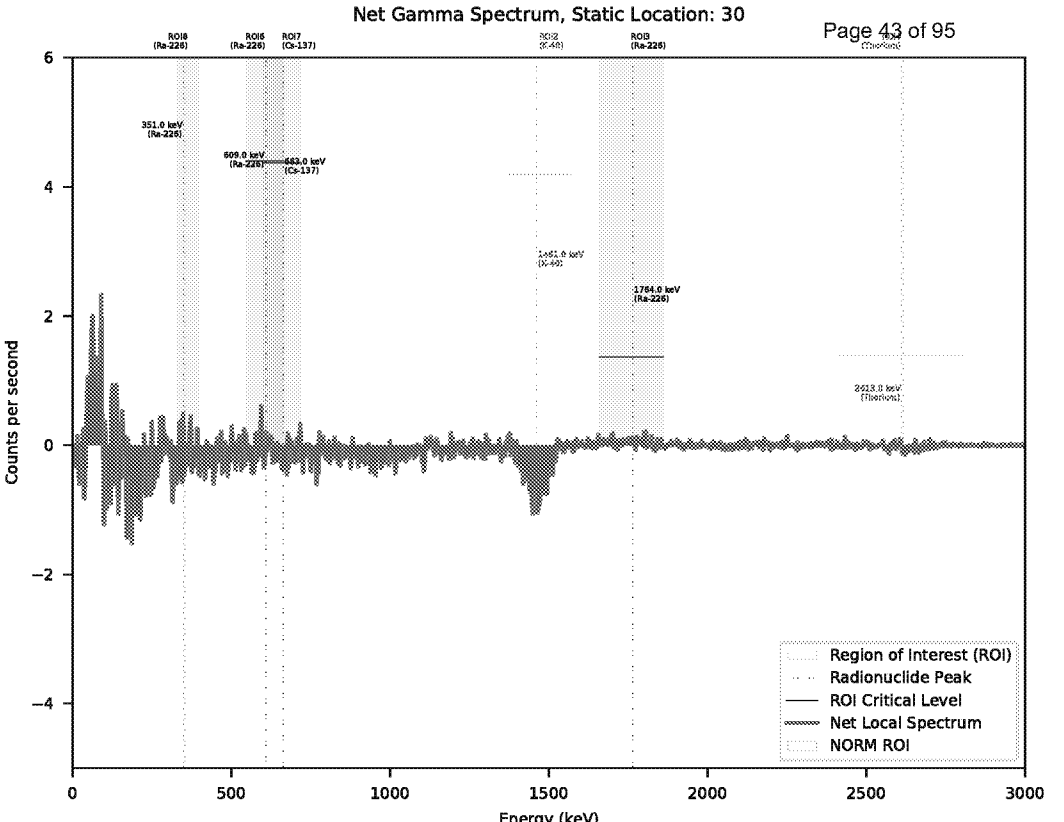

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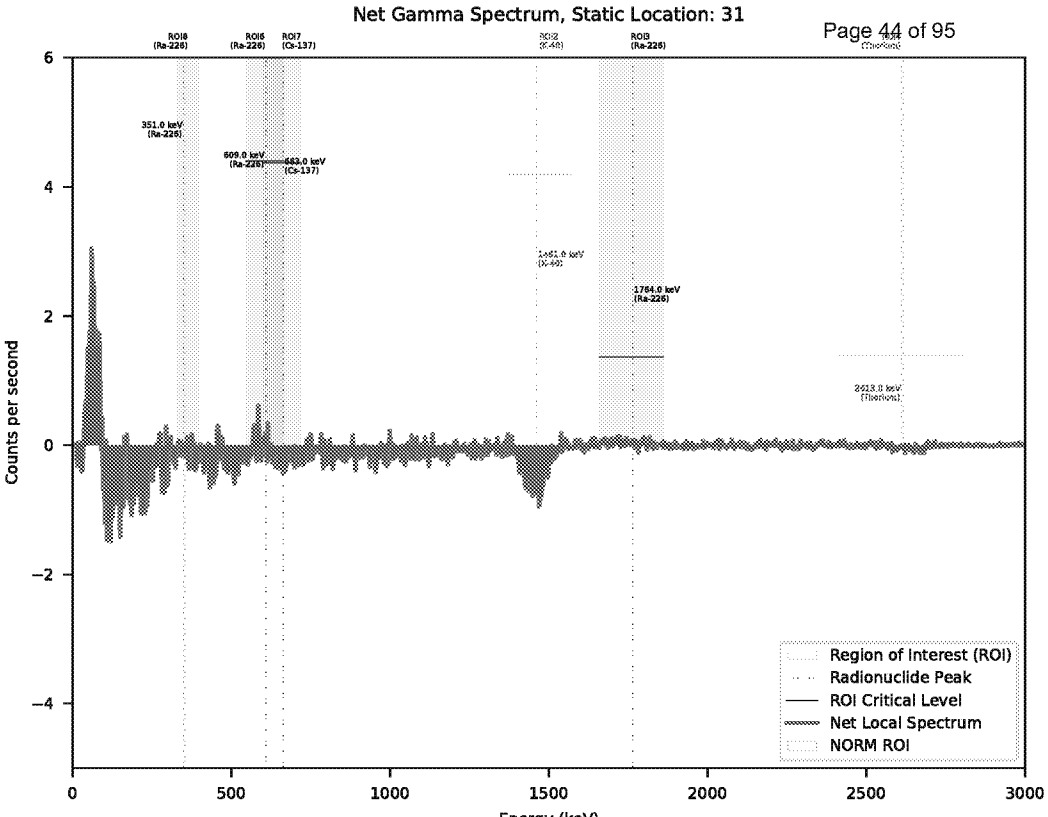
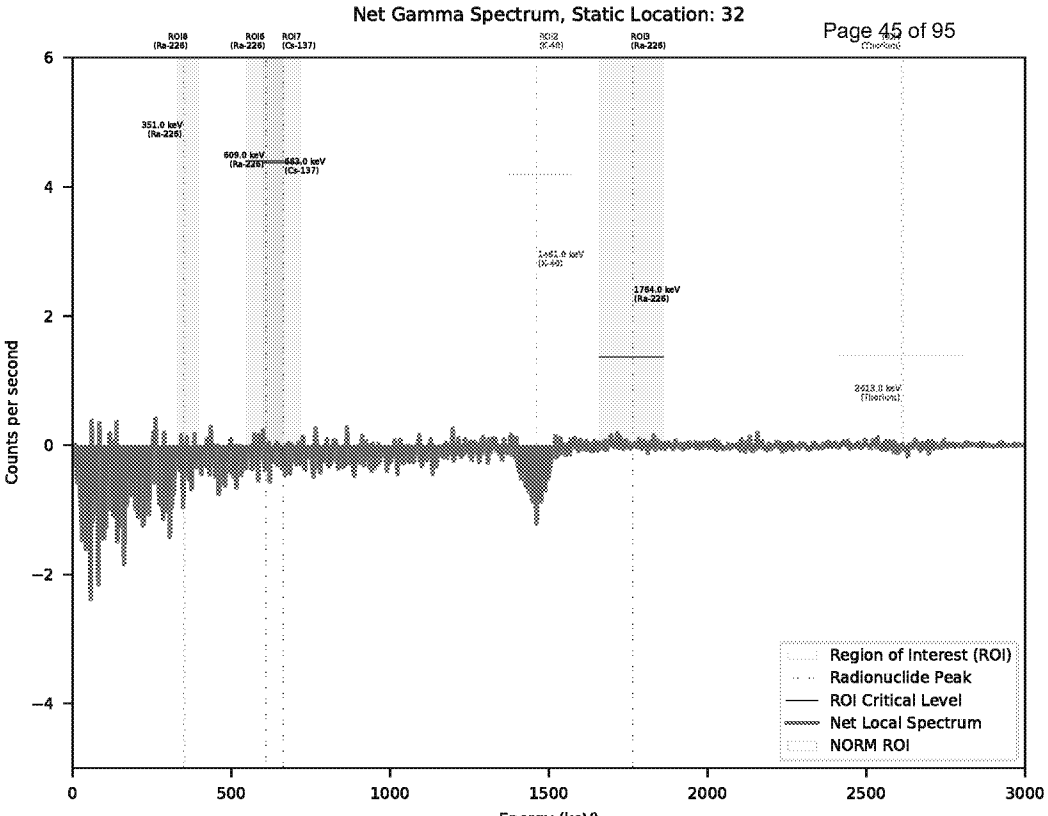
Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.3688354197188, 37.723257802816924



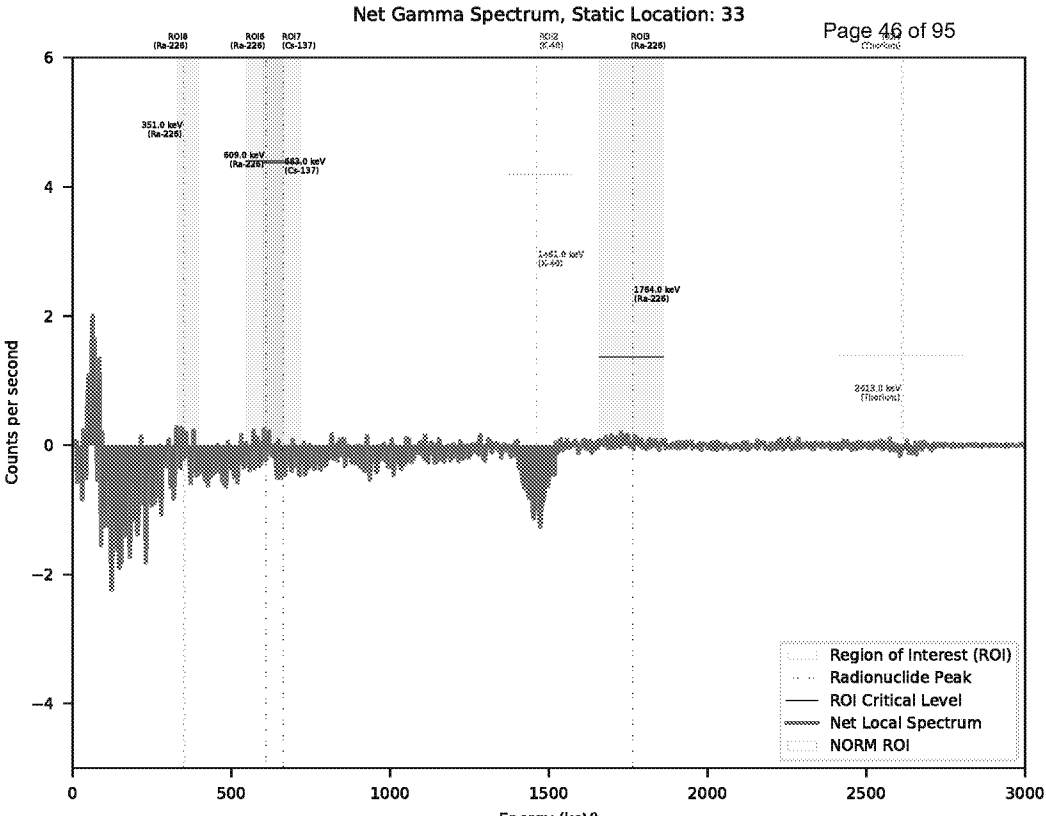
Local Dataset(s): \Static_2020-12-02_0223\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.3688229902912, 37.72321966407768



Local Dataset(s): \Static_2020-12-02_0223\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.36877929589038, 37.72933376849315 6



Local Dataset(s): \Static_2020-12-02_0223\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.36891121511624, 37.72325545697677

eurofins | Environment Testing America

ANALYTICAL REPORT

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

Laboratory Job ID: 160-40635-1
Laboratory Sample Delivery Group: GJ46599741
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

Elizabeth M. Hoerchler

Authorized for release by:
4/12/2021 5:26:39 PM
Elizabeth Hoerchler, Project Manager I
Elizabeth.Hoerchler@Eurofinset.com

Designee for

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

LINKS

Review your project results through Total Access

Have a Question? Ask The Expert

Visit us at: www.eurofinsus.com/Env

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.

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Job ID: 160-40635-1

Laboratory: Eurofins TestAmerica, St. Louis

Narrative

CASE NARRATIVE

Client: Aptim Federal Services LLC

Project: HPNS-Parcel G 501197

Report Number: 160-40635-1

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: 160-40635-1 (Continued)

Laboratory: Eurofins TestAmerica, St. Louis (Continued)

RECEIPT
The samples were received on 12/3/2020 9:55 AM; the samples arrived in good condition, and where required, properly preserved. The temperature of the cooler at receipt was 9.4° C.

STRONTIUM-90 (GFPC)
Samples HPPG-ESU-TU077B-001 (160-40635-1), HPPG-ESU-TU077B-011 (160-40635-11) and HPPG-ESU-TU077B-021 (160-40635-21) were analyzed for Strontium-90 (GFPC) in accordance with EPA 905. The samples were dried on 12/04/2020, prepared on 12/09/2020 and analyzed on 12/18/2020.

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-ESU-TU077B-001 (160-40635-1), HPPG-ESU-TU077B-011 (160-40635-11) and HPPG-ESU-TU077B-021 (160-40635-21)

The method blank (MB) z-score is within limits and is stored in the level IV raw data: (MB 160-491323/23-A).

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-ESU-TU077B-001 (160-40635-1), HPPG-ESU-TU077B-002 (160-40635-2), HPPG-ESU-TU077B-003 (160-40635-3), HPPG-ESU-TU077B-004 (160-40635-4), HPPG-ESU-TU077B-005 (160-40635-5), HPPG-ESU-TU077B-006 (160-40635-6), HPPG-ESU-TU077B-007 (160-40635-7), HPPG-ESU-TU077B-008 (160-40635-8), HPPG-ESU-TU077B-009 (160-40635-9), HPPG-ESU-TU077B-010 (160-40635-10), HPPG-ESU-TU077B-011 (160-40635-11), HPPG-ESU-TU077B-012 (160-40635-12), HPPG-ESU-TU077B-013 (160-40635-13), HPPG-ESU-TU077B-014 (160-40635-14), HPPG-ESU-TU077B-015 (160-40635-15), HPPG-ESU-TU077B-016 (160-40635-16), HPPG-ESU-TU077B-017 (160-40635-17), HPPG-ESU-TU077B-018 (160-40635-18), HPPG-ESU-TU077B-019 (160-40635-19), HPPG-ESU-TU077B-020 (160-40635-20), HPPG-ESU-TU077B-021 (160-40635-21), HPPG-ESU-TU077B-022 (160-40635-22), HPPG-ESU-TU077B-023 (160-40635-23), HPPG-ESU-TU077B-024 (160-40635-24), HPPG-ESU-TU077B-025 (160-40635-25), HPPG-F-051 (160-40635-26) and HPPG-F-052 (160-40635-27) were analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA_01_R. The samples were dried on 12/04/2020, prepared on 12/08/2020 and analyzed on 12/29/2020 and 12/30/2020.

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 Nuclide	Reported to Nuclide
Th-234	Pa-234
Th-234	U-238
Pb-210	Po-210
Pb-210	Bi-210
Cs-137	Ba-137m
Po-216	Pb-212
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

Job ID: 160-40635-1 (Continued)

Laboratory: Eurofins TestAmerica, St. Louis (Continued)

Th-227	Ra-223
Th-227	Ac-227
Th-227	Bi-214
Th-227	Pb-211
Bi-214	Ra-226

Gamma prep batch 491180
The method blank (MB) z-score is within limits and is stored in the level IV raw data: (MB 160-491180/1-A).

The cesium-137 detection goal of 0.0700 pCi/g was not met. This was due to statistical fluctuations in the Compton background from low level activity in the samples in conjunction with the software attempting to fit a peak into the noise of this baseline: HPPG-ESU-TU077B-024 (160-40635-24).

The radium-226 detection goal of 0.200 pCi/g was not met. This was due to statistical fluctuations in the Compton background from low level activity in the samples in conjunction with the software attempting to fit a peak into the noise of this baseline: HPPG-ESU-TU077B-025 (160-40635-25).

Gamma prep batch 491176
The MB z-score for Pa-234 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: (MB 160-491176/1-A).

The cesium-137 detection goal of 0.0700 pCi/g was not met. This was due to statistical fluctuations in the Compton background from low level activity in the samples in conjunction with the software attempting to fit a peak into the noise of this baseline: HPPG-ESU-TU077B-001 (160-40635-1), HPPG-ESU-TU077B-002 (160-40635-2), HPPG-ESU-TU077B-006 (160-40635-6), HPPG-ESU-TU077B-009 (160-40635-9), HPPG-ESU-TU077B-018 (160-40635-18), HPPG-ESU-TU077B-020 (160-40635-20), and (160-40635-A-20-C DU).

The replicate precision Th-234/U-238 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: (160-40635-A-20-C DU).

The Ra-226 detection goal of 0.2 pCi/g was not met. This was due to statistical fluctuations in the Compton background from low level activity in the samples in conjunction with the software attempting to fit a peak into the noise of this baseline: HPPG-ESU-TU077B-002 (160-40635-2), and HPPG-ESU-TU077B-014 (160-40635-14).

The method blank (MB) Z-score is within limits and is located in the level IV raw data: (MB 160-491176/1-A).

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-049

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: Murri, Andrew

Sample Tech(s): 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: 12/2/2020
Waybill Number: 4957 0225 6137
Lab Destination: Test America (St. Louis Lab) 13715 Rider Trail North Earth City, MO 63046
Lab Contact Name/ph # Rhoeda Ridenbower (314)298-8566

160-40635 Chain of Custody

	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-ESU-TU077B-001	12/1/2020	11:32	G	SO	1	16 oz. plastic jar	X		X				4	GJ46599741	
HPPG-ESU-TU077B-002	12/1/2020	11:34	G	SO	1	16 oz. plastic jar	X						4	GJ46599741	
HPPG-ESU-TU077B-003	12/1/2020	11:36	G	SO	1	16 oz. plastic jar	X						4	GJ46599741	
HPPG-ESU-TU077B-004	12/1/2020	11:38	G	SO	1	16 oz. plastic jar	X						4	GJ46599741	
HPPG-ESU-TU077B-005	12/1/2020	11:40	G	SO	1	16 oz. plastic jar	X						4	GJ46599741	
HPPG-ESU-TU077B-006	12/1/2020	11:41	G	SO	1	16 oz. plastic jar	X						4	GJ46599741	
HPPG-ESU-TU077B-007	12/1/2020	11:43	G	SO	1	16 oz. plastic jar	X						4	GJ46599741	
HPPG-ESU-TU077B-008	12/1/2020	11:45	G	SO	1	16 oz. plastic jar	X						4	GJ46599741	

Special Instructions: 21 day ingrowth results only

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:
Murri, Andrew		12/01/2020 17:42	Locked Storage (RKillpack)		12/01/2020 17:42
Locked Storage (RKillpack)		12/02/2020 10:21	Devin Lewis		12/02/2020 10:21
Devin Lewis		12/02/2020 15:43	SHIPPEDTOLAB		

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

APTIM

CHAIN OF CUSTODY

Ref. Document # 501197RSY-049

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: 415-987-0750
Address: 4005 Port Chicago Hwy
City: Concord, CA 94520

Sample Lead: Murri, Andrew
Sample Tech(s): 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: 12/2/2020
Waybill Number: 4957 0235 6137
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-ESU-TU077B-009	12/1/2020	11:46	G	SO	1	16 oz. plastic jar	X						4	GJ46599741	
HPPG-ESU-TU077B-010	12/1/2020	11:50	G	SO	1	16 oz. plastic jar	X						4	GJ46599741	
HPPG-ESU-TU077B-011	12/1/2020	11:52	G	SO	1	16 oz. plastic jar	X		X				4	GJ46599741	
HPPG-ESU-TU077B-012	12/1/2020	12:09	G	SO	1	16 oz. plastic jar	X						4	GJ46599741	
HPPG-ESU-TU077B-013	12/1/2020	13:07	G	SO	1	16 oz. plastic jar	X						4	GJ46599741	
HPPG-ESU-TU077B-014	12/1/2020	13:09	G	SO	1	16 oz. plastic jar	X						4	GJ46599741	
HPPG-ESU-TU077B-015	12/1/2020	13:12	G	SO	1	16 oz. plastic jar	X						4	GJ46599741	
HPPG-ESU-TU077B-016	12/1/2020	13:14	G	SO	1	16 oz. plastic jar	X						4	GJ46599741	
HPPG-ESU-TU077B-017	12/1/2020	13:16	G	SO	1	16 oz. plastic jar	X						4	GJ46599741	
HPPG-ESU-TU077B-018	12/1/2020	13:18	G	SO	1	16 oz. plastic jar	X						4	GJ46599741	
HPPG-ESU-TU077B-019	12/1/2020	13:21	G	SO	1	16 oz. plastic jar	X						4	GJ46599741	
HPPG-ESU-TU077B-020	12/1/2020	13:23	G	SO	1	16 oz. plastic jar	X						4	GJ46599741	
HPPG-ESU-TU077B-021	12/1/2020	13:25	G	SO	1	16 oz. plastic jar	X		X				4	GJ46599741	
HPPG-ESU-TU077B-022	12/1/2020	13:26	G	SO	1	16 oz. plastic jar	X						4	GJ46599741	
HPPG-ESU-TU077B-023	12/1/2020	13:28	G	SO	1	16 oz. plastic jar	X						4	GJ46599741	
HPPG-ESU-TU077B-024	12/1/2020	13:30	G	SO	1	16 oz. plastic jar	X						4	GJ46599741	
HPPG-ESU-TU077B-025	12/1/2020	13:32	G	SO	1	16 oz. plastic jar	X						4	GJ46599741	

APTIM

CHAIN OF CUSTODY

Ref. Document # 501197RSY-049

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
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Lab Contact Name/ph # Rhoeda Ridenbower (314)298-8566

	Collection Information						Analysis Requested								
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HPPG-F-051	12/1/2020	11:46	G	SO	1	16 oz. plastic jar	X						4	GJ46599741	
HPPG-F-052	12/1/2020	13:28	G	SO	1	16 oz. plastic jar	X						4	GJ46599741	

All Transfers for COC 501197RSY-049

Relinquished By:	Relinquisher Signature:	Relinquish Date Time:	Received By:	Received Signature:	Receive Date Time:
Murri, Andrew		12/01/2020 17:42	Locked Storage (RKillpack)		12/01/2020 17:42
Locked Storage (RKillpack)		12/02/2020 10:21	Devin Lewis		12/02/2020 10:21
Devin Lewis		12/02/2020 15:43	SHIPPEDTOLAB		

Login Sample Receipt Checklist

Client: Aptim Federal Services LLC

Job Number: 160-40635-1
SDG Number: GJ46599741

Login Number: 40635
List Number: 1
Creator: Greer, Diane A

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.	True	
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: 160-40635-1
SDG: GJ46599741

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: 160-40635-1
SDG: GJ46599741

Method	Method Description	Protocol	Laboratory
905	Strontium-90 (GFPC)	EPA	TAL SL
GA-01-R	Radium-226 & Other Gamma Emitters (GS)	DOE	TAL SL
DPS-7	Preparation, Digestion/Precipitate Separation (7-Day In-Growth)	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
EPA = US Environmental Protection Agency
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: 160-40635-1
SDG: GJ46599741

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
160-40635-1	HPPG-ESU-TU077B-001	Solid	12/01/20 11:32	12/03/20 09:55	
160-40635-2	HPPG-ESU-TU077B-002	Solid	12/01/20 11:34	12/03/20 09:55	
160-40635-3	HPPG-ESU-TU077B-003	Solid	12/01/20 11:36	12/03/20 09:55	
160-40635-4	HPPG-ESU-TU077B-004	Solid	12/01/20 11:38	12/03/20 09:55	
160-40635-5	HPPG-ESU-TU077B-005	Solid	12/01/20 11:40	12/03/20 09:55	
160-40635-6	HPPG-ESU-TU077B-006	Solid	12/01/20 11:41	12/03/20 09:55	
160-40635-7	HPPG-ESU-TU077B-007	Solid	12/01/20 11:43	12/03/20 09:55	
160-40635-8	HPPG-ESU-TU077B-008	Solid	12/01/20 11:45	12/03/20 09:55	
160-40635-9	HPPG-ESU-TU077B-009	Solid	12/01/20 11:46	12/03/20 09:55	
160-40635-10	HPPG-ESU-TU077B-010	Solid	12/01/20 11:50	12/03/20 09:55	
160-40635-11	HPPG-ESU-TU077B-011	Solid	12/01/20 11:52	12/03/20 09:55	
160-40635-12	HPPG-ESU-TU077B-012	Solid	12/01/20 12:09	12/03/20 09:55	
160-40635-13	HPPG-ESU-TU077B-013	Solid	12/01/20 13:07	12/03/20 09:55	
160-40635-14	HPPG-ESU-TU077B-014	Solid	12/01/20 13:09	12/03/20 09:55	
160-40635-15	HPPG-ESU-TU077B-015	Solid	12/01/20 13:12	12/03/20 09:55	
160-40635-16	HPPG-ESU-TU077B-016	Solid	12/01/20 13:14	12/03/20 09:55	
160-40635-17	HPPG-ESU-TU077B-017	Solid	12/01/20 13:16	12/03/20 09:55	
160-40635-18	HPPG-ESU-TU077B-018	Solid	12/01/20 13:18	12/03/20 09:55	
160-40635-19	HPPG-ESU-TU077B-019	Solid	12/01/20 13:21	12/03/20 09:55	
160-40635-20	HPPG-ESU-TU077B-020	Solid	12/01/20 13:23	12/03/20 09:55	
160-40635-21	HPPG-ESU-TU077B-021	Solid	12/01/20 13:25	12/03/20 09:55	
160-40635-22	HPPG-ESU-TU077B-022	Solid	12/01/20 13:26	12/03/20 09:55	
160-40635-23	HPPG-ESU-TU077B-023	Solid	12/01/20 13:28	12/03/20 09:55	
160-40635-24	HPPG-ESU-TU077B-024	Solid	12/01/20 13:30	12/03/20 09:55	
160-40635-25	HPPG-ESU-TU077B-025	Solid	12/01/20 13:32	12/03/20 09:55	
160-40635-26	HPPG-F-051	Solid	12/01/20 11:46	12/03/20 09:55	
160-40635-27	HPPG-F-052	Solid	12/01/20 13:28	12/03/20 09:55	

Client Sample Results

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

Job ID: 160-40635-1
SDG: GJ46599741

Client Sample ID: HPPG-ESU-TU077B-001

Lab Sample ID: 160-40635-1
Matrix: Solid

Date Collected: 12/01/20 11:32
Date Received: 12/03/20 09:55

Method: 905 - Strontium-90 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Strontium-90	**0.216**		0.162	0.163	0.331	0.115	pCi/g	12/09/20 18:42	12/18/20 20:19	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*88.2*		*40 - 110*	*12/09/20 18:42*	*12/18/20 20:19*	*1*
Y Carrier	*92.7*		*40 - 110*	*12/09/20 18:42*	*12/18/20 20:19*	*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	**0.531**		0.194	0.203		0.0393	pCi/g	12/08/20 13:20	12/29/20 10:58	1
Actinium-227	0.0162	U	0.0690	0.0691		0.473	pCi/g	12/08/20 13:20	12/29/20 10:58	1
Bismuth-212	0.641	U	1.15	1.15		0.892	pCi/g	12/08/20 13:20	12/29/20 10:58	1
Bismuth-214	**0.482**		0.155	0.165		0.0604	pCi/g	12/08/20 13:20	12/29/20 10:58	1
Cesium-137	0.0147	U	0.0967	0.0967	0.0700	0.0785	pCi/g	12/08/20 13:20	12/29/20 10:58	1
Lead-210	0.734	U	1.90	1.91		1.52	pCi/g	12/08/20 13:20	12/29/20 10:58	1
Lead-212	**0.527**		0.113	0.129		0.0536	pCi/g	12/08/20 13:20	12/29/20 10:58	1
Lead-214	**0.474**		0.132	0.143		0.115	pCi/g	12/08/20 13:20	12/29/20 10:58	1
Potassium-40	**7.70**		1.49	1.73		0.347	pCi/g	12/08/20 13:20	12/29/20 10:58	1
Protactinium-231	-0.0610	U	3.46	3.46		2.85	pCi/g	12/08/20 13:20	12/29/20 10:58	1
Protactinium-234	0.140	U	0.384	0.385		0.277	pCi/g	12/08/20 13:20	12/29/20 10:58	1
Radium-226	**0.482**		0.155	0.165	0.200	0.0604	pCi/g	12/08/20 13:20	12/29/20 10:58	1
Radium-228	**0.531**		0.194	0.203		0.0393	pCi/g	12/08/20 13:20	12/29/20 10:58	1
Thallium-208	**0.137**		0.0973	0.0986		0.0448	pCi/g	12/08/20 13:20	12/29/20 10:58	1
Thorium 228	**0.527**		0.113	0.129		0.0536	pCi/g	12/08/20 13:20	12/29/20 10:58	1
Thorium-232	**0.531**		0.194	0.203		0.0393	pCi/g	12/08/20 13:20	12/29/20 10:58	1
Thorium-234	-0.708	U	0.749	0.754		0.992	pCi/g	12/08/20 13:20	12/29/20 10:58	1
Uranium-235	-0.0263	U	0.783	0.783		0.491	pCi/g	12/08/20 13:20	12/29/20 10:58	1
Uranium-238	-0.708	U	0.749	0.754		0.992	pCi/g	12/08/20 13:20	12/29/20 10:58	1

Client Sample ID: HPPG-ESU-TU077B-002

Lab Sample ID: 160-40635-2
Matrix: Solid

Date Collected: 12/01/20 11:34
Date Received: 12/03/20 09:55

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	**0.160**		0.259	0.260		0.147	pCi/g	12/08/20 13:20	12/29/20 11:01	1
Actinium-227	0.160	U	0.357	0.358		0.229	pCi/g	12/08/20 13:20	12/29/20 11:01	1
Bismuth-212	-0.0873	U	0.843	0.843		1.02	pCi/g	12/08/20 13:20	12/29/20 11:01	1
Bismuth-214	0.187	U	0.104	0.106		0.273	pCi/g	12/08/20 13:20	12/29/20 11:01	1
Cesium-137	-0.0538	U	0.168	0.168	0.0700	0.0829	pCi/g	12/08/20 13:20	12/29/20 11:01	1
Lead-210	-0.362	U	1.20	1.20		0.893	pCi/g	12/08/20 13:20	12/29/20 11:01	1
Lead-212	**0.348**		0.102	0.112		0.0445	pCi/g	12/08/20 13:20	12/29/20 11:01	1
Lead-214	**0.123**		0.140	0.140		0.103	pCi/g	12/08/20 13:20	12/29/20 11:01	1
Potassium-40	**5.73**		1.68	1.78		0.555	pCi/g	12/08/20 13:20	12/29/20 11:01	1
Protactinium-231	0.000	U	0.775	0.775		2.42	pCi/g	12/08/20 13:20	12/29/20 11:01	1

Client Sample Results

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

Job ID: 160-40635-1
SDG: GJ46599741

Client Sample ID: HPPG-ESU-TU077B-002

Lab Sample ID: 160-40635-2
Date Collected: 12/01/20 11:34
Matrix: Solid
Date Received: 12/03/20 09:55

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
Protactinium-234	0.0790	U	0.0707	0.0711		0.175	pCi/g	12/08/20 13:20	12/29/20 11:01	1
Radium-226	0.187	U	0.104	0.106	0.200	0.273	pCi/g	12/08/20 13:20	12/29/20 11:01	1
Radium-228	**0.160**		0.259	0.260		0.147	pCi/g	12/08/20 13:20	12/29/20 11:01	1
Thallium-208	0.0314	U	0.0834	0.0834		0.0488	pCi/g	12/08/20 13:20	12/29/20 11:01	1
Thorium 228	**0.348**		0.102	0.112		0.0445	pCi/g	12/08/20 13:20	12/29/20 11:01	1
Thorium-232	**0.160**		0.259	0.260		0.147	pCi/g	12/08/20 13:20	12/29/20 11:01	1
Thorium-234	**0.568**		0.514	0.518		0.383	pCi/g	12/08/20 13:20	12/29/20 11:01	1
Uranium-235	0.0136	U	0.0401	0.0401		0.289	pCi/g	12/08/20 13:20	12/29/20 11:01	1
Uranium-238	**0.568**		0.514	0.518		0.383	pCi/g	12/08/20 13:20	12/29/20 11:01	1

Client Sample ID: HPPG-ESU-TU077B-003

Lab Sample ID: 160-40635-3
Date Collected: 12/01/20 11:36
Matrix: Solid
Date Received: 12/03/20 09:55

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	**0.259**		0.190	0.192		0.0961	pCi/g	12/08/20 13:20	12/29/20 11:59	1
Actinium-227	0.141	U	0.368	0.369		0.315	pCi/g	12/08/20 13:20	12/29/20 11:59	1
Bismuth-212	0.383	U	0.715	0.717		0.549	pCi/g	12/08/20 13:20	12/29/20 11:59	1
Bismuth-214	**0.403**		0.156	0.162		0.0629	pCi/g	12/08/20 13:20	12/29/20 11:59	1
Cesium-137	0.00587	U	0.0543	0.0543	0.0700	0.0441	pCi/g	12/08/20 13:20	12/29/20 11:59	1
Lead-210	-1.30	U	1.79	1.80		1.52	pCi/g	12/08/20 13:20	12/29/20 11:59	1
Lead-212	**0.375**		0.0898	0.102		0.0438	pCi/g	12/08/20 13:20	12/29/20 11:59	1
Lead-214	**0.374**		0.111	0.117		0.0607	pCi/g	12/08/20 13:20	12/29/20 11:59	1
Potassium-40	**6.95**		1.49	1.65		0.497	pCi/g	12/08/20 13:20	12/29/20 11:59	1
Protactinium-231	0.562	U	1.83	1.83		2.01	pCi/g	12/08/20 13:20	12/29/20 11:59	1
Protactinium-234	0.00104	U	0.00237	0.00237		0.249	pCi/g	12/08/20 13:20	12/29/20 11:59	1
Radium-226	**0.403**		0.156	0.162	0.200	0.0629	pCi/g	12/08/20 13:20	12/29/20 11:59	1
Radium-228	**0.259**		0.190	0.192		0.0961	pCi/g	12/08/20 13:20	12/29/20 11:59	1
Thallium-208	**0.158**		0.0597	0.0619		0.0223	pCi/g	12/08/20 13:20	12/29/20 11:59	1
Thorium 228	**0.375**		0.0898	0.102		0.0438	pCi/g	12/08/20 13:20	12/29/20 11:59	1
Thorium-232	**0.259**		0.190	0.192		0.0961	pCi/g	12/08/20 13:20	12/29/20 11:59	1
Thorium-234	0.333	U	0.543	0.545		0.422	pCi/g	12/08/20 13:20	12/29/20 11:59	1
Uranium-235	0.232	U	0.347	0.347		0.393	pCi/g	12/08/20 13:20	12/29/20 11:59	1
Uranium-238	0.333	U	0.543	0.545		0.422	pCi/g	12/08/20 13:20	12/29/20 11:59	1

Client Sample ID: HPPG-ESU-TU077B-004

Lab Sample ID: 160-40635-4
Date Collected: 12/01/20 11:38
Matrix: Solid
Date Received: 12/03/20 09:55

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	**0.541**		0.153	0.163		0.0947	pCi/g	12/08/20 13:20	12/29/20 12:02	1
Actinium-227	0.0616	U	0.106	0.106		0.304	pCi/g	12/08/20 13:20	12/29/20 12:02	1

Client Sample Results

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

Job ID: 160-40635-1
SDG: GJ46599741

Client Sample ID: HPPG-ESU-TU077B-004

Lab Sample ID: 160-40635-4
Matrix: Solid

Date Collected: 12/01/20 11:38
Date Received: 12/03/20 09:55

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-212	-0.258	U	0.585	0.585		0.537	pCi/g	12/08/20 13:20	12/29/20 12:02	1
Bismuth-214	**0.483**		0.126	0.136		0.0369	pCi/g	12/08/20 13:20	12/29/20 12:02	1
Cesium-137	0.0164	U	0.0333	0.0334	0.0700	0.0247	pCi/g	12/08/20 13:20	12/29/20 12:02	1
Lead-210	**1.11**		1.19	1.20		0.818	pCi/g	12/08/20 13:20	12/29/20 12:02	1
Lead-212	**0.536**		0.0980	0.120		0.0437	pCi/g	12/08/20 13:20	12/29/20 12:02	1
Lead-214	**0.364**		0.109	0.115		0.0484	pCi/g	12/08/20 13:20	12/29/20 12:02	1
Potassium-40	**8.73**		1.35	1.62		0.311	pCi/g	12/08/20 13:20	12/29/20 12:02	1
Protactinium-231	0.550	U	1.74	1.75		1.91	pCi/g	12/08/20 13:20	12/29/20 12:02	1
Protactinium-234	0.00512	U	0.0105	0.0105		0.199	pCi/g	12/08/20 13:20	12/29/20 12:02	1
Radium-226	**0.483**		0.126	0.136	0.200	0.0369	pCi/g	12/08/20 13:20	12/29/20 12:02	1
Radium-228	**0.541**		0.153	0.163		0.0947	pCi/g	12/08/20 13:20	12/29/20 12:02	1
Thallium-208	**0.240**		0.0629	0.0677		0.0205	pCi/g	12/08/20 13:20	12/29/20 12:02	1
Thorium 228	**0.536**		0.0980	0.120		0.0437	pCi/g	12/08/20 13:20	12/29/20 12:02	1
Thorium-232	**0.541**		0.153	0.163		0.0947	pCi/g	12/08/20 13:20	12/29/20 12:02	1
Thorium-234	-0.327	U	0.904	0.905		0.753	pCi/g	12/08/20 13:20	12/29/20 12:02	1
Uranium-235	0.125	U	0.318	0.319		0.256	pCi/g	12/08/20 13:20	12/29/20 12:02	1
Uranium-238	-0.327	U	0.904	0.905		0.753	pCi/g	12/08/20 13:20	12/29/20 12:02	1

Client Sample ID: HPPG-ESU-TU077B-005

Lab Sample ID: 160-40635-5
Matrix: Solid

Date Collected: 12/01/20 11:40
Date Received: 12/03/20 09:55

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	**0.175**		0.207	0.208		0.158	pCi/g	12/08/20 13:20	12/29/20 12:00	1
Actinium-227	0.180	U	0.221	0.222		0.186	pCi/g	12/08/20 13:20	12/29/20 12:00	1
Bismuth-212	0.00956	U	0.902	0.902		0.742	pCi/g	12/08/20 13:20	12/29/20 12:00	1
Bismuth-214	**0.375**		0.123	0.129		0.0443	pCi/g	12/08/20 13:20	12/29/20 12:00	1
Cesium-137	0.0225	U	0.0476	0.0477	0.0700	0.0354	pCi/g	12/08/20 13:20	12/29/20 12:00	1
Lead-210	**1.69**		1.01	1.03		0.588	pCi/g	12/08/20 13:20	12/29/20 12:00	1
Lead-212	**0.407**		0.0924	0.102		0.0413	pCi/g	12/08/20 13:20	12/29/20 12:00	1
Lead-214	**0.358**		0.102	0.108		0.0473	pCi/g	12/08/20 13:20	12/29/20 12:00	1
Potassium-40	**5.88**		1.36	1.49		0.256	pCi/g	12/08/20 13:20	12/29/20 12:00	1
Protactinium-231	0.700	U	2.58	2.58		2.10	pCi/g	12/08/20 13:20	12/29/20 12:00	1
Protactinium-234	-0.0158	U	0.0406	0.0406		0.242	pCi/g	12/08/20 13:20	12/29/20 12:00	1
Radium-226	**0.375**		0.123	0.129	0.200	0.0443	pCi/g	12/08/20 13:20	12/29/20 12:00	1
Radium-228	**0.175**		0.207	0.208		0.158	pCi/g	12/08/20 13:20	12/29/20 12:00	1
Thallium-208	**0.0530**		0.104	0.104		0.0411	pCi/g	12/08/20 13:20	12/29/20 12:00	1
Thorium 228	**0.407**		0.0924	0.102		0.0413	pCi/g	12/08/20 13:20	12/29/20 12:00	1
Thorium-232	**0.175**		0.207	0.208		0.158	pCi/g	12/08/20 13:20	12/29/20 12:00	1
Thorium-234	0.455	U	0.497	0.500		0.496	pCi/g	12/08/20 13:20	12/29/20 12:00	1
Uranium-235	0.0561	U	0.144	0.144		0.455	pCi/g	12/08/20 13:20	12/29/20 12:00	1
Uranium-238	0.455	U	0.497	0.500		0.496	pCi/g	12/08/20 13:20	12/29/20 12:00	1

Client Sample Results

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

Job ID: 160-40635-1
SDG: GJ46599741

Client Sample ID: HPPG-ESU-TU077B-006

Lab Sample ID: 160-40635-6
Matrix: Solid

Date Collected: 12/01/20 11:41
Date Received: 12/03/20 09:55

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	**0.632**		0.213	0.222		0.141	pCi/g	12/08/20 13:20	12/29/20 12:05	1
Actinium-227	0.277	U	0.537	0.538		0.318	pCi/g	12/08/20 13:20	12/29/20 12:05	1
Bismuth-212	0.0425	U	0.945	0.945		0.775	pCi/g	12/08/20 13:20	12/29/20 12:05	1
Bismuth-214	**0.588**		0.148	0.160		0.0540	pCi/g	12/08/20 13:20	12/29/20 12:05	1
Cesium-137	-0.0578	U	0.0960	0.0962	0.0700	0.0748	pCi/g	12/08/20 13:20	12/29/20 12:05	1
Lead-210	**1.73**		2.38	2.39		1.41	pCi/g	12/08/20 13:20	12/29/20 12:05	1
Lead-212	**0.450**		0.114	0.123		0.0630	pCi/g	12/08/20 13:20	12/29/20 12:05	1
Lead-214	**0.617**		0.161	0.172		0.0700	pCi/g	12/08/20 13:20	12/29/20 12:05	1
Potassium-40	**10.2**		1.57	1.88		0.141	pCi/g	12/08/20 13:20	12/29/20 12:05	1
Protactinium-231	0.797	U	2.32	2.32		2.54	pCi/g	12/08/20 13:20	12/29/20 12:05	1
Protactinium-234	0.0485	U	0.351	0.351		0.287	pCi/g	12/08/20 13:20	12/29/20 12:05	1
Radium-226	**0.588**		0.148	0.160	0.200	0.0540	pCi/g	12/08/20 13:20	12/29/20 12:05	1
Radium-228	**0.632**		0.213	0.222		0.141	pCi/g	12/08/20 13:20	12/29/20 12:05	1
Thallium-208	**0.231**		0.0729	0.0765		0.0192	pCi/g	12/08/20 13:20	12/29/20 12:05	1
Thorium 228	**0.450**		0.114	0.123		0.0630	pCi/g	12/08/20 13:20	12/29/20 12:05	1
Thorium-232	**0.632**		0.213	0.222		0.141	pCi/g	12/08/20 13:20	12/29/20 12:05	1
Thorium-234	**1.42**		0.862	0.877		0.504	pCi/g	12/08/20 13:20	12/29/20 12:05	1
Uranium-235	0.120	U	0.253	0.254		0.488	pCi/g	12/08/20 13:20	12/29/20 12:05	1
Uranium-238	**1.42**		0.862	0.877		0.504	pCi/g	12/08/20 13:20	12/29/20 12:05	1

Client Sample ID: HPPG-ESU-TU077B-007

Lab Sample ID: 160-40635-7
Matrix: Solid

Date Collected: 12/01/20 11:43
Date Received: 12/03/20 09:55

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	**0.390**		0.162	0.167		0.0534	pCi/g	12/08/20 13:20	12/29/20 12:06	1
Actinium-227	0.0832	U	0.172	0.172		0.351	pCi/g	12/08/20 13:20	12/29/20 12:06	1
Bismuth-212	0.0166	U	0.553	0.553		0.454	pCi/g	12/08/20 13:20	12/29/20 12:06	1
Bismuth-214	**0.282**		0.0944	0.0988		0.0428	pCi/g	12/08/20 13:20	12/29/20 12:06	1
Cesium-137	0.0119	U	0.0454	0.0454	0.0700	0.0241	pCi/g	12/08/20 13:20	12/29/20 12:06	1
Lead-210	-0.211	U	1.11	1.11		0.901	pCi/g	12/08/20 13:20	12/29/20 12:06	1
Lead-212	**0.403**		0.118	0.129		0.0811	pCi/g	12/08/20 13:20	12/29/20 12:06	1
Lead-214	**0.391**		0.105	0.113		0.0601	pCi/g	12/08/20 13:20	12/29/20 12:06	1
Potassium-40	**7.82**		1.13	1.38		0.0944	pCi/g	12/08/20 13:20	12/29/20 12:06	1
Protactinium-231	0.611	U	1.02	1.02		1.36	pCi/g	12/08/20 13:20	12/29/20 12:06	1
Protactinium-234	0.00841	U	0.0145	0.0145		0.195	pCi/g	12/08/20 13:20	12/29/20 12:06	1
Radium-226	**0.282**		0.0944	0.0988	0.200	0.0428	pCi/g	12/08/20 13:20	12/29/20 12:06	1
Radium-228	**0.390**		0.162	0.167		0.0534	pCi/g	12/08/20 13:20	12/29/20 12:06	1
Thallium-208	**0.124**		0.0409	0.0429		0.0112	pCi/g	12/08/20 13:20	12/29/20 12:06	1
Thorium 228	**0.403**		0.118	0.129		0.0811	pCi/g	12/08/20 13:20	12/29/20 12:06	1
Thorium-232	**0.390**		0.162	0.167		0.0534	pCi/g	12/08/20 13:20	12/29/20 12:06	1
Thorium-234	0.000	U	0.365	0.365		0.790	pCi/g	12/08/20 13:20	12/29/20 12:06	1
Uranium-235	0.0692	U	0.0713	0.0716		0.333	pCi/g	12/08/20 13:20	12/29/20 12:06	1
Uranium-238	0.000	U	0.365	0.365		0.790	pCi/g	12/08/20 13:20	12/29/20 12:06	1

Client Sample Results

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

Job ID: 160-40635-1
SDG: GJ46599741

Client Sample ID: HPPG-ESU-TU077B-008

Lab Sample ID: 160-40635-8
Matrix: Solid

Date Collected: 12/01/20 11:45
Date Received: 12/03/20 09:55

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	**0.553**		0.224	0.233		0.131	pCi/g	12/08/20 13:20	12/29/20 12:08	1
Actinium-227	0.249	U	0.426	0.427		0.393	pCi/g	12/08/20 13:20	12/29/20 12:08	1
Bismuth-212	0.426	U	0.834	0.836		0.637	pCi/g	12/08/20 13:20	12/29/20 12:08	1
Bismuth-214	**0.413**		0.145	0.153		0.0629	pCi/g	12/08/20 13:20	12/29/20 12:08	1
Cesium-137	**0.0912**		0.0546	0.0556	0.0700	0.0290	pCi/g	12/08/20 13:20	12/29/20 12:08	1
Lead-210	-1.43	U	2.42	2.43		2.04	pCi/g	12/08/20 13:20	12/29/20 12:08	1
Lead-212	**0.428**		0.107	0.118		0.0525	pCi/g	12/08/20 13:20	12/29/20 12:08	1
Lead-214	**0.408**		0.126	0.135		0.0735	pCi/g	12/08/20 13:20	12/29/20 12:08	1
Potassium-40	**6.84**		1.45	1.65		0.365	pCi/g	12/08/20 13:20	12/29/20 12:08	1
Protactinium-231	0.808	U	2.35	2.35		2.70	pCi/g	12/08/20 13:20	12/29/20 12:08	1
Protactinium-234	0.147	U	0.273	0.274		0.269	pCi/g	12/08/20 13:20	12/29/20 12:08	1
Radium-226	**0.413**		0.145	0.153	0.200	0.0629	pCi/g	12/08/20 13:20	12/29/20 12:08	1
Radium-228	**0.553**		0.224	0.233		0.131	pCi/g	12/08/20 13:20	12/29/20 12:08	1
Thallium-208	**0.153**		0.0759	0.0779		0.0338	pCi/g	12/08/20 13:20	12/29/20 12:08	1
Thorium 228	**0.428**		0.107	0.118		0.0525	pCi/g	12/08/20 13:20	12/29/20 12:08	1
Thorium-232	**0.553**		0.224	0.233		0.131	pCi/g	12/08/20 13:20	12/29/20 12:08	1
Thorium-234	-0.850	U	1.04	1.05		0.733	pCi/g	12/08/20 13:20	12/29/20 12:08	1
Uranium-235	0.00712	U	0.647	0.647		0.532	pCi/g	12/08/20 13:20	12/29/20 12:08	1
Uranium-238	-0.850	U	1.04	1.05		0.733	pCi/g	12/08/20 13:20	12/29/20 12:08	1

Client Sample ID: HPPG-ESU-TU077B-009

Lab Sample ID: 160-40635-9
Matrix: Solid

Date Collected: 12/01/20 11:46
Date Received: 12/03/20 09:55

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	**0.415**		0.182	0.186		0.0475	pCi/g	12/08/20 13:20	12/29/20 12:07	1
Actinium-227	0.131	U	0.292	0.292		0.227	pCi/g	12/08/20 13:20	12/29/20 12:07	1
Bismuth-212	-0.00506	U	0.854	0.854		0.499	pCi/g	12/08/20 13:20	12/29/20 12:07	1
Bismuth-214	**0.218**		0.159	0.161		0.0952	pCi/g	12/08/20 13:20	12/29/20 12:07	1
Cesium-137	-0.00480	U	0.0857	0.0857	0.0700	0.0709	pCi/g	12/08/20 13:20	12/29/20 12:07	1
Lead-210	**0.694**		0.949	0.953		0.663	pCi/g	12/08/20 13:20	12/29/20 12:07	1
Lead-212	**0.352**		0.0945	0.105		0.0419	pCi/g	12/08/20 13:20	12/29/20 12:07	1
Lead-214	**0.178**		0.118	0.120		0.0739	pCi/g	12/08/20 13:20	12/29/20 12:07	1
Potassium-40	**2.90**		1.83	1.86		0.833	pCi/g	12/08/20 13:20	12/29/20 12:07	1
Protactinium-231	-0.936	U	2.62	2.63		2.11	pCi/g	12/08/20 13:20	12/29/20 12:07	1
Protactinium-234	0.0388	U	0.0814	0.0815		0.185	pCi/g	12/08/20 13:20	12/29/20 12:07	1
Radium-226	**0.218**		0.159	0.161	0.200	0.0952	pCi/g	12/08/20 13:20	12/29/20 12:07	1
Radium-228	**0.415**		0.182	0.186		0.0475	pCi/g	12/08/20 13:20	12/29/20 12:07	1
Thallium-208	**0.104**		0.105	0.105		0.0428	pCi/g	12/08/20 13:20	12/29/20 12:07	1
Thorium 228	**0.352**		0.0945	0.105		0.0419	pCi/g	12/08/20 13:20	12/29/20 12:07	1
Thorium-232	**0.415**		0.182	0.186		0.0475	pCi/g	12/08/20 13:20	12/29/20 12:07	1
Thorium-234	**0.488**		0.567	0.569		0.377	pCi/g	12/08/20 13:20	12/29/20 12:07	1
Uranium-235	0.0867	U	0.278	0.278		0.222	pCi/g	12/08/20 13:20	12/29/20 12:07	1
Uranium-238	**0.488**		0.567	0.569		0.377	pCi/g	12/08/20 13:20	12/29/20 12:07	1

Client Sample Results

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

Job ID: 160-40635-1
SDG: GJ46599741

Client Sample ID: HPPG-ESU-TU077B-010

Lab Sample ID: 160-40635-10
Date Collected: 12/01/20 11:50
Matrix: Solid
Date Received: 12/03/20 09:55

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	**0.687**		0.223	0.234		0.0454	pCi/g	12/08/20 13:20	12/29/20 13:32	1
Actinium-227	-0.400	U	0.855	0.856		0.516	pCi/g	12/08/20 13:20	12/29/20 13:32	1
Bismuth-212	0.377	U	0.894	0.895		0.691	pCi/g	12/08/20 13:20	12/29/20 13:32	1
Bismuth-214	**0.406**		0.179	0.184		0.0948	pCi/g	12/08/20 13:20	12/29/20 13:32	1
Cesium-137	0.0128	U	0.0698	0.0698	0.0700	0.0557	pCi/g	12/08/20 13:20	12/29/20 13:32	1
Lead-210	**2.42**		1.33	1.36		0.721	pCi/g	12/08/20 13:20	12/29/20 13:32	1
Lead-212	**0.522**		0.117	0.135		0.0560	pCi/g	12/08/20 13:20	12/29/20 13:32	1
Lead-214	**0.378**		0.177	0.181		0.0938	pCi/g	12/08/20 13:20	12/29/20 13:32	1
Potassium-40	**7.86**		1.82	1.99		0.525	pCi/g	12/08/20 13:20	12/29/20 13:32	1
Protactinium-231	0.744	U	2.11	2.11		2.31	pCi/g	12/08/20 13:20	12/29/20 13:32	1
Protactinium-234	0.0760	U	0.108	0.108		0.219	pCi/g	12/08/20 13:20	12/29/20 13:32	1
Radium-226	**0.406**		0.179	0.184	0.200	0.0948	pCi/g	12/08/20 13:20	12/29/20 13:32	1
Radium-228	**0.687**		0.223	0.234		0.0454	pCi/g	12/08/20 13:20	12/29/20 13:32	1
Thallium-208	**0.198**		0.0638	0.0671		0.0172	pCi/g	12/08/20 13:20	12/29/20 13:32	1
Thorium 228	**0.522**		0.117	0.135		0.0560	pCi/g	12/08/20 13:20	12/29/20 13:32	1
Thorium-232	**0.687**		0.223	0.234		0.0454	pCi/g	12/08/20 13:20	12/29/20 13:32	1
Thorium-234	**0.865**		0.571	0.579		0.425	pCi/g	12/08/20 13:20	12/29/20 13:32	1
Uranium-235	0.115	U	0.329	0.329		0.269	pCi/g	12/08/20 13:20	12/29/20 13:32	1
Uranium-238	**0.865**		0.571	0.579		0.425	pCi/g	12/08/20 13:20	12/29/20 13:32	1

Client Sample ID: HPPG-ESU-TU077B-011

Lab Sample ID: 160-40635-11
Date Collected: 12/01/20 11:52
Matrix: Solid
Date Received: 12/03/20 09:55

Method: 905 - Strontium-90 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Strontium-90	0.0144	U	0.151	0.151	0.331	0.123	pCi/g	12/09/20 18:42	12/18/20 20:19	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*91.4*		*40 - 110*	*12/09/20 18:42*	*12/18/20 20:19*	*1*
Y Carrier	*94.2*		*40 - 110*	*12/09/20 18:42*	*12/18/20 20:19*	*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	**0.219**		0.109	0.111		0.138	pCi/g	12/08/20 13:20	12/29/20 12:52	1
Actinium-227	-0.0830	U	0.314	0.314		0.360	pCi/g	12/08/20 13:20	12/29/20 12:52	1
Bismuth-212	-0.326	U	0.596	0.597		0.616	pCi/g	12/08/20 13:20	12/29/20 12:52	1
Bismuth-214	**0.382**		0.127	0.133		0.0455	pCi/g	12/08/20 13:20	12/29/20 12:52	1
Cesium-137	-0.0220	U	0.0600	0.0600	0.0700	0.0473	pCi/g	12/08/20 13:20	12/29/20 12:52	1
Lead-210	0.547	U	1.25	1.25		0.985	pCi/g	12/08/20 13:20	12/29/20 12:52	1
Lead-212	**0.408**		0.0948	0.109		0.0489	pCi/g	12/08/20 13:20	12/29/20 12:52	1
Lead-214	**0.409**		0.0960	0.105		0.0579	pCi/g	12/08/20 13:20	12/29/20 12:52	1
Potassium-40	**6.29**		1.20	1.36		0.327	pCi/g	12/08/20 13:20	12/29/20 12:52	1
Protactinium-231	0.0955	U	1.21	1.21		2.27	pCi/g	12/08/20 13:20	12/29/20 12:52	1

Client Sample Results

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

Job ID: 160-40635-1
SDG: GJ46599741

Client Sample ID: HPPG-ESU-TU077B-011

Lab Sample ID: 160-40635-11
Date Collected: 12/01/20 11:52
Matrix: Solid
Date Received: 12/03/20 09:55

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
Protactinium-234	0.105	U	0.196	0.197		0.142	pCi/g	12/08/20 13:20	12/29/20 12:52	1
Radium-226	**0.382**		0.127	0.133	0.200	0.0455	pCi/g	12/08/20 13:20	12/29/20 12:52	1
Radium-228	**0.219**		0.109	0.111		0.138	pCi/g	12/08/20 13:20	12/29/20 12:52	1
Thallium-208	**0.0623**		0.0389	0.0395		0.0465	pCi/g	12/08/20 13:20	12/29/20 12:52	1
Thorium 228	**0.408**		0.0948	0.109		0.0489	pCi/g	12/08/20 13:20	12/29/20 12:52	1
Thorium-232	**0.219**		0.109	0.111		0.138	pCi/g	12/08/20 13:20	12/29/20 12:52	1
Thorium-234	0.113	U	0.196	0.196		0.721	pCi/g	12/08/20 13:20	12/29/20 12:52	1
Uranium-235	**0.312**		0.170	0.173		0.0881	pCi/g	12/08/20 13:20	12/29/20 12:52	1
Uranium-238	0.113	U	0.196	0.196		0.721	pCi/g	12/08/20 13:20	12/29/20 12:52	1

Client Sample ID: HPPG-ESU-TU077B-012

Lab Sample ID: 160-40635-12
Date Collected: 12/01/20 12:09
Matrix: Solid
Date Received: 12/03/20 09:55

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	**0.294**		0.201	0.204		0.0902	pCi/g	12/08/20 13:20	12/29/20 12:54	1
Actinium-227	0.00794	U	0.540	0.540		0.336	pCi/g	12/08/20 13:20	12/29/20 12:54	1
Bismuth-212	-0.435	U	1.13	1.13		0.894	pCi/g	12/08/20 13:20	12/29/20 12:54	1
Bismuth-214	**0.341**		0.136	0.141		0.0575	pCi/g	12/08/20 13:20	12/29/20 12:54	1
Cesium-137	-0.00371	U	0.0575	0.0575	0.0700	0.0469	pCi/g	12/08/20 13:20	12/29/20 12:54	1
Lead-210	0.622	U	1.46	1.46		0.995	pCi/g	12/08/20 13:20	12/29/20 12:54	1
Lead-212	**0.309**		0.0823	0.0884		0.0390	pCi/g	12/08/20 13:20	12/29/20 12:54	1
Lead-214	**0.366**		0.122	0.127		0.0488	pCi/g	12/08/20 13:20	12/29/20 12:54	1
Potassium-40	**4.49**		1.19	1.28		0.254	pCi/g	12/08/20 13:20	12/29/20 12:54	1
Protactinium-231	0.398	U	1.47	1.47		2.04	pCi/g	12/08/20 13:20	12/29/20 12:54	1
Protactinium-234	0.0885	U	0.134	0.135		0.222	pCi/g	12/08/20 13:20	12/29/20 12:54	1
Radium-226	**0.341**		0.136	0.141	0.200	0.0575	pCi/g	12/08/20 13:20	12/29/20 12:54	1
Radium-228	**0.294**		0.201	0.204		0.0902	pCi/g	12/08/20 13:20	12/29/20 12:54	1
Thallium-208	**0.0917**		0.0757	0.0763		0.0352	pCi/g	12/08/20 13:20	12/29/20 12:54	1
Thorium 228	**0.309**		0.0823	0.0884		0.0390	pCi/g	12/08/20 13:20	12/29/20 12:54	1
Thorium-232	**0.294**		0.201	0.204		0.0902	pCi/g	12/08/20 13:20	12/29/20 12:54	1
Thorium-234	**0.538**		0.502	0.506		0.330	pCi/g	12/08/20 13:20	12/29/20 12:54	1
Uranium-235	0.155	U	0.356	0.357		0.374	pCi/g	12/08/20 13:20	12/29/20 12:54	1
Uranium-238	**0.538**		0.502	0.506		0.330	pCi/g	12/08/20 13:20	12/29/20 12:54	1

Client Sample ID: HPPG-ESU-TU077B-013

Lab Sample ID: 160-40635-13
Date Collected: 12/01/20 13:07
Matrix: Solid
Date Received: 12/03/20 09:55

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	**0.508**		0.151	0.160		0.0236	pCi/g	12/08/20 13:20	12/29/20 13:07	1
Actinium-227	0.106	U	0.287	0.287		0.282	pCi/g	12/08/20 13:20	12/29/20 13:07	1

Client Sample Results

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

Job ID: 160-40635-1
SDG: GJ46599741

Client Sample ID: HPPG-ESU-TU077B-013

Lab Sample ID: 160-40635-13

Date Collected: 12/01/20 13:07
Matrix: Solid
Date Received: 12/03/20 09:55

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-212	-0.0958	U	0.542	0.543		0.522	pCi/g	12/08/20 13:20	12/29/20 13:07	1
Bismuth-214	0.0859	U	0.0651	0.0657		0.133	pCi/g	12/08/20 13:20	12/29/20 13:07	1
Cesium-137	-0.0180	U	0.0512	0.0512	0.0700	0.0406	pCi/g	12/08/20 13:20	12/29/20 13:07	1
Lead-210	-0.0190	U	1.27	1.27		1.05	pCi/g	12/08/20 13:20	12/29/20 13:07	1
Lead-212	**0.459**		0.0805	0.100		0.0343	pCi/g	12/08/20 13:20	12/29/20 13:07	1
Lead-214	**0.462**		0.0973	0.108		0.0398	pCi/g	12/08/20 13:20	12/29/20 13:07	1
Potassium-40	**7.16**		1.12	1.34		0.264	pCi/g	12/08/20 13:20	12/29/20 13:07	1
Protactinium-231	-0.758	U	2.44	2.44		1.98	pCi/g	12/08/20 13:20	12/29/20 13:07	1
Protactinium-234	-0.106	U	0.304	0.304		0.247	pCi/g	12/08/20 13:20	12/29/20 13:07	1
Radium-226	0.0859	U	0.0651	0.0657	0.200	0.133	pCi/g	12/08/20 13:20	12/29/20 13:07	1
Radium-228	**0.508**		0.151	0.160		0.0236	pCi/g	12/08/20 13:20	12/29/20 13:07	1
Thallium-208	**0.181**		0.0485	0.0520		0.0154	pCi/g	12/08/20 13:20	12/29/20 13:07	1
Thorium 228	**0.459**		0.0805	0.100		0.0343	pCi/g	12/08/20 13:20	12/29/20 13:07	1
Thorium-232	**0.508**		0.151	0.160		0.0236	pCi/g	12/08/20 13:20	12/29/20 13:07	1
Thorium-234	0.258	U	0.778	0.779		0.783	pCi/g	12/08/20 13:20	12/29/20 13:07	1
Uranium-235	-0.0888	U	0.280	0.280		0.471	pCi/g	12/08/20 13:20	12/29/20 13:07	1
Uranium-238	0.258	U	0.778	0.779		0.783	pCi/g	12/08/20 13:20	12/29/20 13:07	1

Client Sample ID: HPPG-ESU-TU077B-014

Lab Sample ID: 160-40635-14

Date Collected: 12/01/20 13:09
Matrix: Solid
Date Received: 12/03/20 09:55

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	**0.546**		0.164	0.174		0.0420	pCi/g	12/08/20 13:20	12/29/20 13:21	1
Actinium-227	-0.264	U	0.734	0.735		0.425	pCi/g	12/08/20 13:20	12/29/20 13:21	1
Bismuth-212	0.716	U	1.38	1.38		1.09	pCi/g	12/08/20 13:20	12/29/20 13:21	1
Bismuth-214	0.110	U	0.135	0.136		0.237	pCi/g	12/08/20 13:20	12/29/20 13:21	1
Cesium-137	-0.0315	U	0.0740	0.0740	0.0700	0.0576	pCi/g	12/08/20 13:20	12/29/20 13:21	1
Lead-210	-1.19	U	1.03	1.04		1.66	pCi/g	12/08/20 13:20	12/29/20 13:21	1
Lead-212	**0.283**		0.0994	0.106		0.0594	pCi/g	12/08/20 13:20	12/29/20 13:21	1
Lead-214	**0.446**		0.112	0.121		0.0380	pCi/g	12/08/20 13:20	12/29/20 13:21	1
Potassium-40	**5.73**		1.35	1.47		0.312	pCi/g	12/08/20 13:20	12/29/20 13:21	1
Protactinium-231	-1.15	U	3.48	3.49		2.83	pCi/g	12/08/20 13:20	12/29/20 13:21	1
Protactinium-234	0.160	U	0.271	0.271		0.245	pCi/g	12/08/20 13:20	12/29/20 13:21	1
Radium-226	0.110	U	0.135	0.136	0.200	0.237	pCi/g	12/08/20 13:20	12/29/20 13:21	1
Radium-228	**0.546**		0.164	0.174		0.0420	pCi/g	12/08/20 13:20	12/29/20 13:21	1
Thallium-208	**0.0682**		0.0515	0.0520		0.0551	pCi/g	12/08/20 13:20	12/29/20 13:21	1
Thorium 228	**0.283**		0.0994	0.106		0.0594	pCi/g	12/08/20 13:20	12/29/20 13:21	1
Thorium-232	**0.546**		0.164	0.174		0.0420	pCi/g	12/08/20 13:20	12/29/20 13:21	1
Thorium-234	0.394	U	0.606	0.607		0.469	pCi/g	12/08/20 13:20	12/29/20 13:21	1
Uranium-235	-0.00948	U	0.323	0.323		0.428	pCi/g	12/08/20 13:20	12/29/20 13:21	1
Uranium-238	0.394	U	0.606	0.607		0.469	pCi/g	12/08/20 13:20	12/29/20 13:21	1

Client Sample Results

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

Job ID: 160-40635-1
SDG: GJ46599741

Client Sample ID: HPPG-ESU-TU077B-015

Lab Sample ID: 160-40635-15

Date Collected: 12/01/20 13:12
Date Received: 12/03/20 09:55

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	**0.289**		0.149	0.152		0.0538	pCi/g	12/08/20 13:20	12/29/20 12:57	1
Actinium-227	-0.0678	U	0.551	0.551		0.325	pCi/g	12/08/20 13:20	12/29/20 12:57	1
Bismuth-212	-0.273	U	0.635	0.636		0.499	pCi/g	12/08/20 13:20	12/29/20 12:57	1
Bismuth-214	**0.315**		0.0909	0.0966		0.0374	pCi/g	12/08/20 13:20	12/29/20 12:57	1
Cesium-137	-0.0398	U	0.0603	0.0604	0.0700	0.0466	pCi/g	12/08/20 13:20	12/29/20 12:57	1
Lead-210	0.547	U	1.10	1.10		0.870	pCi/g	12/08/20 13:20	12/29/20 12:57	1
Lead-212	**0.359**		0.0735	0.0870		0.0331	pCi/g	12/08/20 13:20	12/29/20 12:57	1
Lead-214	**0.322**		0.0891	0.0952		0.0475	pCi/g	12/08/20 13:20	12/29/20 12:57	1
Potassium-40	**6.32**		1.02	1.20		0.0950	pCi/g	12/08/20 13:20	12/29/20 12:57	1
Protactinium-231	0.000	U	0.226	0.226		1.72	pCi/g	12/08/20 13:20	12/29/20 12:57	1
Protactinium-234	-0.0863	U	0.224	0.224		0.181	pCi/g	12/08/20 13:20	12/29/20 12:57	1
Radium-226	**0.315**		0.0909	0.0966	0.200	0.0374	pCi/g	12/08/20 13:20	12/29/20 12:57	1
Radium-228	**0.289**		0.149	0.152		0.0538	pCi/g	12/08/20 13:20	12/29/20 12:57	1
Thallium-208	**0.104**		0.0653	0.0662		0.0312	pCi/g	12/08/20 13:20	12/29/20 12:57	1
Thorium 228	**0.359**		0.0735	0.0870		0.0331	pCi/g	12/08/20 13:20	12/29/20 12:57	1
Thorium-232	**0.289**		0.149	0.152		0.0538	pCi/g	12/08/20 13:20	12/29/20 12:57	1
Thorium-234	-0.107	U	0.311	0.311		0.758	pCi/g	12/08/20 13:20	12/29/20 12:57	1
Uranium-235	-0.156	U	0.423	0.423		0.344	pCi/g	12/08/20 13:20	12/29/20 12:57	1
Uranium-238	-0.107	U	0.311	0.311		0.758	pCi/g	12/08/20 13:20	12/29/20 12:57	1

Client Sample ID: HPPG-ESU-TU077B-016

Lab Sample ID: 160-40635-16

Date Collected: 12/01/20 13:14
Date Received: 12/03/20 09:55

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	**0.639**		0.222	0.234		0.0451	pCi/g	12/08/20 13:20	12/29/20 14:14	1
Actinium-227	-0.166	U	0.780	0.780		0.470	pCi/g	12/08/20 13:20	12/29/20 14:14	1
Bismuth-212	0.000	U	0.563	0.563		0.803	pCi/g	12/08/20 13:20	12/29/20 14:14	1
Bismuth-214	**0.427**		0.173	0.180		0.0749	pCi/g	12/08/20 13:20	12/29/20 14:14	1
Cesium-137	0.0342	U	0.0856	0.0857	0.0700	0.0670	pCi/g	12/08/20 13:20	12/29/20 14:14	1
Lead-210	0.331	U	1.55	1.56		1.15	pCi/g	12/08/20 13:20	12/29/20 14:14	1
Lead-212	**0.400**		0.119	0.128		0.0671	pCi/g	12/08/20 13:20	12/29/20 14:14	1
Lead-214	**0.408**		0.134	0.142		0.0585	pCi/g	12/08/20 13:20	12/29/20 14:14	1
Potassium-40	**5.81**		1.41	1.56		0.398	pCi/g	12/08/20 13:20	12/29/20 14:14	1
Protactinium-231	0.247	U	1.93	1.93		2.98	pCi/g	12/08/20 13:20	12/29/20 14:14	1
Protactinium-234	0.144	U	0.316	0.317		0.294	pCi/g	12/08/20 13:20	12/29/20 14:14	1
Radium-226	**0.427**		0.173	0.180	0.200	0.0749	pCi/g	12/08/20 13:20	12/29/20 14:14	1
Radium-228	**0.639**		0.222	0.234		0.0451	pCi/g	12/08/20 13:20	12/29/20 14:14	1
Thallium-208	**0.195**		0.0675	0.0711		0.0223	pCi/g	12/08/20 13:20	12/29/20 14:14	1
Thorium 228	**0.400**		0.119	0.128		0.0671	pCi/g	12/08/20 13:20	12/29/20 14:14	1
Thorium-232	**0.639**		0.222	0.234		0.0451	pCi/g	12/08/20 13:20	12/29/20 14:14	1
Thorium-234	**1.05**		1.00	1.01		0.601	pCi/g	12/08/20 13:20	12/29/20 14:14	1
Uranium-235	-0.0302	U	0.414	0.414		0.530	pCi/g	12/08/20 13:20	12/29/20 14:14	1
Uranium-238	**1.05**		1.00	1.01		0.601	pCi/g	12/08/20 13:20	12/29/20 14:14	1

Client Sample Results

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

Job ID: 160-40635-1
SDG: GJ46599741

Client Sample ID: HPPG-ESU-TU077B-017

Lab Sample ID: 160-40635-17

Date Collected: 12/01/20 13:16
Matrix: Solid
Date Received: 12/03/20 09:55

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	**0.424**		0.194	0.198		0.107	pCi/g	12/08/20 13:20	12/29/20 12:55	1
Actinium-227	-0.438	U	0.935	0.937		0.564	pCi/g	12/08/20 13:20	12/29/20 12:55	1
Bismuth-212	0.468	U	0.967	0.968		0.740	pCi/g	12/08/20 13:20	12/29/20 12:55	1
Bismuth-214	**0.318**		0.199	0.202		0.0932	pCi/g	12/08/20 13:20	12/29/20 12:55	1
Cesium-137	0.0140	U	0.0843	0.0843	0.0700	0.0676	pCi/g	12/08/20 13:20	12/29/20 12:55	1
Lead-210	-0.250	U	1.49	1.49		1.08	pCi/g	12/08/20 13:20	12/29/20 12:55	1
Lead-212	**0.362**		0.106	0.116		0.0481	pCi/g	12/08/20 13:20	12/29/20 12:55	1
Lead-214	**0.456**		0.189	0.195		0.122	pCi/g	12/08/20 13:20	12/29/20 12:55	1
Potassium-40	**6.65**		1.57	1.71		0.339	pCi/g	12/08/20 13:20	12/29/20 12:55	1
Protactinium-231	0.000000327	U	3.67	3.67		3.02	pCi/g	12/08/20 13:20	12/29/20 12:55	1
Protactinium-234	0.0402	U	0.0956	0.0957		0.182	pCi/g	12/08/20 13:20	12/29/20 12:55	1
Radium-226	**0.318**		0.199	0.202	0.200	0.0932	pCi/g	12/08/20 13:20	12/29/20 12:55	1
Radium-228	**0.424**		0.194	0.198		0.107	pCi/g	12/08/20 13:20	12/29/20 12:55	1
Thallium-208	**0.133**		0.0571	0.0587		0.0188	pCi/g	12/08/20 13:20	12/29/20 12:55	1
Thorium 228	**0.362**		0.106	0.116		0.0481	pCi/g	12/08/20 13:20	12/29/20 12:55	1
Thorium-232	**0.424**		0.194	0.198		0.107	pCi/g	12/08/20 13:20	12/29/20 12:55	1
Thorium-234	**0.890**		0.630	0.638		0.496	pCi/g	12/08/20 13:20	12/29/20 12:55	1
Uranium-235	0.174	U	0.314	0.314		0.257	pCi/g	12/08/20 13:20	12/29/20 12:55	1
Uranium-238	**0.890**		0.630	0.638		0.496	pCi/g	12/08/20 13:20	12/29/20 12:55	1

Client Sample ID: HPPG-ESU-TU077B-018

Lab Sample ID: 160-40635-18

Date Collected: 12/01/20 13:18
Matrix: Solid
Date Received: 12/03/20 09:55

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	**0.523**		0.290	0.295		0.123	pCi/g	12/08/20 13:20	12/29/20 14:14	1
Actinium-227	0.0592	U	0.0938	0.0941		0.453	pCi/g	12/08/20 13:20	12/29/20 14:14	1
Bismuth-212	0.000	U	0.697	0.697		0.653	pCi/g	12/08/20 13:20	12/29/20 14:14	1
Bismuth-214	**0.587**		0.152	0.164		0.0563	pCi/g	12/08/20 13:20	12/29/20 14:14	1
Cesium-137	-0.0598	U	0.0923	0.0925	0.0700	0.0715	pCi/g	12/08/20 13:20	12/29/20 14:14	1
Lead-210	-0.662	U	1.96	1.96		1.64	pCi/g	12/08/20 13:20	12/29/20 14:14	1
Lead-212	**0.461**		0.109	0.124		0.0591	pCi/g	12/08/20 13:20	12/29/20 14:14	1
Lead-214	**0.452**		0.125	0.133		0.0770	pCi/g	12/08/20 13:20	12/29/20 14:14	1
Potassium-40	**7.60**		1.45	1.65		0.279	pCi/g	12/08/20 13:20	12/29/20 14:14	1
Protactinium-231	0.000	U	0.368	0.368		2.42	pCi/g	12/08/20 13:20	12/29/20 14:14	1
Protactinium-234	-0.136	U	0.360	0.360		0.293	pCi/g	12/08/20 13:20	12/29/20 14:14	1
Radium-226	**0.587**		0.152	0.164	0.200	0.0563	pCi/g	12/08/20 13:20	12/29/20 14:14	1
Radium-228	**0.523**		0.290	0.295		0.123	pCi/g	12/08/20 13:20	12/29/20 14:14	1
Thallium-208	**0.195**		0.0584	0.0618		0.0174	pCi/g	12/08/20 13:20	12/29/20 14:14	1
Thorium 228	**0.461**		0.109	0.124		0.0591	pCi/g	12/08/20 13:20	12/29/20 14:14	1
Thorium-232	**0.523**		0.290	0.295		0.123	pCi/g	12/08/20 13:20	12/29/20 14:14	1
Thorium-234	-0.478	U	1.45	1.45		1.20	pCi/g	12/08/20 13:20	12/29/20 14:14	1
Uranium-235	0.122	U	0.276	0.277		0.318	pCi/g	12/08/20 13:20	12/29/20 14:14	1
Uranium-238	-0.478	U	1.45	1.45		1.20	pCi/g	12/08/20 13:20	12/29/20 14:14	1

Client Sample Results

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

Job ID: 160-40635-1
SDG: GJ46599741

Client Sample ID: HPPG-ESU-TU077B-019

Lab Sample ID: 160-40635-19

Date Collected: 12/01/20 13:21
Matrix: Solid
Date Received: 12/03/20 09:55

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	**0.431**		0.185	0.190		0.0705	pCi/g	12/08/20 13:20	12/29/20 13:30	1
Actinium-227	0.0814	U	0.169	0.169		0.310	pCi/g	12/08/20 13:20	12/29/20 13:30	1
Bismuth-212	-0.303	U	0.625	0.626		0.490	pCi/g	12/08/20 13:20	12/29/20 13:30	1
Bismuth-214	**0.305**		0.104	0.108		0.0476	pCi/g	12/08/20 13:20	12/29/20 13:30	1
Cesium-137	-0.0418	U	0.0683	0.0684	0.0700	0.0536	pCi/g	12/08/20 13:20	12/29/20 13:30	1
Lead-210	-0.251	U	1.35	1.35		1.10	pCi/g	12/08/20 13:20	12/29/20 13:30	1
Lead-212	**0.363**		0.0682	0.0828		0.0274	pCi/g	12/08/20 13:20	12/29/20 13:30	1
Lead-214	**0.361**		0.110	0.116		0.0531	pCi/g	12/08/20 13:20	12/29/20 13:30	1
Potassium-40	**7.67**		1.08	1.33		0.0880	pCi/g	12/08/20 13:20	12/29/20 13:30	1
Protactinium-231	0.352	U	2.04	2.04		1.66	pCi/g	12/08/20 13:20	12/29/20 13:30	1
Protactinium-234	0.0919	U	0.190	0.190		0.193	pCi/g	12/08/20 13:20	12/29/20 13:30	1
Radium-226	**0.305**		0.104	0.108	0.200	0.0476	pCi/g	12/08/20 13:20	12/29/20 13:30	1
Radium-228	**0.431**		0.185	0.190		0.0705	pCi/g	12/08/20 13:20	12/29/20 13:30	1
Thallium-208	**0.182**		0.0470	0.0507		0.0134	pCi/g	12/08/20 13:20	12/29/20 13:30	1
Thorium 228	**0.363**		0.0682	0.0828		0.0274	pCi/g	12/08/20 13:20	12/29/20 13:30	1
Thorium-232	**0.431**		0.185	0.190		0.0705	pCi/g	12/08/20 13:20	12/29/20 13:30	1
Thorium-234	0.000	U	0.437	0.437		0.832	pCi/g	12/08/20 13:20	12/29/20 13:30	1
Uranium-235	0.000	U	0.162	0.162		0.329	pCi/g	12/08/20 13:20	12/29/20 13:30	1
Uranium-238	0.000	U	0.437	0.437		0.832	pCi/g	12/08/20 13:20	12/29/20 13:30	1

Client Sample ID: HPPG-ESU-TU077B-020

Lab Sample ID: 160-40635-20

Date Collected: 12/01/20 13:23
Matrix: Solid
Date Received: 12/03/20 09:55

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	**0.163**		0.264	0.265		0.149	pCi/g	12/08/20 13:20	12/30/20 07:04	1
Actinium-227	0.0263	U	0.0485	0.0486		0.467	pCi/g	12/08/20 13:20	12/30/20 07:04	1
Bismuth-212	-0.0386	U	0.803	0.803		0.831	pCi/g	12/08/20 13:20	12/30/20 07:04	1
Bismuth-214	**0.375**		0.160	0.164		0.0859	pCi/g	12/08/20 13:20	12/30/20 07:04	1
Cesium-137	-0.0748	U	0.0642	0.0647	0.0700	0.0784	pCi/g	12/08/20 13:20	12/30/20 07:04	1
Lead-210	-0.805	U	1.81	1.81		1.32	pCi/g	12/08/20 13:20	12/30/20 07:04	1
Lead-212	**0.506**		0.121	0.138		0.0598	pCi/g	12/08/20 13:20	12/30/20 07:04	1
Lead-214	**0.371**		0.134	0.139		0.0888	pCi/g	12/08/20 13:20	12/30/20 07:04	1
Potassium-40	**9.35**		1.83	2.06		0.333	pCi/g	12/08/20 13:20	12/30/20 07:04	1
Protactinium-231	0.000	U	0.477	0.477		2.57	pCi/g	12/08/20 13:20	12/30/20 07:04	1
Protactinium-234	0.0825	U	0.128	0.128		0.231	pCi/g	12/08/20 13:20	12/30/20 07:04	1
Radium-226	**0.375**		0.160	0.164	0.200	0.0859	pCi/g	12/08/20 13:20	12/30/20 07:04	1
Radium-228	**0.163**		0.264	0.265		0.149	pCi/g	12/08/20 13:20	12/30/20 07:04	1
Thallium-208	**0.195**		0.0666	0.0696		0.0185	pCi/g	12/08/20 13:20	12/30/20 07:04	1
Thorium 228	**0.506**		0.121	0.138		0.0598	pCi/g	12/08/20 13:20	12/30/20 07:04	1
Thorium-232	**0.163**		0.264	0.265		0.149	pCi/g	12/08/20 13:20	12/30/20 07:04	1
Thorium-234	**0.857**		0.538	0.546		0.382	pCi/g	12/08/20 13:20	12/30/20 07:04	1
Uranium-235	0.0963	U	0.333	0.333		0.268	pCi/g	12/08/20 13:20	12/30/20 07:04	1
Uranium-238	**0.857**		0.538	0.546		0.382	pCi/g	12/08/20 13:20	12/30/20 07:04	1

Client Sample Results

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

Job ID: 160-40635-1
SDG: GJ46599741

Client Sample ID: HPPG-ESU-TU077B-021

Lab Sample ID: 160-40635-21
Date Collected: 12/01/20 13:25
Matrix: Solid
Date Received: 12/03/20 09:55

Method: 905 - Strontium-90 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Strontium-90	**0.174**		0.143	0.143	0.331	0.103	pCi/g	12/09/20 18:42	12/18/20 20:19	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*103*		*40 - 110*	*12/09/20 18:42*	*12/18/20 20:19*	*1*
Y Carrier	*94.2*		*40 - 110*	*12/09/20 18:42*	*12/18/20 20:19*	*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	**0.268**		0.222	0.223		0.112	pCi/g	12/08/20 14:09	12/29/20 09:18	1
Actinium-227	0.246	U	0.550	0.551		0.329	pCi/g	12/08/20 14:09	12/29/20 09:18	1
Bismuth-212	-0.0166	U	0.861	0.861		0.708	pCi/g	12/08/20 14:09	12/29/20 09:18	1
Bismuth-214	**0.436**		0.146	0.152		0.0660	pCi/g	12/08/20 14:09	12/29/20 09:18	1
Cesium-137	0.0219	U	0.0809	0.0809	0.0700	0.0648	pCi/g	12/08/20 14:09	12/29/20 09:18	1
Lead-210	**2.36**		1.81	1.83		1.11	pCi/g	12/08/20 14:09	12/29/20 09:18	1
Lead-212	**0.488**		0.105	0.117		0.0495	pCi/g	12/08/20 14:09	12/29/20 09:18	1
Lead-214	**0.449**		0.132	0.139		0.0561	pCi/g	12/08/20 14:09	12/29/20 09:18	1
Potassium-40	**8.21**		1.39	1.62		0.138	pCi/g	12/08/20 14:09	12/29/20 09:18	1
Protactinium-231	0.000	U	0.764	0.764		2.45	pCi/g	12/08/20 14:09	12/29/20 09:18	1
Protactinium-234	0.117	U	0.251	0.251		0.252	pCi/g	12/08/20 14:09	12/29/20 09:18	1
Radium-226	**0.436**		0.146	0.152	0.200	0.0660	pCi/g	12/08/20 14:09	12/29/20 09:18	1
Radium-228	**0.268**		0.222	0.223		0.112	pCi/g	12/08/20 14:09	12/29/20 09:18	1
Thallium-208	**0.210**		0.0919	0.0944		0.0367	pCi/g	12/08/20 14:09	12/29/20 09:18	1
Thorium 228	**0.488**		0.105	0.117		0.0495	pCi/g	12/08/20 14:09	12/29/20 09:18	1
Thorium-232	**0.268**		0.222	0.223		0.112	pCi/g	12/08/20 14:09	12/29/20 09:18	1
Thorium-234	**1.29**		0.803	0.815		0.459	pCi/g	12/08/20 14:09	12/29/20 09:18	1
Uranium-235	-0.219	U	0.674	0.674		0.549	pCi/g	12/08/20 14:09	12/29/20 09:18	1
Uranium-238	**1.29**		0.803	0.815		0.459	pCi/g	12/08/20 14:09	12/29/20 09:18	1

Client Sample ID: HPPG-ESU-TU077B-022

Lab Sample ID: 160-40635-22
Date Collected: 12/01/20 13:26
Matrix: Solid
Date Received: 12/03/20 09:55

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	**0.582**		0.201	0.210		0.107	pCi/g	12/08/20 14:09	12/29/20 09:19	1
Actinium-227	0.103	U	0.203	0.203		0.175	pCi/g	12/08/20 14:09	12/29/20 09:19	1
Bismuth-212	-0.0663	U	0.663	0.663		0.541	pCi/g	12/08/20 14:09	12/29/20 09:19	1
Bismuth-214	**0.279**		0.107	0.111		0.0511	pCi/g	12/08/20 14:09	12/29/20 09:19	1
Cesium-137	**0.0729**		0.0328	0.0337	0.0700	0.0138	pCi/g	12/08/20 14:09	12/29/20 09:19	1
Lead-210	-0.614	U	1.35	1.35		1.08	pCi/g	12/08/20 14:09	12/29/20 09:19	1
Lead-212	**0.371**		0.0741	0.0883		0.0329	pCi/g	12/08/20 14:09	12/29/20 09:19	1
Lead-214	**0.364**		0.0879	0.0957		0.0387	pCi/g	12/08/20 14:09	12/29/20 09:19	1
Potassium-40	**6.47**		1.09	1.28		0.196	pCi/g	12/08/20 14:09	12/29/20 09:19	1
Protactinium-231	-0.00571	U	2.19	2.19		1.81	pCi/g	12/08/20 14:09	12/29/20 09:19	1

Client Sample Results

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

Job ID: 160-40635-1
SDG: GJ46599741

Client Sample ID: HPPG-ESU-TU077B-022

Lab Sample ID: 160-40635-22
Date Collected: 12/01/20 13:26
Matrix: Solid
Date Received: 12/03/20 09:55

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
Protactinium-234	0.126	U	0.207	0.208		0.175	pCi/g	12/08/20 14:09	12/29/20 09:19	1
Radium-226	**0.279**		0.107	0.111	0.200	0.0511	pCi/g	12/08/20 14:09	12/29/20 09:19	1
Radium-228	**0.582**		0.201	0.210		0.107	pCi/g	12/08/20 14:09	12/29/20 09:19	1
Thallium-208	**0.162**		0.0502	0.0530		0.0137	pCi/g	12/08/20 14:09	12/29/20 09:19	1
Thorium 228	**0.371**		0.0741	0.0883		0.0329	pCi/g	12/08/20 14:09	12/29/20 09:19	1
Thorium-232	**0.582**		0.201	0.210		0.107	pCi/g	12/08/20 14:09	12/29/20 09:19	1
Thorium-234	-0.328	U	1.07	1.08		0.878	pCi/g	12/08/20 14:09	12/29/20 09:19	1
Uranium-235	0.000	U	0.152	0.152		0.312	pCi/g	12/08/20 14:09	12/29/20 09:19	1
Uranium-238	-0.328	U	1.07	1.08		0.878	pCi/g	12/08/20 14:09	12/29/20 09:19	1

Client Sample ID: HPPG-ESU-TU077B-023

Lab Sample ID: 160-40635-23
Date Collected: 12/01/20 13:28
Matrix: Solid
Date Received: 12/03/20 09:55

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	**0.157**		0.271	0.271		0.139	pCi/g	12/08/20 14:09	12/29/20 09:24	1
Actinium-227	-0.0838	U	0.374	0.374		0.369	pCi/g	12/08/20 14:09	12/29/20 09:24	1
Bismuth-212	-0.238	U	0.434	0.434		0.502	pCi/g	12/08/20 14:09	12/29/20 09:24	1
Bismuth-214	**0.276**		0.108	0.112		0.0503	pCi/g	12/08/20 14:09	12/29/20 09:24	1
Cesium-137	-0.0343	U	0.0662	0.0663	0.0700	0.0517	pCi/g	12/08/20 14:09	12/29/20 09:24	1
Lead-210	-0.824	U	1.55	1.55		1.24	pCi/g	12/08/20 14:09	12/29/20 09:24	1
Lead-212	**0.336**		0.0784	0.0896		0.0372	pCi/g	12/08/20 14:09	12/29/20 09:24	1
Lead-214	**0.324**		0.0951	0.101		0.0473	pCi/g	12/08/20 14:09	12/29/20 09:24	1
Potassium-40	**5.43**		1.56	1.65		0.623	pCi/g	12/08/20 14:09	12/29/20 09:24	1
Protactinium-231	0.566	U	2.20	2.20		1.79	pCi/g	12/08/20 14:09	12/29/20 09:24	1
Protactinium-234	0.0197	U	0.0335	0.0335		0.206	pCi/g	12/08/20 14:09	12/29/20 09:24	1
Radium-226	**0.276**		0.108	0.112	0.200	0.0503	pCi/g	12/08/20 14:09	12/29/20 09:24	1
Radium-228	**0.157**		0.271	0.271		0.139	pCi/g	12/08/20 14:09	12/29/20 09:24	1
Thallium-208	0.0314	U	0.0819	0.0819		0.0411	pCi/g	12/08/20 14:09	12/29/20 09:24	1
Thorium 228	**0.336**		0.0784	0.0896		0.0372	pCi/g	12/08/20 14:09	12/29/20 09:24	1
Thorium-232	**0.157**		0.271	0.271		0.139	pCi/g	12/08/20 14:09	12/29/20 09:24	1
Thorium-234	0.277	U	0.848	0.849		0.839	pCi/g	12/08/20 14:09	12/29/20 09:24	1
Uranium-235	0.0622	U	0.190	0.190		0.363	pCi/g	12/08/20 14:09	12/29/20 09:24	1
Uranium-238	0.277	U	0.848	0.849		0.839	pCi/g	12/08/20 14:09	12/29/20 09:24	1

Client Sample ID: HPPG-ESU-TU077B-024

Lab Sample ID: 160-40635-24
Date Collected: 12/01/20 13:30
Matrix: Solid
Date Received: 12/03/20 09:55

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	**0.610**		0.218	0.227		0.132	pCi/g	12/08/20 14:09	12/29/20 09:21	1
Actinium-227	0.224	U	0.404	0.405		0.312	pCi/g	12/08/20 14:09	12/29/20 09:21	1

Client Sample Results

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

Job ID: 160-40635-1
SDG: GJ46599741

Client Sample ID: HPPG-ESU-TU077B-024

Lab Sample ID: 160-40635-24

Date Collected: 12/01/20 13:30
Matrix: Solid
Date Received: 12/03/20 09:55

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-212	0.000	U	0.432	0.432		0.433	pCi/g	12/08/20 14:09	12/29/20 09:21	1
Bismuth-214	**0.540**		0.144	0.154		0.0509	pCi/g	12/08/20 14:09	12/29/20 09:21	1
Cesium-137	-0.0642	U	0.0969	0.0971	0.0700	0.0749	pCi/g	12/08/20 14:09	12/29/20 09:21	1
Lead-210	0.632	U	1.18	1.18		0.798	pCi/g	12/08/20 14:09	12/29/20 09:21	1
Lead-212	**0.290**		0.120	0.125		0.0813	pCi/g	12/08/20 14:09	12/29/20 09:21	1
Lead-214	**0.496**		0.144	0.153		0.0551	pCi/g	12/08/20 14:09	12/29/20 09:21	1
Potassium-40	**6.76**		1.42	1.58		0.300	pCi/g	12/08/20 14:09	12/29/20 09:21	1
Protactinium-231	-0.0000000666	U	2.92	2.92		2.40	pCi/g	12/08/20 14:09	12/29/20 09:21	1
Protactinium-234	0.163	U	0.295	0.296		0.248	pCi/g	12/08/20 14:09	12/29/20 09:21	1
Radium-226	**0.540**		0.144	0.154	0.200	0.0509	pCi/g	12/08/20 14:09	12/29/20 09:21	1
Radium-228	**0.610**		0.218	0.227		0.132	pCi/g	12/08/20 14:09	12/29/20 09:21	1
Thallium-208	**0.0631**		0.0887	0.0889		0.0489	pCi/g	12/08/20 14:09	12/29/20 09:21	1
Thorium 228	**0.290**		0.120	0.125		0.0813	pCi/g	12/08/20 14:09	12/29/20 09:21	1
Thorium-232	**0.610**		0.218	0.227		0.132	pCi/g	12/08/20 14:09	12/29/20 09:21	1
Thorium-234	-0.0627	U	1.42	1.42		1.17	pCi/g	12/08/20 14:09	12/29/20 09:21	1
Uranium-235	0.0629	U	0.350	0.350		0.448	pCi/g	12/08/20 14:09	12/29/20 09:21	1
Uranium-238	-0.0627	U	1.42	1.42		1.17	pCi/g	12/08/20 14:09	12/29/20 09:21	1

Client Sample ID: HPPG-ESU-TU077B-025

Lab Sample ID: 160-40635-25

Date Collected: 12/01/20 13:32
Matrix: Solid
Date Received: 12/03/20 09:55

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	**0.878**		0.253	0.273		0.0426	pCi/g	12/08/20 14:09	12/29/20 09:23	1
Actinium-227	0.184	U	0.509	0.509		0.426	pCi/g	12/08/20 14:09	12/29/20 09:23	1
Bismuth-212	0.538	U	1.19	1.19		0.935	pCi/g	12/08/20 14:09	12/29/20 09:23	1
Bismuth-214	-0.0569	U	0.270	0.270		0.225	pCi/g	12/08/20 14:09	12/29/20 09:23	1
Cesium-137	0.0430	U	0.0832	0.0834	0.0700	0.0643	pCi/g	12/08/20 14:09	12/29/20 09:23	1
Lead-210	0.933	U	1.65	1.66		1.18	pCi/g	12/08/20 14:09	12/29/20 09:23	1
Lead-212	**0.519**		0.120	0.135		0.0599	pCi/g	12/08/20 14:09	12/29/20 09:23	1
Lead-214	**0.408**		0.149	0.156		0.0722	pCi/g	12/08/20 14:09	12/29/20 09:23	1
Potassium-40	**8.28**		1.61	1.87		0.377	pCi/g	12/08/20 14:09	12/29/20 09:23	1
Protactinium-231	0.136	U	1.60	1.60		2.59	pCi/g	12/08/20 14:09	12/29/20 09:23	1
Protactinium-234	0.143	U	0.352	0.353		0.321	pCi/g	12/08/20 14:09	12/29/20 09:23	1
Radium-226	-0.0569	U	0.270	0.270	0.200	0.225	pCi/g	12/08/20 14:09	12/29/20 09:23	1
Radium-228	**0.878**		0.253	0.273		0.0426	pCi/g	12/08/20 14:09	12/29/20 09:23	1
Thallium-208	**0.180**		0.0704	0.0734		0.0278	pCi/g	12/08/20 14:09	12/29/20 09:23	1
Thorium 228	**0.519**		0.120	0.135		0.0599	pCi/g	12/08/20 14:09	12/29/20 09:23	1
Thorium-232	**0.878**		0.253	0.273		0.0426	pCi/g	12/08/20 14:09	12/29/20 09:23	1
Thorium-234	-0.371	U	1.29	1.29		1.07	pCi/g	12/08/20 14:09	12/29/20 09:23	1
Uranium-235	0.118	U	0.237	0.237		0.571	pCi/g	12/08/20 14:09	12/29/20 09:23	1
Uranium-238	-0.371	U	1.29	1.29		1.07	pCi/g	12/08/20 14:09	12/29/20 09:23	1

Client Sample Results

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

Job ID: 160-40635-1
SDG: GJ46599741

Client Sample ID: HPPG-F-051

Lab Sample ID: 160-40635-26

Date Collected: 12/01/20 11:46
Matrix: Solid
Date Received: 12/03/20 09:55

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	**0.271**		0.249	0.251		0.151	pCi/g	12/08/20 14:09	12/29/20 09:25	1
Actinium-227	0.130	U	0.533	0.534		0.508	pCi/g	12/08/20 14:09	12/29/20 09:25	1
Bismuth-212	-0.420	U	0.845	0.846		0.876	pCi/g	12/08/20 14:09	12/29/20 09:25	1
Bismuth-214	**0.430**		0.204	0.209		0.0942	pCi/g	12/08/20 14:09	12/29/20 09:25	1
Cesium-137	0.00302	U	0.0628	0.0628	0.0700	0.0509	pCi/g	12/08/20 14:09	12/29/20 09:25	1
Lead-210	**1.29**		1.18	1.19		0.767	pCi/g	12/08/20 14:09	12/29/20 09:25	1
Lead-212	**0.441**		0.102	0.117		0.0376	pCi/g	12/08/20 14:09	12/29/20 09:25	1
Lead-214	**0.333**		0.118	0.123		0.0773	pCi/g	12/08/20 14:09	12/29/20 09:25	1
Potassium-40	**6.48**		1.79	1.91		0.570	pCi/g	12/08/20 14:09	12/29/20 09:25	1
Protactinium-231	0.000	U	0.416	0.416		2.40	pCi/g	12/08/20 14:09	12/29/20 09:25	1
Protactinium-234	**0.251**		0.182	0.184		0.197	pCi/g	12/08/20 14:09	12/29/20 09:25	1
Radium-226	**0.430**		0.204	0.209	0.200	0.0942	pCi/g	12/08/20 14:09	12/29/20 09:25	1
Radium-228	**0.271**		0.249	0.251		0.151	pCi/g	12/08/20 14:09	12/29/20 09:25	1
Thallium-208	0.0427	U	0.114	0.114		0.0502	pCi/g	12/08/20 14:09	12/29/20 09:25	1
Thorium 228	**0.441**		0.102	0.117		0.0376	pCi/g	12/08/20 14:09	12/29/20 09:25	1
Thorium-232	**0.271**		0.249	0.251		0.151	pCi/g	12/08/20 14:09	12/29/20 09:25	1
Thorium-234	-0.203	U	1.02	1.02		0.847	pCi/g	12/08/20 14:09	12/29/20 09:25	1
Uranium-235	0.110	U	0.332	0.332		0.266	pCi/g	12/08/20 14:09	12/29/20 09:25	1
Uranium-238	-0.203	U	1.02	1.02		0.847	pCi/g	12/08/20 14:09	12/29/20 09:25	1

Client Sample ID: HPPG-F-052

Lab Sample ID: 160-40635-27

Date Collected: 12/01/20 13:28
Matrix: Solid
Date Received: 12/03/20 09:55

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	**0.245**		0.187	0.189		0.102	pCi/g	12/08/20 14:09	12/29/20 10:04	1
Actinium-227	-0.381	U	0.763	0.765		0.460	pCi/g	12/08/20 14:09	12/29/20 10:04	1
Bismuth-212	0.469	U	0.967	0.968		0.758	pCi/g	12/08/20 14:09	12/29/20 10:04	1
Bismuth-214	**0.380**		0.133	0.138		0.0604	pCi/g	12/08/20 14:09	12/29/20 10:04	1
Cesium-137	-0.0262	U	0.0635	0.0635	0.0700	0.0496	pCi/g	12/08/20 14:09	12/29/20 10:04	1
Lead-210	0.274	U	1.19	1.19		0.877	pCi/g	12/08/20 14:09	12/29/20 10:04	1
Lead-212	**0.345**		0.0969	0.107		0.0538	pCi/g	12/08/20 14:09	12/29/20 10:04	1
Lead-214	**0.404**		0.122	0.129		0.0639	pCi/g	12/08/20 14:09	12/29/20 10:04	1
Potassium-40	**5.62**		1.19	1.32		0.310	pCi/g	12/08/20 14:09	12/29/20 10:04	1
Protactinium-231	0.000	U	0.753	0.753		2.19	pCi/g	12/08/20 14:09	12/29/20 10:04	1
Protactinium-234	0.0151	U	0.0231	0.0231		0.262	pCi/g	12/08/20 14:09	12/29/20 10:04	1
Radium-226	**0.380**		0.133	0.138	0.200	0.0604	pCi/g	12/08/20 14:09	12/29/20 10:04	1
Radium-228	**0.245**		0.187	0.189		0.102	pCi/g	12/08/20 14:09	12/29/20 10:04	1
Thallium-208	**0.168**		0.0610	0.0634		0.0236	pCi/g	12/08/20 14:09	12/29/20 10:04	1
Thorium 228	**0.345**		0.0969	0.107		0.0538	pCi/g	12/08/20 14:09	12/29/20 10:04	1
Thorium-232	**0.245**		0.187	0.189		0.102	pCi/g	12/08/20 14:09	12/29/20 10:04	1
Thorium-234	**0.533**		0.660	0.662		0.474	pCi/g	12/08/20 14:09	12/29/20 10:04	1
Uranium-235	0.198	U	0.362	0.363		0.261	pCi/g	12/08/20 14:09	12/29/20 10:04	1
Uranium-238	**0.533**		0.660	0.662		0.474	pCi/g	12/08/20 14:09	12/29/20 10:04	1

QC Sample Results

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

Job ID: 160-40635-1
SDG: GJ46599741

Method: 905 - Strontium-90 (GFPC)

Lab Sample ID: MB 160-491323/23-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 492430 — **Prep Batch: 491323**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Strontium-90	0.07392	U	0.140	0.140	0.331	0.108	pCi/g	12/09/20 18:42	12/18/20 20:20	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*100*		*40 - 110*	*12/09/20 18:42*	*12/18/20 20:20*	*1*
Y Carrier	*92.7*		*40 - 110*	*12/09/20 18:42*	*12/18/20 20:20*	*1*

Lab Sample ID: LCS 160-491323/1-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 492430 — **Prep Batch: 491323**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Strontium-90	7.76	5.897		0.638	0.331	0.109	pCi/g	76	75 - 125

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Sr Carrier	*100*		*40 - 110*
Y Carrier	*99.8*		*40 - 110*

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

Lab Sample ID: MB 160-491176/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 493212 — **Prep Batch: 491176**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.05275		0.130	0.130		0.0292	pCi/g	12/08/20 13:20	12/29/20 12:29	1
Actinium-227	0.1255	U	0.222	0.222		0.169	pCi/g	12/08/20 13:20	12/29/20 12:29	1
Bismuth-212	-0.1593	U	0.348	0.348		0.550	pCi/g	12/08/20 13:20	12/29/20 12:29	1
Bismuth-214	-0.06394	U	0.0759	0.0762		0.121	pCi/g	12/08/20 13:20	12/29/20 12:29	1
Cesium-137	-0.01337	U	0.0423	0.0423	0.0700	0.0331	pCi/g	12/08/20 13:20	12/29/20 12:29	1
Lead-210	-0.4619	U	1.04	1.04		0.821	pCi/g	12/08/20 13:20	12/29/20 12:29	1
Lead-212	-0.04586	U	0.0768	0.0771		0.0732	pCi/g	12/08/20 13:20	12/29/20 12:29	1
Lead-214	-0.003728	U	0.00986	0.00987		0.0710	pCi/g	12/08/20 13:20	12/29/20 12:29	1
Potassium-40	-0.1504	U	0.693	0.693		0.433	pCi/g	12/08/20 13:20	12/29/20 12:29	1
Protactinium-231	0.0000	U	0.422	0.422		1.53	pCi/g	12/08/20 13:20	12/29/20 12:29	1
Protactinium-234	0.1023	U	0.0617	0.0626		0.144	pCi/g	12/08/20 13:20	12/29/20 12:29	1
Radium-226	-0.06394	U	0.0759	0.0762	0.200	0.121	pCi/g	12/08/20 13:20	12/29/20 12:29	1
Radium-228	0.05275		0.130	0.130		0.0292	pCi/g	12/08/20 13:20	12/29/20 12:29	1
Thallium-208	0.02545		0.0253	0.0255		0.0139	pCi/g	12/08/20 13:20	12/29/20 12:29	1
Thorium 228	-0.04586	U	0.0768	0.0771		0.0732	pCi/g	12/08/20 13:20	12/29/20 12:29	1
Thorium-232	0.05275		0.130	0.130		0.0292	pCi/g	12/08/20 13:20	12/29/20 12:29	1
Thorium-234	0.0000	U	0.124	0.124		0.481	pCi/g	12/08/20 13:20	12/29/20 12:29	1
Uranium-235	0.04560	U	0.188	0.188		0.271	pCi/g	12/08/20 13:20	12/29/20 12:29	1
Uranium-238	0.0000	U	0.124	0.124		0.481	pCi/g	12/08/20 13:20	12/29/20 12:29	1

QC Sample Results

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

Job ID: 160-40635-1
SDG: GJ46599741

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

Lab Sample ID: LCS 160-491176/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 493213 — **Prep Batch: 491176**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Americium-241	96.4	92.41		9.78		0.699	pCi/g	96	87 - 116
Cesium-137	26.7	25.61		2.76	0.0700	0.121	pCi/g	96	87 - 120
Cobalt-60	9.41	9.465		1.02		0.0598	pCi/g	101	87 - 115

Lab Sample ID: 160-40635-20 DU — **Client Sample ID: HPPG-ESU-TU077B-020**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 493373 — **Prep Batch: 491176**

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	RER	RER Limit
Actinium 228	0.163		0.6143		0.226		0.0428	pCi/g	0.92	1
Actinium-227	0.0263	U	0.1667	U	0.424		0.376	pCi/g	0.30	1
Bismuth-212	-0.0386	U	0.0000	U	0.397		1.01	pCi/g	0.03	1
Bismuth-214	0.375		0.5055		0.240		0.102	pCi/g	0.32	1
Cesium-137	-0.0748	U	0.04460	U	0.101	0.0700	0.0798	pCi/g	0.72	1
Lead-210	-0.805	U	-0.5135	U	1.73		1.44	pCi/g	0.08	1
Lead-212	0.506		0.5170		0.170		0.0695	pCi/g	0.04	1
Lead-214	0.371		0.2219		0.158		0.112	pCi/g	0.50	1
Potassium-40	9.35		7.478		1.72		0.319	pCi/g	0.49	1
Protactinium-231	0.000	U	-1.175	U	3.59		2.92	pCi/g	0.29	1
Protactinium-234	0.0825	U	0.02314	U	0.0371		0.312	pCi/g	0.36	1
Radium-226	0.375		0.5055		0.240	0.200	0.102	pCi/g	0.32	1
Radium-228	0.163		0.6143		0.226		0.0428	pCi/g	0.92	1
Thallium-208	0.195		0.1665		0.0615		0.0198	pCi/g	0.22	1
Thorium 228	0.506		0.5170		0.170		0.0695	pCi/g	0.04	1
Thorium-232	0.163		0.6143		0.226		0.0428	pCi/g	0.92	1
Thorium-234	0.857		-1.040	U	1.06		1.39	pCi/g	1.18	1
Uranium-235	0.0963	U	0.2149	U	0.608		0.494	pCi/g	0.13	1
Uranium-238	0.857		-1.040	U	1.06		1.39	pCi/g	1.18	1

Lab Sample ID: MB 160-491180/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 493217 — **Prep Batch: 491180**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	-0.08901	U	0.164	0.164		0.140	pCi/g	12/08/20 14:09	12/29/20 09:14	1
Actinium-227	0.02924	U	0.0896	0.0897		0.297	pCi/g	12/08/20 14:09	12/29/20 09:14	1
Bismuth-212	-0.03906	U	0.370	0.370		0.850	pCi/g	12/08/20 14:09	12/29/20 09:14	1
Bismuth-214	0.08648	U	0.0654	0.0660		0.146	pCi/g	12/08/20 14:09	12/29/20 09:14	1
Cesium-137	-0.009708	U	0.0706	0.0706	0.0700	0.0572	pCi/g	12/08/20 14:09	12/29/20 09:14	1
Lead-210	0.5110	U	1.35	1.35		0.927	pCi/g	12/08/20 14:09	12/29/20 09:14	1
Lead-212	-0.02045	U	0.0776	0.0776		0.0650	pCi/g	12/08/20 14:09	12/29/20 09:14	1
Lead-214	-0.1161	U	0.188	0.189		0.117	pCi/g	12/08/20 14:09	12/29/20 09:14	1
Potassium-40	-0.03970	U	0.463	0.463		0.380	pCi/g	12/08/20 14:09	12/29/20 09:14	1
Protactinium-231	0.0000	U	0.192	0.192		1.77	pCi/g	12/08/20 14:09	12/29/20 09:14	1
Protactinium-234	-0.06706	U	0.166	0.166		0.133	pCi/g	12/08/20 14:09	12/29/20 09:14	1
Radium-226	0.08648	U	0.0654	0.0660	0.200	0.146	pCi/g	12/08/20 14:09	12/29/20 09:14	1

QC Sample Results

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

Job ID: 160-40635-1
SDG: GJ46599741

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

Lab Sample ID: MB 160-491180/1-A
Matrix: Solid
Analysis Batch: 493217

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 491180

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.08901	U	0.164	0.164		0.140	pCi/g	12/08/20 14:09	12/29/20 09:14	1
Thallium-208	0.003662	U	0.00788	0.00789		0.0362	pCi/g	12/08/20 14:09	12/29/20 09:14	1
Thorium 228	-0.02045	U	0.0776	0.0776		0.0650	pCi/g	12/08/20 14:09	12/29/20 09:14	1
Thorium-232	-0.08901	U	0.164	0.164		0.140	pCi/g	12/08/20 14:09	12/29/20 09:14	1
Thorium-234	0.3269		0.465	0.466		0.311	pCi/g	12/08/20 14:09	12/29/20 09:14	1
Uranium-235	-0.1266	U	0.280	0.280		0.222	pCi/g	12/08/20 14:09	12/29/20 09:14	1
Uranium-238	0.3269		0.465	0.466		0.311	pCi/g	12/08/20 14:09	12/29/20 09:14	1

Lab Sample ID: LCS 160-491180/2-A
Matrix: Solid
Analysis Batch: 493308

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 491180

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Americium-241	96.4	96.36		11.3		0.501	pCi/g	100	87 - 116
Cesium-137	26.7	28.79		3.03	0.0700	0.0890	pCi/g	108	87 - 120
Cobalt-60	9.41	9.453		1.01		0.0389	pCi/g	100	87 - 115

QC Association Summary

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

Job ID: 160-40635-1
SDG: GJ46599741

Rad

Leach Batch: 490914

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40635-1	HPPG-ESU-TU077B-001	Total/NA	Solid	Dry and Grind	
160-40635-2	HPPG-ESU-TU077B-002	Total/NA	Solid	Dry and Grind	
160-40635-3	HPPG-ESU-TU077B-003	Total/NA	Solid	Dry and Grind	
160-40635-4	HPPG-ESU-TU077B-004	Total/NA	Solid	Dry and Grind	
160-40635-5	HPPG-ESU-TU077B-005	Total/NA	Solid	Dry and Grind	
160-40635-6	HPPG-ESU-TU077B-006	Total/NA	Solid	Dry and Grind	
160-40635-7	HPPG-ESU-TU077B-007	Total/NA	Solid	Dry and Grind	
160-40635-8	HPPG-ESU-TU077B-008	Total/NA	Solid	Dry and Grind	
160-40635-9	HPPG-ESU-TU077B-009	Total/NA	Solid	Dry and Grind	
160-40635-10	HPPG-ESU-TU077B-010	Total/NA	Solid	Dry and Grind	
160-40635-11	HPPG-ESU-TU077B-011	Total/NA	Solid	Dry and Grind	
160-40635-12	HPPG-ESU-TU077B-012	Total/NA	Solid	Dry and Grind	
160-40635-13	HPPG-ESU-TU077B-013	Total/NA	Solid	Dry and Grind	
160-40635-14	HPPG-ESU-TU077B-014	Total/NA	Solid	Dry and Grind	
160-40635-15	HPPG-ESU-TU077B-015	Total/NA	Solid	Dry and Grind	
160-40635-16	HPPG-ESU-TU077B-016	Total/NA	Solid	Dry and Grind	
160-40635-17	HPPG-ESU-TU077B-017	Total/NA	Solid	Dry and Grind	
160-40635-18	HPPG-ESU-TU077B-018	Total/NA	Solid	Dry and Grind	

Leach Batch: 490916

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40635-19	HPPG-ESU-TU077B-019	Total/NA	Solid	Dry and Grind	
160-40635-20	HPPG-ESU-TU077B-020	Total/NA	Solid	Dry and Grind	
160-40635-21	HPPG-ESU-TU077B-021	Total/NA	Solid	Dry and Grind	
160-40635-22	HPPG-ESU-TU077B-022	Total/NA	Solid	Dry and Grind	
160-40635-23	HPPG-ESU-TU077B-023	Total/NA	Solid	Dry and Grind	
160-40635-24	HPPG-ESU-TU077B-024	Total/NA	Solid	Dry and Grind	
160-40635-25	HPPG-ESU-TU077B-025	Total/NA	Solid	Dry and Grind	
160-40635-26	HPPG-F-051	Total/NA	Solid	Dry and Grind	
160-40635-27	HPPG-F-052	Total/NA	Solid	Dry and Grind	
160-40635-20 DU	HPPG-ESU-TU077B-020	Total/NA	Solid	Dry and Grind	

Prep Batch: 491176

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40635-1	HPPG-ESU-TU077B-001	Total/NA	Solid	Fill_Geo-21	490914
160-40635-2	HPPG-ESU-TU077B-002	Total/NA	Solid	Fill_Geo-21	490914
160-40635-3	HPPG-ESU-TU077B-003	Total/NA	Solid	Fill_Geo-21	490914
160-40635-4	HPPG-ESU-TU077B-004	Total/NA	Solid	Fill_Geo-21	490914
160-40635-5	HPPG-ESU-TU077B-005	Total/NA	Solid	Fill_Geo-21	490914
160-40635-6	HPPG-ESU-TU077B-006	Total/NA	Solid	Fill_Geo-21	490914
160-40635-7	HPPG-ESU-TU077B-007	Total/NA	Solid	Fill_Geo-21	490914
160-40635-8	HPPG-ESU-TU077B-008	Total/NA	Solid	Fill_Geo-21	490914
160-40635-9	HPPG-ESU-TU077B-009	Total/NA	Solid	Fill_Geo-21	490914
160-40635-10	HPPG-ESU-TU077B-010	Total/NA	Solid	Fill_Geo-21	490914
160-40635-11	HPPG-ESU-TU077B-011	Total/NA	Solid	Fill_Geo-21	490914
160-40635-12	HPPG-ESU-TU077B-012	Total/NA	Solid	Fill_Geo-21	490914
160-40635-13	HPPG-ESU-TU077B-013	Total/NA	Solid	Fill_Geo-21	490914
160-40635-14	HPPG-ESU-TU077B-014	Total/NA	Solid	Fill_Geo-21	490914
160-40635-15	HPPG-ESU-TU077B-015	Total/NA	Solid	Fill_Geo-21	490914
160-40635-16	HPPG-ESU-TU077B-016	Total/NA	Solid	Fill_Geo-21	490914
160-40635-17	HPPG-ESU-TU077B-017	Total/NA	Solid	Fill_Geo-21	490914

QC Association Summary

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

Job ID: 160-40635-1
SDG: GJ46599741

Rad (Continued)

Prep Batch: 491176 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40635-18	HPPG-ESU-TU077B-018	Total/NA	Solid	Fill_Geo-21	490914
160-40635-19	HPPG-ESU-TU077B-019	Total/NA	Solid	Fill_Geo-21	490916
160-40635-20	HPPG-ESU-TU077B-020	Total/NA	Solid	Fill_Geo-21	490916
MB 160-491176/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-491176/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
160-40635-20 DU	HPPG-ESU-TU077B-020	Total/NA	Solid	Fill_Geo-21	490916

Prep Batch: 491180

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40635-21	HPPG-ESU-TU077B-021	Total/NA	Solid	Fill_Geo-21	490916
160-40635-22	HPPG-ESU-TU077B-022	Total/NA	Solid	Fill_Geo-21	490916
160-40635-23	HPPG-ESU-TU077B-023	Total/NA	Solid	Fill_Geo-21	490916
160-40635-24	HPPG-ESU-TU077B-024	Total/NA	Solid	Fill_Geo-21	490916
160-40635-25	HPPG-ESU-TU077B-025	Total/NA	Solid	Fill_Geo-21	490916
160-40635-26	HPPG-F-051	Total/NA	Solid	Fill_Geo-21	490916
160-40635-27	HPPG-F-052	Total/NA	Solid	Fill_Geo-21	490916
MB 160-491180/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-491180/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	

Prep Batch: 491323

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40635-1	HPPG-ESU-TU077B-001	Total/NA	Solid	DPS-7	490914
160-40635-11	HPPG-ESU-TU077B-011	Total/NA	Solid	DPS-7	490914
160-40635-21	HPPG-ESU-TU077B-021	Total/NA	Solid	DPS-7	490916
MB 160-491323/23-A	Method Blank	Total/NA	Solid	DPS-7	
LCS 160-491323/1-A	Lab Control Sample	Total/NA	Solid	DPS-7	

Tracer/Carrier Summary

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

Job ID: 160-40635-1
SDG: GJ46599741

Method: 905 - Strontium-90 (GFPC)

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

		Percent Yield (Acceptance Limits)	
Lab Sample ID	**Client Sample ID**	**Sr (40-110)**	**Y (40-110)**
160-40635-1	HPPG-ESU-TU077B-001	88.2	92.7
160-40635-11	HPPG-ESU-TU077B-011	91.4	94.2
160-40635-21	HPPG-ESU-TU077B-021	103	94.2
LCS 160-491323/1-A	Lab Control Sample	100	99.8
MB 160-491323/23-A	Method Blank	100	92.7

Tracer/Carrier Legend

Sr = Sr Carrier
Y = Y Carrier

eurofins | Environment Testing America

ANALYTICAL REPORT

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

Laboratory Job ID: 160-40636-1
Laboratory Sample Delivery Group: D1189451
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

Elizabeth M. Hoerchler

Authorized for release by:
4/13/2021 10:27:44 AM
Elizabeth Hoerchler, Project Manager I
Elizabeth.Hoerchler@Eurofinset.com

Designee for

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

LINKS

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Have a Question? Ask The Expert

Visit us at: www.eurofinsus.com/Env

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.

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Job ID: 160-40636-1

Laboratory: Eurofins TestAmerica, St. Louis

Narrative

CASE NARRATIVE

Client: Aptim Federal Services LLC

Project: HPNS-Parcel G 501197

Report Number: 160-40636-1

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: 160-40636-1 (Continued)

Laboratory: Eurofins TestAmerica, St. Louis (Continued)

RECEIPT
The samples were received on 12/03/2020; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 9.4 C.

STRONTIUM-90 (GFPC)
Sample HPPG-ESU-TU077B-B-001 (160-40636-1) was analyzed for Strontium-90 (GFPC) in accordance with EPA 905. The samples were dried on 12/04/2020, prepared on 12/09/2020 and analyzed on 12/18/2020.

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-ESU-TU077B-B-001 (160-40636-1) and (160-40636-A-1-A DU)

The method blank (MB) z-score is within limits and is stored in the level IV raw data. (MB 160-491323/23-A)

No 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-ESU-TU077B-B-001 (160-40636-1) was analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA_01_R. The samples were dried on 12/04/2020, prepared on 12/08/2020 and analyzed on 12/29/2020.

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 associated with Prep Batch 160-491180 is within limits and is stored in the level IV raw data. (MB 160-491180/1-A)

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

APTIM

CHAIN OF CUSTODY

Ref. Document # 501197RSY-050

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

Project Number: 501197
Project Name: Hunters Point Naval Shipyard: Parcel G Remedial Action
Project Location: San Francisco, CA
Purchase Order #: 1159058
Shipment/Pickup Date: 12/2/2020
Waybill Number: 4957 0225 6137
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-ESU-TU077B-B-001	12/2/2020	13:55	G	SO	1	16 oz. plastic jar	X		X				4	D1189451	

Special Instructions: 21 day ingrowth results only

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		12/02/2020 15:43	SHIPPEDTOLAB		12/3/20 09:50

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

160-40636 Chain of Custody

All Transfers for COC 501197RSY-050

Relinquished By:	Relinquisher Signature:	Relinquish Date Time:	Received By:	Received Signature:	Receive Date Time:
Lewis, Devin		12/02/2020 15:43	SHIPPEDTOLAB		

Login Sample Receipt Checklist

Client: Aptim Federal Services LLC

Job Number: 160-40636-1
SDG Number: D1189451

Login Number: 40636
List Number: 1
Creator: Greer, Diane A

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.	True	
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: 160-40636-1
SDG: D1189451

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: 160-40636-1
SDG: D1189451

Method	Method Description	Protocol	Laboratory
905	Strontium-90 (GFPC)	EPA	TAL SL
GA-01-R	Radium-226 & Other Gamma Emitters (GS)	DOE	TAL SL
DPS-7	Preparation, Digestion/Precipitate Separation (7-Day In-Growth)	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
EPA = US Environmental Protection Agency
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: 160-40636-1
SDG: D1189451

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
160-40636-1	HPPG-ESU-TU077B-B-001	Solid	12/02/20 13:55	12/03/20 09:55	

Client Sample Results

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

Job ID: 160-40636-1
SDG: D1189451

Client Sample ID: HPPG-ESU-TU077B-B-001

Lab Sample ID: 160-40636-1
Matrix: Solid

Date Collected: 12/02/20 13:55
Date Received: 12/03/20 09:55

Method: 905 - Strontium-90 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Strontium-90	-0.0157	U	0.141	0.141	0.331	0.117	pCi/g	12/09/20 18:42	12/18/20 20:20	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*97.5*		*40 - 110*	*12/09/20 18:42*	*12/18/20 20:20*	*1*
Y Carrier	*95.3*		*40 - 110*	*12/09/20 18:42*	*12/18/20 20:20*	*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	**0.520**		0.135	0.145		0.0561	pCi/g	12/08/20 14:09	12/29/20 09:56	1
Actinium-227	-0.0397	U	0.550	0.550		0.323	pCi/g	12/08/20 14:09	12/29/20 09:56	1
Bismuth-212	0.0304	U	0.715	0.715		0.586	pCi/g	12/08/20 14:09	12/29/20 09:56	1
Bismuth-214	**0.248**		0.0993	0.103		0.102	pCi/g	12/08/20 14:09	12/29/20 09:56	1
Cesium-137	-0.0378	U	0.0622	0.0623	0.0700	0.0482	pCi/g	12/08/20 14:09	12/29/20 09:56	1
Lead-210	**1.15**		1.32	1.33		0.829	pCi/g	12/08/20 14:09	12/29/20 09:56	1
Lead-212	**0.411**		0.0843	0.0997		0.0412	pCi/g	12/08/20 14:09	12/29/20 09:56	1
Lead-214	**0.497**		0.108	0.120		0.0473	pCi/g	12/08/20 14:09	12/29/20 09:56	1
Potassium-40	**8.89**		1.28	1.57		0.274	pCi/g	12/08/20 14:09	12/29/20 09:56	1
Protactinium-231	0.000	U	0.439	0.439		2.05	pCi/g	12/08/20 14:09	12/29/20 09:56	1
Protactinium-234	0.0152	U	0.0283	0.0283		0.180	pCi/g	12/08/20 14:09	12/29/20 09:56	1
Radium-226	**0.248**		0.0993	0.103	0.200	0.102	pCi/g	12/08/20 14:09	12/29/20 09:56	1
Radium-228	**0.520**		0.135	0.145		0.0561	pCi/g	12/08/20 14:09	12/29/20 09:56	1
Thallium-208	**0.170**		0.0642	0.0666		0.0292	pCi/g	12/08/20 14:09	12/29/20 09:56	1
Thorium 228	**0.411**		0.0843	0.0997		0.0412	pCi/g	12/08/20 14:09	12/29/20 09:56	1
Thorium-232	**0.520**		0.135	0.145		0.0561	pCi/g	12/08/20 14:09	12/29/20 09:56	1
Thorium-234	0.261	U	0.427	0.428		0.334	pCi/g	12/08/20 14:09	12/29/20 09:56	1
Uranium-235	0.0722	U	0.273	0.273		0.253	pCi/g	12/08/20 14:09	12/29/20 09:56	1
Uranium-238	0.261	U	0.427	0.428		0.334	pCi/g	12/08/20 14:09	12/29/20 09:56	1

QC Sample Results

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

Job ID: 160-40636-1
SDG: D1189451

Method: 905 - Strontium-90 (GFPC)

Lab Sample ID: MB 160-491323/23-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 492430 — **Prep Batch: 491323**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Strontium-90	0.07392	U	0.140	0.140	0.331	0.108	pCi/g	12/09/20 18:42	12/18/20 20:20	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*100*		*40 - 110*	*12/09/20 18:42*	*12/18/20 20:20*	*1*
Y Carrier	*92.7*		*40 - 110*	*12/09/20 18:42*	*12/18/20 20:20*	*1*

Lab Sample ID: LCS 160-491323/1-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 492430 — **Prep Batch: 491323**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Strontium-90	7.76	5.897		0.638	0.331	0.109	pCi/g	76	75 - 125

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Sr Carrier	*100*		*40 - 110*
Y Carrier	*99.8*		*40 - 110*

Lab Sample ID: 160-40636-1 DU — **Client Sample ID: HPPG-ESU-TU077B-B-001**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 492430 — **Prep Batch: 491323**

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	RER	RER Limit
Strontium-90	-0.0157	U	0.1127		0.134	0.331	0.0999	pCi/g	0.47	1

Carrier	*DU %Yield*	*DU Qualifier*	*Limits*
Sr Carrier	*101*		*40 - 110*
Y Carrier	*94.2*		*40 - 110*

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

Lab Sample ID: MB 160-491180/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 493217 — **Prep Batch: 491180**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	-0.08901	U	0.164	0.164		0.140	pCi/g	12/08/20 14:09	12/29/20 09:14	1
Actinium-227	0.02924	U	0.0896	0.0897		0.297	pCi/g	12/08/20 14:09	12/29/20 09:14	1
Bismuth-212	-0.03906	U	0.370	0.370		0.850	pCi/g	12/08/20 14:09	12/29/20 09:14	1
Bismuth-214	0.08648	U	0.0654	0.0660		0.146	pCi/g	12/08/20 14:09	12/29/20 09:14	1
Cesium-137	-0.009708	U	0.0706	0.0706	0.0700	0.0572	pCi/g	12/08/20 14:09	12/29/20 09:14	1
Lead-210	0.5110	U	1.35	1.35		0.927	pCi/g	12/08/20 14:09	12/29/20 09:14	1
Lead-212	-0.02045	U	0.0776	0.0776		0.0650	pCi/g	12/08/20 14:09	12/29/20 09:14	1
Lead-214	-0.1161	U	0.188	0.189		0.117	pCi/g	12/08/20 14:09	12/29/20 09:14	1
Potassium-40	-0.03970	U	0.463	0.463		0.380	pCi/g	12/08/20 14:09	12/29/20 09:14	1

QC Sample Results

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

Job ID: 160-40636-1
SDG: D1189451

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

Lab Sample ID: MB 160-491180/1-A
Matrix: Solid
Analysis Batch: 493217

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 491180

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Protactinium-231	0.0000	U	0.192	0.192		1.77	pCi/g	12/08/20 14:09	12/29/20 09:14	1
Protactinium-234	-0.06706	U	0.166	0.166		0.133	pCi/g	12/08/20 14:09	12/29/20 09:14	1
Radium-226	0.08648	U	0.0654	0.0660	0.200	0.146	pCi/g	12/08/20 14:09	12/29/20 09:14	1
Radium-228	-0.08901	U	0.164	0.164		0.140	pCi/g	12/08/20 14:09	12/29/20 09:14	1
Thallium-208	0.003662	U	0.00788	0.00789		0.0362	pCi/g	12/08/20 14:09	12/29/20 09:14	1
Thorium 228	-0.02045	U	0.0776	0.0776		0.0650	pCi/g	12/08/20 14:09	12/29/20 09:14	1
Thorium-232	-0.08901	U	0.164	0.164		0.140	pCi/g	12/08/20 14:09	12/29/20 09:14	1
Thorium-234	0.3269		0.465	0.466		0.311	pCi/g	12/08/20 14:09	12/29/20 09:14	1
Uranium-235	-0.1266	U	0.280	0.280		0.222	pCi/g	12/08/20 14:09	12/29/20 09:14	1
Uranium-238	0.3269		0.465	0.466		0.311	pCi/g	12/08/20 14:09	12/29/20 09:14	1

Lab Sample ID: LCS 160-491180/2-A
Matrix: Solid
Analysis Batch: 493308

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 491180

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Americium-241	96.4	96.36		11.3		0.501	pCi/g	100	87 - 116
Cesium-137	26.7	28.79		3.03	0.0700	0.0890	pCi/g	108	87 - 120
Cobalt-60	9.41	9.453		1.01		0.0389	pCi/g	100	87 - 115

QC Association Summary

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

Job ID: 160-40636-1
SDG: D1189451

Rad

Leach Batch: 490916

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40636-1	HPPG-ESU-TU077B-B-001	Total/NA	Solid	Dry and Grind	
160-40636-1 DU	HPPG-ESU-TU077B-B-001	Total/NA	Solid	Dry and Grind	

Prep Batch: 491180

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40636-1	HPPG-ESU-TU077B-B-001	Total/NA	Solid	Fill_Geo-21	490916
MB 160-491180/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-491180/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	

Prep Batch: 491323

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40636-1	HPPG-ESU-TU077B-B-001	Total/NA	Solid	DPS-7	490916
MB 160-491323/23-A	Method Blank	Total/NA	Solid	DPS-7	
LCS 160-491323/1-A	Lab Control Sample	Total/NA	Solid	DPS-7	
160-40636-1 DU	HPPG-ESU-TU077B-B-001	Total/NA	Solid	DPS-7	490916

Tracer/Carrier Summary

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

Job ID: 160-40636-1
SDG: D1189451

Method: 905 - Strontium-90 (GFPC)

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

		Percent Yield (Acceptance Limits)	
Lab Sample ID	**Client Sample ID**	**Sr (40-110)**	**Y (40-110)**
160-40636-1	HPPG-ESU-TU077B-B-001	97.5	95.3
160-40636-1 DU	HPPG-ESU-TU077B-B-001	101	94.2
LCS 160-491323/1-A	Lab Control Sample	100	99.8
MB 160-491323/23-A	Method Blank	100	92.7

Tracer/Carrier Legend

Sr = Sr Carrier
Y = Y Carrier