Law Offices of Anthony J. Thompson, P.C.

1225 19th Street, NW., Suite 200
Washington, DC 20036
202-496-0780
Fax 202-496-0783
(e-mail): ajthompson@athompsonlaw.com

December 20, 2002

By Federal Express

Mr. Craig Gordon
Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406

Dear Craig:

Enclosed is the Sampling Survey completed by RSI in the area with respect to the elevated radionuclide concentrations in and around the HMI mill.

If you have any questions, please feel free to contact me.

Sincerely,

Anthony J. Thompson

AJT/cls
Enclosure

(cgordonsamplingreportltr.doc)

Characterization Survey
for
Heritage Minerals, Inc.

Prepared by Radiation Science, Inc.
November, 2002

REPORT OF RADIOLOGICAL CHARACTERIZATION BEHIND THE DRY MILL BUILDING AT HERITAGE MINERALS, INC., LAKEHURST, NJ

Project Summary and Conclusions

RSI completed a thorough radiological characterization of the open land area behind the dry mill building adjacent to and including the footprint of the former monazite pile where deposits of radioactive material were suspected. Licensable concentrations of source material were detected at several locations within the survey area. All of these locations were determined to be outside the footprint of the former monazite pile.

Uranium and thorium concentrations within the survey area were generally elevated indicating a broad use of the area for deposit of concentrated tailings from the mill processes. The highest level of source material concentrations was 550 pCi/gm at a depth of six feet below the surface. It is clear from this analytical record that the source material discovered by this characterization is separate from the monazite pile.

Because the boundaries of the source material are not well defined, as was the case of the monazite pile, which was covered and fenced, we estimate that approximately 265 cubic yards of soil would have to be excavated to capture these additional licensable concentrations of source material. This estimation is based on considering the areas represented by elevated surface readings in areas determined to contain licensable concentrations of source material and the average depth at which the source material was discovered. Most of the excavated material is located in the deposit to the north and west of the former monazite pile.

Description and Results of the Survey

The survey of the property behind the dry mill was conducted according to the approved sampling protocol and consisted of a scanning survey of the entire area, fixed measurements at grid locations, and sampling program to determine the depth of material deposits.

The characterization survey consisted of a surface scan of the property using shielded or "downward looking" NaI detectors to locate radiations from material at or below the surface of the property. Fixed readings were taken every four feet at grid intersections to create a 2-dimensional view of radioactive material deposits within the survey area. This display is included as Figure 1 along with an aerial photo showing the proximity of the survey area to buildings and site features. Soil sampling was conducted at the "hotspots" using a geoprobe sampling device to extract core sample of these deposits. The depth of sampling was determined to be adequate by scanning the core sample along its axis to verify that background had been reached. Cores were extracted in four-foot lengths. The core samples were divided into lofts representing one-foot increments and subsequently analyzed to produce a vertical profile of the material concentrations.

The lofts were dried and the sample ground to uniform a consistency. Prepared samples were allowed to "rest" for a period of at least 14 days before counting to guarantee proper in-growth. The samples were then counted by gamma spectroscopy in a marinelli geometry using a three-inch NaI detector and multi-channel analyzer. Total uranium activity was determined as twice the activity of the ^{214}Pb daughter accounting for both isotopes of Uranium (^{238}U and ^{234}U) in the decay chain. Total thorium was calculated as twice the activity of the ^{228}Ac daughter, accounting for the two isotopes of Thorium (^{232}Th and ^{228}Th) in the Thorium decay chain, plus the total uranium concentration accounting for the two isotopes of Thorium (^{234}Th and ^{230}Th) in the Uranium decay chain. Secular equilibrium is assumed in each sample.

For the purpose of reporting, material containing greater than 116 pCi/gm of Thorium or 339 pCi/gm (equivalent to 0.05w% based on total thorium and uranium activity) is considered to be a licensable quantity of source material.

Figure 1 displays a plan view of the gamma flux at the surface of the survey area. The presentation of count rate data by a color-coded scheme (e.g. 10,000 to 20,000 cpm) is arbitrary and intended only to aid in the visualization. Areas of higher readings are identified by darker colors indicating the probable concentration of the material. A site photograph is included to show the relation of the surveyed area to the immediate site features, including the former monazite pile.

Thirteen sample locations were chosen representing the "hot spots" identified during the scanning survey. These locations are identified Gamma Flux Map in Figure 1. The large, darkened area to the north and west of the monazite pile is consistent with historical records indicating temporary storage of tailings materials. Only sample locations 8 and 9 are within the footprint of the monazite pile. Sample 11 is located in a low-lying area adjacent to a bridge linking the pump house with solid ground. A concrete wall encloses the area on two of four sides. A large underground obstruction was encountered at sample location #1 and #10. The core sample was obtained at location #1 by moving the sample location 2 feet to the east. Sample location #10 was not re-sampled because scanning the core did not indicate further contamination.

Several sample locations were chosen as representative of areas displaying slightly elevated gamma exposure rates such as those areas marked as orange and bright yellow on the Gamma Flux Map in Figure 1. Specifically, sample locations #7 and #12 were chosen for this purpose. Analytical results from these locations show that it is unlikely that any of the broader areas or "hot spots" defined by the Gamma Flux Map contain licensable materials. No further sampling was determined necessary on the basis of these results.

Figures 2 through 14 are graphical presentations of the analytical results showing the vertical profile of the material deposits. Five of the thirteen locations were determined to contain licensable quantities of source material. We believe that sample location #13 was that area identified and sampled by the ORISE team during the audit performed last

fall. Table 1 summarizes the sample location, the depth of sample, and the source material concentration. Licensable quantities are bold face.

Sampling Data

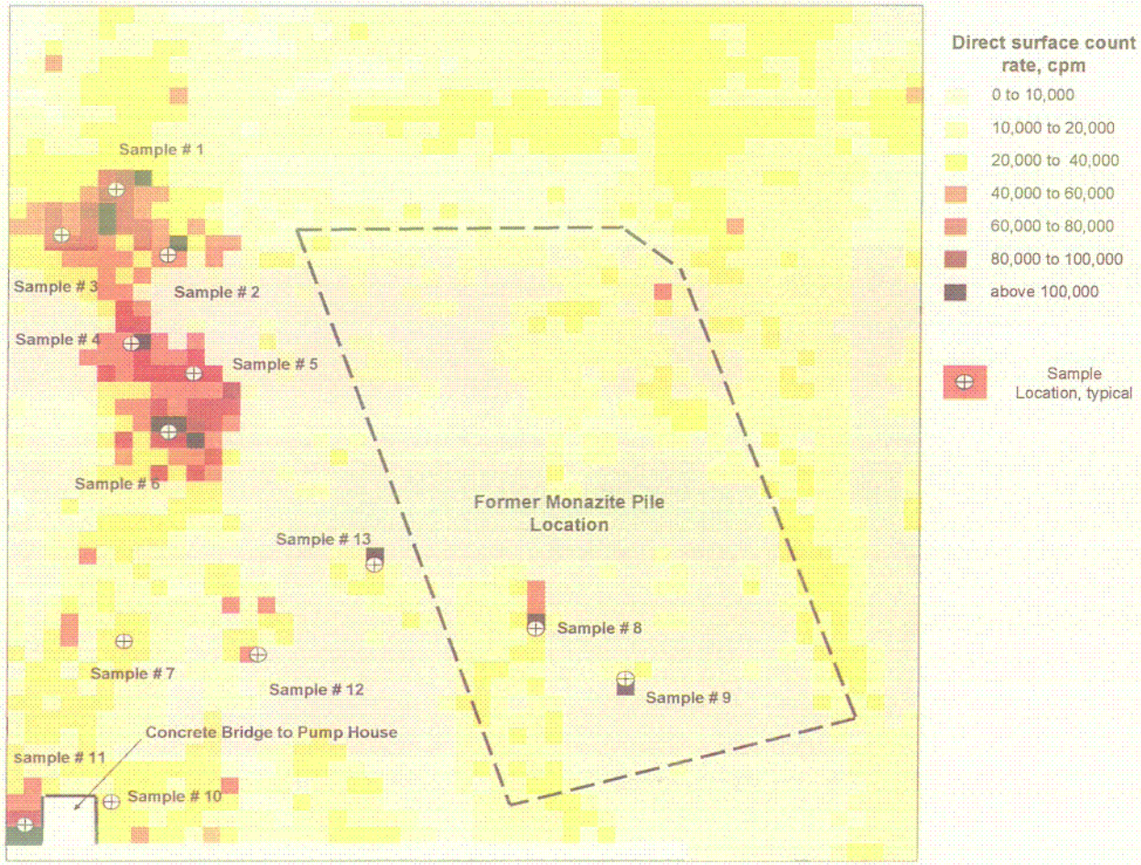
The results of the sample analysis are presented in the appendix to this report. A complete set of analytical reports is included for sample locations #1. This includes the spectral results, the isotopic summaries, and the line details used to determine the sample activity and is exemplary of the data obtained for each sample. Only the isotopic results are presented for sample locations 2 through 13.

Table 1
Sample Location, Sample Depth, Source Material Concentration

Sample Location	*Source Material Concentration (pCi/gm)*						
	0 to 1 foot	*1 to 2 feet*	*2 to 3 feet*	*3 to 4 feet*	*4 to 5 feet*	*5 to 6 feet*	*6 to 7 feet*
1	**145.9 ± 12.7**	69.8 ± 7.2	**163.7 ± 15.1**	**345.5 ± 32.4**	148.0 ± 14.2	**364.5 ± 34.6**	11.32 ± 1.7
2	102.6 ± 8.7	46.1 ± 4.4	< MDA	< MDA	-	-	-
3	**554.8 ± 8.7**	**475.0 ± 50.0**	**345.7 ± 36.8**	< MDA	-	-	-
4	**325.9 ± 29.7**	59.7 ± 6.0	< MDA	< MDA	-	-	-
5	25.3 ± 3.1	< MDA	< MDA	< MDA	-	-	-
6	120.2 ± 11.4	49.7 ± 5.4	64.2 ± 6.4	< MDA	-	-	-
7	42.7 ± 4.8	< MDA	5.6 ± 1.9	< MDA	-	-	-
8	157.7 ± 16.8	88.3 ± 8.3	3.7 ± 1.9	< MDA	-	-	-
9	< MDA	13.2 ± 2.4	< MDA	< MDA	-	-	-
10	37.4 ± 4.0	16.7 ± 2.1	-	-	-	-	-
11	**173.7 ± 16.2**	**241.6 ± 20.6**	55.1 ± 5.5	< MDA	-	-	-
12	101.4 ± 10.8	< MDA	< MDA	< MDA	-	-	-
13	**363.1 ± 35.3**	38.6 ± 4.2	< MDA	< MDA	-	-	-

Note: 1. licensable concentrations bold print
2. MDA is the minimum detectable activity of the counting technique

Radiological Characterization Survey for Heritage Minerals, Inc. Lakehurst, NJ.

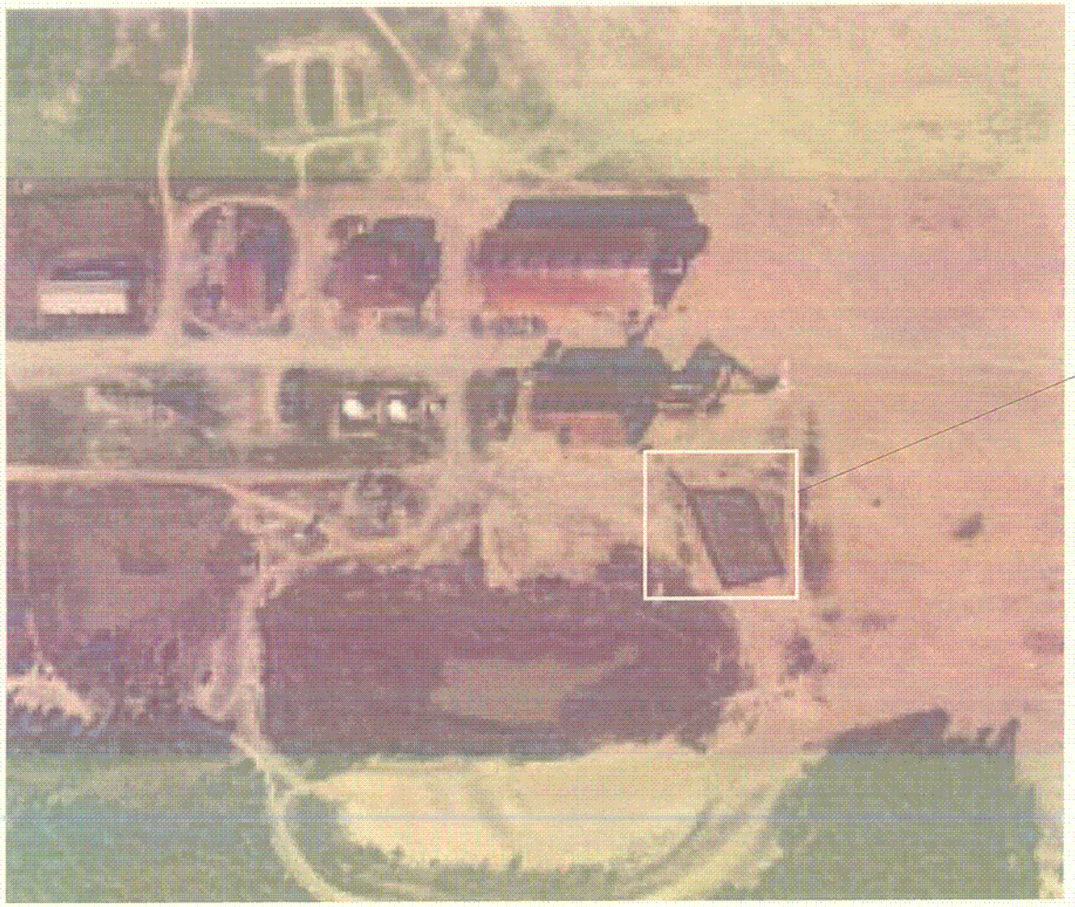


Survey Area
(see photo insert next page)

Figure 1
Gamma Flux Map

Radiation Science, Inc.

Site Photograph of the Dry
Mill Area and Monazite Pile



Inser from previous page

Figure 2

Sample Location #1
SOIL CONCENTRATION vs DEPTH

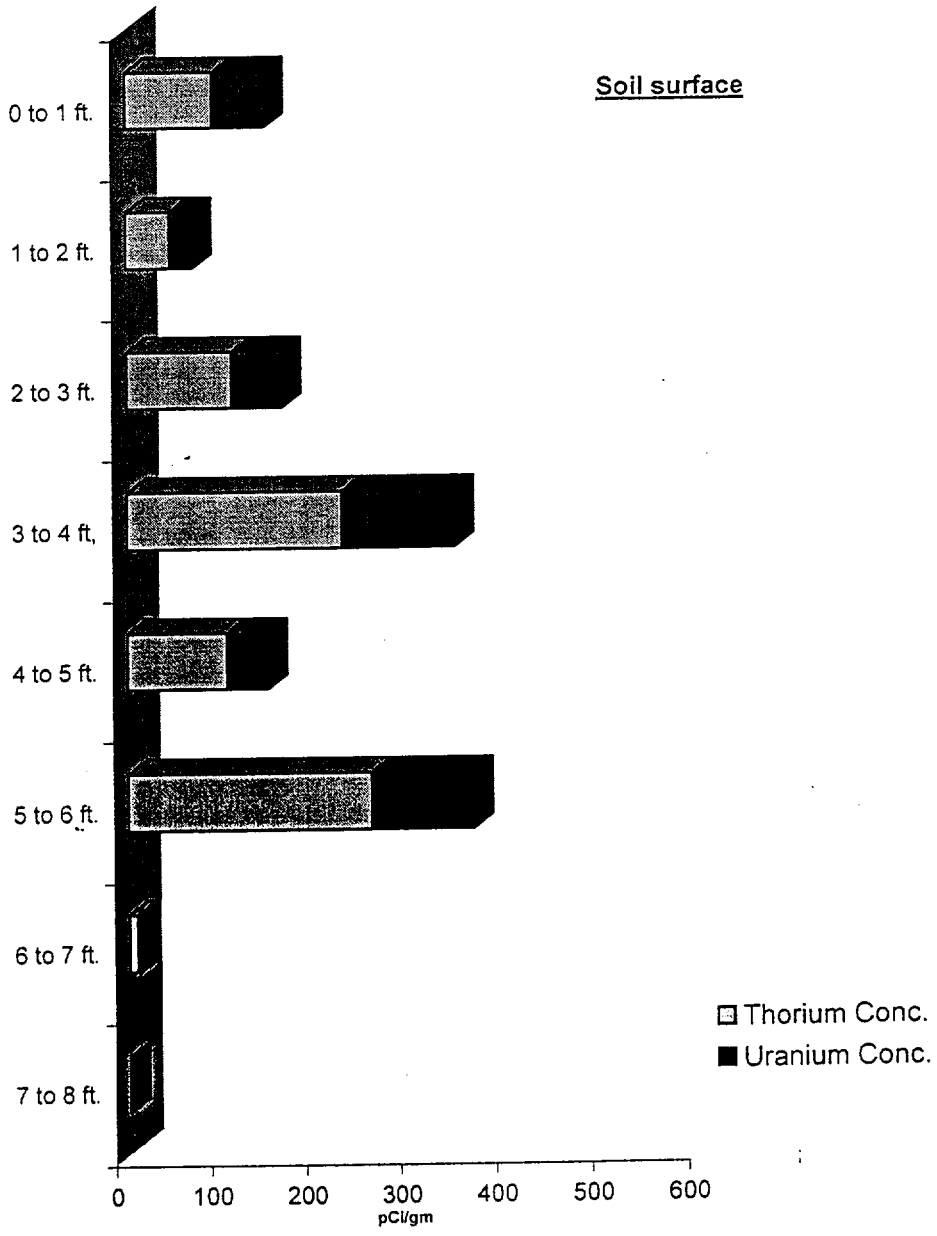


Figure 3

Sample Location #2
SOIL CONCENTRATION vs DEPTH

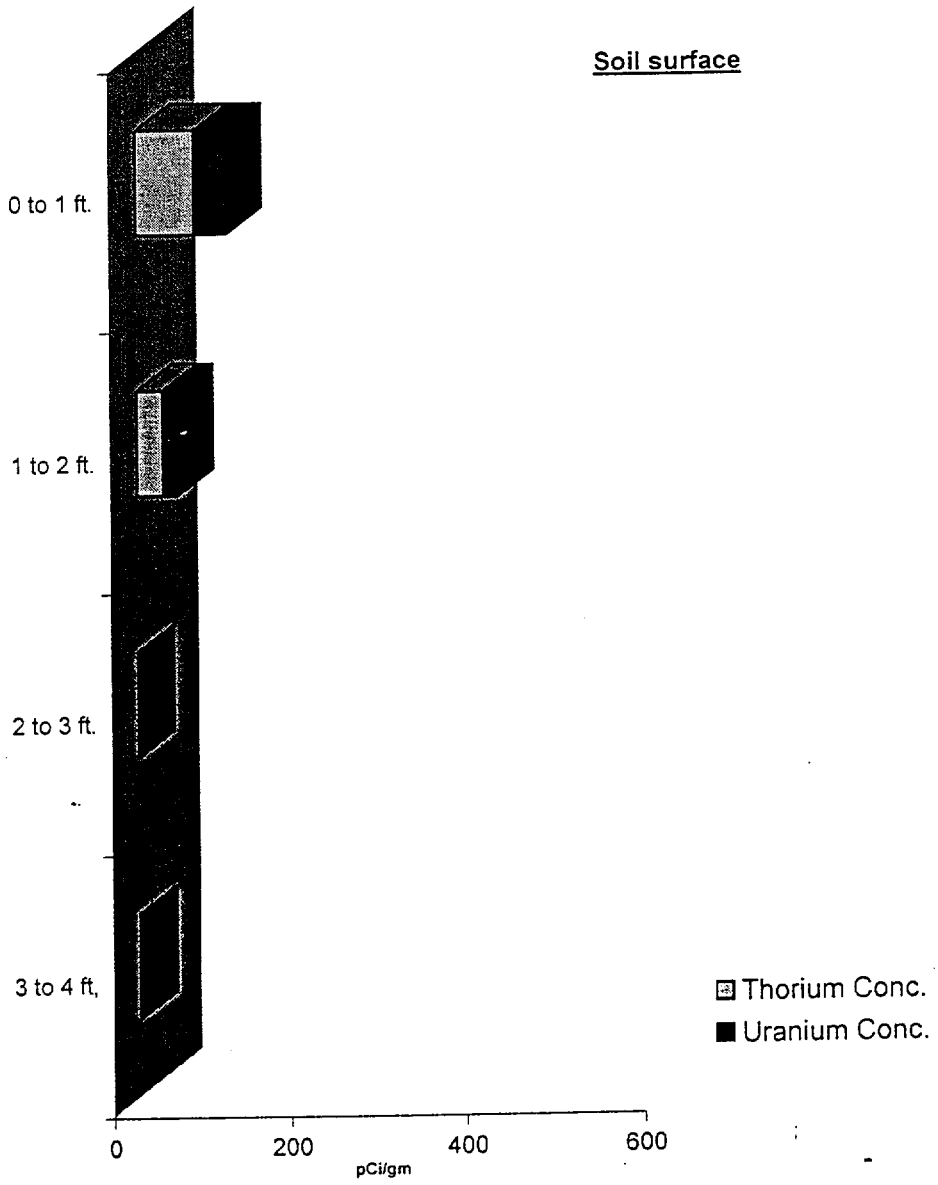


Figure 4

Sample Location #3
SOIL CONCENTRATION vs DEPTH

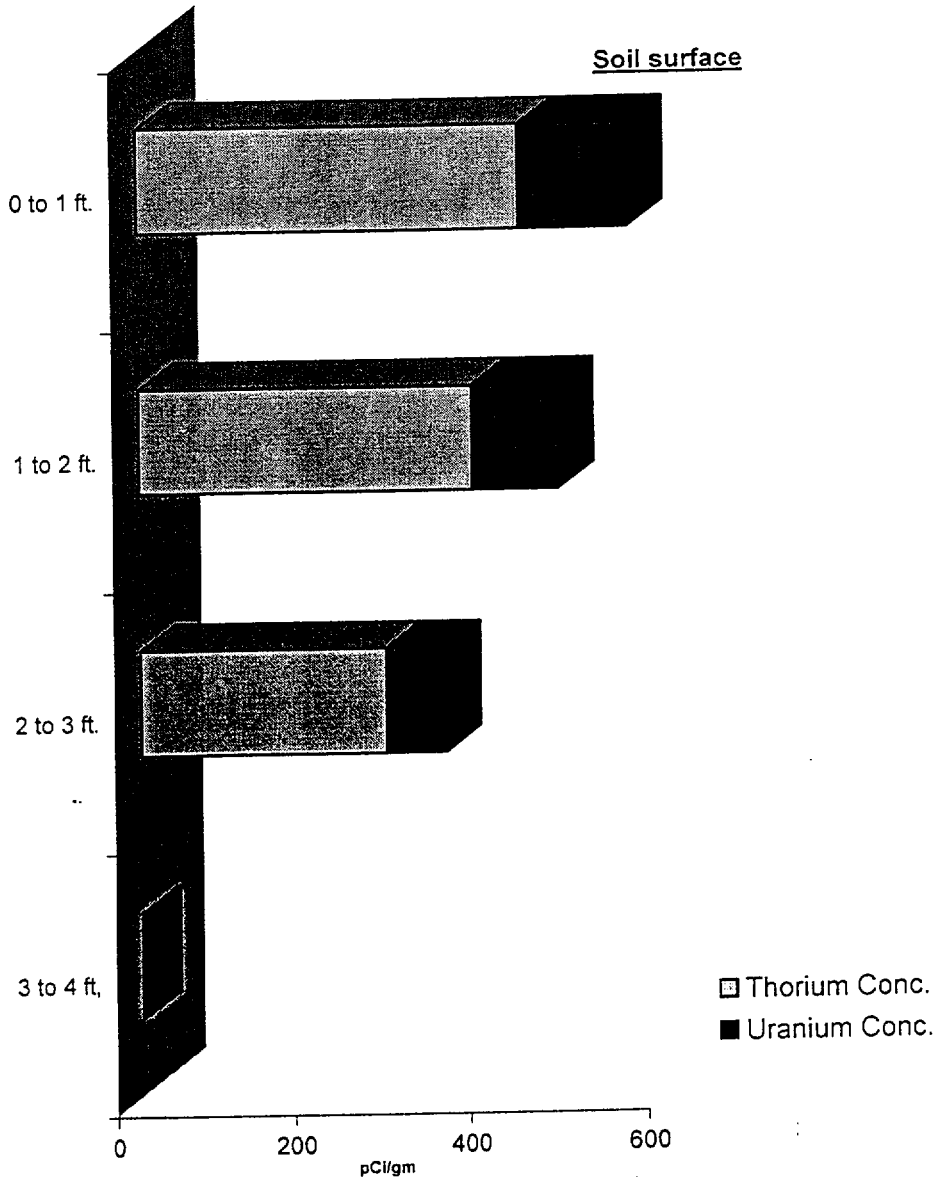


Figure 5

Sample Location #4
SOIL CONCENTRATION vs DEPTH

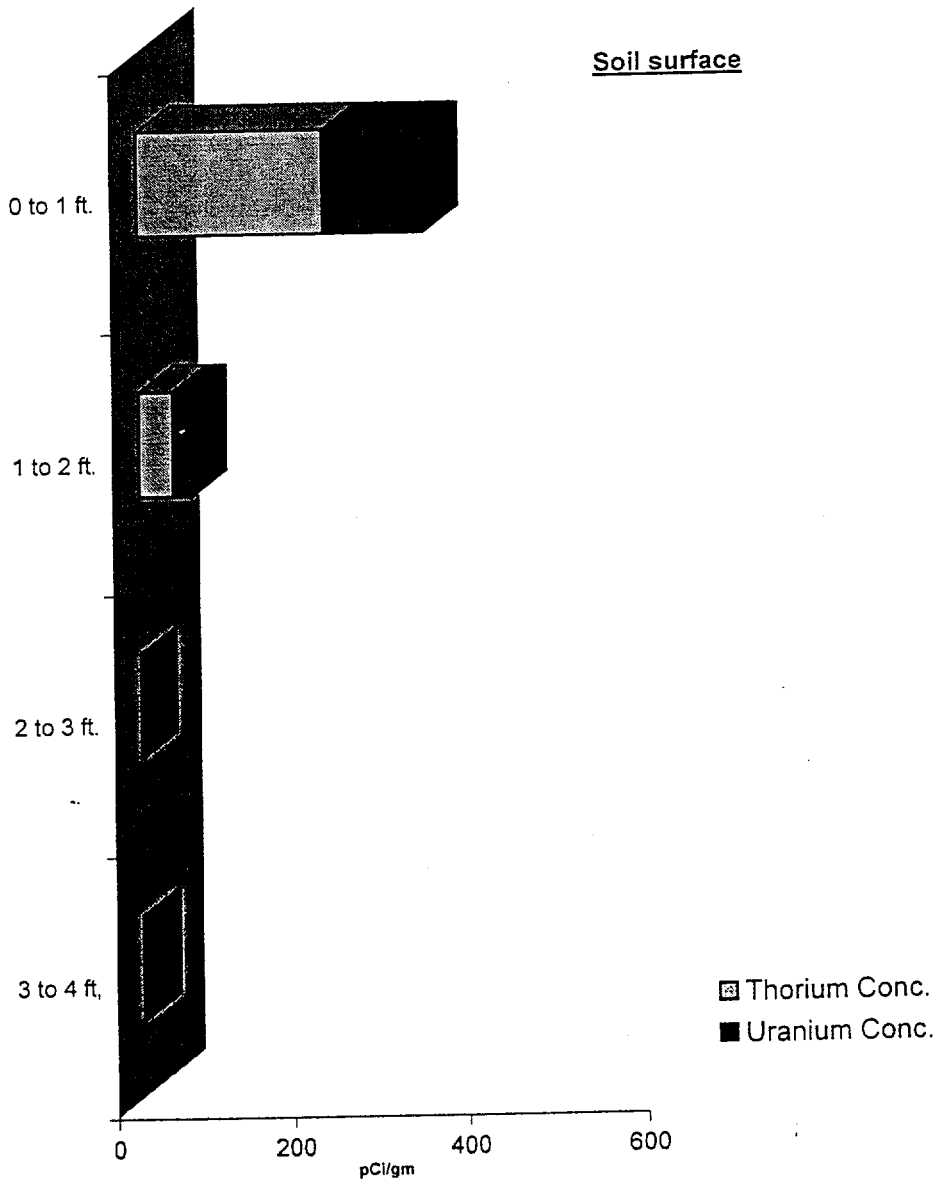


Figure 6

Sample Location #5
SOIL CONCENTRATION vs DEPTH

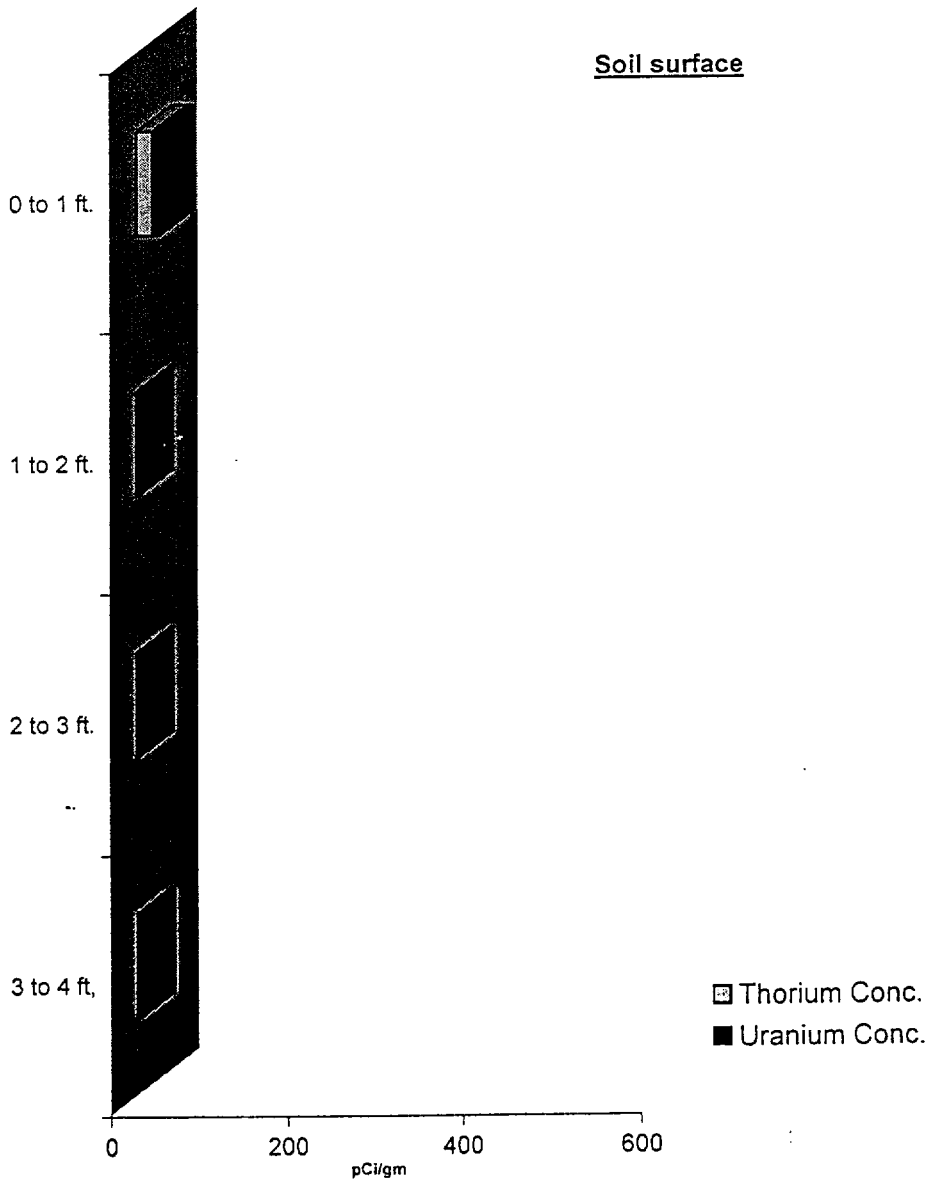


Figure 7

Sample Location #6
SOIL CONCENTRATION vs DEPTH

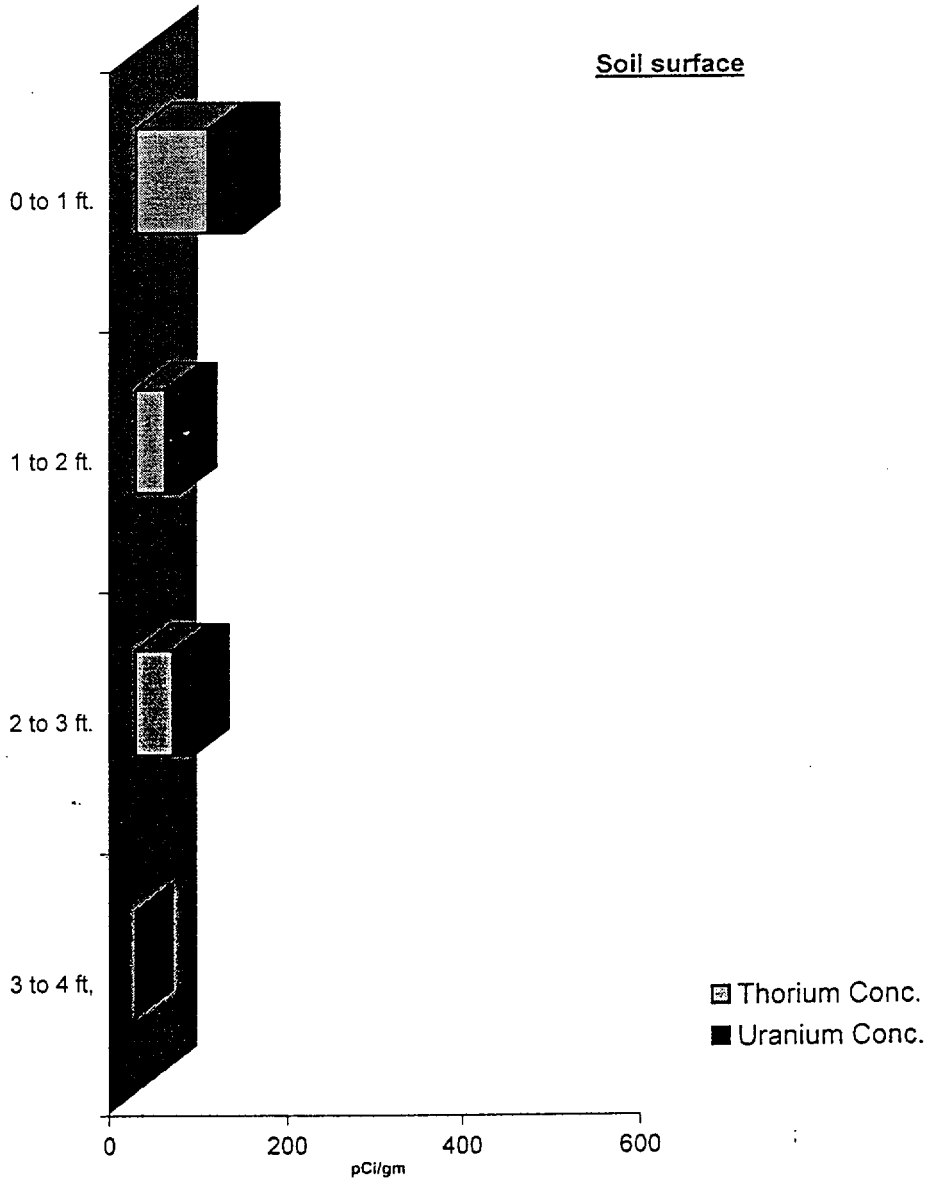


Figure 8

Sample Location #7
SOIL CONCENTRATION vs DEPTH

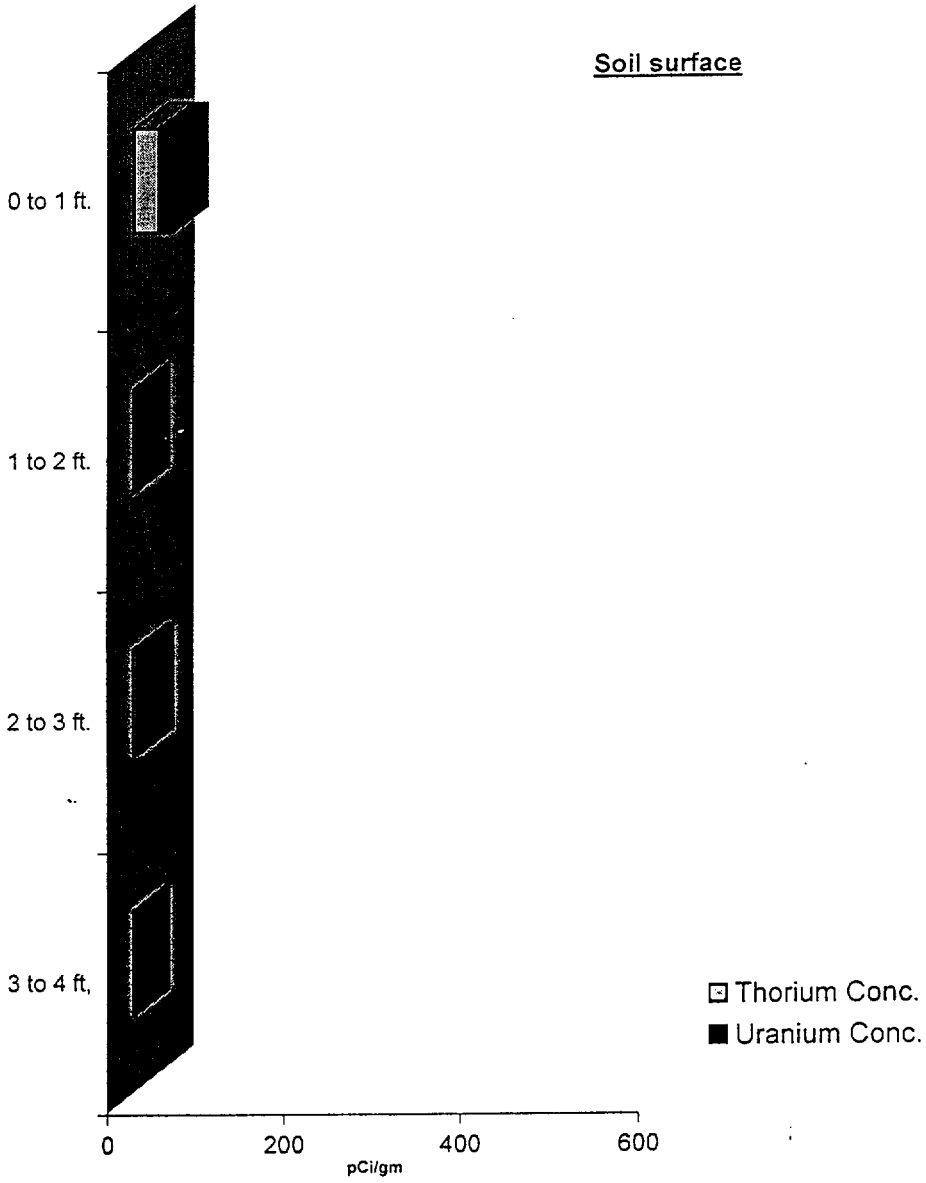


Figure 9

Sample Location #8
SOIL CONCENTRATION vs DEPTH

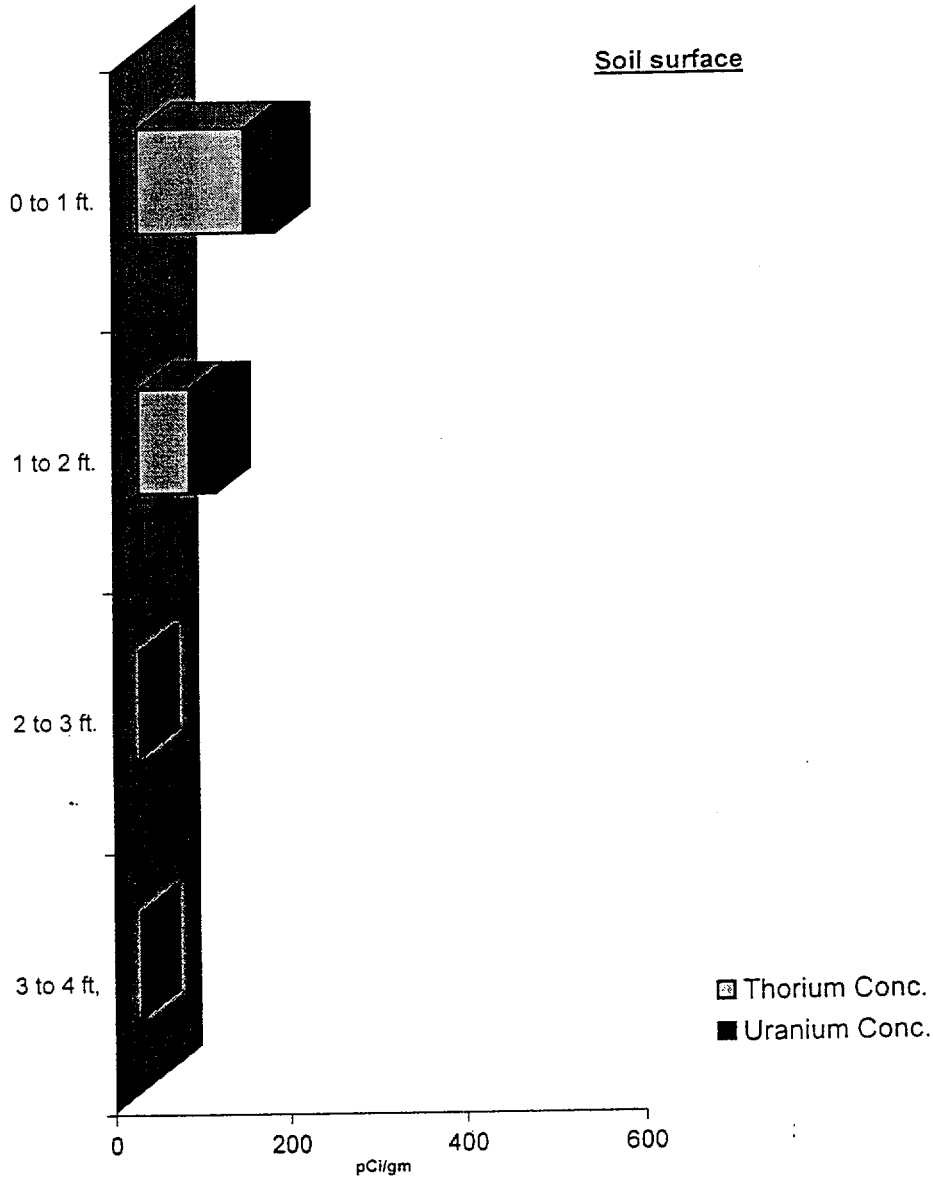


Figure 10

Sample Location #9
SOIL CONCENTRATION vs DEPTH

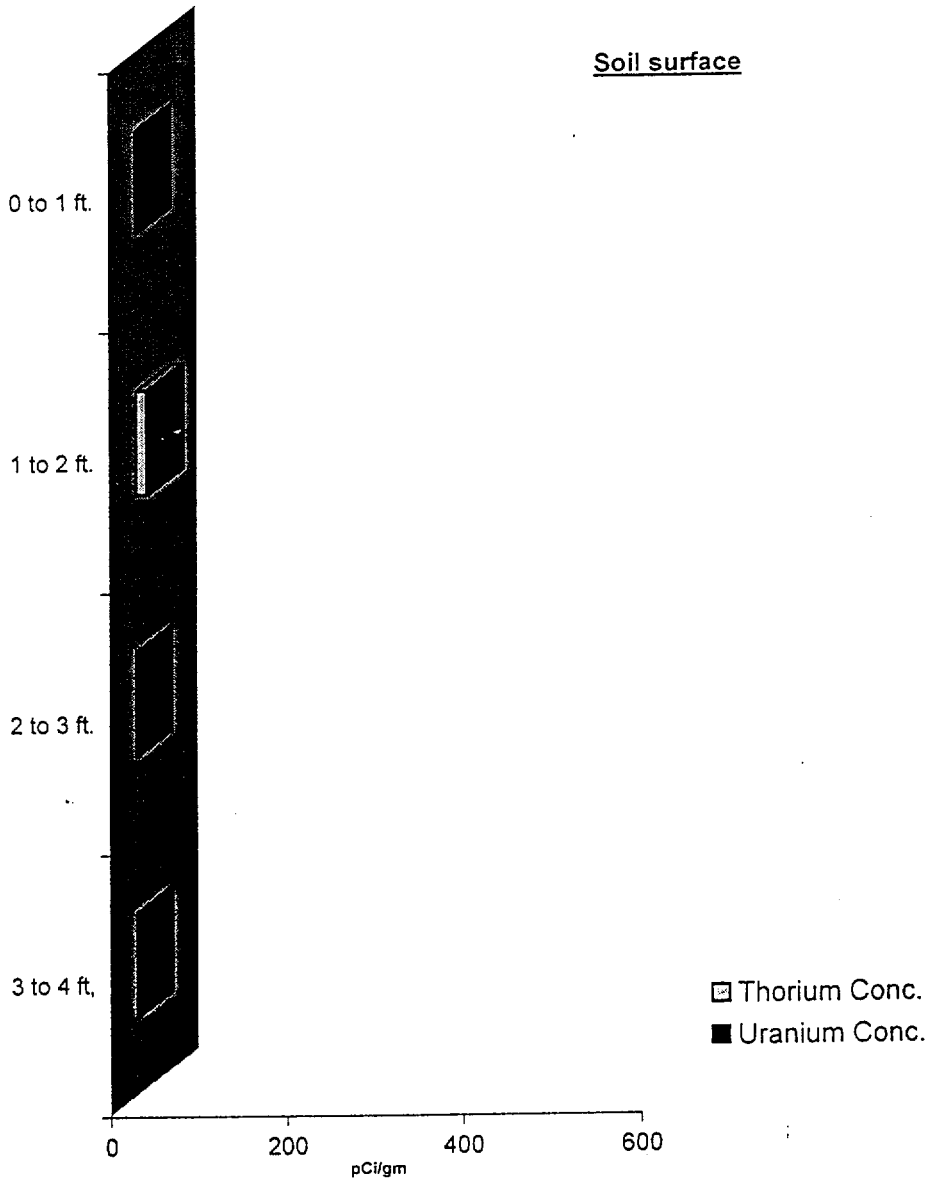


Figure 11

Sample Location #10
SOIL CONCENTRATION vs DEPTH

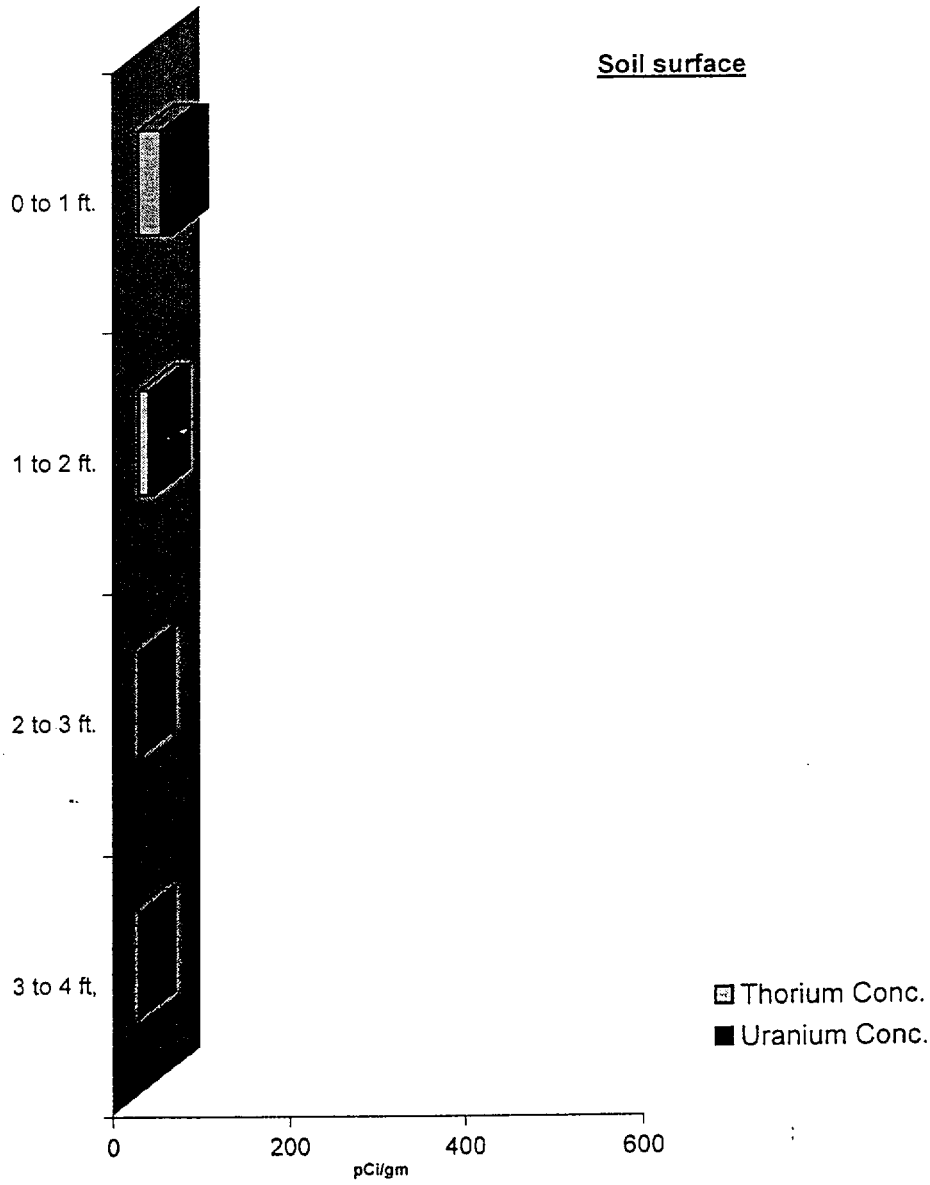


Figure 12

Sample Location #11
SOIL CONCENTRATION vs DEPTH

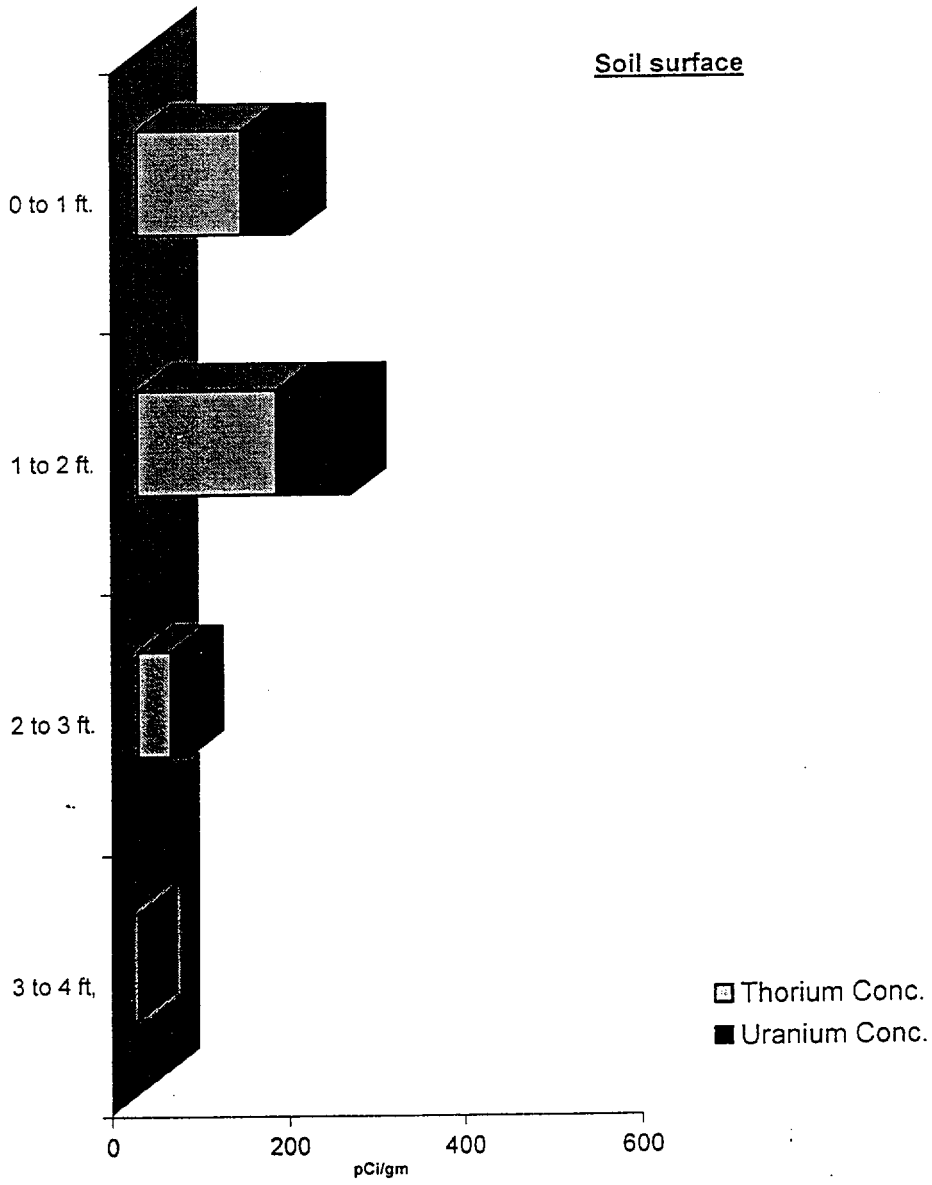


Figure 13

Sample Location #12
SOIL CONCENTRATION vs DEPTH

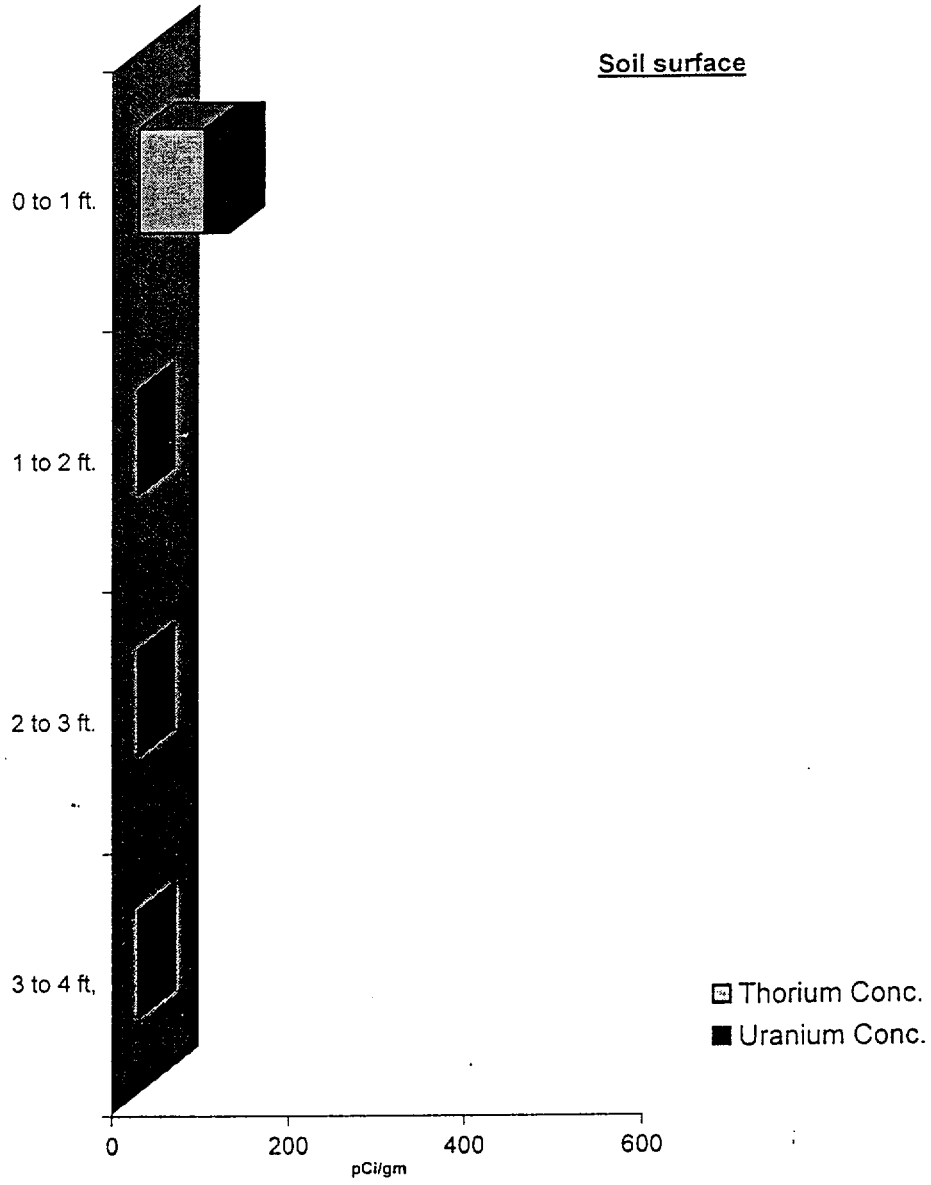
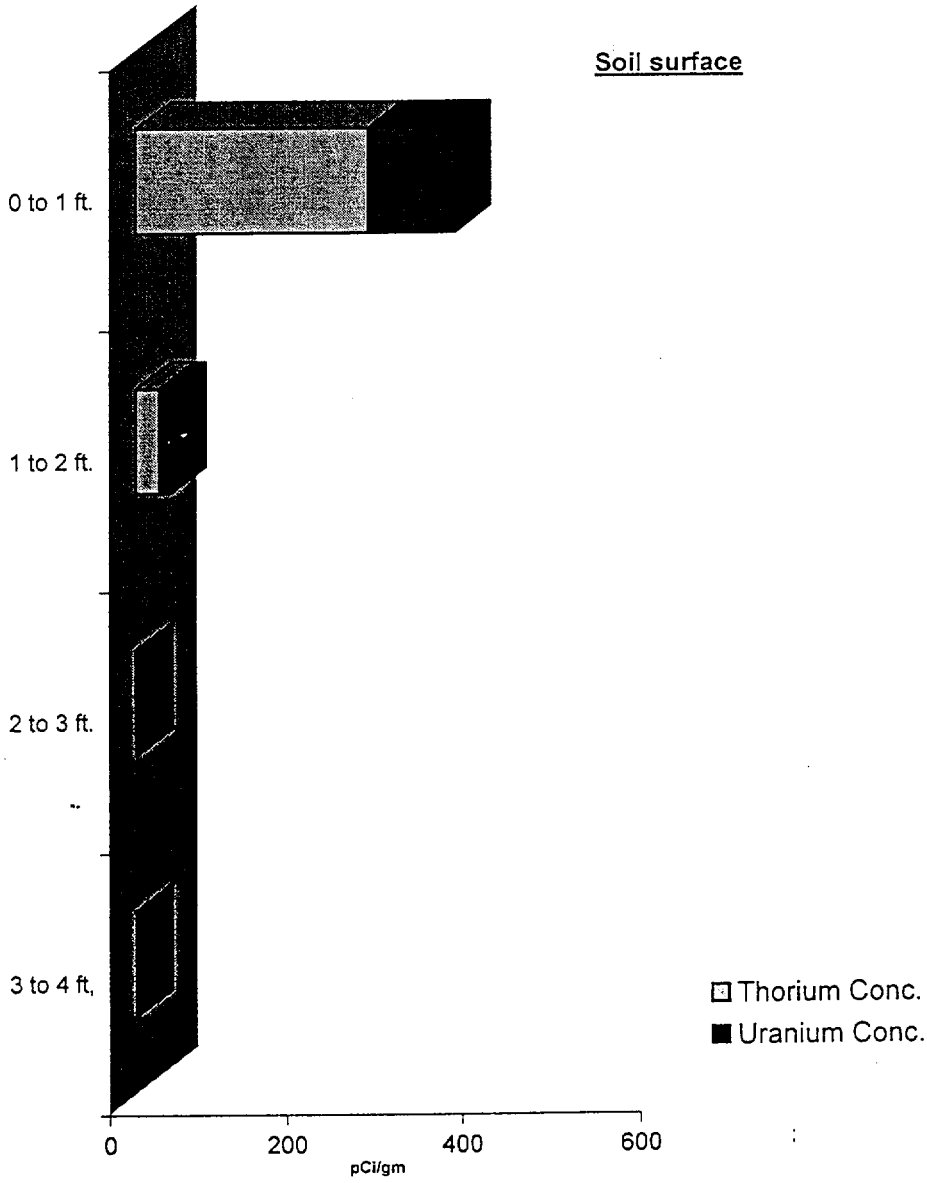


Figure 14

Sample Location #13
SOIL CONCENTRATION vs DEPTH



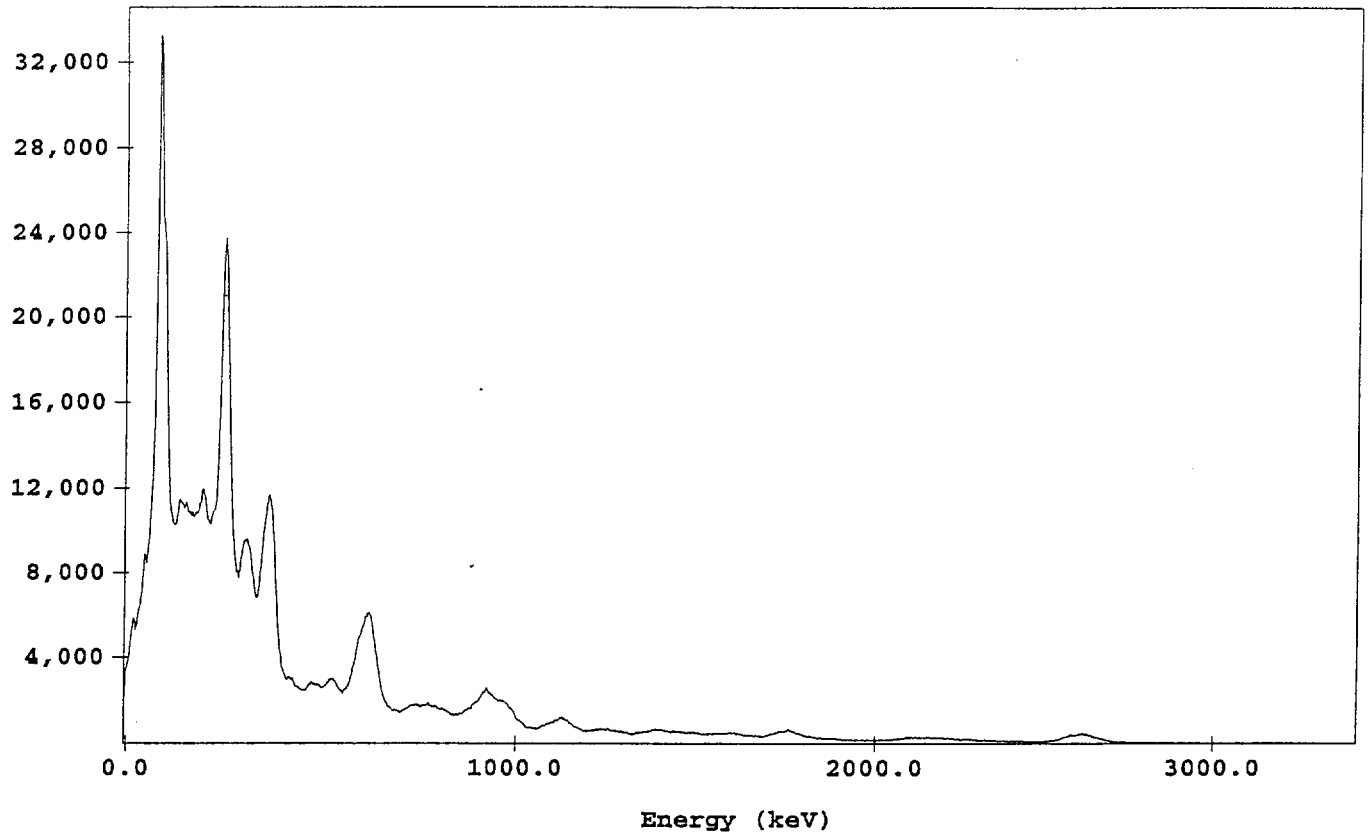
Appendix

Gamma Spectroscopy Data

Radiation Science, Inc.

NaI Gamma Spectroscopy Report

ID(3): HMI Sample Location #1, 0 to 1 ft.
File: HMI #1 0-1.ANS LT: 3,600.00 RT: 3,619.27
Bias: 953 Coarse Gain: 2 Fine Gain: 1.07



ROI #	ID	ASSOCIATED NUCLIDE	CENTER (??)	GROSS (cnts)	NET (cnts)	FWHM (??)	FWHM (%)
1	Ra226@ 186.1	Ra226	189.0	69044 ± 263	3616 ± 552	15.06	7.97
2	Pb212@ 238.6	Pb212	243.1	242549 ± 492	98900 ± 1181	22.13	9.11
3	Pb214@ 295.2	Pb214	300.7	136528 ± 369	15533 ± 1102	24.81	8.25
4	Pb214@ 351.9	Pb214	357.5	146467 ± 383	48542 ± 1004	31.02	8.68
5	Ac228@ 463.0	Ac228	469.4	37660 ± 194	1864 ± 575	16.76	3.57
6	Tl208@ 510.8	Tl208	520.3	38890 ± 197	3046 ± 570	20.38	3.92
7	Bi212@ 756.4	Bi212	762.3	74339 ± 273	10368 ± 1320	93.33	12.24
8	Ac228@ 939.6	Ac228	935.8	98443 ± 314	38186 ± 1416	97.16	10.38
9	Bi214@1120.3	Bi214	1123.6	35402 ± 188	9999 ± 785	59.13	5.26
10	Bi214@1764.5	Bi214	1756.0	22056 ± 149	6330 ± 682	69.62	3.96
11	Tl208@2614.5	Tl208	2599.8	15294 ± 124	7685 ± 464	100.69	3.87

Radiation Science, Inc.

NaI Gamma Spectroscopy Report

ID: HMI Sample Location #1, 0 to 1 ft.

File: HMI #1 0-1.ANS Date: October 13, 2002 13:06:02
LT: 3,600.00 RT: 3,619.27 DT: 0.5 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226	1.600E+03 Y	A			Activity = 15.599 ± 2.384	pCi/gm
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
190.1	3.50	189.03	69,044 ± 263	3,686 ± 515	Ra226@ 186.1	15.599
Pb212	10.640 H	B-			Activity = 37.950 ± 2.556	pCi/gm
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
243.9	43.30	243.08	242,549 ± 492	97,971 ± 1,120	Pb212@ 238.6	37.950
Pb214	26.800 M	B-			Activity = 27.463 ± 2.182	pCi/gm
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
300.7	18.50	300.71	136,528 ± 369	16,072 ± 1,049	Pb214@ 295.2	16.764
358.5	35.80	357.45	146,467 ± 383	49,339 ± 961	Pb214@ 351.9	30.656
Ac228	6.150 H	B-			Activity = 18.045 ± 1.973	pCi/gm
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
470.9	4.44	469.44	37,660 ± 194	2,086 ± 535	Ac228@ 463.0	13.602
939.7	117.13	935.80	98,443 ± 314	39,615 ± 1,321	Ac228@ 939.6	18.622
Tl208	3.053 M	B-			Activity = 3.408 ± 0.358	pCi/gm
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
522.9	22.60	520.34	38,890 ± 197	3,862 ± 533	Tl208@ 510.8	5.482
2599.7	99.16	2599.79	15,294 ± 124	9,138 ± 437	Tl208@2614.5	2.690
Bi212	60.550 M	B-			Activity = 31.668 ± 5.350	pCi/gm
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
757.7	15.36	762.32	74,339 ± 273	10,349 ± 1,230	Bi212@ 756.4	31.668
Bi214	19.900 M	B-			Activity = 26.941 ± 4.513	pCi/gm
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1124.1	16.44	1123.61	35,402 ± 188	10,364 ± 724	Bi214@1120.3	35.962
1753.9	20.28	1756.04	22,056 ± 149	6,705 ± 643	Bi214@1764.5	14.549

Radiation Science, Inc.

NaI Gamma Spectroscopy Report

ID: HMI Sample Location #1, 0 to 1 ft.

File: HMI #1 0-1.ANS Date: October 13, 2002 13:06:02
LT: 3,600.00 RT: 3,619.27 DT: 0.5 %

Calibrations:

Energy = -4.972E+00 +2.962E+00 * Ch +3.984E-04 * Ch^2 (keV)
Efficiency = (Det. Model) * (C1 + C2*Log(E) + C3*Log(E)^2 + C4*Log(E)^3)
where Detector Model = A*Exp((-T1*U1-T2*U2-T3*U3-T4*U4-DL*U5) / Cos(AI))*
(1-Exp(-DI*U5/Cos(AI)))

and E is Energy in keV

C1:	-7.360E+00
C2:	4.368E+00
C3:	-7.941E-01
C4:	4.609E-02

where the Ui are the appropriate linear mass absorption coefficients and

Geometry Factor (A):	0.373	Al Window (T1):	508.000 um
Detector Thickness (DI)	7.620 cm		
Detector Dead Layer (DL):	0.000 um		
Det. Incident Angle (AI):	0.000 deg		

Additional Detector Parameters

Detector ID:	ANS SD30X30		
Detector Material:	NaI Scintillation		
		Detector Shape:	Planar
Detector Diameter:	7.620 cm	Source Dist.:	1.000 cm

Resolution = 1.035E+01 +4.669E-02 * E +-9.237E-06 * E^2
FWHM at 661.66 keV = 37.20 keV

Library Natural.mdb

Library efficiencies were ignored

ROI ID	Ra226@ 186.1	Pb212@ 238.6	Pb214@ 295.2	Pb214@ 351.9	Ac228@ 463.0
Center (chan)	64.92	82.81	101.80	120.40	156.84
Start Channel	63	77	96	114	151
End Channel	69	91	110	129	164
Center (keV)	189.03	243.08	300.71	357.45	469.44
Centroid (keV)	190.00	243.90	300.74	358.39	471.77
Peak (keV)	189.26	243.64	301.32	356.24	466.83
FWHM (keV)	15.06	22.13	24.81	31.02	16.76
2nd Moment	55.06	31.42	172.93	52.27	340.24
3rd Moment	37.80	20.45	281.46	41.10	-1012.10
Gross Counts	69,044	242,549	136,528	146,467	37,660
sigma	± 263	± 492	± 369	± 383	± 194
Amb. BKG	9,916	16,753	13,179	10,133	5,675
sigma	± 100	± 129	± 115	± 101	± 75
Continuum	55,512	126,896	107,816	87,792	30,121
sigma	± 475	± 1,066	± 1,032	± 923	± 536
NetCounts	3,616	98,900	15,533	48,542	1,864
sigma	± 552	± 1,181	± 1,102	± 1,004	± 575
Activity (pCi/gm)	15.303	38.310	16.202	30.161	12.154
sigma	± 2.521	± 2.583	± 1.723	± 2.750	± 4.019
MDA (pCi/gm)	4.648	0.643	1.595	0.858	5.280
Nuclide	Ra226	Pb212	Pb214	Pb214	Ac228
Correlation	0.000	0.000	0.000	0.000	0.000

Analysis Report by Line

Lib Matches	1	1	1	1	1
Finder Integ.	0	0	0	0	0
Finder Power	0	0	0	0	0
Efficiency (%)	13.024	11.439	9.909	8.604	6.633
sigma	± 0.000	± 0.000	± 0.000	± 0.000	± 0.000
Intensity	3.50	43.30	18.50	35.80	4.44
sigma	±5.00E-02	± 0.400	± 0.300	± 0.500	± 0.110
E Window	18.57	21.57	24.74	27.85	33.93

ROI ID	Tl208@ 510.8	Bi212@ 756.4	Ac228@ 939.6	Bi214@1120.3	Bi214@1764.5
Center (chan)	173.29	250.58	305.07	363.24	553.31
Start Channel	168	232	280	346	533
End Channel	181	275	335	385	584
Center (keV)	520.34	762.32	935.80	1123.61	1756.04
Centroid (keV)	523.53	758.25	939.60	1123.49	1753.60
Peak (keV)	519.42	769.98	922.76	1126.08	1758.40
FWHM (keV)	20.38	93.33	97.16	59.13	69.62
2nd Moment	198.04	1196.35	533.75	381.29	637.50
3rd Moment	44.59	11398.65	-1566.72	1337.78	7534.48
Gross Counts	38,890	74,339	98,443	35,402	22,056
sigma	± 197	± 273	± 314	± 188	± 149
Amb. BKG	5,877	9,746	10,333	4,889	2,313
sigma	± 77	± 99	± 102	± 70	± 48
Continuum	29,967	54,225	49,924	20,514	13,413
sigma	± 530	± 1,288	± 1,377	± 759	± 664
NetCounts	3,046	10,368	38,186	9,999	6,330
sigma	± 570	± 1,320	± 1,416	± 785	± 682
Activity (pCi/gm)	4.324	31.726	17.950	34.696	13.735
sigma	± 0.974	± 5.552	± 2.114	± 7.442	± 2.347
MDA (pCi/gm)	1.146	3.322	0.490	2.320	1.174
Nuclide	Tl208	Bi212	Ac228	Bi214	Bi214
Correlation	0.000	0.000	0.000	0.000	0.000
Lib Matches	1	3	5	2	3
Finder Integ.	0	0	0	0	0
Finder Power	0	0	0	0	0
Efficiency (%)	5.936	4.041	3.551	3.431	4.460
sigma	± 0.000	± 0.000	± 0.000	± 0.000	± 0.000
Intensity	22.60	15.36	117.13	16.44	20.28
sigma	± 0.300	±9.27E-02	± 1.157	± 0.204	± 0.213
E Window	36.82	50.44	59.90	70.20	105.55

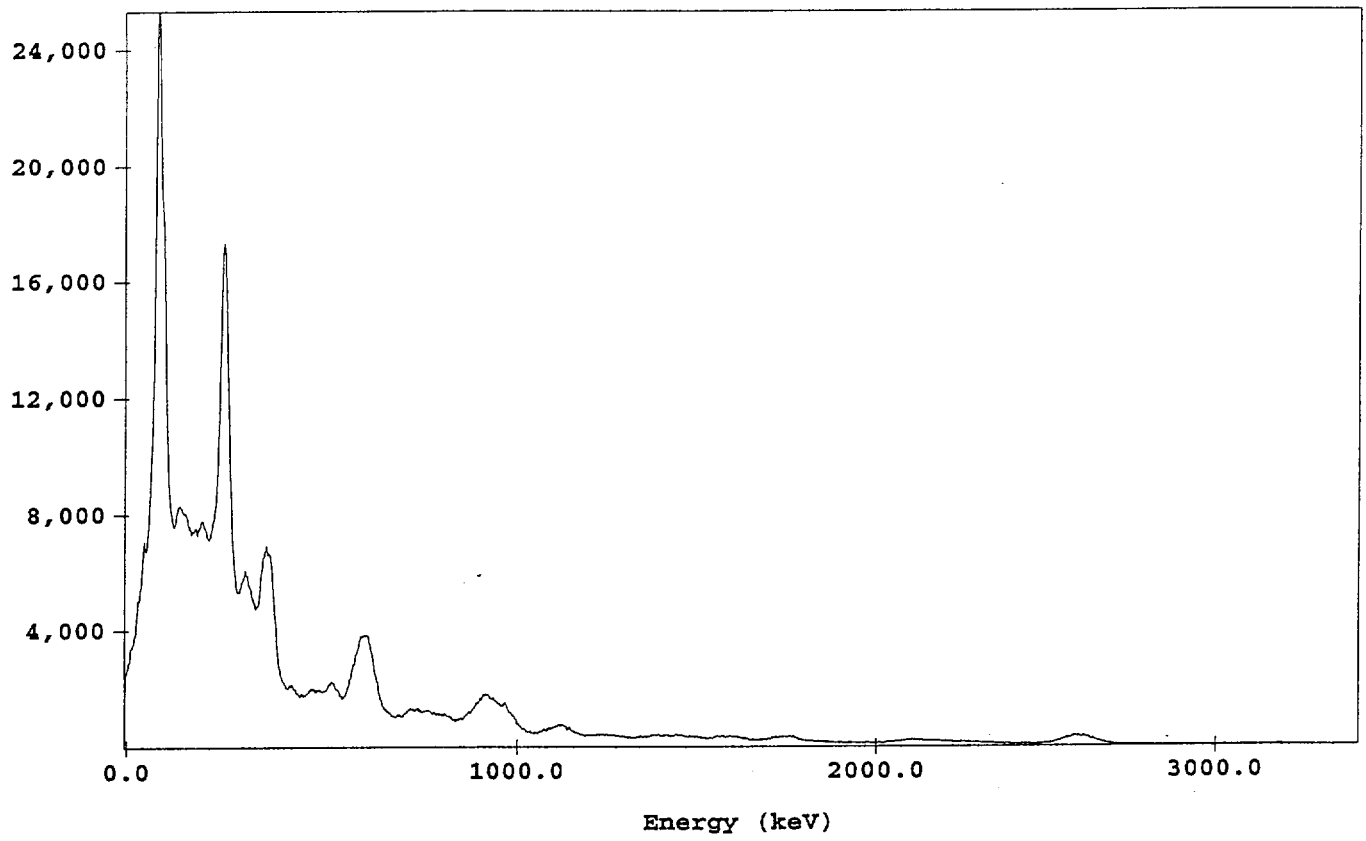
ROI ID	Tl208@2614.5
Center (chan)	794.43
Start Channel	767
End Channel	823
Center (keV)	2599.79
Centroid (keV)	2601.67
Peak (keV)	2601.83
FWHM (keV)	100.69
2nd Moment	344.68
3rd Moment	-1131.36
Gross Counts	15,294
sigma	± 124
Amb. BKG	2,223
sigma	± 47
Continuum	5,387

sigma	±	444
NetCounts		7,685
sigma	±	464
Activity (pCi/gm)		2.262
sigma	±	0.288
MDA (pCi/gm)		0.101
Nuclide		Tl208
Correlation		0.000
Lib Matches		1
Finder Integ.		0
Finder Power		0
Efficiency (%)		6.668
sigma	±	0.000
Intensity		99.16
sigma	±	0.000
E Window		151.10

Radiation Science, Inc.

NaI Gamma Spectroscopy Report

ID(3): HMI Sample Location #1, 1 to 2 ft.
File: HMI #1 1-2.ANS LT: 3,600.00 RT: 3,613.61
Bias: 953 Coarse Gain: 2 Fine Gain: 1.07



ROI #	ID	ASSOCIATED NUCLIDE	CENTER (??)	GROSS (cnts)	NET (cnts)	FWHM (??)	FWHM (%)
1	Ra226@ 186.1	Ra226	187.1	45520 ± 213	1260 ± 466	15.06	8.05
2	Pb212@ 238.6	Pb212	241.6	173798 ± 417	71008 ± 1020	21.93	9.08
3	Pb214@ 295.2	Pb214	298.5	86803 ± 295	5120 ± 922	14.29	4.79
4	Pb214@ 351.9	Pb214	353.7	86579 ± 294	20782 ± 832	32.41	9.17
5	Ac228@ 463.0	Ac228	465.8	26891 ± 164	1112 ± 500	14.64	3.14
6	Tl208@ 510.8	Tl208	517.8	28080 ± 168	1567 ± 499	17.77	3.43
7	Bi212@ 756.4	Bi212	752.1	52126 ± 228	7888 ± 1130	36.82	4.90
8	Ac228@ 939.6	Ac228	930.9	70759 ± 266	27218 ± 1229	99.79	10.72
9	Bi214@1120.3	Bi214	1117.3	22725 ± 151	4947 ± 675	59.22	5.30
10	Bi214@1764.5	Bi214	1747.6	13326 ± 115	2394 ± 578	76.31	4.37
11	Tl208@2614.5	Tl208	2584.0	12174 ± 110	5961 ± 415	101.67	3.93

Radiation Science, Inc.

NaI Gamma Spectroscopy Report

ID: HMI Sample Location #1, 1 to 2 ft.

File: HMI #1 1-2.ANS Date: October 13, 2002 09:33:04
LT: 3,600.00 RT: 3,613.61 DT: 0.4 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226	1.600E+03 Y	A		Activity = 5.629 ± 1.820 pCi/gm		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
188.7	3.50	187.09	45,520 ± 213	1,330 ± 422	Ra226@ 186.1	5.629

Pb212	10.640 H	B-		Activity = 27.146 ± 1.839 pCi/gm		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
242.7	43.30	241.56	173,798 ± 417	70,079 ± 949	Pb212@ 238.6	27.146

Pb214	26.800 M	B-		Activity = 11.965 ± 1.056 pCi/gm		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
296.7	18.50	298.53	86,803 ± 295	5,659 ± 858	Pb214@ 295.2	5.903
356.5	35.80	353.67	86,579 ± 294	21,579 ± 779	Pb214@ 351.9	13.408

Ac228	6.150 H	B-		Activity = 12.975 ± 1.466 pCi/gm		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
467.2	4.44	465.84	26,891 ± 164	1,334 ± 454	Ac228@ 463.0	8.699
935.3	117.13	930.85	70,759 ± 266	28,647 ± 1,118	Ac228@ 939.6	13.466

Tl208	3.053 M	B-		Activity = 2.438 ± 0.269 pCi/gm		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
517.3	22.60	517.81	28,080 ± 168	2,383 ± 456	Tl208@ 510.8	3.383
2584.7	99.16	2584.01	12,174 ± 110	7,415 ± 384	Tl208@2614.5	2.183

Bi212	60.550 M	B-		Activity = 24.078 ± 4.262 pCi/gm		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
756.2	15.36	752.08	52,126 ± 228	7,868 ± 1,024	Bi212@ 756.4	24.078

Bi214	19.900 M	B-		Activity = 13.819 ± 2.710 pCi/gm		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1118.0	16.44	1117.30	22,725 ± 151	5,312 ± 602	Bi214@1120.3	18.430
1746.0	20.28	1747.61	13,326 ± 115	2,769 ± 532	Bi214@1764.5	6.008

Radiation Science, Inc.

NaI Gamma Spectroscopy Report

ID: HMI Sample Location #1, 1 to 2 ft.

File: HMI #1 1-2.ANS Date: October 13, 2002 09:33:04
LT: 3,600.00 RT: 3,613.61 DT: 0.4 %

Calibrations:

Energy = -4.972E+00 +2.962E+00 * Ch +3.984E-04 * Ch^2 (keV)
Efficiency = (Det. Model) * (C1 + C2*Log(E) + C3*Log(E)^2 + C4*Log(E)^3)
where Detector Model = A*Exp((-T1*U1-T2*U2-T3*U3-T4*U4-DL*U5) / Cos(AI))*
(1-Exp(-DI*U5/Cos(AI)))

and E is Energy in keV

C1:	-7.360E+00
C2:	4.368E+00
C3:	-7.941E-01
C4:	4.609E-02

where the Ui are the appropriate linear mass absorption coefficients and

Geometry Factor (A):	0.373	Al Window (T1):	508.000 um
Detector Thickness (DI)	7.620 cm		
Detector Dead Layer (DL):	0.000 um		
Det. Incident Angle (AI):	0.000 deg		

Additional Detector Parameters

Detector ID:	ANS SD30X30		
Detector Material:	NaI Scintillation		
		Detector Shape:	Planar
Detector Diameter:	7.620 cm	Source Dist.:	1.000 cm

Resolution = 1.035E+01 +4.669E-02 * E +-9.237E-06 * E^2
FWHM at 661.66 keV = 37.20 keV

Library Natural.mdb

Library efficiencies were ignored

ROI ID	Ra226@ 186.1	Pb212@ 238.6	Pb214@ 295.2	Pb214@ 351.9	Ac228@ 463.0
Center (chan)	64.28	82.31	101.08	119.16	155.68
Start Channel	63	77	96	114	151
End Channel	69	91	110	129	164
Center (keV)	187.09	241.56	298.53	353.67	465.84
Centroid (keV)	188.22	242.82	296.49	356.09	467.95
Peak (keV)	186.24	240.61	295.24	350.12	469.92
FWHM (keV)	15.06	21.93	14.29	32.41	14.64
2nd Moment	127.92	31.18	403.13	74.78	387.18
3rd Moment	276.52	43.05	2146.44	183.28	228.27
Gross Counts	45,520	173,798	86,803	86,579	26,891
sigma	± 213	± 417	± 295	± 294	± 164
Amb. BKG	9,916	16,753	13,179	10,133	5,675
sigma	± 100	± 129	± 115	± 101	± 75
Continuum	34,344	86,037	68,504	55,664	20,104
sigma	± 403	± 922	± 866	± 771	± 466
NetCounts	1,260	71,008	5,120	20,782	1,112
sigma	± 466	± 1,020	± 922	± 832	± 500
Activity (pCi/gm)	5.332	27.506	5.341	12.913	7.251
sigma	± 2.001	± 1.868	± 1.051	± 1.257	± 3.371
MDA (pCi/gm)	3.658	0.529	1.272	0.683	4.317
Nuclide	Ra226	Pb212	Pb214	Pb214	Ac228
Correlation	0.000	0.000	0.000	0.000	0.000

Analysis Report by Line

Lib Matches	1	1	1	1	1
Finder Integ.	0	0	0	0	0
Finder Power	0	0	0	0	0
Efficiency (%)	13.024	11.439	9.909	8.604	6.633
sigma	± 0.000	± 0.000	± 0.000	± 0.000	± 0.000
Intensity	3.50	43.30	18.50	35.80	4.44
sigma	±5.00E-02	± 0.400	± 0.300	± 0.500	± 0.110
E Window	18.57	21.57	24.74	27.85	33.93

ROI ID	T1208@ 510.8	Bi212@ 756.4	Ac228@ 939.6	Bi214@1120.3	Bi214@1764.5
Center (chan)	172.48	247.34	303.53	361.30	550.83
Start Channel	168	232	280	346	533
End Channel	181	275	335	385	584
Center (keV)	517.81	752.08	930.85	1117.30	1747.61
Centroid (keV)	515.55	756.98	934.95	1116.18	1744.01
Peak (keV)	516.32	738.38	916.36	1113.07	1758.40
FWHM (keV)	17.77	36.82	99.79	59.22	76.31
2nd Moment	386.27	1123.09	516.43	533.54	1198.21
3rd Moment	2426.05	11443.54	39.59	4864.23	21835.85
Gross Counts	28,080	52,126	70,759	22,725	13,326
sigma	± 168	± 228	± 266	± 151	± 115
Amb. BKG	5,877	9,746	10,333	4,889	2,313
sigma	± 77	± 99	± 102	± 70	± 48
Continuum	20,636	34,493	33,208	12,890	8,619
sigma	± 464	± 1,103	± 1,195	± 654	± 564
NetCounts	1,567	7,888	27,218	4,947	2,394
sigma	± 499	± 1,130	± 1,229	± 675	± 578
Activity (pCi/gm)	2.224	24.136	12.795	17.164	5.195
sigma	± 0.762	± 4.511	± 1.543	± 4.150	± 1.431
MDA (pCi/gm)	0.952	2.651	0.400	1.841	0.943
Nuclide	T1208	Bi212	Ac228	Bi214	Bi214
Correlation	0.000	0.000	0.000	0.000	0.000
Lib Matches	1	3	5	2	3
Finder Integ.	0	0	0	0	0
Finder Power	0	0	0	0	0
Efficiency (%)	5.936	4.041	3.551	3.431	4.460
sigma	± 0.000	± 0.000	± 0.000	± 0.000	± 0.000
Intensity	22.60	15.36	117.13	16.44	20.28
sigma	± 0.300	±9.27E-02	± 1.157	± 0.204	± 0.213
E Window	36.82	50.44	59.90	70.20	105.55

ROI ID	T1208@2614.5
Center (chan)	790.04
Start Channel	767
End Channel	823
Center (keV)	2584.01
Centroid (keV)	2583.60
Peak (keV)	2573.09
FWHM (keV)	101.67
2nd Moment	348.99
3rd Moment	2083.38
Gross Counts	12,174
sigma	± 110
Amb. BKG	2,223
sigma	± 47
Continuum	3,990

sigma	±	397
NetCounts		5,961
sigma	±	415
Activity (pCi/gm)		1.755
sigma	±	0.232
MDA (pCi/gm)		8.73E-02
Nuclide		Tl208
Correlation		0.000
Lib Matches		1
Finder Integ.		0
Finder Power		0
Efficiency (%)		6.668
sigma	±	0.000
Intensity		99.16
sigma	±	0.000
E Window		151.10

Radiation Science, Inc.

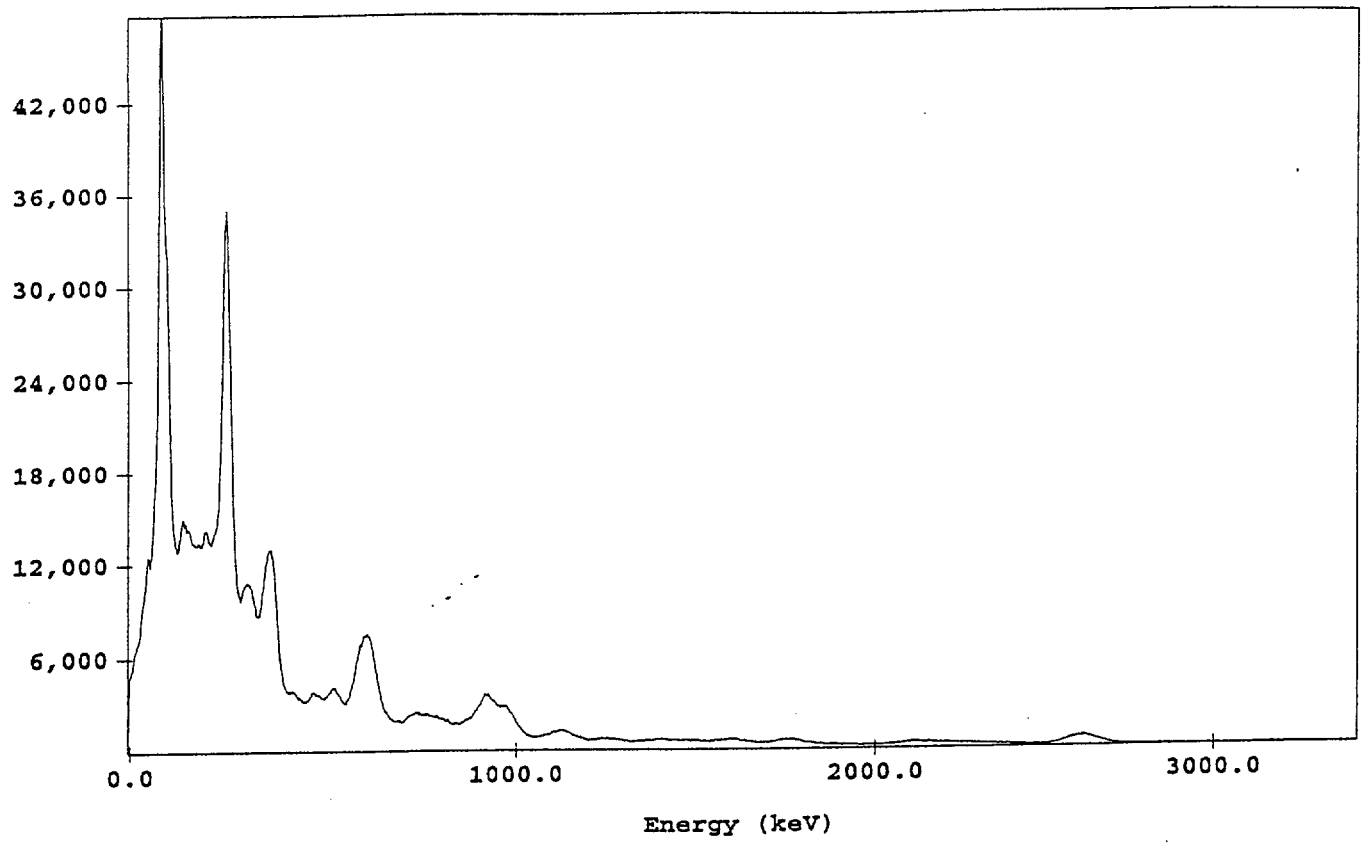
NaI Gamma Spectroscopy Report

ID(3): HMI Sample Location #1, 2 to 3 ft.
File: HMI #1 2-3.ANS
Bias: 953

Coarse Gain: 2

LT: 3,600.00
Fine Gain: 1.07

RT: 3,625.07



ROI #	ID	ASSOCIATED NUCLIDE	CENTER (??)	GROSS (cnts)	NET (cnts)	FWHM (??)	FWHM (%)
1	Ra226@ 186.1	Ra226	189.9	83440 ± 289	3405 ± 602	15.06	7.93
2	Pb212@ 238.6	Pb212	243.9	346387 ± 589	156013 ± 1351	22.20	9.10
3	Pb214@ 295.2	Pb214	300.7	159726 ± 400	9747 ± 1212	21.90	7.28
4	Pb214@ 351.9	Pb214	356.2	166638 ± 408	47361 ± 1095	34.68	9.74
5	Ac228@ 463.0	Ac228	468.4	49839 ± 223	3515 ± 645	24.10	5.15
6	Tl208@ 510.8	Tl208	520.2	52045 ± 228	5155 ± 645	24.99	4.80
7	Bi212@ 756.4	Bi212	755.6	96551 ± 311	14828 ± 1471	86.99	11.51
8	Ac228@ 939.6	Ac228	936.9	137285 ± 371	59892 ± 1589	97.66	10.42
9	Bi214@1120.3	Bi214	1124.2	40165 ± 200	8873 ± 858	61.73	5.49
10	Bi214@1764.5	Bi214	1760.7	24481 ± 156	6690 ± 721	74.65	4.24
11	Tl208@2614.5	Tl208	2601.2	23595 ± 154	13335 ± 547	99.99	3.84

Radiation Science, Inc.

NaI Gamma Spectroscopy Report

ID: HMI Sample Location #1, 2 to 3 ft.

File: HMI #1 2-3.ANS Date: October 12, 2002 17:55:26
LT: 3,600.00 RT: 3,625.07 DT: 0.7 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226 1.600E+03 Y A — Activity = 14.706 ± 2.574 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
189.7	3.50	189.94	83,440 ± 289	3,475 ± 569	Ra226@ 186.1	14.706

Pb212 10.640 H B- — Activity = 60.07 ± 4.019 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
244.4	43.30	243.93	346,387 ± 589	155,084 ± 1,298	Pb212@ 238.6	60.07

Pb214 26.800 M B- — Activity = 26.808 ± 2.305 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
299.5	18.50	300.71	159,726 ± 400	10,286 ± 1,164	Pb214@ 295.2	10.729
358.2	35.80	356.18	166,638 ± 408	48,158 ± 1,056	Pb214@ 351.9	29.923

Ac228 6.150 H B- — Activity = 28.243 ± 2.940 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
467.8	4.44	468.39	49,839 ± 223	3,737 ± 610	Ac228@ 463.0	24.368
938.1	117.13	936.91	137,285 ± 371	61,321 ± 1,505	Ac228@ 939.6	28.826

Tl208 3.053 M B- — Activity = 5.412 ± 0.519 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
522.4	22.60	520.18	52,045 ± 228	5,971 ± 612	Tl208@ 510.8	8.475
2599.9	99.16	2601.16	23,595 ± 154	14,789 ± 524	Tl208@2614.5	4.353

Bi212 60.550 M B- — Activity = 45.31 ± 6.906 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
755.4	15.36	755.59	96,551 ± 311	14,809 ± 1,391	Bi212@ 756.4	45.31

Bi214 19.900 M B- — Activity = 24.151 ± 3.867 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1125.6	16.44	1124.15	40,165 ± 200	9,238 ± 802	Bi214@1120.3	32.055
1762.7	20.28	1760.70	24,481 ± 156	7,065 ± 685	Bi214@1764.5	15.329

Radiation Science, Inc.

NaI Gamma Spectroscopy Report

ID: HMI Sample Location #1, 2 to 3 ft.

File: HMI #1 2-3.ANS Date: October 12, 2002 17:55:26
LT: 3,600.00 RT: 3,625.07 DT: 0.7 %

Calibrations:

Energy = -4.972E+00 +2.962E+00 * Ch +3.984E-04 * Ch^2 (keV)
Efficiency = (Det. Model) * (C1 + C2*Log(E) + C3*Log(E)^2 + C4*Log(E)^3)
where Detector Model = A*Exp((-T1*U1-T2*U2-T3*U3-T4*U4-DL*U5) / Cos(AI))*
(1-Exp(-DI*U5/Cos(AI)))

and E is Energy in keV

C1:	-7.360E+00
C2:	4.368E+00
C3:	-7.941E-01
C4:	4.609E-02

where the Ui are the appropriate linear mass absorption coefficients and

Geometry Factor (A):	0.373	Al Window (T1):	508.000 um
Detector Thickness (DI)	7.620 cm		
Detector Dead Layer (DL):	0.000 um		
Det. Incident Angle (AI):	0.000 deg		

Additional Detector Parameters

Detector ID:	ANS SD30X30		
Detector Material:	NaI Scintillation		
		Detector Shape:	Planar
Detector Diameter:	7.620 cm	Source Dist.:	1.000 cm

Resolution = 1.035E+01 +4.669E-02 * E +-9.237E-06 * E^2
FWHM at 661.66 keV = 37.20 keV

Library Natural.mdb

Library efficiencies were ignored

ROI ID	Ra226@ 186.1	Pb212@ 238.6	Pb214@ 295.2	Pb214@ 351.9	Ac228@ 463.0
Center (chan)	65.23	83.10	101.80	119.98	156.50
Start Channel	63	77	96	114	151
End Channel	69	91	110	129	164
Center (keV)	189.94	243.93	300.71	356.18	468.39
Centroid (keV)	189.56	244.47	299.54	358.06	468.03
Peak (keV)	192.27	243.64	295.24	353.18	469.92
FWHM (keV)	15.06	22.20	21.90	34.68	24.10
2nd Moment	73.88	27.51	342.86	62.20	222.59
3rd Moment	84.94	5.45	964.68	59.68	104.80
Gross Counts	83,440	346,387	159,726	166,638	49,839
sigma	± 289	± 589	± 400	± 408	± 223
Amb. BKG	9,916	16,753	13,179	10,133	5,675
sigma	± 100	± 129	± 115	± 101	± 75
Continuum	70,119	173,621	136,800	109,144	40,649
sigma	± 519	± 1,210	± 1,139	± 1,011	± 601
NetCounts	3,405	156,013	9,747	47,361	3,515
sigma	± 602	± 1,351	± 1,212	± 1,095	± 645
Activity (pCi/gm)	14.410	60.43	10.167	29.427	22.920
sigma	± 2.701	± 4.045	± 1.499	± 2.700	± 5.017
MDA (pCi/gm)	5.222	0.752	1.797	0.956	6.131
Nuclide	Ra226	Pb212	Pb214	Pb214	Ac228
Correlation	0.000	0.000	0.000	0.000	0.000

Analysis Report by Line

Lib Matches	1	1	1	1	1
Finder Integ.	0	0	0	0	0
Finder Power	0	0	0	0	0
Efficiency (%)	13.024	11.439	9.909	8.604	6.633
sigma	± 0.000	± 0.000	± 0.000	± 0.000	± 0.000
Intensity	3.50	43.30	18.50	35.80	4.44
sigma	±5.00E-02	± 0.400	± 0.300	± 0.500	± 0.110
E Window	18.57	21.57	24.74	27.85	33.93

ROI ID	Tl208@ 510.8	Bi212@ 756.4	Ac228@ 939.6	Bi214@1120.3	Bi214@1764.5
Center (chan)	173.24	248.45	305.41	363.41	554.68
Start Channel	168	232	280	346	533
End Channel	181	275	335	385	584
Center (keV)	520.18	755.59	936.91	1124.15	1760.70
Centroid (keV)	522.67	755.85	938.04	1124.95	1762.90
Peak (keV)	522.52	732.07	916.36	1129.33	1765.21
FWHM (keV)	24.99	86.99	97.66	61.73	74.65
2nd Moment	156.44	1112.60	454.79	497.42	668.59
3rd Moment	159.33	12721.55	-562.69	1113.77	3180.08
Gross Counts	52,045	96,551	137,285	40,165	24,481
sigma	± 228	± 311	± 371	± 200	± 156
Amb. BKG	5,877	9,746	10,333	4,889	2,313
sigma	± 77	± 99	± 102	± 70	± 48
Continuum	41,013	71,978	67,060	26,403	15,479
sigma	± 598	± 1,435	± 1,542	± 831	± 703
NetCounts	5,155	14,828	59,892	8,873	6,690
sigma	± 645	± 1,471	± 1,589	± 858	± 721
Activity (pCi/gm)	7.317	45.37	28.154	30.789	14.515
sigma	± 1.296	± 7.066	± 3.235	± 6.828	± 2.481
MDA (pCi/gm)	1.341	3.826	0.567	2.631	1.261
Nuclide	Tl208	Bi212	Ac228	Bi214	Bi214
Correlation	0.000	0.000	0.000	0.000	0.000
Lib Matches	1	3	5	2	3
Finder Integ.	0	0	0	0	0
Finder Power	0	0	0	0	0
Efficiency (%)	5.936	4.041	3.551	3.431	4.460
sigma	± 0.000	± 0.000	± 0.000	± 0.000	± 0.000
Intensity	22.60	15.36	117.13	16.44	20.28
sigma	± 0.300	±9.27E-02	± 1.157	± 0.204	± 0.213
E Window	36.82	50.44	59.90	70.20	105.55

ROI ID	Tl208@2614.5
Center (chan)	794.81
Start Channel	767
End Channel	823
Center (keV)	2601.16
Centroid (keV)	2601.05
Peak (keV)	2601.83
FWHM (keV)	99.99
2nd Moment	304.68
3rd Moment	-603.62
Gross Counts	23,595
sigma	± 154
Amb. BKG	2,223
sigma	± 47
Continuum	8,037

sigma	±	522
NetCounts		13,335
sigma	±	547
Activity (pCi/gm)		3.926
sigma	±	0.469
MDA (pCi/gm)		0.124
Nuclide		Tl208
Correlation		0.000
Lib Matches		1
Finder Integ.		0
Finder Power		0
Efficiency (%)		6.668
sigma	±	0.000
Intensity		99.16
sigma	±	0.000
E Window		151.10

Radiation Science, Inc.

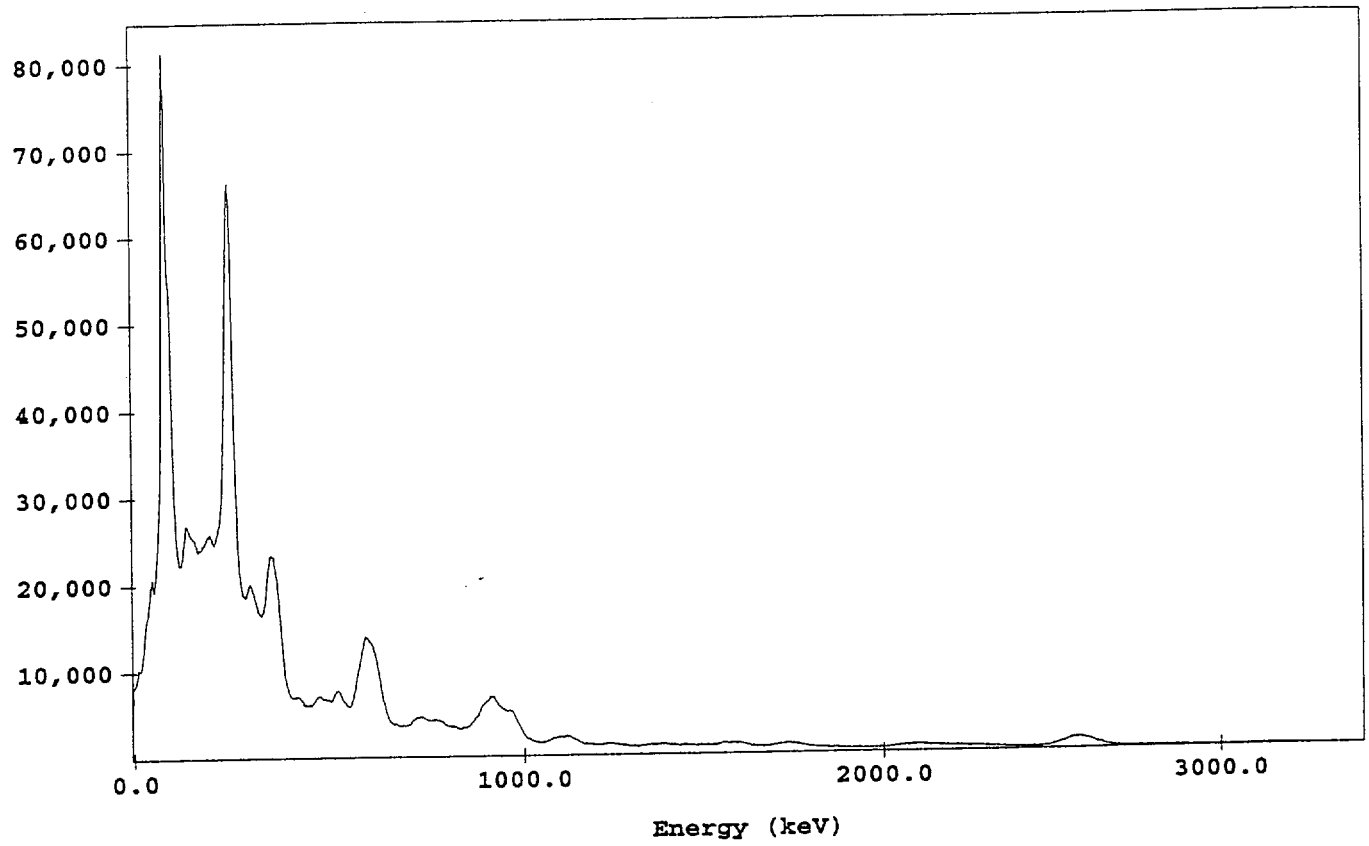
NaI Gamma Spectroscopy Report

ID(5): HMI Sample Location #1, 3 to 4 ft.
File: HMI #1 3-4.ANS
Bias: 953

Coarse Gain: 2

LT: 3,600.00
Fine Gain: 1.07

RT: 3,644.38



ROI #	ID	ASSOCIATED NUCLIDE	CENTER (??)	GROSS (cnts)	NET (cnts)	FWHM (??)	FWHM (%)
1	Ra226@ 186.1	Ra226	188.5	152212 ± 390	3403 ± 774	9.81	5.20
2	Pb212@ 238.6	Pb212	240.1	641850 ± 801	268491 ± 1804	21.58	8.99
3	Pb214@ 295.2	Pb214	295.1	257036 ± 507	10153 ± 1409	15.91	5.39
4	Pb214@ 351.9	Pb214	349.7	327330 ± 572	103908 ± 1492	33.75	9.65
5	Ac228@ 463.0	Ac228	465.4	94466 ± 307	5853 ± 845	19.41	4.17
6	Tl208@ 510.8	Tl208	515.3	95720 ± 309	7345 ± 845	19.44	3.77
7	Bi212@ 756.4	Bi212	742.3	175398 ± 419	25138 ± 1866	80.43	10.84
8	Ac228@ 939.6	Ac228	924.1	257140 ± 507	118288 ± 2036	100.50	10.88
9	Bi214@1120.3	Bi214	1108.8	70368 ± 265	16428 ± 1072	68.18	6.15
10	Bi214@1764.5	Bi214	1737.6	43573 ± 209	10501 ± 959	76.77	4.42
11	Tl208@2614.5	Tl208	2565.7	45015 ± 212	29167 ± 699	100.44	3.91

Radiation Science, Inc.

NaI Gamma Spectroscopy Report

ID: HMI Sample Location #1, 3 to 4 ft.

File: HMI #1 3-4.ANS Date: October 12, 2002 16:15:52
LT: 3,600.00 RT: 3,644.38 DT: 1.2 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226 1.600E+03 Y A — Activity = 14.401 ± 3.394 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
189.6	3.50	188.50	152,212 ± 390	3,403 ± 774	Ra226@ 186.1	14.401

Pb212 10.640 H B- — Activity = 104.0 ± 6.938 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
241.4	43.30	240.08	641,850 ± 801	268,491 ± 1,804	Pb212@ 238.6	104.0

Pb214 26.800 M B- — Activity = 59.50 ± 5.264 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
292.9	18.50	295.14	257,036 ± 507	10,153 ± 1,409	Pb214@ 295.2	10.590
350.2	35.80	349.72	327,330 ± 572	103,908 ± 1,492	Pb214@ 351.9	64.56

Ac228 6.150 H B- — Activity = 53.75 ± 5.672 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
465.5	4.44	465.36	94,466 ± 307	5,853 ± 845	Ac228@ 463.0	38.165
928.1	117.13	924.11	257,140 ± 507	118,288 ± 2,036	Ac228@ 939.6	55.60

Tl208 3.053 M B- — Activity = 8.903 ± 0.870 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
514.2	22.60	515.30	95,720 ± 309	7,345 ± 845	Tl208@ 510.8	10.426
2566.4	99.16	2565.74	45,015 ± 212	29,167 ± 699	Tl208@2614.5	8.586

Bi212 60.550 M B- — Activity = 76.92 ± 10.854 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
748.6	15.36	742.31	175,398 ± 419	25,138 ± 1,866	Bi212@ 756.4	76.92

Bi214 19.900 M B- — Activity = 43.86 ± 7.219 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1109.5	16.44	1108.85	70,368 ± 265	16,428 ± 1,072	Bi214@1120.3	57.00
1741.9	18.24	1737.57	43,573 ± 209	10,501 ± 959	Bi214@1764.5	25.459

Radiation Science, Inc.

NaI Gamma Spectroscopy Report

ID: HMI Sample Location #1, 3 to 4 ft.

File: HMI #1 3-4.ANS Date: October 12, 2002 16:15:52
LT: 3,600.00 RT: 3,644.38 DT: 1.2 %

Calibrations:

Energy = -4.972E+00 +2.962E+00 * Ch +3.984E-04 * Ch^2 (keV)
Efficiency = (Det. Model) * (C1 + C2*Log(E) + C3*Log(E)^2 + C4*Log(E)^3)
where Detector Model = A*Exp((-T1*U1-T2*U2-T3*U3-T4*U4-DL*U5) / Cos(AI))*
(1-Exp(-DI*U5/Cos(AI)))

and E is Energy in keV

C1:	-7.360E+00
C2:	4.368E+00
C3:	-7.941E-01
C4:	4.609E-02

where the Ui are the appropriate linear mass absorption coefficients and

Geometry Factor (A):	0.373	Al Window (T1):	508.000 um
Detector Thickness (DI)	7.620 cm		
Detector Dead Layer (DL):	0.000 um		
Det. Incident Angle (AI):	0.000 deg		

Additional Detector Parameters

Detector ID:	ANS SD30X30		
Detector Material:	NaI Scintillation		
		Detector Shape:	Planar
Detector Diameter:	7.620 cm	Source Dist.:	1.000 cm

Resolution = 1.035E+01 +4.669E-02 * E +-9.237E-06 * E^2
FWHM at 661.66 keV = 37.20 keV

Library Natural.mdb

Library efficiencies were ignored

ROI ID	Ra226@ 186.1	Pb212@ 238.6	Pb214@ 295.2	Pb214@ 351.9	Ac228@ 463.0
Center (chan)	64.75	81.82	99.97	117.87	155.52
Start Channel	63	77	95	110	151
End Channel	69	91	108	127	164
Center (keV)	188.50	240.08	295.14	349.72	465.36
Centroid (keV)	189.42	241.47	291.96	350.17	465.56
Peak (keV)	189.26	240.61	292.20	344.01	469.92
FWHM (keV)	9.81	21.58	15.91	33.75	19.41
2nd Moment	140.64	29.77	589.44	65.27	280.14
3rd Moment	176.17	64.67	3585.50	-64.43	777.19
Gross Counts	152,212	641,850	257,036	327,330	94,466
sigma	± 390	± 801	± 507	± 572	± 307
Amb. BKG	9,916	16,753	11,805	11,230	5,675
sigma	± 100	± 129	± 109	± 106	± 75
Continuum	138,963	355,677	235,935	212,747	83,160
sigma	± 690	± 1,654	± 1,343	± 1,411	± 811
NetCounts	3,333	269,420	9,296	103,354	5,631
sigma	± 799	± 1,843	± 1,440	± 1,526	± 871
Activity (pCi/gm)	14.105	104.4	9.697	64.22	36.718
sigma	± 3.492	± 6.963	± 1.687	± 5.780	± 7.170
MDA (pCi/gm)	7.347	1.075	2.359	1.334	8.761
Nuclide	Ra226	Pb212	Pb214	Pb214	Ac228
Correlation	0.000	0.000	0.000	0.000	0.000

Analysis Report by Line

Lib Matches	1	1	1	1	1
Finder Integ.	0	0	0	0	0
Finder Power	0	0	0	0	0
Efficiency (%)	13.024	11.439	10.023	8.802	6.633
sigma	± 0.000	± 0.000	± 0.000	± 0.000	± 0.000
Intensity	3.50	43.30	18.50	35.80	4.44
sigma	±5.00E-02	± 0.400	± 0.300	± 0.500	± 0.110
E Window	18.57	21.57	24.49	27.34	33.93

ROI ID	Tl208@ 510.8	Bi212@ 756.4	Ac228@ 939.6	Bi214@1120.3	Bi214@1764.5
Center (chan)	171.67	244.25	301.42	358.70	547.88
Start Channel	168	229	278	341	528
End Channel	181	272	333	380	579
Center (keV)	515.30	742.31	924.11	1108.85	1737.57
Centroid (keV)	513.40	748.62	927.97	1109.21	1742.45
Peak (keV)	513.22	725.76	909.96	1113.07	1734.59
FWHM (keV)	19.44	80.43	100.50	68.18	76.77
2nd Moment	370.26	1075.23	416.00	511.91	846.95
3rd Moment	2684.00	8957.60	152.06	1673.32	6459.41
Gross Counts	95,720	175,398	257,140	70,368	43,573
sigma	± 309	± 419	± 507	± 265	± 209
Amb. BKG	5,877	9,747	10,433	5,140	2,454
sigma	± 77	± 99	± 102	± 72	± 50
Continuum	83,314	140,096	129,164	49,340	30,608
sigma	± 809	± 1,879	± 2,039	± 1,082	± 970
NetCounts	6,529	25,555	117,543	15,888	10,512
sigma	± 869	± 1,927	± 2,104	± 1,116	± 994
Activity (pCi/gm)	9.267	78.20	55.25	55.13	25.485
sigma	± 1.695	± 11.084	± 6.256	± 11.665	± 4.451
MDA (pCi/gm)	1.909	5.334	0.787	3.593	1.979
Nuclide	Tl208	Bi212	Ac228	Bi214	Bi214
Correlation	0.000	0.000	0.000	0.000	0.000
Lib Matches	1	3	5	2	2
Finder Integ.	0	0	0	0	0
Finder Power	0	0	0	0	0
Efficiency (%)	5.936	4.083	3.561	3.429	4.419
sigma	± 0.000	± 0.000	± 0.000	± 0.000	± 0.000
Intensity	22.60	15.36	117.13	16.44	18.24
sigma	± 0.300	±9.27E-02	± 1.157	± 0.204	± 0.209
E Window	36.82	49.91	59.54	69.31	104.62

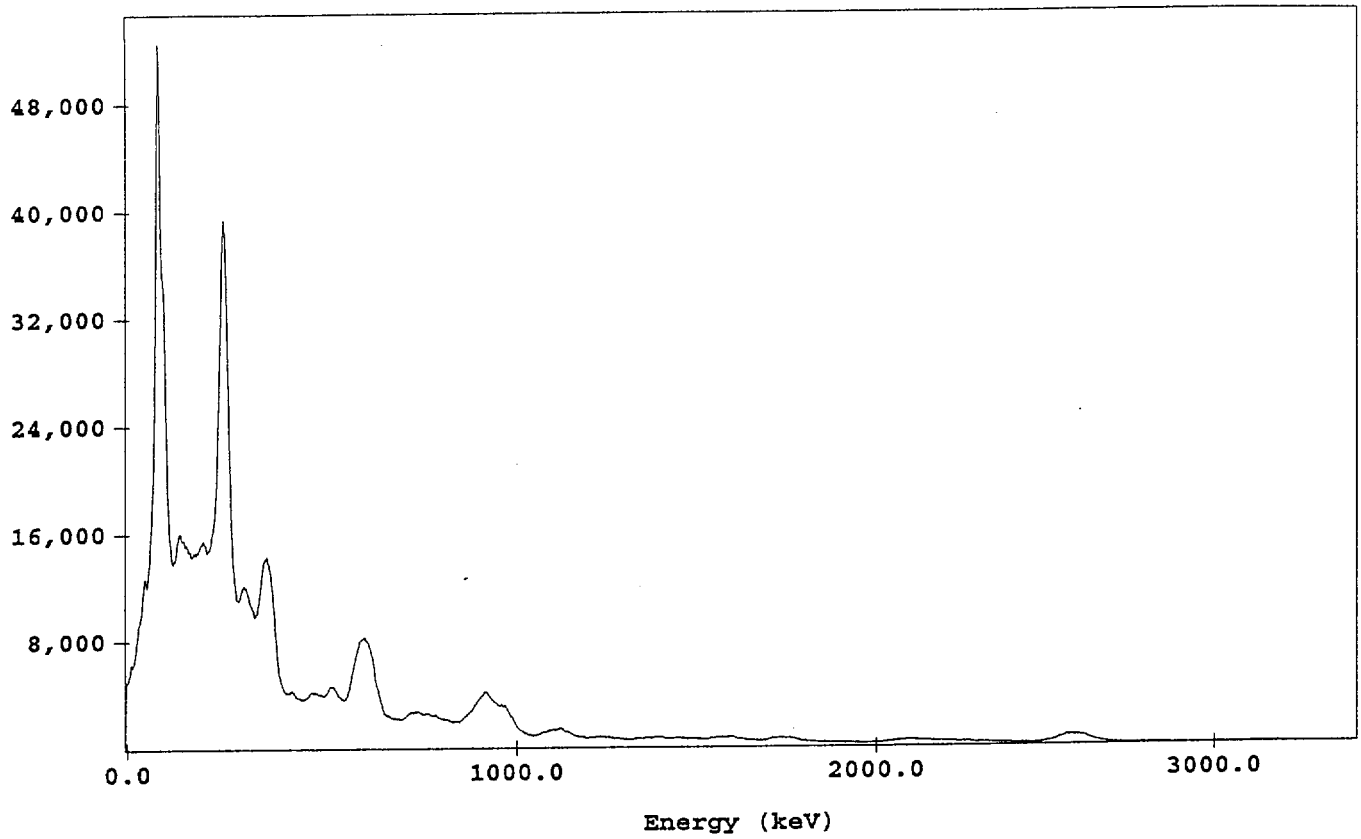
ROI ID	Tl208@2614.5
Center (chan)	784.95
Start Channel	759
End Channel	815
Center (keV)	2565.74
Centroid (keV)	2565.73
Peak (keV)	2547.98
FWHM (keV)	100.44
2nd Moment	272.04
3rd Moment	517.32
Gross Counts	45,015
sigma	± 212
Amb. BKG	2,278
sigma	± 48
Continuum	15,092

sigma	±	682
NetCounts		27,645
sigma	±	716
Activity (pCi/gm)		8.138
sigma	±	0.936
MDA (pCi/gm)		0.169
Nuclide		T1208
Correlation		0.000
Lib Matches		1
Finder Integ.		0
Finder Power		0
Efficiency (%)		6.590
sigma	±	0.000
Intensity		99.16
sigma	±	0.000
E Window		149.52

Radiation Science, Inc.

NaI Gamma Spectroscopy Report

ID(2): HMI Sample Location #1, 4 to 5 ft.
File: HMI #1 4-5.ANS
Bias: 953
Coarse Gain: 2
LT: 3,600.00
Fine Gain: 1.07
RT: 3,627.28



ROI #	ID	ASSOCIATED NUCLIDE	CENTER (??)	GROSS (cnts)	NET (cnts)	FWHM (??)	FWHM (%)
1	Ra226@ 186.1	Ra226	188.9	90967 ± 302	1800 ± 631	11.62	6.15
2	Pb212@ 238.6	Pb212	241.2	388112 ± 623	165524 ± 1447	22.21	9.21
3	Pb214@ 295.2	Pb214	296.6	156891 ± 396	8145 ± 1132	19.95	6.73
4	Pb214@ 351.9	Pb214	352.2	176535 ± 420	40458 ± 1159	31.66	8.99
5	Ac228@ 463.0	Ac228	467.6	56501 ± 238	3142 ± 687	22.05	4.71
6	Tl208@ 510.8	Tl208	515.9	58633 ± 242	3588 ± 692	23.41	4.54
7	Bi212@ 756.4	Bi212	747.4	107681 ± 328	15229 ± 1559	80.88	10.82
8	Ac228@ 939.6	Ac228	927.3	154638 ± 393	67333 ± 1679	98.53	10.63
9	Bi214@1120.3	Bi214	1113.1	45135 ± 212	10879 ± 907	66.11	5.94
10	Bi214@1764.5	Bi214	1743.0	26030 ± 161	4847 ± 780	79.76	4.58
11	Tl208@2614.5	Tl208	2573.9	26952 ± 164	16008 ± 558	103.10	4.01

Radiation Science, Inc.

NaI Gamma Spectroscopy Report

ID: HMI Sample Location #1, 4 to 5 ft.

File: HMI #1 4-5.ANS Date: October 12, 2002 08:07:48
LT: 3,600.00 RT: 3,627.28 DT: 0.8 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226 1.600E+03 Y A — Activity = 7.507 ± 2.671 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
188.3	3.50	188.87	90,967 ± 302	1,800 ± 631	Ra226@ 186.1	7.507

Pb212 10.640 H B- — Activity = 63.18 ± 4.230 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
242.4	43.30	241.19	388,112 ± 623	165,524 ± 1,447	Pb212@ 238.6	63.18

Pb214 26.800 M B- — Activity = 21.968 ± 1.930 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
295.5	18.50	296.57	156,891 ± 396	8,145 ± 1,132	Pb214@ 295.2	8.372
355.2	35.80	352.16	176,535 ± 420	40,458 ± 1,159	Pb214@ 351.9	24.772

Ac228 6.150 H B- — Activity = 30.065 ± 3.248 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
469.8	4.44	467.62	56,501 ± 238	3,142 ± 687	Ac228@ 463.0	20.190
932.8	117.13	927.33	154,638 ± 393	67,333 ± 1,679	Ac228@ 939.6	31.191

Tl208 3.053 M B- — Activity = 4.701 ± 0.494 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
516.7	22.60	515.91	58,633 ± 242	3,588 ± 692	Tl208@ 510.8	5.019
2577.2	99.16	2573.89	26,952 ± 164	16,008 ± 558	Tl208@2614.5	4.644

Bi212 60.550 M B- — Activity = 45.92 ± 7.243 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
748.4	15.36	747.39	107,681 ± 328	15,229 ± 1,559	Bi212@ 756.4	45.92

Bi214 19.900 M B- — Activity = 28.040 ± 5.351 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1114.2	16.44	1113.11	45,135 ± 212	10,879 ± 907	Bi214@1120.3	37.200
1744.5	20.28	1743.02	26,030 ± 161	4,847 ± 780	Bi214@1764.5	10.364

Radiation Science, Inc.

NaI Gamma Spectroscopy Report

ID: HMI Sample Location #1, 4 to 5 ft.

File: HMI #1 4-5.ANS Date: October 12, 2002 08:07:48
LT: 3,600.00 RT: 3,627.28 DT: 0.8 %

Calibrations:

Energy = -4.972E+00 +2.962E+00 * Ch +3.984E-04 * Ch^2 (keV)
Efficiency = (Det. Model) * (C1 + C2*Log(E) + C3*Log(E)^2 + C4*Log(E)^3)
where Detector Model = A*Exp((-T1*U1-T2*U2-T3*U3-T4*U4-DL*U5) / Cos(AI))*
(1-Exp(-DI*U5/Cos(AI)))

and E is Energy in keV

C1:	-7.360E+00
C2:	4.368E+00
C3:	-7.941E-01
C4:	4.609E-02

where the Ui are the appropriate linear mass absorption coefficients and

Geometry Factor (A):	0.373	Al Window (T1):	508.000 um
Detector Thickness (DI)	7.620 cm		
Detector Dead Layer (DL):	0.000 um		
Det. Incident Angle (AI):	0.000 deg		

Additional Detector Parameters

Detector ID:	ANS SD30X30		
Detector Material:	NaI Scintillation		
		Detector Shape:	Planar
Detector Diameter:	7.620 cm	Source Dist.:	1.000 cm

Resolution = 1.035E+01 +4.669E-02 * E +-9.237E-06 * E^2
FWHM at 661.66 keV = 37.20 keV

Library Natural.mdb

Library efficiencies were ignored

ROI ID	Ra226@ 186.1	Pb212@ 238.6	Pb214@ 295.2	Pb214@ 351.9	Ac228@ 463.0
Center (chan)	64.87	82.19	100.44	118.67	156.25
Start Channel	63	77	96	114	151
End Channel	69	91	108	129	164
Center (keV)	188.87	241.19	296.57	352.16	467.62
Centroid (keV)	188.28	242.38	295.55	355.24	469.76
Peak (keV)	189.26	240.61	292.20	350.12	466.83
FWHM (keV)	11.62	22.21	19.95	31.66	22.05
2nd Moment	178.42	29.36	329.50	78.85	287.57
3rd Moment	381.53	46.04	1211.84	240.68	-337.59
Gross Counts	90,967	388,112	156,891	176,535	56,501
sigma	± 302	± 623	± 396	± 420	± 238
Amb. BKG	9,916	16,753	11,805	10,133	5,675
sigma	± 100	± 129	± 109	± 101	± 75
Continuum	79,251	205,835	136,941	125,944	47,684
sigma	± 545	± 1,299	± 1,054	± 1,076	± 640
NetCounts	1,800	165,524	8,145	40,458	3,142
sigma	± 631	± 1,447	± 1,132	± 1,159	± 687
Activity (pCi/gm)	7.507	63.18	8.372	24.772	20.189
sigma	± 2.671	± 4.230	± 1.339	± 2.311	± 5.029
MDA (pCi/gm)	5.471	0.806	1.772	1.012	6.542
Nuclide	Ra226	Pb212	Pb214	Pb214	Ac228
Correlation	0.000	0.000	0.000	0.000	0.000

Analysis Report by Line

Lib Matches	1	1	1	1	1
Finder Integ.	0	0	0	0	0
Finder Power	0	0	0	0	0
Efficiency (%)	13.024	11.439	9.985	8.604	6.633
sigma	± 0.000	± 0.000	± 0.000	± 0.000	± 0.000
Intensity	3.50	43.30	18.50	35.80	4.44
sigma	±5.00E-02	± 0.400	± 0.300	± 0.500	± 0.110
E Window	18.57	21.57	24.57	27.85	33.93

ROI ID	Tl208@ 510.8	Bi212@ 756.4	Ac228@ 939.6	Bi214@1120.3	Bi214@1764.5
Center (chan)	171.87	245.85	302.43	360.01	549.48
Start Channel	168	231	280	343	533
End Channel	181	274	335	382	584
Center (keV)	515.91	747.39	927.33	1113.11	1743.02
Centroid (keV)	516.75	748.44	932.81	1114.17	1744.49
Peak (keV)	510.12	728.92	916.36	1122.82	1731.19
FWHM (keV)	23.41	80.88	98.53	66.11	79.76
2nd Moment	326.26	1292.30	443.60	485.27	1140.28
3rd Moment	1849.17	18703.76	507.85	2141.79	20139.95
Gross Counts	58,633	107,681	154,638	45,135	26,030
sigma	± 242	± 328	± 393	± 212	± 161
Amb. BKG	5,877	9,787	10,333	5,096	2,313
sigma	± 77	± 99	± 102	± 71	± 48
Continuum	49,168	82,665	76,972	29,160	18,870
sigma	± 644	± 1,521	± 1,629	± 879	± 762
NetCounts	3,588	15,229	67,333	10,879	4,847
sigma	± 692	± 1,559	± 1,679	± 907	± 780
Activity (pCi/gm)	5.019	45.92	31.191	37.200	10.364
sigma	± 1.155	± 7.243	± 3.573	± 8.047	± 2.161
MDA (pCi/gm)	1.446	4.040	0.599	2.724	1.372
Nuclide	Tl208	Bi212	Ac228	Bi214	Bi214
Correlation	0.000	0.000	0.000	0.000	0.000
Lib Matches	1	3	5	2	3
Finder Integ.	0	0	0	0	0
Finder Power	0	0	0	0	0
Efficiency (%)	5.936	4.055	3.551	3.429	4.460
sigma	± 0.000	± 0.000	± 0.000	± 0.000	± 0.000
Intensity	22.60	15.36	117.13	16.44	20.28
sigma	± 0.300	±9.27E-02	± 1.157	± 0.204	± 0.213
E Window	36.82	50.26	59.90	69.67	105.55

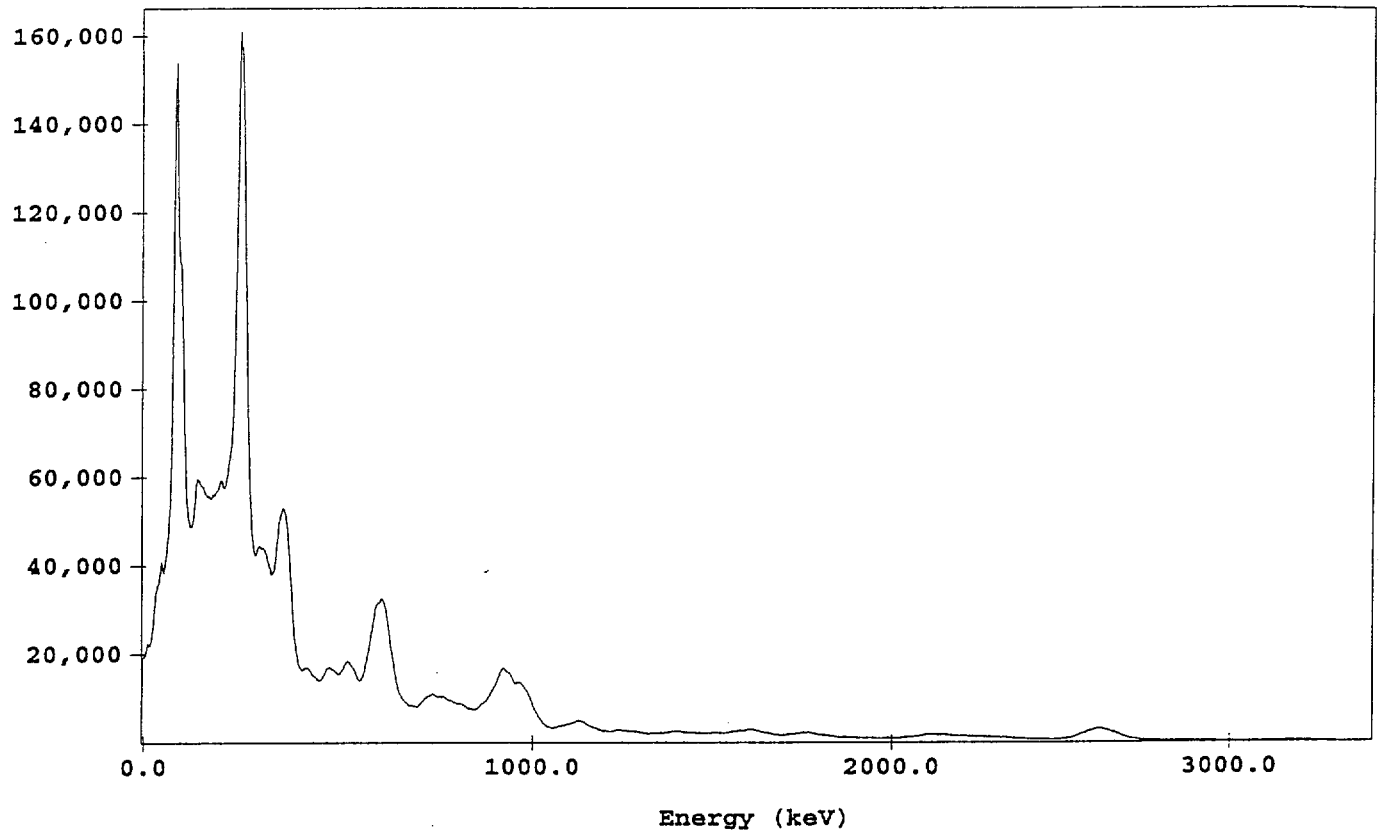
ROI ID	Tl208@2614.5
Center (chan)	787.22
Start Channel	763
End Channel	819
Center (keV)	2573.89
Centroid (keV)	2577.16
Peak (keV)	2569.50
FWHM (keV)	103.10
2nd Moment	292.28
3rd Moment	435.81
Gross Counts	26,952
sigma	± 164
Amb. BKG	2,280
sigma	± 48
Continuum	8,664

sigma	±	532
NetCounts		16,008
sigma	±	558
Activity (pCi/gm)		4.644
sigma	±	0.545
MDA (pCi/gm)		0.126
Nuclide		Tl208
Correlation		0.000
Lib Matches		1
Finder Integ.		0
Finder Power		0
Efficiency (%)		6.629
sigma	±	0.000
Intensity		99.16
sigma	±	0.000
E Window		150.31

Radiation Science, Inc.

NaI Gamma Spectroscopy Report

ID(3): HMI Sample Location #1, 5 to 6 ft.
File: HMI #1 5-6.ANS LT: 3,600.00 RT: 3,702.39
Bias: 953 Coarse Gain: 2 Fine Gain: 1.07



ROI #	ID	ASSOCIATED NUCLIDE	CENTER (??)	GROSS (cnts)	NET (cnts)	FWHM (??)	FWHM (%)
1	Ra226@ 186.1	Ra226	191.7	349395 ± 591	6161 ± 1191	11.33	5.91
2	Pb212@ 238.6	Pb212	244.0	1610874 ± 1269	729880 ± 2815	22.73	9.32
3	Pb214@ 295.2	Pb214	301.1	673416 ± 821	12605 ± 2464	5.43	1.80
4	Pb214@ 351.9	Pb214	354.5	684803 ± 828	172278 ± 2205	34.13	9.63
5	Ac228@ 463.0	Ac228	470.3	223517 ± 473	15297 ± 1313	25.24	5.37
6	Tl208@ 510.8	Tl208	520.3	236176 ± 486	26046 ± 1320	27.48	5.28
7	Bi212@ 756.4	Bi212	753.0	427372 ± 654	77066 ± 2922	79.05	10.50
8	Ac228@ 939.6	Ac228	938.8	640094 ± 800	307901 ± 3188	98.25	10.47
9	Bi214@1120.3	Bi214	1126.1	156270 ± 395	36546 ± 1605	57.76	5.13
10	Bi214@1764.5	Bi214	1766.7	93512 ± 306	17224 ± 1443	68.21	3.86
11	Tl208@2614.5	Tl208	2607.3	112596 ± 336	64232 ± 1214	105.56	4.05

Radiation Science, Inc.

NaI Gamma Spectroscopy Report

ID: HMI Sample Location #1, 5 to 6 ft.

File: HMI #1 5-6.ANS Date: October 12, 2002 10:27:00
LT: 3,600.00 RT: 3,702.39 DT: 2.8 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226 1.600E+03 Y A — Activity = 13.982 ± 2.774 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
191.7	3.50	191.73	349,395 ± 591	6,231 ± 1,174	Ra226@ 186.1	13.982

Pb212 10.640 H B- — Activity = 149.7 ± 9.954 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
244.5	43.30	243.99	1,610,874 ± 1,269	728,951 ± 2,790	Pb212@ 238.6	149.7

Pb214 26.800 M B- — Activity = 53.85 ± 4.789 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
296.9	18.50	301.06	673,416 ± 821	13,144 ± 2,440	Pb214@ 295.2	7.270
357.3	35.80	354.51	684,803 ± 828	173,075 ± 2,186	Pb214@ 351.9	57.02

Ac228 6.150 H B- — Activity = 74.56 ± 7.763 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
470.6	4.44	470.26	223,517 ± 473	15,519 ± 1,296	Ac228@ 463.0	53.66
940.5	117.13	938.79	640,094 ± 800	309,330 ± 3,147	Ac228@ 939.6	77.10

Tl208 3.053 M B- — Activity = 12.984 ± 1.127 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
522.3	22.60	520.26	236,176 ± 486	26,862 ± 1,304	Tl208@ 510.8	20.218
2604.9	99.16	2607.28	112,596 ± 336	65,685 ± 1,204	Tl208@2614.5	10.253

Bi212 60.550 M B- — Activity = 125.0 ± 15.715 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
758.0	15.36	753.03	427,372 ± 654	77,047 ± 2,883	Bi212@ 756.4	125.0

Bi214 19.900 M B- — Activity = 51.45 ± 9.139 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1124.4	16.44	1126.11	156,270 ± 395	36,911 ± 1,576	Bi214@1120.3	67.91
1769.2	20.28	1766.70	93,512 ± 306	17,599 ± 1,425	Bi214@1764.5	20.248

Radiation Science, Inc.

NaI Gamma Spectroscopy Report

ID: HMI Sample Location #1, 5 to 6 ft.

File: HMI #1 5-6.ANS Date: October 12, 2002 10:27:00
LT: 3,600.00 RT: 3,702.39 DT: 2.8 %

Calibrations:

Energy = -4.972E+00 +2.962E+00 * Ch +3.984E-04 * Ch^2 (keV)
Efficiency = (Det. Model) * (C1 + C2*Log(E) + C3*Log(E)^2 + C4*Log(E)^3)
where Detector Model = A*Exp((-T1*U1-T2*U2-T3*U3-T4*U4-DL*U5) / Cos(AI))*
(1-Exp(-DI*U5/Cos(AI)))

and E is Energy in keV

C1:	-7.360E+00
C2:	4.368E+00
C3:	-7.941E-01
C4:	4.609E-02

where the Ui are the appropriate linear mass absorption coefficients and

Geometry Factor (A):	0.373	Al Window (T1):	508.000 um
Detector Thickness (DI)	7.620 cm		
Detector Dead Layer (DL):	0.000 um		
Det. Incident Angle (AI):	0.000 deg		

Additional Detector Parameters

Detector ID:	ANS SD30X30		
Detector Material:	NaI Scintillation		
		Detector Shape:	Planar
Detector Diameter:	7.620 cm	Source Dist.:	1.000 cm

Resolution = 1.035E+01 +4.669E-02 * E +-9.237E-06 * E^2
FWHM at 661.66 keV = 37.20 keV

Library Natural.mdb

Library efficiencies were ignored

ROI ID	Ra226@ 186.1	Pb212@ 238.6	Pb214@ 295.2	Pb214@ 351.9	Ac228@ 463.0
Center (chan)	65.82	83.11	101.91	119.44	157.11
Start Channel	63	77	96	114	151
End Channel	69	91	110	129	164
Center (keV)	191.73	243.99	301.06	354.51	470.26
Centroid (keV)	191.61	244.46	296.81	357.26	470.70
Peak (keV)	192.27	243.64	292.20	350.12	469.92
FWHM (keV)	11.33	22.73	5.43	34.13	25.24
2nd Moment	167.79	27.31	1276.63	71.99	233.35
3rd Moment	-136.47	5.08	6535.86	115.29	-452.27
Gross Counts	349,395	1,610,874	673,416	684,803	223,517
sigma	± 591	± 1,269	± 821	± 828	± 473
Amb. BKG	9,916	16,753	13,179	10,133	5,675
sigma	± 100	± 129	± 115	± 101	± 75
Continuum	333,318	864,241	647,632	502,392	202,545
sigma	± 1,029	± 2,509	± 2,320	± 2,042	± 1,222
NetCounts	6,161	729,880	12,605	172,278	15,297
sigma	± 1,191	± 2,815	± 2,464	± 2,205	± 1,313
Activity (pCi/gm)	13.825	149.9	6.972	56.76	52.89
sigma	± 2.807	± 9.967	± 1.470	± 5.091	± 7.767
MDA (pCi/gm)	6.030	0.888	2.071	1.087	7.245
Nuclide	Ra226	Pb212	Pb214	Pb214	Ac228
Correlation	0.000	0.000	0.000	0.000	0.000

Analysis Report by Line

Lib Matches	1	1	1	1	1
Finder Integ.	0	0	0	0	0
Finder Power	0	0	0	0	0
Efficiency (%)	13.024	11.439	9.909	8.604	6.633
sigma	± 0.000	± 0.000	± 0.000	± 0.000	± 0.000
Intensity	3.50	43.30	18.50	35.80	4.44
sigma	±5.00E-02	± 0.400	± 0.300	± 0.500	± 0.110
E Window	18.57	21.57	24.74	27.85	33.93

ROI ID	Tl208@ 510.8	Bi212@ 756.4	Ac228@ 939.6	Bi214@1120.3	Bi214@1764.5
Center (chan)	173.27	247.64	306.00	364.01	556.44
Start Channel	168	232	280	346	533
End Channel	181	275	335	385	584
Center (keV)	520.26	753.03	938.79	1126.11	1766.70
Centroid (keV)	522.36	758.04	940.51	1124.21	1769.42
Peak (keV)	519.42	735.23	922.76	1122.82	1761.80
FWHM (keV)	27.48	79.05	98.25	57.76	68.21
2nd Moment	141.37	919.90	408.22	476.01	1032.48
3rd Moment	189.59	8836.40	-1257.12	1421.26	-132.51
Gross Counts	236,176	427,372	640,094	156,270	93,512
sigma	± 486	± 654	± 800	± 395	± 306
Amb. BKG	5,877	9,746	10,333	4,889	2,313
sigma	± 77	± 99	± 102	± 70	± 48
Continuum	204,253	340,560	321,860	114,836	73,976
sigma	± 1,225	± 2,846	± 3,084	± 1,554	± 1,409
NetCounts	26,046	77,066	307,901	36,546	17,224
sigma	± 1,320	± 2,922	± 3,188	± 1,605	± 1,443
Activity (pCi/gm)	19.603	125.0	76.75	67.24	19.817
sigma	± 2.650	± 15.737	± 8.617	± 13.742	± 3.108
MDA (pCi/gm)	1.584	4.407	0.658	2.904	1.458
Nuclide	Tl208	Bi212	Ac228	Bi214	Bi214
Correlation	0.000	0.000	0.000	0.000	0.000
Lib Matches	1	3	5	2	3
Finder Integ.	0	0	0	0	0
Finder Power	0	0	0	0	0
Efficiency (%)	5.936	4.041	3.551	3.431	4.460
sigma	± 0.000	± 0.000	± 0.000	± 0.000	± 0.000
Intensity	22.60	15.36	117.13	16.44	20.28
sigma	± 0.300	±9.27E-02	± 1.157	± 0.204	± 0.213
E Window	36.82	50.44	59.90	70.20	105.55

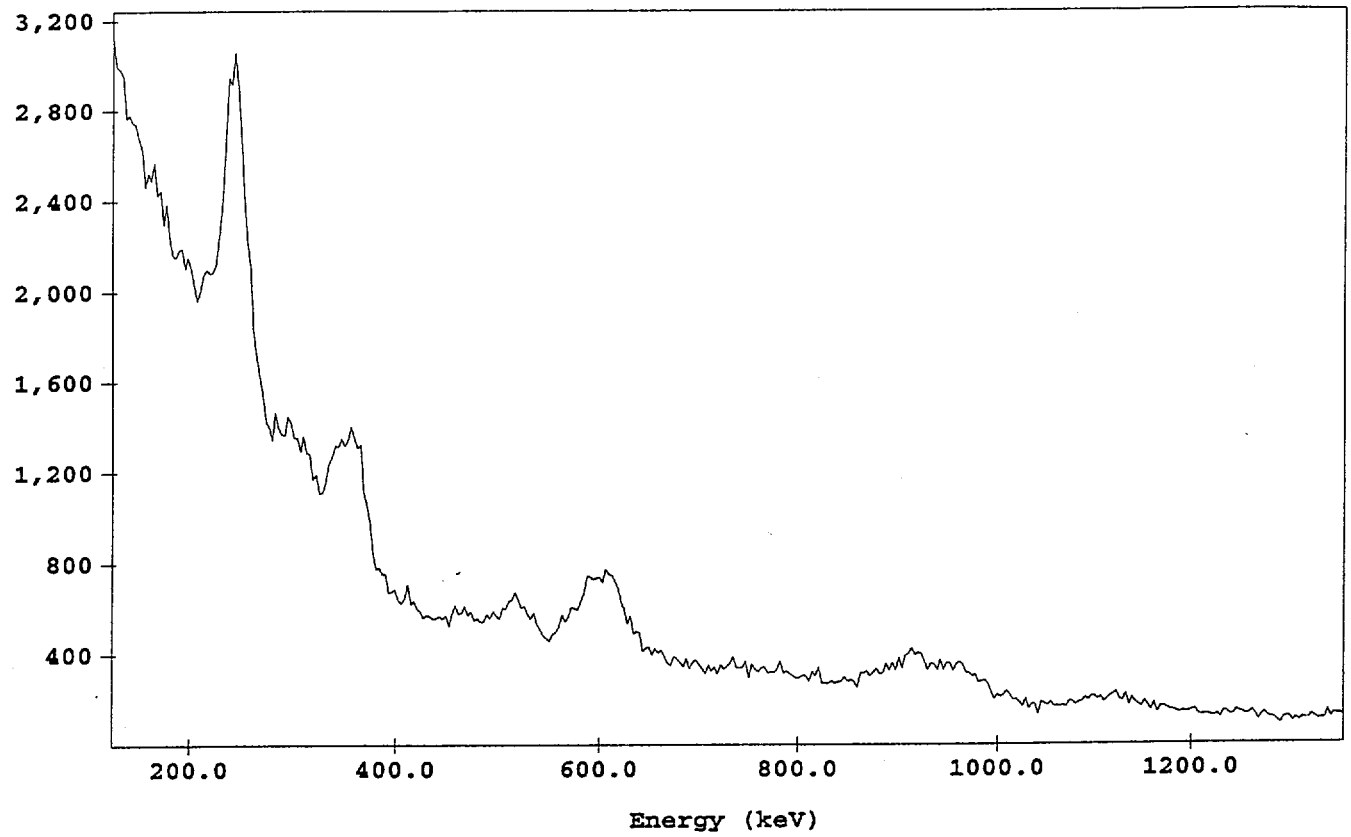
ROI ID	Tl208@2614.5
Center (chan)	796.52
Start Channel	767
End Channel	823
Center (keV)	2607.28
Centroid (keV)	2605.29
Peak (keV)	2609.02
FWHM (keV)	105.56
2nd Moment	321.38
3rd Moment	-1211.05
Gross Counts	112,596
sigma	± 336
Amb. BKG	2,223
sigma	± 47
Continuum	46,142

sigma	±	1,166
NetCounts		64,232
sigma	±	1,214
Activity (pCi/gm)		10.026
sigma	±	1.140
MDA (pCi/gm)		0.156
Nuclide		Tl208
Correlation		0.000
Lib Matches		1
Finder Integ.		0
Finder Power		0
Efficiency (%)		6.668
sigma	±	0.000
Intensity		99.16
sigma	±	0.000
E Window		151.10

Radiation Science, Inc.

NaI Gamma Spectroscopy Report

ID(3): HMI Sample Location #1, 6 to 7 ft.
File: HMI #1 6-7.ANS LT: 3,600.00 RT: 3,603.79
Bias: 953 Coarse Gain: 2 Fine Gain: 1.07



ROI #	ID	ASSOCIATED NUCLIDE	CENTER (??)	GROSS (cnts)	NET (cnts)	FWHM (??)	FWHM (%)
1	Ra226@ 186.1	Ra226	190.8	12955 ± 114	-159 ± 303	0.80	0.42
2	Pb212@ 238.6	Pb212	243.5	34235 ± 185	9152 ± 597	20.49	8.41
3	Pb214@ 295.2	Pb214	302.4	21211 ± 146	568 ± 544	7.67	2.54
4	Pb214@ 351.9	Pb214	356.7	18852 ± 137	2127 ± 481	30.88	8.66
5	Ac228@ 463.0	Ac228	464.2	7998 ± 89	-29 ± 326	3.37	0.73
6	Tl208@ 510.8	Tl208	518.3	8259 ± 91	261 ± 316	20.22	3.90
7	Bi212@ 756.4	Bi212	765.5	14477 ± 120	-196 ± 758	3.69	0.48
8	Ac228@ 939.6	Ac228	931.0	17229 ± 131	3592 ± 787	24.64	2.65
9	Bi214@1120.3	Bi214	1118.1	7100 ± 84	729 ± 466	16.63	1.49
10	Bi214@1764.5	Bi214	1751.7	3618 ± 60	540 ± 353	4.29	0.24
11	Tl208@2614.5	Tl208	2572.2	3465 ± 59	531 ± 278	96.42	3.75

Radiation Science, Inc.

NaI Gamma Spectroscopy Report

ID: HMI Sample Location #1, 6 to 7 ft.

File: HMI #1 6-7.ANS Date: October 12, 2002 11:39:32
LT: 3,600.00 RT: 3,603.79 DT: 0.1 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226 1.600E+03 Y A — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
190.8	3.50	190.76	12,955 ± 114	0 ± 228	Ra226@ 186.1	

Pb212 10.640 H B- — Activity = 3.185 ± 0.278 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
244.2	43.30	243.54	34,235 ± 185	8,223 ± 465	Pb212@ 238.6	3.185

Pb214 26.800 M B- — Activity = 1.649 ± 0.243 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
302.2	18.50	302.40	21,211 ± 146	1,107 ± 427	Pb214@ 295.2	1.155
357.3	35.80	356.69	18,852 ± 137	2,924 ± 382	Pb214@ 351.9	1.817

Ac228 6.150 H B- — Activity = 2.360 ± 0.386 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
462.9	4.44	464.20	7,998 ± 89	193 ± 250	Ac228@ 463.0	1.258
938.5	117.13	930.98	17,229 ± 131	5,021 ± 599	Ac228@ 939.6	2.360

Tl208 3.053 M B- — Activity = 0.886 ± 0.149 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
521.1	22.60	518.25	8,259 ± 91	1,077 ± 242	Tl208@ 510.8	1.529
2577.5	99.16	2572.17	3,465 ± 59	1,841 ± 221	Tl208@2614.5	0.542

Bi212 60.550 M B- — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
770.0	15.36	765.45	14,477 ± 120	0 ± 587	Bi212@ 756.4	

Bi214 19.900 M B- — Activity = 2.850 ± 0.764 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1120.4	16.44	1118.13	7,100 ± 84	1,094 ± 352	Bi214@1120.3	3.796
1744.2	20.28	1751.71	3,618 ± 60	915 ± 269	Bi214@1764.5	1.985

Radiation Science, Inc.

NaI Gamma Spectroscopy Report

ID: HMI Sample Location #1, 6 to 7 ft.

File: HMI #1 6-7.ANS Date: October 12, 2002 11:39:32
LT: 3,600.00 RT: 3,603.79 DT: 0.1 %

Calibrations:

Energy = -4.972E+00 +2.962E+00 * Ch +3.984E-04 * Ch^2 (keV)
Efficiency = (Det. Model) * (C1 + C2*Log(E) + C3*Log(E)^2 + C4*Log(E)^3)
where Detector Model = A*Exp((-T1*U1-T2*U2-T3*U3-T4*U4-DL*U5) / Cos(AI))*
(1-Exp(-DI*U5/Cos(AI)))

and E is Energy in keV

C1:	-7.360E+00
C2:	4.368E+00
C3:	-7.941E-01
C4:	4.609E-02

where the Ui are the appropriate linear mass absorption coefficients and

Geometry Factor (A):	0.373	Al Window (T1):	508.000 um
Detector Thickness (DI)	7.620 cm		
Detector Dead Layer (DL):	0.000 um		
Det. Incident Angle (AI):	0.000 deg		

Additional Detector Parameters

Detector ID:	ANS SD30X30		
Detector Material:	NaI Scintillation		
		Detector Shape:	Planar
Detector Diameter:	7.620 cm	Source Dist.:	1.000 cm

Resolution = 1.035E+01 +4.669E-02 * E +-9.237E-06 * E^2
FWHM at 661.66 keV = 37.20 keV

Library Natural.mdb

Library efficiencies were ignored

ROI ID	Ra226@ 186.1	Pb212@ 238.6	Pb214@ 295.2	Pb214@ 351.9	Ac228@ 463.0
Center (chan)	65.50	82.97	102.35	120.15	155.15
Start Channel	63	77	96	114	151
End Channel	69	91	110	129	164
Center (keV)	190.76	243.54	302.40	356.69	464.20
Centroid (keV)	190.76	244.72	305.07	353.62	468.38
Peak (keV)	198.30	243.64	295.24	356.24	466.83
FWHM (keV)	0.80	20.49	7.67	30.88	3.37
2nd Moment	-236.86	52.68	806.88	193.03	-4409.71
3rd Moment	1.98	-3.22	-2124.09	1007.78	39.27
Gross Counts	12,955	34,235	21,211	18,852	7,998
sigma	± 114	± 185	± 146	± 137	± 89
Amb. BKG	9,916	16,753	13,179	10,133	5,675
sigma	± 100	± 129	± 115	± 101	± 75
Continuum	3,198	8,330	7,464	6,592	2,352
sigma	± 262	± 553	± 512	± 450	± 305
NetCounts	-159	9,152	568	2,127	-29
sigma	± 303	± 597	± 544	± 481	± 326
Activity (pCi/gm)	-0.673	3.545	0.592	1.322	-0.189
sigma	± 1.281	± 0.330	± 0.570	± 0.321	± 2.128
MDA (pCi/gm)	1.124	0.165	0.422	0.236	1.488
Nuclide	Ra226	Pb212	Pb214	Pb214	Ac228
Correlation	0.000	0.000	0.000	0.000	0.000

Analysis Report by Line

Lib Matches	1	1	1	1	1
Finder Integ.	0	0	0	0	0
Finder Power	0	0	0	0	0
Efficiency (%)	13.024	11.439	9.909	8.604	6.633
sigma	± 0.000	± 0.000	± 0.000	± 0.000	± 0.000
Intensity	3.50	43.30	18.50	35.80	4.44
sigma	±5.00E-02	± 0.400	± 0.300	± 0.500	± 0.110
E Window	18.57	21.57	24.74	27.85	33.93

ROI ID	Tl208@ 510.8	Bi212@ 756.4	Ac228@ 939.6	Bi214@1120.3	Bi214@1764.5
Center (chan)	172.62	251.57	303.57	361.56	552.03
Start Channel	168	232	280	346	533
End Channel	181	275	335	385	584
Center (keV)	518.25	765.45	930.98	1118.13	1751.71
Centroid (keV)	522.02	769.98	937.40	1109.57	1734.26
Peak (keV)	516.32	747.85	900.37	1132.58	1761.80
FWHM (keV)	20.22	3.69	24.64	16.63	4.29
2nd Moment	496.10	-12119.27	1073.82	1402.61	1861.61
3rd Moment	744.14	17629.14	-1067.28	20528.23	43992.98
Gross Counts	8,259	14,477	17,229	7,100	3,618
sigma	± 91	± 120	± 131	± 84	± 60
Amb. BKG	5,877	9,746	10,333	4,889	2,313
sigma	± 77	± 99	± 102	± 70	± 48
Continuum	2,121	4,928	3,304	1,482	765
sigma	± 293	± 742	± 769	± 453	± 344
NetCounts	261	-196	3,592	729	540
sigma	± 316	± 758	± 787	± 466	± 353
Activity (pCi/gm)	0.370	-0.601	1.689	2.530	1.172
sigma	± 0.451	± 2.321	± 0.415	± 1.695	± 0.781
MDA (pCi/gm)	0.308	1.007	0.127	0.631	0.285
Nuclide	Tl208	Bi212	Ac228	Bi214	Bi214
Correlation	0.000	0.000	0.000	0.000	0.000
Lib Matches	1	3	5	2	3
Finder Integ.	0	0	0	0	0
Finder Power	0	0	0	0	0
Efficiency (%)	5.936	4.041	3.551	3.431	4.460
sigma	± 0.000	± 0.000	± 0.000	± 0.000	± 0.000
Intensity	22.60	15.36	117.13	16.44	20.28
sigma	± 0.300	±9.27E-02	± 1.157	± 0.204	± 0.213
E Window	36.82	50.44	59.90	70.20	105.55

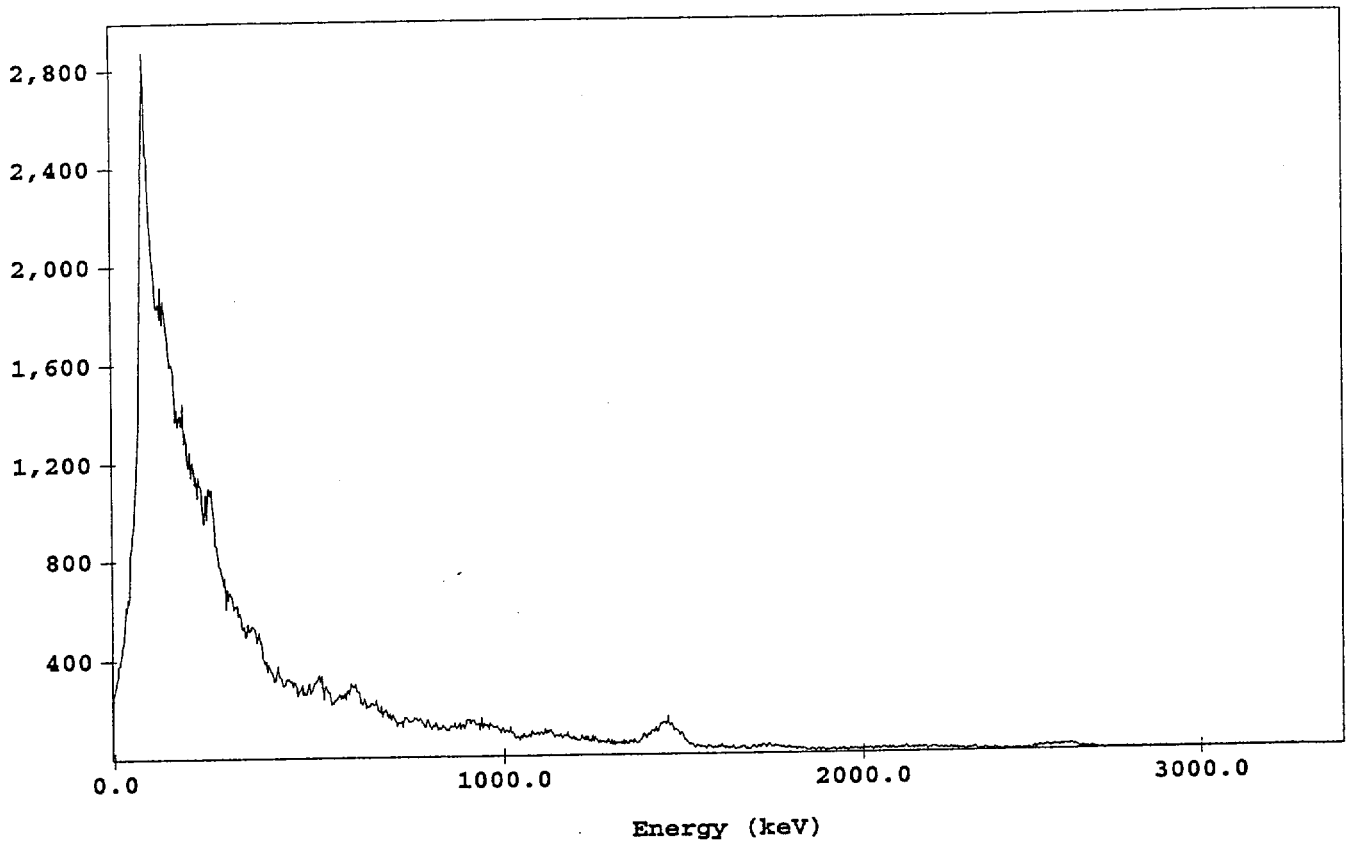
ROI ID	Tl208@2614.5
Center (chan)	786.74
Start Channel	764
End Channel	820
Center (keV)	2572.17
Centroid (keV)	2539.26
Peak (keV)	2551.57
FWHM (keV)	96.42
2nd Moment	1806.16
3rd Moment	45498.98
Gross Counts	3,465
sigma	± 59
Amb. BKG	2,234
sigma	± 47
Continuum	700

sigma	±	267
NetCounts		531
sigma	±	278
Activity (pCi/gm)		0.156
sigma	±	8.36E-02
MDA (pCi/gm)		3.70E-02
Nuclide		Tl208
Correlation		0.000
Lib Matches		1
Finder Integ.		0
Finder Power		0
Efficiency (%)		6.639
sigma	±	0.000
Intensity		99.16
sigma	±	0.000
E Window		150.51

Radiation Science, Inc.

NaI Gamma Spectroscopy Report

ID(2): HMI Sample Location #1, 7 to 8 ft.
File: HMI #1 7-8.ANS
Bias: 953
Coarse Gain: 2
LT: 3,600.00
Fine Gain: 1.07
RT: 3,601.78



ROI #	ID	ASSOCIATED NUCLIDE	CENTER (??)	GROSS (cnts)	NET (cnts)	FWHM (??)	FWHM (%)
1	Ra226@ 186.1	Ra226	190.8	7144 ± 85	-123 ± 261	0.07	0.04
2	Pb212@ 238.6	Pb212	241.6	13415 ± 116	2374 ± 488	17.04	7.05
3	Pb214@ 295.2	Pb214	302.8	9683 ± 98	-632 ± 450	4.51	1.49
4	Pb214@ 351.9	Pb214	353.4	7476 ± 86	-737 ± 389	11.04	3.12
5	Ac228@ 463.0	Ac228	468.4	3904 ± 62	-679 ± 280	1.03	0.22
6	Tl208@ 510.8	Tl208	515.6	4132 ± 64	-177 ± 264	17.88	3.47
7	Bi212@ 756.4	Bi212	776.3	6266 ± 79	-420 ± 622	6.60	0.85
8	Ac228@ 939.6	Ac228	933.1	6721 ± 82	84 ± 642	4.17	0.45
9	Bi214@1120.3	Bi214	1112.8	3305 ± 57	-83 ± 394	5.18	0.47
10	Bi214@1764.5	Bi214	1740.1	1215 ± 35	-104 ± 278	14.23	0.82
11	Tl208@2614.5	Tl208	2576.6	818 ± 29	-1177 ± 201	39.01	1.51

Radiation Science, Inc.

NaI Gamma Spectroscopy Report

ID: HMI Sample Location #1, 7 to 8 ft.

File: HMI #1 7-8.ANS Date: October 19, 2002 15:59:44
LT: 3,600.00 RT: 3,601.78 DT: 0.0 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226 1.600E+03 Y A — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
190.8	3.50	190.76	7,144 ± 85	-123 ± 261	Ra226@ 186.1	-0.336

Pb212 10.640 H B- — Activity = 0.594 ± 0.128 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
244.3	43.30	241.57	13,415 ± 116	2,374 ± 488	Pb212@ 238.6	0.594

Pb214 26.800 M B- — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
302.8	18.50	302.84	9,683 ± 98	-632 ± 450	Pb214@ 295.2	-0.426
360.8	35.80	353.37	7,476 ± 86	-737 ± 389	Pb214@ 351.9	-0.296

Ac228 6.150 H B- — Activity = 2.55E-02 ± 0.195 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
468.4	4.44	468.38	3,904 ± 62	-679 ± 280	Ac228@ 463.0	-2.861
942.4	117.13	933.12	6,721 ± 82	84 ± 642	Ac228@ 939.6	2.55E-02

Tl208 3.053 M B- — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
524.1	22.60	515.64	4,132 ± 64	-177 ± 264	Tl208@ 510.8	-0.162
2598.2	99.16	2576.63	818 ± 29	-1,177 ± 201	Tl208@2614.5	-0.224

Bi212 60.550 M B- — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
770.0	15.36	776.28	6,266 ± 79	-420 ± 622	Bi212@ 756.4	-0.831

Bi214 19.900 M B- — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1129.3	16.44	1112.75	3,305 ± 57	-83 ± 394	Bi214@1120.3	-0.185
1772.0	20.28	1740.10	1,215 ± 35	-104 ± 278	Bi214@1764.5	-0.145

Radiation Science, Inc.

NaI Gamma Spectroscopy Report

ID: HMI Sample Location #1, 7 to 8 ft.

File: HMI #1 7-8.ANS Date: October 19, 2002 15:59:44
LT: 3,600.00 RT: 3,601.78 DT: 0.0 %

Calibrations:

Energy = -4.972E+00 +2.962E+00 * Ch +3.984E-04 * Ch^2 (keV)
Efficiency = (Det. Model) * (C1 + C2*Log(E) + C3*Log(E)^2 + C4*Log(E)^3)
where Detector Model = A*Exp((-T1*U1-T2*U2-T3*U3-T4*U4-DL*U5) / Cos(AI))*
(1-Exp(-DI*U5/Cos(AI)))

and E is Energy in keV

C1:	-7.360E+00
C2:	4.368E+00
C3:	-7.941E-01
C4:	4.609E-02

where the Ui are the appropriate linear mass absorption coefficients and

Geometry Factor (A):	0.373	Al Window (T1):	508.000 um
Detector Thickness (DI)	7.620 cm		
Detector Dead Layer (DL):	0.000 um		
Det. Incident Angle (AI):	0.000 deg		

Additional Detector Parameters

Detector ID:	ANS SD30X30		
Detector Material:	NaI Scintillation		
		Detector Shape:	Planar
Detector Diameter:	7.620 cm	Source Dist.:	1.000 cm

Resolution = 1.035E+01 +4.669E-02 * E +-9.237E-06 * E^2
FWHM at 661.66 keV = 37.20 keV

Library Natural.mdb

Library efficiencies were ignored

ROI ID	Ra226@ 186.1	Pb212@ 238.6	Pb214@ 295.2	Pb214@ 351.9	Ac228@ 463.0
Center (chan)	65.50	82.32	102.50	119.06	156.50
Start Channel	63	77	96	114	151
End Channel	69	91	110	129	164
Center (keV)	190.76	241.57	302.84	353.37	468.38
Centroid (keV)	190.76	244.33	302.84	360.82	468.38
Peak (keV)	198.30	243.64	322.65	350.12	469.92
FWHM (keV)	0.07	17.04	4.51	11.04	1.03
2nd Moment	-168.94	86.17	-319.14	-208.40	-95.14
3rd Moment	0.34	17.75	167.85	197.44	20.10
Gross Counts	7,144	13,415	9,683	7,476	3,904
sigma	± 85	± 116	± 98	± 86	± 62
Amb. BKG	9,916	16,753	13,179	10,133	5,675
sigma	± 100	± 129	± 115	± 101	± 75
Continuum	-2,649	-5,712	-2,864	-1,920	-1,092
sigma	± 226	± 456	± 423	± 366	± 262
NetCounts	-123	2,374	-632	-737	-679
sigma	± 261	± 488	± 450	± 389	± 280
Activity (pCi/gm)	-0.336	0.594	-0.426	-0.296	-2.861
sigma	± 0.715	± 0.128	± 0.305	± 0.159	± 1.227
MDA (pCi/gm)	7.41E-03	6.78E-04	1.83E-03	1.09E-03	1.14E-02
Nuclide	Ra226	Pb212	Pb214	Pb214	Ac228
Correlation	0.000	0.000	0.000	0.000	0.000

Analysis Report by Line

Lib Matches	1	1	1	1	1
Finder Integ.	0	0	0	0	0
Finder Power	0	0	0	0	0
Efficiency (%)	13.024	11.439	9.909	8.604	6.633
sigma	± 0.000	± 0.000	± 0.000	± 0.000	± 0.000
Intensity	3.50	43.30	18.50	35.80	4.44
sigma	±5.00E-02	± 0.400	± 0.300	± 0.500	± 0.110
E Window	18.57	21.57	24.74	27.85	33.93

ROI ID	Tl208@ 510.8	Bi212@ 756.4	Ac228@ 939.6	Bi214@1120.3	Bi214@1764.5
Center (chan)	171.78	254.99	304.23	359.90	548.62
Start Channel	168	232	280	346	533
End Channel	181	275	335	385	584
Center (keV)	515.64	776.28	933.12	1112.75	1740.10
Centroid (keV)	524.07	769.98	942.44	1129.33	1772.02
Peak (keV)	538.04	795.32	900.37	1109.83	1734.59
FWHM (keV)	17.88	6.60	4.17	5.18	14.23
2nd Moment	-372.90	-2456.40	19542.47	-4847.20	-2358.54
3rd Moment	126.11	4710.95	-81808.33	7152.68	13557.52
Gross Counts	4,132	6,266	6,721	3,305	1,215
sigma	± 64	± 79	± 82	± 57	± 35
Amb. BKG	5,877	9,746	10,333	4,889	2,313
sigma	± 77	± 99	± 102	± 70	± 48
Continuum	-1,568	-3,060	-3,696	-1,502	-995
sigma	± 245	± 609	± 629	± 384	± 271
NetCounts	-177	-420	84	-83	-104
sigma	± 264	± 622	± 642	± 394	± 278
Activity (pCi/gm)	-0.162	-0.831	2.55E-02	-0.185	-0.145
sigma	± 0.243	± 1.234	± 0.195	± 0.885	± 0.390
MDA (pCi/gm)	2.49E-03	5.36E-03	8.23E-04	6.08E-03	3.80E-03
Nuclide	Tl208	Bi212	Ac228	Bi214	Bi214
Correlation	0.000	0.000	0.000	0.000	0.000
Lib Matches	1	3	5	2	3
Finder Integ.	0	0	0	0	0
Finder Power	0	0	0	0	0
Efficiency (%)	5.936	4.041	3.551	3.431	4.460
sigma	± 0.000	± 0.000	± 0.000	± 0.000	± 0.000
Intensity	22.60	15.36	117.13	16.44	20.28
sigma	± 0.300	±9.27E-02	± 1.157	± 0.204	± 0.213
E Window	36.82	50.44	59.90	70.20	105.55

ROI ID	Tl208@2614.5
Center (chan)	787.99
Start Channel	767
End Channel	823
Center (keV)	2576.63
Centroid (keV)	2598.24
Peak (keV)	2666.68
FWHM (keV)	39.01
2nd Moment	-144.86
3rd Moment	1185.68
Gross Counts	818
sigma	± 29
Amb. BKG	2,223
sigma	± 47
Continuum	-228

sigma	±	193
NetCounts		-1,177
sigma	±	201
Activity (pCi/gm)		-0.224
sigma	±	4.57E-02
MDA (pCi/gm)		5.16E-04
Nuclide		Tl208
Correlation		0.000
Lib Matches		1
Finder Integ.		0
Finder Power		0
Efficiency (%)		6.668
sigma	±	0.000
Intensity		99.16
sigma	±	0.000
E Window		151.10

Radiation Science, Inc.

NaI Gamma Spectroscopy Report

ID: HMI Sample Location #2, 0 to 1 ft.

File: HMI #2 0-1.ANS Date: October 13, 2002 16:00:55
LT: 3,600.00 RT: 3,614.81 DT: 0.4 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226 1.600E+03 Y A — Activity = 12.781 ± 2.048 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
189.9	3.50	188.72	52,064 ± 228	3,020 ± 446	Ra226@ 186.1	12.781

Pb212 10.640 H B- — Activity = 28.140 ± 1.906 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
242.8	43.30	241.70	185,339 ± 431	72,646 ± 987	Pb212@ 238.6	28.140

Pb214 26.800 M B- — Activity = 18.210 ± 1.404 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
297.8	18.50	298.29	97,571 ± 312	12,521 ± 858	Pb214@ 295.2	13.060
357.8	35.80	355.39	106,662 ± 327	32,430 ± 837	Pb214@ 351.9	20.150

Ac228 6.150 H B- — Activity = 14.869 ± 1.542 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
469.1	4.44	466.88	29,618 ± 172	2,619 ± 468	Ac228@ 463.0	17.078
933.5	117.13	930.37	75,441 ± 275	30,641 ± 1,153	Ac228@ 939.6	14.404

Tl208 3.053 M B- — Activity = 2.612 ± 0.291 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
518.6	22.60	516.53	30,463 ± 175	2,890 ± 473	Tl208@ 510.8	4.102
2587.0	99.16	2582.50	12,256 ± 111	7,155 ± 397	Tl208@2614.5	2.106

Bi212 60.550 M B- — Activity = 27.439 ± 4.645 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
756.8	15.36	755.58	57,342 ± 239	8,967 ± 1,070	Bi212@ 756.4	27.439

Bi214 19.900 M B- — Activity = 13.453 ± 2.578 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1116.6	16.44	1116.63	26,962 ± 164	5,181 ± 672	Bi214@1120.3	17.976
1737.6	20.28	1744.74	16,563 ± 129	3,303 ± 596	Bi214@1764.5	7.167

Radiation Science, Inc.

NaI Gamma Spectroscopy Report

ID: HMI Sample Location #2, 1 to 2 ft.

File: HMI #2 1-2.ANS Date: October 13, 2002 18:32:38
LT: 49,542.99 RT: 49,649.11 DT: 0.2 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226 1.600E+03 Y A — Activity = 3.572 ± 0.769 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
178.4	3.50	180.26	773,638 ± 880	11,617 ± 2,393	Ra226@ 186.1	3.572

Pb212 10.640 H B- — Activity = 13.924 ± 0.927 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
235.0	43.30	235.87	1,275,698 ± 1,129	494,680 ± 2,597	Pb212@ 238.6	13.924

Pb214 26.800 M B- — Activity = 8.325 ± 0.743 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
282.7	18.50	290.25	662,076 ± 814	8,540 ± 2,427	Pb214@ 295.2	0.647
346.2	35.80	344.52	695,328 ± 834	191,372 ± 2,231	Pb214@ 351.9	8.640

Ac228 6.150 H B- — Activity = 6.373 ± 0.704 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
455.7	4.44	460.24	219,405 ± 468	3,140 ± 1,317	Ac228@ 463.0	1.488
911.5	118.81	907.81	538,333 ± 734	195,109 ± 3,186	Ac228@ 939.6	6.564

Tl208 3.053 M B- — Activity = 1.341 ± 0.133 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
507.7	22.60	508.50	239,068 ± 489	13,828 ± 1,389	Tl208@ 510.8	1.426
2514.5	99.16	2511.37	97,297 ± 312	61,986 ± 1,067	Tl208@2614.5	1.326

Bi212 60.550 M B- — Activity = 5.257 ± 0.922 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
728.0	15.36	735.77	411,946 ± 642	23,641 ± 3,025	Bi212@ 756.4	5.257

Bi214 19.900 M B- — Activity = 5.455 ± 0.795 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1089.3	16.44	1088.59	191,733 ± 438	28,328 ± 1,882	Bi214@1120.3	7.142
1703.2	19.38	1701.67	103,842 ± 322	23,058 ± 1,471	Bi214@1764.5	3.835

Radiation Science, Inc.

NaI Gamma Spectroscopy Report

ID: HMI Sample Location #2, 2 to 3 ft.

File: HMI #2 2-3.ANS Date: October 14, 2002 08:34:14
LT: 3,600.00 RT: 3,602.57 DT: 0.1 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226 1.600E+03 Y A — Activity = 1.280 ± 1.003 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
188.4	3.50	190.76	9,798 ± 99	356 ± 278	Ra226@ 186.1	1.280

Pb212 10.640 H B- — Activity = 0.421 ± 0.177 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
246.6	43.30	240.67	17,985 ± 134	1,281 ± 531	Pb212@ 238.6	0.421

Pb214 26.800 M B- — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
302.8	18.50	304.72	13,459 ± 116	-232 ± 483	Pb214@ 295.2	-0.206
360.8	35.80	353.17	10,625 ± 103	-132 ± 418	Pb214@ 351.9	-6.97E-02

Ac228 6.150 H B- — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
468.4	4.44	468.38	5,687 ± 75	-422 ± 301	Ac228@ 463.0	-2.337
940.4	117.13	941.44	10,470 ± 102	-899 ± 741	Ac228@ 939.6	-0.359

Tl208 3.053 M B- — Activity = 1.25E-02 ± 5.50E-02 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
524.1	22.60	519.88	6,105 ± 78	-157 ± 292	Tl208@ 510.8	-0.189
2598.2	99.16	2590.95	2,273 ± 48	50 ± 220	Tl208@2614.5	1.25E-02

Bi212 60.550 M B- — Activity = 0.448 ± 1.767 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
770.0	15.36	784.05	10,031 ± 100	173 ± 680	Bi212@ 756.4	0.448

Bi214 19.900 M B- — Activity = 0.488 ± 1.280 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1099.0	16.44	1132.11	5,113 ± 72	166 ± 433	Bi214@1120.3	0.488
1772.0	20.28	1758.35	2,320 ± 48	-325 ± 335	Bi214@1764.5	-0.598

Radiation Science, Inc.

NaI Gamma Spectroscopy Report

ID: HMI Sample Location #2, 3 to 4 ft.

File: HMI #2 3-4.ANS Date: October 14, 2002 09:42:16
LT: 3,600.00 RT: 3,602.65 DT: 0.1 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226 1.600E+03 Y A — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
190.8	3.50	190.76	9,749 ± 99	-59 ± 280	Ra226@ 186.1	-0.208

Pb212 10.640 H B- — Activity = 0.436 ± 0.175 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
250.2	43.30	243.80	18,678 ± 137	1,351 ± 536	Pb212@ 238.6	0.436

Pb214 26.800 M B- — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
305.1	18.50	302.84	14,040 ± 118	61 ± 486	Pb214@ 295.2	5.30E-02
360.8	35.80	357.27	11,222 ± 106	-47 ± 424	Pb214@ 351.9	-2.43E-02

Ac228 6.150 H B- — Activity = 0.560 ± 1.624 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
468.4	4.44	468.38	5,946 ± 77	103 ± 299	Ac228@ 463.0	0.560
940.4	117.13	938.50	11,235 ± 106	-274 ± 744	Ac228@ 939.6	-0.107

Tl208 3.053 M B- — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
524.1	22.60	520.66	6,182 ± 79	-451 ± 297	Tl208@ 510.8	-0.534
2598.2	99.16	2596.60	2,415 ± 49	-64 ± 236	Tl208@2614.5	-1.58E-02

Bi212 60.550 M B- — Activity = 0.639 ± 1.739 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
804.3	15.36	769.98	10,199 ± 101	251 ± 681	Bi212@ 756.4	0.639

Bi214 19.900 M B- — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1129.3	16.44	1131.98	5,223 ± 72	-895 ± 459	Bi214@1120.3	-2.587
1772.0	20.28	1774.81	2,434 ± 49	-491 ± 345	Bi214@1764.5	-0.888

Radiation Science, Inc.

MCA2100R / QuantumNaI Report

ID: HMI Sample Location 3, 0 to 1 ft.

File: HMI #3 0-1.ANS Date: October 14, 2002 20:15:10
LT: 3,600.00 RT: 3,674.83 DT: 2.0 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226	1.600E+03 Y	A		Activity = 0.000 ± 0.000 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
190.8	3.50	192.59	232,580 ± 482	1,186 ± 983	Ra226@ 186.1	4.946
Pb212	10.640 H	B-		Activity = 206.5 ± 13.739 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
245.9	43.30	245.85	1,189,963 ± 1,091	541,103 ± 2,425	Pb212@ 238.6	206.5
Pb214	26.800 M	B-		Activity = 74.50 ± 6.641 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
305.0	18.50	304.75	436,061 ± 660	9,752 ± 1,931	Pb214@ 295.2	10.023
358.8	35.80	357.08	490,109 ± 700	129,328 ± 1,859	Pb214@ 351.9	79.18
Ac228	6.150 H	B-		Activity = 156.0 ± 17.724 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
472.5	4.44	472.30	158,161 ± 398	10,810 ± 1,111	Ac228@ 463.0	69.46
946.5	69.22	947.97	478,437 ± 692	213,276 ± 2,850	Ac228@ 939.6	167.3
Tl208	3.053 M	B-		Activity = 16.447 ± 1.466 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
526.0	22.60	524.19	170,031 ± 412	17,134 ± 1,133	Tl208@ 510.8	23.965
2642.8	99.16	2638.33	85,319 ± 292	47,424 ± 1,122	Tl208@2614.5	13.756
Bi212	60.550 M	B-		Activity = 276.2 ± 45.51 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
761.4	7.68	758.06	307,620 ± 555	46,392 ± 2,533	Bi212@ 756.4	276.2
Bi214	19.900 M	B-		Activity = 60.70 ± 11.627 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1134.6	16.44	1137.95	112,439 ± 335	23,322 ± 1,392	Bi214@1120.3	79.74
1788.6	20.28	1787.60	56,385 ± 237	7,864 ± 1,082	Bi214@1764.5	16.814

Radiation Science, Inc.

MCA2100R / QuantumNaI Report

ID: HMI Sample Location #3, 1 to 2 ft.

File: HMI #3 1-2.ANS Date: October 15, 2002 07:41:19
LT: 1,800.00 RT: 1,841.68 DT: 2.3 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226 1.600E+03 Y A — Activity = 17.666 ± 4.847 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
189.2	3.50	188.55	140,962 ± 375	2,813 ± 752	Ra226@ 186.1	17.666

Pb212 10.640 H B- — Activity = 172.1 ± 11.471 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
242.2	43.30	241.22	653,875 ± 809	299,482 ± 1,781	Pb212@ 238.6	172.1

Pb214 26.800 M B- — Activity = 48.60 ± 4.509 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
302.8	18.50	296.21	274,639 ± 524	-2,782 ± 1,588	Pb214@ 295.2	-4.307
354.2	35.80	350.45	269,584 ± 519	52,706 ± 1,422	Pb214@ 351.9	48.60

Ac228 6.150 H B- — Activity = 140.3 ± 15.971 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
468.4	4.44	468.25	92,226 ± 304	6,701 ± 837	Ac228@ 463.0	64.84
933.6	69.22	929.34	259,880 ± 510	126,838 ± 2,007	Ac228@ 939.6	149.8

Tl208 3.053 M B- — Activity = 13.716 ± 1.267 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
518.8	22.60	516.82	95,708 ± 309	9,487 ± 841	Tl208@ 510.8	19.983
2585.7	99.16	2580.44	46,075 ± 215	26,795 ± 762	Tl208@2614.5	11.705

Bi212 60.550 M B- — Activity = 216.6 ± 37.752 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
748.2	7.68	745.51	175,140 ± 418	24,152 ± 1,905	Bi212@ 756.4	216.6

Bi214 19.900 M B- — Activity = 45.80 ± 7.605 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1118.4	16.44	1114.80	63,988 ± 253	11,896 ± 1,049	Bi214@1120.3	61.26
1755.3	20.28	1749.49	38,168 ± 195	8,426 ± 897	Bi214@1764.5	27.131

Radiation Science, Inc.

MCA2100R / QuantumNaI Report

ID: HMI Sample Location #3, 2 to 3 ft.

File: HMI #3 2-3.ANS Date: October 15, 2002 08:15:55
LT: 1,800.00 RT: 1,831.82 DT: 1.7 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226	1.600E+03 Y	A		Activity = 13.182 ± 4.131 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
190.4	3.50	190.11	103,051 ± 321	2,099 ± 645	Ra226@ 186.1	13.182
Pb212	10.640 H	B-		Activity = 130.6 ± 8.713 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
242.4	43.30	241.36	485,047 ± 696	227,232 ± 1,526	Pb212@ 238.6	130.6
Pb214	26.800 M	B-		Activity = 34.224 ± 3.241 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
302.8	18.50	296.21	199,850 ± 447	-5,100 ± 1,366	Pb214@ 295.2	-7.893
353.8	35.80	350.30	196,885 ± 444	37,118 ± 1,222	Pb214@ 351.9	34.224
Ac228	6.150 H	B-		Activity = 104.4 ± 11.896 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
466.1	4.44	466.86	67,497 ± 260	5,142 ± 717	Ac228@ 463.0	49.75
933.8	69.22	928.91	190,964 ± 437	94,434 ± 1,714	Ac228@ 939.6	111.5
Tl208	3.053 M	B-		Activity = 10.487 ± 0.988 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
518.6	22.60	517.49	70,512 ± 266	7,195 ± 722	Tl208@ 510.8	15.155
2583.4	99.16	2579.56	34,605 ± 186	20,683 ± 646	Tl208@2614.5	9.035
Bi212	60.550 M	B-		Activity = 159.6 ± 28.836 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
746.3	7.68	743.76	129,004 ± 359	17,796 ± 1,640	Bi212@ 756.4	159.6
Bi214	19.900 M	B-		Activity = 33.749 ± 5.579 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1113.1	16.44	1114.32	47,026 ± 217	8,721 ± 902	Bi214@1120.3	44.91
1753.7	20.28	1749.26	27,823 ± 167	6,674 ± 758	Bi214@1764.5	21.492

Radiation Science, Inc.

MCA2100R / QuantumNaI Report

ID: HMI Sample Location #3, 3 to 4 ft.

File: HMI #3 3-4.ANS Date: October 15, 2002 08:52:04
LT: 3,600.00 RT: 3,602.77 DT: 0.1 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226 1.600E+03 Y A — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
190.8	3.50	190.76	10,171 ± 101	-120 ± 283	Ra226@ 186.1	-0.385

Pb212 10.640 H B- — Activity = 0.789 ± 0.168 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
244.4	43.30	241.60	20,622 ± 144	2,686 ± 541	Pb212@ 238.6	0.789

Pb214 26.800 M B- — Activity = 0.298 ± 0.203 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
302.8	18.50	302.84	14,715 ± 121	-472 ± 496	Pb214@ 295.2	-0.374
348.9	35.80	358.25	12,165 ± 110	632 ± 428	Pb214@ 351.9	0.298

Ac228 6.150 H B- — Activity = 0.408 ± 0.444 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
468.4	4.44	468.38	6,032 ± 78	-140 ± 303	Ac228@ 463.0	-0.693
906.1	69.22	930.53	11,484 ± 107	675 ± 731	Ac228@ 939.6	0.408

Tl208 3.053 M B- — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
524.1	22.60	515.10	6,267 ± 79	-128 ± 294	Tl208@ 510.8	-0.138
2598.2	99.16	2565.74	2,366 ± 49	-114 ± 236	Tl208@2614.5	-2.54E-02

Bi212 60.550 M B- — Activity = 4.216 ± 3.172 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
742.7	7.68	761.20	10,598 ± 103	920 ± 677	Bi212@ 756.4	4.216

Bi214 19.900 M B- — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1129.3	16.44	1118.33	5,324 ± 73	-92 ± 444	Bi214@1120.3	-0.241
1772.0	20.28	1749.97	2,555 ± 51	-268 ± 342	Bi214@1764.5	-0.441

Radiation Science, Inc.

MCA2100R / QuantumNaI Report

ID: HMI Sample #4, 0 to 1 ft.

File: HMI #4 0-1.ANS Date: October 15, 2002 09:59:24
LT: 1,926.32 RT: 1,948.52 DT: 1.1 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226	1.600E+03 Y	A			Activity = 36.858 ± 4.361 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
184.7	3.50	185.21	88,751 ± 298	5,866 ± 591	Ra226@ 186.1	36.858
Pb212	10.640 H	B-			Activity = 72.53 ± 4.869 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
238.8	43.30	238.74	304,859 ± 552	126,128 ± 1,264	Pb212@ 238.6	72.53
Pb214	26.800 M	B-			Activity = 57.19 ± 4.463 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
294.0	18.50	293.84	170,099 ± 412	22,750 ± 1,144	Pb214@ 295.2	35.229
350.0	35.80	350.92	198,452 ± 445	69,617 ± 1,120	Pb214@ 351.9	64.22
Ac228	6.150 H	B-			Activity = 48.56 ± 5.923 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
464.6	4.44	463.72	47,416 ± 218	1,202 ± 619	Ac228@ 463.0	11.638
922.9	69.22	920.14	116,932 ± 342	43,184 ± 1,490	Ac228@ 939.6	51.03
Tl208	3.053 M	B-			Activity = 5.233 ± 0.549 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
513.8	22.60	513.91	47,568 ± 218	3,465 ± 606	Tl208@ 510.8	7.302
2549.1	99.16	2550.96	17,883 ± 134	10,843 ± 453	Tl208@2614.5	4.739
Bi212	60.550 M	B-			Activity = 111.4 ± 21.393 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
750.9	7.68	751.34	92,053 ± 303	12,416 ± 1,401	Bi212@ 756.4	111.4
Bi214	19.900 M	B-			Activity = 50.53 ± 7.135 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1103.0	16.44	1103.79	45,702 ± 214	12,416 ± 866	Bi214@1120.3	63.96
1723.0	19.38	1724.11	29,689 ± 172	11,270 ± 715	Bi214@1764.5	38.293

Radiation Science, Inc.

MCA2100R / QuantumNaI Report

ID: HMI Sample Location #4, 1 to 2 ft.

File: HMI #4 1-2.ANS Date: October 15, 2002 10:38:20
LT: 3,600.00 RT: 3,611.61 DT: 0.3 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226 1.600E+03 Y A — Activity = 3.409 ± 1.265 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
187.1	3.50	186.93	41,491 ± 204	1,227 ± 449	Ra226@ 186.1	3.409

Pb212 10.640 H B- — Activity = 13.734 ± 0.942 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
239.3	43.30	239.33	138,885 ± 373	54,013 ± 936	Pb212@ 238.6	13.734

Pb214 26.800 M B- — Activity = 10.898 ± 0.914 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
295.8	18.50	295.02	81,497 ± 285	8,505 ± 887	Pb214@ 295.2	5.823
350.1	35.80	351.36	88,714 ± 298	29,935 ± 806	Pb214@ 351.9	12.209

Ac228 6.150 H B- — Activity = 8.055 ± 1.145 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
468.4	4.44	464.36	22,534 ± 150	-179 ± 473	Ac228@ 463.0	-0.766
924.3	69.22	920.18	56,401 ± 237	15,416 ± 1,205	Ac228@ 939.6	8.055

Tl208 3.053 M B- — Activity = 0.943 ± 0.128 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
510.9	22.60	514.59	23,098 ± 152	1,205 ± 460	Tl208@ 510.8	1.123
2541.1	99.16	2551.29	9,164 ± 96	4,690 ± 361	Tl208@2614.5	0.906

Bi212 60.550 M B- — Activity = 18.576 ± 5.131 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
754.6	7.68	753.39	43,646 ± 209	4,683 ± 1,069	Bi212@ 756.4	18.576

Bi214 19.900 M B- — Activity = 10.018 ± 1.738 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1107.6	16.44	1103.31	22,633 ± 150	5,793 ± 678	Bi214@1120.3	13.195
1724.1	19.38	1724.68	13,956 ± 118	4,206 ± 573	Bi214@1764.5	6.319

Radiation Science, Inc.

MCA2100R / QuantumNaI Report

ID: HMI Sample Location #4, 2 to 3 ft.

File: HMI #4 2-3.ANS Date: October 15, 2002 11:53:14
LT: 3,600.00 RT: 3,602.62 DT: 0.1 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226 1.600E+03 Y A — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
190.8	3.50	190.76	9,735 ± 99	-64 ± 280	Ra226@ 186.1	-0.184

Pb212 10.640 H B- — Activity = 0.633 ± 0.145 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
244.0	43.30	240.79	18,618 ± 136	2,404 ± 528	Pb212@ 238.6	0.633

Pb214 26.800 M B- — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
302.8	18.50	302.84	13,779 ± 117	-312 ± 486	Pb214@ 295.2	-0.221
360.8	35.80	361.36	10,996 ± 105	-217 ± 423	Pb214@ 351.9	-9.16E-02

Ac228 6.150 H B- — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
468.4	4.44	468.38	5,960 ± 77	-254 ± 303	Ac228@ 463.0	-1.125
940.4	69.22	929.35	10,983 ± 105	6 ± 733	Ac228@ 939.6	3.25E-03

Tl208 3.053 M B- — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
524.1	22.60	513.80	6,050 ± 78	-247 ± 293	Tl208@ 510.8	-0.238
2598.2	99.16	2562.48	2,227 ± 47	-338 ± 241	Tl208@2614.5	-6.76E-02

Bi212 60.550 M B- — Activity = 1.014 ± 2.800 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
817.8	7.68	761.08	10,173 ± 101	247 ± 681	Bi212@ 756.4	1.014

Bi214 19.900 M B- — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1129.3	16.44	1106.30	5,113 ± 72	-634 ± 451	Bi214@1120.3	-1.495
1772.0	20.28	1746.12	2,376 ± 49	-218 ± 333	Bi214@1764.5	-0.321

Radiation Science, Inc.

MCA2100R / QuantumNaI Report

ID: HMI Sample Location #4, 3 to 4 ft.

File: HMI #4 3-4.ANS Date: October 15, 2002 13:05:36
LT: 3,600.00 RT: 3,602.64 DT: 0.1 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226	1.600E+03 Y	A		Activity = 0.000 ± 0.000 pCi/gm		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
196.8	3.50	190.76	9,792 ± 99	2 ± 280	Ra226@ 186.1	5.75E-03

Pb212	10.640 H	B-		Activity = 0.581 ± 0.145 pCi/gm		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
245.9	43.30	241.85	18,633 ± 137	2,209 ± 530	Pb212@ 238.6	0.581

Pb214	26.800 M	B-		Activity = 0.201 ± 0.343 pCi/gm		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
293.8	18.50	302.84	13,943 ± 118	284 ± 483	Pb214@ 295.2	0.201
360.8	35.80	360.16	11,020 ± 105	-273 ± 424	Pb214@ 351.9	-0.115

Ac228	6.150 H	B-		Activity = 0.343 ± 0.391 pCi/gm		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
468.4	4.44	468.38	5,868 ± 77	-10 ± 299	Ac228@ 463.0	-4.43E-02
940.4	69.22	934.93	10,828 ± 104	635 ± 718	Ac228@ 939.6	0.343

Tl208	3.053 M	B-		Activity = 0.000 ± 0.000 pCi/gm		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
524.1	22.60	516.73	6,136 ± 78	-70 ± 292	Tl208@ 510.8	-6.75E-02
2598.2	99.16	2566.79	2,187 ± 47	-435 ± 244	Tl208@2614.5	-8.70E-02

Bi212	60.550 M	B-		Activity = 0.000 ± 0.000 pCi/gm		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
770.0	7.68	769.98	10,003 ± 100	-576 ± 691	Bi212@ 756.4	-2.363

Bi214	19.900 M	B-		Activity = 0.184 ± 1.031 pCi/gm		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1129.3	16.44	1111.60	5,201 ± 72	78 ± 437	Bi214@1120.3	0.184
1772.0	20.28	1738.62	2,391 ± 49	-254 ± 335	Bi214@1764.5	-0.374

Radiation Science, Inc.

MCA2100R / QuantumNaI Report

ID: HMI Sample Location #5, 0 to 1 ft.

File: HMI #5 0-1.ANS Date: October 15, 2002 14:09:18
LT: 3,600.00 RT: 3,606.60 DT: 0.2 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226	1.600E+03 Y	A		Activity = 0.000 ± 0.000 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
190.5	3.50	190.76	21,630 ± 147	428 ± 353	Ra226@ 186.1	1.060
Pb212	10.640 H	B-		Activity = 6.783 ± 0.481 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
239.4	43.30	239.14	77,757 ± 279	29,915 ± 746	Pb212@ 238.6	6.783
Pb214	26.800 M	B-		Activity = 3.755 ± 0.399 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
308.2	18.50	294.27	36,650 ± 191	640 ± 650	Pb214@ 295.2	0.391
349.7	35.80	349.05	39,351 ± 198	10,324 ± 602	Pb214@ 351.9	3.755
Ac228	6.150 H	B-		Activity = 5.180 ± 0.759 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
465.3	4.44	463.21	13,454 ± 116	36 ± 389	Ac228@ 463.0	0.137
920.3	69.22	917.97	33,565 ± 183	11,116 ± 955	Ac228@ 939.6	5.180
T1208	3.053 M	B-		Activity = 0.435 ± 8.98E-02 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
508.4	22.60	510.23	14,377 ± 120	729 ± 389	T1208@ 510.8	0.606
2535.7	99.16	2544.43	6,068 ± 78	2,256 ± 324	T1208@2614.5	0.389
Bi212	60.550 M	B-		Activity = 10.308 ± 3.460 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
752.8	7.68	740.53	24,915 ± 158	2,914 ± 867	Bi212@ 756.4	10.308
Bi214	19.900 M	B-		Activity = 3.963 ± 1.175 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1103.1	16.44	1100.83	11,519 ± 107	2,368 ± 552	Bi214@1120.3	4.810
1717.4	18.24	1724.81	6,273 ± 79	547 ± 480	Bi214@1764.5	0.776

Radiation Science, Inc.

MCA2100R / QuantumNaI Report

ID: HMI Sample Location #5, 1 to 2 ft.

File: HMI #5 1-2.ANS Date: October 15, 2002 15:14:51
LT: 3,600.00 RT: 3,602.49 DT: 0.1 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226 1.600E+03 Y A — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
190.8	3.50	190.76	9,226 ± 96	-222 ± 277	Ra226@ 186.1	-0.739

Pb212 10.640 H B- — Activity = 0.476 ± 0.162 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
249.7	43.30	241.90	16,859 ± 130	1,562 ± 521	Pb212@ 238.6	0.476

Pb214 26.800 M B- — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
302.8	18.50	302.84	12,915 ± 114	-616 ± 481	Pb214@ 295.2	-0.505
354.7	35.80	360.44	10,392 ± 102	-93 ± 422	Pb214@ 351.9	-4.54E-02

Ac228 6.150 H B- — Activity = 0.385 ± 0.462 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
468.4	4.44	462.46	5,669 ± 75	-188 ± 298	Ac228@ 463.0	-0.964
947.2	70.90	928.15	10,812 ± 104	632 ± 753	Ac228@ 939.6	0.385

Tl208 3.053 M B- — Activity = 0.134 ± 0.355 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
504.9	22.60	512.50	6,474 ± 80	120 ± 318	Tl208@ 510.8	0.134
2571.3	99.16	2576.05	2,326 ± 48	-92 ± 226	Tl208@2614.5	-2.13E-02

Bi212 60.550 M B- — Activity = 2.449 ± 3.200 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
778.2	7.68	769.98	9,744 ± 99	516 ± 669	Bi212@ 756.4	2.449

Bi214 19.900 M B- — Activity = 0.248 ± 1.184 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1129.3	16.44	1110.85	5,058 ± 71	91 ± 433	Bi214@1120.3	0.248
1732.9	19.38	1733.01	2,443 ± 49	-938 ± 371	Bi214@1764.5	-1.688

Radiation Science, Inc.

MCA2100R / QuantumNaI Report

ID: HMI Sample Location #5, 2 to 3 ft.

File: HMI #5 2-3.ANS Date: October 15, 2002 16:58:30
LT: 3,600.00 RT: 3,602.49 DT: 0.1 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226	1.600E+03 Y	A		Activity = 0.000 ± 0.000 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
190.8	3.50	190.76	9,266 ± 96	-425 ± 279	Ra226@ 186.1	-1.254
Pb212	10.640 H	B-		Activity = 0.480 ± 0.144 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
247.7	43.30	241.51	17,122 ± 131	1,776 ± 521	Pb212@ 238.6	0.480
Pb214	26.800 M	B-		Activity = 0.000 ± 0.000 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
302.8	18.50	302.84	12,923 ± 114	-56 ± 476	Pb214@ 295.2	-4.07E-02
360.8	35.80	365.22	10,040 ± 100	-733 ± 418	Pb214@ 351.9	-0.317
Ac228	6.150 H	B-		Activity = 0.377 ± 0.393 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
468.4	4.44	468.38	5,743 ± 76	-170 ± 299	Ac228@ 463.0	-0.773
929.7	69.22	929.26	10,172 ± 101	679 ± 704	Ac228@ 939.6	0.377
Tl208	3.053 M	B-		Activity = 0.000 ± 0.000 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
513.2	22.60	516.30	6,435 ± 80	3 ± 315	Tl208@ 510.8	2.97E-03
2583.9	99.16	2572.05	2,279 ± 48	-286 ± 220	Tl208@2614.5	-5.87E-02
Bi212	60.550 M	B-		Activity = 0.000 ± 0.000 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
770.0	7.68	768.82	9,755 ± 99	-126 ± 680	Bi212@ 756.4	-0.531
Bi214	19.900 M	B-		Activity = 0.000 ± 0.000 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1129.3	16.44	1127.90	4,910 ± 70	-837 ± 451	Bi214@1120.3	-2.024
1772.0	20.28	1755.88	2,261 ± 48	-128 ± 325	Bi214@1764.5	-0.194

Radiation Science, Inc.

MCA2100R / QuantumNaI Report

ID: HMI Sample Location #5, 3 to 4 ft.

File: HMI #5 3-4.ANS Date: October 15, 2002 18:04:56
LT: 3,600.00 RT: 3,602.63 DT: 0.1 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226	1.600E+03 Y	A		Activity = 0.167 ± 0.791 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
190.8	3.50	190.76	9,699 ± 98	59 ± 279	Ra226@ 186.1	0.167
Pb212	10.640 H	B-		Activity = 0.585 ± 0.143 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
246.5	43.30	240.79	18,729 ± 137	2,256 ± 530	Pb212@ 238.6	0.585
Pb214	26.800 M	B-		Activity = 0.119 ± 0.214 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
319.0	18.50	297.14	13,922 ± 118	231 ± 483	Pb214@ 295.2	0.161
360.8	35.80	355.41	10,996 ± 105	135 ± 420	Pb214@ 351.9	5.62E-02
Ac228	6.150 H	B-		Activity = 0.428 ± 1.302 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
483.5	4.44	468.38	5,899 ± 77	98 ± 298	Ac228@ 463.0	0.428
940.4	69.22	928.34	10,739 ± 104	-182 ± 732	Ac228@ 939.6	-9.70E-02
Tl208	3.053 M	B-		Activity = 0.000 ± 0.000 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
524.1	22.60	524.07	6,213 ± 79	-441 ± 297	Tl208@ 510.8	-0.419
2583.9	99.16	2562.12	2,369 ± 49	-538 ± 241	Tl208@2614.5	-0.106
Bi212	60.550 M	B-		Activity = 0.000 ± 0.000 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
770.0	7.68	768.29	10,070 ± 100	-14 ± 683	Bi212@ 756.4	-5.46E-02
Bi214	19.900 M	B-		Activity = 1.552 ± 1.024 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1119.3	16.44	1132.69	5,050 ± 71	668 ± 420	Bi214@1120.3	1.552
1772.0	20.28	1743.76	2,522 ± 50	-72 ± 333	Bi214@1764.5	-0.104

Radiation Science, Inc.

MCA2100R / QuantumNaI Report

ID: HMI Sample Location #6, 0 to 1 ft.

File: HMI #6 0-1.ANS Date: October 15, 2002 19:24:19
LT: 3,600.00 RT: 3,620.01 DT: 0.6 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226	1.600E+03 Y	A		Activity = 11.366 ± 1.760 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
188.5	3.50	189.03	74,167 ± 272	4,012 ± 569	Ra226@ 186.1	11.366
Pb212	10.640 H	B-		Activity = 24.466 ± 1.655 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
242.4	43.30	241.03	253,954 ± 504	94,352 ± 1,232	Pb212@ 238.6	24.466
Pb214	26.800 M	B-		Activity = 20.340 ± 1.678 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
295.2	18.50	297.37	147,508 ± 384	14,857 ± 1,148	Pb214@ 295.2	10.374
353.7	35.80	354.69	155,725 ± 395	54,565 ± 997	Pb214@ 351.9	22.696
Ac228	6.150 H	B-		Activity = 19.415 ± 2.332 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
465.7	4.44	463.84	40,155 ± 200	1,776 ± 593	Ac228@ 463.0	7.752
931.1	69.22	927.04	101,152 ± 318	38,838 ± 1,422	Ac228@ 939.6	20.694
Tl208	3.053 M	B-		Activity = 1.814 ± 0.213 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
516.0	22.60	514.80	43,446 ± 208	2,912 ± 625	Tl208@ 510.8	2.767
2571.9	99.16	2570.26	15,673 ± 125	7,892 ± 459	Tl208@2614.5	1.555
Bi212	60.550 M	B-		Activity = 36.253 ± 7.925 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
746.8	7.68	755.12	79,004 ± 281	8,962 ± 1,377	Bi212@ 756.4	36.253
Bi214	19.900 M	B-		Activity = 14.455 ± 2.178 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1112.4	16.44	1112.21	38,220 ± 195	7,864 ± 852	Bi214@1120.3	18.268
1747.4	20.28	1737.34	24,559 ± 157	7,609 ± 736	Bi214@1764.5	11.053

Radiation Science, Inc.

MCA2100R / QuantumNaI Report

ID: HMI Sample Location #6, 1 to 2 ft.

File: HMI #6 1-2.ANS Date: October 16, 2002 09:04:56
LT: 3,600.00 RT: 3,607.29 DT: 0.2 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226	1.600E+03 Y	A			Activity = 5.578 ± 1.608 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
189.5	3.50	188.66	25,619 ± 160	1,318 ± 371	Ra226@ 186.1	5.578
Pb212	10.640 H	B-			Activity = 10.702 ± 0.777 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
241.5	43.30	241.51	83,568 ± 289	27,628 ± 814	Pb212@ 238.6	10.702
Pb214	26.800 M	B-			Activity = 8.438 ± 0.739 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
297.9	18.50	297.93	45,572 ± 213	4,794 ± 670	Pb214@ 295.2	5.001
354.0	35.80	355.41	50,052 ± 224	15,247 ± 642	Pb214@ 351.9	9.474
Ac228	6.150 H	B-			Activity = 7.958 ± 1.210 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
456.6	4.44	465.32	14,337 ± 120	192 ± 395	Ac228@ 463.0	1.252
931.5	69.22	926.73	34,087 ± 185	9,998 ± 950	Ac228@ 939.6	7.958
Tl208	3.053 M	B-			Activity = 1.003 ± 0.217 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
516.0	22.60	515.23	15,271 ± 124	1,301 ± 393	Tl208@ 510.8	1.847
2568.4	99.16	2572.58	5,841 ± 76	1,936 ± 300	Tl208@2614.5	0.570
Bi212	60.550 M	B-			Activity = 15.605 ± 5.997 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
754.2	7.68	755.03	27,741 ± 167	2,582 ± 908	Bi212@ 756.4	15.605
Bi214	19.900 M	B-			Activity = 11.093 ± 2.133 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1111.1	16.44	1113.48	14,226 ± 119	4,315 ± 568	Bi214@1120.3	14.973
1742.2	20.28	1739.38	8,507 ± 92	2,687 ± 480	Bi214@1764.5	5.830

Radiation Science, Inc.

MCA2100R / QuantumNaI Report

ID: HMI Sample Location #6, 2 to 3 ft.

File: HMI #6 2-3.ANS Date: October 16, 2002 10:16:12
LT: 3,600.00 RT: 3,611.79 DT: 0.3 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226	1.600E+03 Y	A		Activity = 7.626 ± 1.354 pCi/gm
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts) / ROI ASSIGNMENT / Activity (pCi/gm)
189.7	3.50	187.39	42,383 ± 206	2,692 ± 448 Ra226@ 186.1 7.626
Pb212	10.640 H	B-		Activity = 13.219 ± 0.911 pCi/gm
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts) / ROI ASSIGNMENT / Activity (pCi/gm)
242.1	43.30	240.54	138,368 ± 372	50,978 ± 947 Pb212@ 238.6 13.219
Pb214	26.800 M	B-		Activity = 11.136 ± 0.965 pCi/gm
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts) / ROI ASSIGNMENT / Activity (pCi/gm)
294.0	18.50	296.74	82,307 ± 287	6,792 ± 892 Pb214@ 295.2 4.743
352.8	35.80	353.28	85,329 ± 292	29,769 ± 762 Pb214@ 351.9 12.382
Ac228	6.150 H	B-		Activity = 9.842 ± 1.275 pCi/gm
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts) / ROI ASSIGNMENT / Activity (pCi/gm)
463.9	4.44	464.32	23,166 ± 152	831 ± 471 Ac228@ 463.0 3.627
925.1	69.22	923.58	56,688 ± 238	19,684 ± 1,161 Ac228@ 939.6 10.489
Tl208	3.053 M	B-		Activity = 0.847 ± 0.123 pCi/gm
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts) / ROI ASSIGNMENT / Activity (pCi/gm)
507.3	22.60	513.07	25,307 ± 159	1,011 ± 501 Tl208@ 510.8 0.961
2556.3	99.16	2559.02	8,884 ± 94	4,199 ± 359 Tl208@2614.5 0.827
Bi212	60.550 M	B-		Activity = 24.684 ± 5.799 pCi/gm
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts) / ROI ASSIGNMENT / Activity (pCi/gm)
756.9	7.68	755.15	45,233 ± 213	6,102 ± 1,075 Bi212@ 756.4 24.684
Bi214	19.900 M	B-		Activity = 9.279 ± 1.429 pCi/gm
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts) / ROI ASSIGNMENT / Activity (pCi/gm)
1108.2	16.44	1108.48	22,146 ± 149	4,602 ± 678 Bi214@1120.3 10.690
1743.2	18.24	1729.48	13,778 ± 117	5,062 ± 562 Bi214@1764.5 8.216

Radiation Science, Inc.

MCA2100R / QuantumNaI Report

ID: HMI Sample Location 6, 3 to 4 ft.

File: HMI #6 3-4.ANS Date: October 16, 2002 11:21:25
LT: 3,600.00 RT: 3,602.60 DT: 0.1 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226 1.600E+03 Y A — Activity = 0.569 ± 0.781 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
186.1	3.50	190.76	9,702 ± 98	203 ± 278	Ra226@ 186.1	0.569

Pb212 10.640 H B- — Activity = 0.448 ± 0.139 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
245.1	43.30	242.27	18,161 ± 135	1,744 ± 529	Pb212@ 238.6	0.448

Pb214 26.800 M B- — Activity = 0.125 ± 0.176 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
302.8	18.50	302.84	13,573 ± 117	-622 ± 487	Pb214@ 295.2	-0.430
337.2	35.80	353.24	11,141 ± 106	304 ± 426	Pb214@ 351.9	0.125

Ac228 6.150 H B- — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
468.4	4.44	468.38	5,812 ± 76	-178 ± 300	Ac228@ 463.0	-0.769
940.4	69.22	927.52	10,829 ± 104	-456 ± 739	Ac228@ 939.6	-0.241

Tl208 3.053 M B- — Activity = 1.64E-02 ± 4.77E-02 pCi/g

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
524.1	22.60	524.07	6,222 ± 79	-271 ± 295	Tl208@ 510.8	-0.255
2567.7	99.16	2553.88	2,412 ± 49	84 ± 244	Tl208@2614.5	1.64E-02

Bi212 60.550 M B- — Activity = 2.109 ± 2.727 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
753.2	7.68	742.93	10,160 ± 101	526 ± 676	Bi212@ 756.4	2.109

Bi214 19.900 M B- — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1129.3	16.44	1122.89	5,170 ± 72	-265 ± 444	Bi214@1120.3	-0.610
1765.2	20.28	1740.01	2,426 ± 49	-6 ± 351	Bi214@1764.5	-8.63E-03

Radiation Science, Inc.

MCA2100R / QuantumNaI Report

ID: HMI Sample Location #7, 0 to 1 ft.

File: HMI #7 0-1.ANS Date: October 16, 2002 12:38:26
LT: 3,600.00 RT: 3,607.17 DT: 0.2 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226	1.600E+03 Y	A		Activity = 4.369 ± 1.453 pCi/gm
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts) / ROI ASSIGNMENT / Activity (pCi/gm)
189.9	3.50	189.45	25,116 ± 158	1,130 ± 369 Ra226@ 186.1 4.369
Pb212	10.640 H	B-		Activity = 9.260 ± 0.677 pCi/gm
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts) / ROI ASSIGNMENT / Activity (pCi/gm)
241.1	43.30	240.95	80,364 ± 283	26,164 ± 804 Pb212@ 238.6 9.260
Pb214	26.800 M	B-		Activity = 7.506 ± 0.699 pCi/gm
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts) / ROI ASSIGNMENT / Activity (pCi/gm)
295.5	18.50	296.47	47,952 ± 219	3,173 ± 718 Pb214@ 295.2 3.024
352.8	35.80	354.00	47,819 ± 219	14,676 ± 613 Pb214@ 351.9 8.332
Ac228	6.150 H	B-		Activity = 6.350 ± 0.994 pCi/gm
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts) / ROI ASSIGNMENT / Activity (pCi/gm)
460.2	4.44	462.23	14,127 ± 119	457 ± 393 Ac228@ 463.0 2.723
929.6	69.22	925.11	33,283 ± 182	9,342 ± 983 Ac228@ 939.6 6.794
Tl208	3.053 M	B-		Activity = 0.603 ± 0.106 pCi/gm
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts) / ROI ASSIGNMENT / Activity (pCi/gm)
515.6	22.60	513.01	15,192 ± 123	368 ± 400 Tl208@ 510.8 0.477
2551.6	99.16	2561.54	5,722 ± 76	2,241 ± 303 Tl208@2614.5 0.603
Bi212	60.550 M	B-		Activity = 13.477 ± 5.400 pCi/gm
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts) / ROI ASSIGNMENT / Activity (pCi/gm)
760.2	7.68	758.06	27,126 ± 165	2,441 ± 902 Bi212@ 756.4 13.477
Bi214	19.900 M	B-		Activity = 7.083 ± 1.283 pCi/gm
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts) / ROI ASSIGNMENT / Activity (pCi/gm)
1110.5	16.44	1108.14	14,183 ± 119	2,423 ± 579 Bi214@1120.3 7.682
1745.6	18.24	1733.94	8,357 ± 91	3,021 ± 472 Bi214@1764.5 6.692

Radiation Science, Inc.

MCA2100R / QuantumNaI Report

ID: HMI Sample Location#7, 1 to 2 ft.

File: HMI #7 1-2.ANS Date: October 16, 2002 13:41:50
LT: 3,600.00 RT: 3,602.60 DT: 0.1 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226	1.600E+03 Y	A		Activity = 0.174 ± 1.075 pCi/gm		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
190.8	3.50	190.76	9,529 ± 98	45 ± 278	Ra226@ 186.1	0.174

Pb212	10.640 H	B-		Activity = 0.655 ± 0.191 pCi/gm		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
244.4	43.30	237.68	17,793 ± 133	1,852 ± 526	Pb212@ 238.6	0.655

Pb214	26.800 M	B-		Activity = 0.000 ± 0.000 pCi/gm		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
302.8	18.50	302.84	13,575 ± 117	-220 ± 484	Pb214@ 295.2	-0.210
360.8	35.80	354.95	10,710 ± 103	-423 ± 422	Pb214@ 351.9	-0.240

Ac228	6.150 H	B-		Activity = 0.000 ± 0.000 pCi/gm		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
468.4	4.44	462.22	5,843 ± 76	-357 ± 303	Ac228@ 463.0	-2.127
940.4	69.22	920.92	10,989 ± 105	-44 ± 735	Ac228@ 939.6	-3.20E-02

Tl208	3.053 M	B-		Activity = 0.000 ± 0.000 pCi/gm		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
524.1	22.60	510.30	6,276 ± 79	-378 ± 297	Tl208@ 510.8	-0.490
2589.2	99.16	2555.98	2,279 ± 48	-39 ± 242	Tl208@2614.5	-1.05E-02

Bi212	60.550 M	B-		Activity = 0.000 ± 0.000 pCi/gm		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
770.0	7.68	769.98	10,354 ± 102	0 ± 688	Bi212@ 756.4	2.76E-03

Bi214	19.900 M	B-		Activity = 0.590 ± 1.419 pCi/gm		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1140.1	16.44	1122.92	5,331 ± 73	186 ± 446	Bi214@1120.3	0.590
1772.0	20.28	1772.02	2,491 ± 50	-332 ± 342	Bi214@1764.5	-0.658

Radiation Science, Inc.

MCA2100R / QuantumNaI Report

ID: HMI Sample Location #7, 2 to 3 ft.

File: HMI #7 2-3.ANS Date: October 16, 2002 14:47:00
LT: 3,600.00 RT: 3,603.18 DT: 0.1 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226	1.600E+03 Y	A		Activity = 0.000 ± 0.000 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
190.8	3.50	190.76	11,475 ± 107	101 ± 291	Ra226@ 186.1	0.352
Pb212	10.640 H	B-		Activity = 1.313 ± 0.200 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
245.3	43.30	241.64	24,799 ± 157	4,112 ± 563	Pb212@ 238.6	1.313
Pb214	26.800 M	B-		Activity = 0.721 ± 0.213 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
299.7	18.50	299.35	17,888 ± 134	605 ± 516	Pb214@ 295.2	0.520
352.3	35.80	355.70	15,187 ± 123	1,542 ± 450	Pb214@ 351.9	0.790
Ac228	6.150 H	B-		Activity = 1.364 ± 0.515 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
468.4	4.44	468.38	6,848 ± 83	-269 ± 315	Ac228@ 463.0	-1.446
928.5	69.22	931.13	13,588 ± 117	2,079 ± 745	Ac228@ 939.6	1.364
Tl208	3.053 M	B-		Activity = 0.000 ± 0.000 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
524.1	22.60	515.41	7,085 ± 84	-94 ± 305	Tl208@ 510.8	-0.110
2598.2	99.16	2570.55	2,727 ± 52	76 ± 247	Tl208@2614.5	1.86E-02
Bi212	60.550 M	B-		Activity = 6.542 ± 3.632 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
769.1	7.68	774.00	12,319 ± 111	1,313 ± 700	Bi212@ 756.4	6.542
Bi214	19.900 M	B-		Activity = 0.744 ± 1.313 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1129.3	16.44	1115.38	6,202 ± 79	260 ± 456	Bi214@1120.3	0.744
1772.0	20.28	1735.95	3,258 ± 57	-202 ± 366	Bi214@1764.5	-0.362

Radiation Science, Inc.

MCA2100R / QuantumNaI Report

ID: HMI Sample Location #7, 3 to 4 ft.

File: HMI #7 3-4.ANS Date: October 16, 2002 15:50:39
LT: 3,600.00 RT: 3,602.59 DT: 0.1 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226 1.600E+03 Y A — Activity = 0.697 ± 1.053 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
183.9	3.50	190.76	9,584 ± 98	184 ± 278	Ra226@ 186.1	0.697

Pb212 10.640 H B- — Activity = 0.825 ± 0.189 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
245.8	43.30	239.17	17,746 ± 133	2,379 ± 522	Pb212@ 238.6	0.825

Pb214 26.800 M B- — Activity = 9.57E-02 ± 0.232 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
302.8	18.50	302.84	13,706 ± 117	-145 ± 484	Pb214@ 295.2	-0.135
360.8	35.80	360.22	10,689 ± 103	172 ± 416	Pb214@ 351.9	9.57E-02

Ac228 6.150 H B- — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
468.4	4.44	468.38	5,822 ± 76	-504 ± 304	Ac228@ 463.0	-2.943
940.4	69.22	927.09	11,062 ± 105	-307 ± 741	Ac228@ 939.6	-0.219

Tl208 3.053 M B- — Activity = 1.96E-02 ± 5.75E-02 pCi/g

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
524.1	22.60	517.45	6,157 ± 78	-7 ± 291	Tl208@ 510.8	-8.90E-03
2598.2	99.16	2566.64	2,269 ± 48	74 ± 218	Tl208@2614.5	1.96E-02

Bi212 60.550 M B- — Activity = 2.078 ± 3.698 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
751.5	7.68	769.98	10,310 ± 102	384 ± 681	Bi212@ 756.4	2.078

Bi214 19.900 M B- — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1129.3	16.44	1117.33	5,279 ± 73	-663 ± 455	Bi214@1120.3	-2.060
1772.0	20.28	1772.02	2,578 ± 51	61 ± 330	Bi214@1764.5	0.119

Radiation Science, Inc.

MCA2100R / QuantumNaI Report

ID: HMI Sample Location #8, 0 to 1 ft.

File: HMI #8 0-1.ANS Date: October 16, 2002 16:55:01
LT: 3,600.00 RT: 3,629.52 DT: 0.8 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226 1.600E+03 Y A — Activity = 5.877 ± 2.142 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
189.1	3.50	187.83	96,609 ± 311	1,805 ± 648	Ra226@ 186.1	5.877

Pb212 10.640 H B- — Activity = 52.58 ± 3.519 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
241.9	43.30	240.42	426,394 ± 653	176,436 ± 1,524	Pb212@ 238.6	52.58

Pb214 26.800 M B- — Activity = 18.161 ± 1.714 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
302.8	18.50	296.76	193,353 ± 440	1,950 ± 1,354	Pb214@ 295.2	1.565
355.2	35.80	351.26	188,749 ± 434	37,992 ± 1,214	Pb214@ 351.9	18.161

Ac228 6.150 H B- — Activity = 42.52 ± 4.964 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
468.4	4.44	465.29	62,154 ± 249	3,328 ± 718	Ac228@ 463.0	16.696
931.0	69.22	926.62	171,681 ± 414	74,100 ± 1,767	Ac228@ 939.6	45.38

Tl208 3.053 M B- — Activity = 3.400 ± 0.366 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
514.6	22.60	515.04	65,040 ± 255	3,695 ± 728	Tl208@ 510.8	4.035
2579.5	99.16	2572.52	29,431 ± 172	14,354 ± 665	Tl208@2614.5	3.251

Bi212 60.550 M B- — Activity = 73.99 ± 13.791 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
748.8	7.68	745.36	119,442 ± 346	15,916 ± 1,637	Bi212@ 756.4	73.99

Bi214 19.900 M B- — Activity = 14.320 ± 2.821 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1106.7	16.44	1111.71	47,188 ± 217	7,218 ± 955	Bi214@1120.3	19.270
1755.0	20.28	1741.67	27,932 ± 167	4,250 ± 821	Bi214@1764.5	7.095

Radiation Science, Inc.

NaI Gamma Spectroscopy Report

ID: HMI Sample Location #8, 1 to 2 ft.

File: HMI #8 1-2.ANS Date: October 16, 2002 17:59:53
LT: 3,600.00 RT: 3,619.89 DT: 0.5 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226 1.600E+03 Y A — Activity = 10.058 ± 1.741 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
190.5	3.50	189.00	66,283 ± 257	3,357 ± 542	Ra226@ 186.1	10.058

Pb212 10.640 H B- — Activity = 30.243 ± 2.036 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
244.1	43.30	243.28	267,933 ± 518	110,277 ± 1,232	Pb212@ 238.6	30.243

Pb214 26.800 M B- — Activity = 15.167 ± 1.306 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
300.1	18.50	300.61	131,248 ± 362	9,053 ± 1,104	Pb214@ 295.2	6.686
358.0	35.80	356.37	136,760 ± 370	38,579 ± 1,000	Pb214@ 351.9	16.971

Ac228 6.150 H B- — Activity = 13.826 ± 1.519 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
469.4	4.44	465.70	39,558 ± 199	2,201 ± 586	Ac228@ 463.0	10.161
938.5	117.13	935.51	108,707 ± 330	42,962 ± 1,473	Ac228@ 939.6	14.298

Tl208 3.053 M B- — Activity = 2.259 ± 0.253 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
523.1	22.60	519.22	41,790 ± 204	3,391 ± 588	Tl208@ 510.8	3.408
2599.0	99.16	2596.70	18,140 ± 135	9,049 ± 510	Tl208@2614.5	1.886

Bi212 60.550 M B- — Activity = 25.867 ± 4.252 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
761.4	15.36	756.67	78,206 ± 280	11,940 ± 1,341	Bi212@ 756.4	25.867

Bi214 19.900 M B- — Activity = 10.261 ± 1.691 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1125.4	16.44	1124.06	33,493 ± 183	5,282 ± 818	Bi214@1120.3	12.976
1763.0	20.28	1758.33	20,330 ± 143	5,216 ± 669	Bi214@1764.5	8.013

Radiation Science, Inc.

MCA2100R / QuantumNaI Report

ID: HMI Sample Location #8, 2 to 3 ft.

File: HMI #8 2-3.ANS Date: October 17, 2002 08:17:08
LT: 3,600.00 RT: 3,602.94 DT: 0.1 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226 1.600E+03 Y A

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
190.8	3.50	190.76	10,650 ± 103	-160 ± 287	Ra226@ 186.1	-0.548

Activity = 0.000 ± 0.000 pCi/gm

Pb212 10.640 H B-

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
245.0	43.30	241.83	22,348 ± 149	3,467 ± 549	Pb212@ 238.6	1.087

Activity = 1.087 ± 0.187 pCi/gm

Pb214 26.800 M B-

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
293.9	18.50	297.08	15,927 ± 126	188 ± 502	Pb214@ 295.2	0.159
340.7	35.80	356.17	13,293 ± 115	560 ± 440	Pb214@ 351.9	0.282

Activity = 0.282 ± 0.223 pCi/gm

Ac228 6.150 H B-

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
468.4	4.44	468.76	6,292 ± 79	-377 ± 309	Ac228@ 463.0	-1.991
917.1	69.22	923.13	12,762 ± 113	1,981 ± 731	Ac228@ 939.6	1.277

Activity = 1.277 ± 0.495 pCi/gm

Tl208 3.053 M B-

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
524.1	22.60	514.72	6,664 ± 82	-417 ± 303	Tl208@ 510.8	-0.479
2507.5	99.16	2574.56	2,549 ± 50	126 ± 233	Tl208@2614.5	3.02E-02

Activity = 3.02E-02 ± 5.57E-02 pCi/g

Bi212 60.550 M B-

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
770.0	7.68	755.47	11,387 ± 107	-114 ± 707	Bi212@ 756.4	-0.558

Activity = 0.000 ± 0.000 pCi/gm

Bi214 19.900 M B-

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1129.3	16.44	1109.41	5,731 ± 76	-250 ± 456	Bi214@1120.3	-0.702
1739.9	20.28	1737.36	2,785 ± 53	217 ± 332	Bi214@1764.5	0.381

Activity = 0.381 ± 0.586 pCi/gm

Radiation Science, Inc.

MCA2100R / QuantumNaI Report

ID: HMI Sample Location #8, 3 to 4 ft.

File: HMI #8 3-4.ANS Date: October 17, 2002 09:25:59
LT: 3,600.00 RT: 3,602.48 DT: 0.1 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226 1.600E+03 Y A — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
190.8	3.50	190.76	9,162 ± 96	-19 ± 276	Ra226@ 186.1	-8.49E-02

Pb212 10.640 H B- — Activity = 0.748 ± 0.217 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
245.5	43.30	241.29	16,503 ± 128	1,829 ± 516	Pb212@ 238.6	0.748

Pb214 26.800 M B- — Activity = 0.382 ± 0.519 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
311.4	18.50	302.84	12,670 ± 113	347 ± 470	Pb214@ 295.2	0.382
360.8	35.80	360.82	9,646 ± 98	-359 ± 410	Pb214@ 351.9	-0.236

Ac228 6.150 H B- — Activity = 0.587 ± 0.602 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
468.4	4.44	468.38	5,689 ± 75	-91 ± 297	Ac228@ 463.0	-0.627
868.7	69.22	922.07	10,555 ± 103	698 ± 711	Ac228@ 939.6	0.587

Tl208 3.053 M B- — Activity = 0.247 ± 0.321 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
535.4	22.60	519.38	5,940 ± 77	217 ± 286	Tl208@ 510.8	0.325
2598.2	99.16	2565.98	2,338 ± 48	58 ± 224	Tl208@2614.5	1.80E-02

Bi212 60.550 M B- — Activity = 1.922 ± 4.301 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
775.0	7.68	763.73	9,732 ± 99	301 ± 672	Bi212@ 756.4	1.922

Bi214 19.900 M B- — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1129.3	16.44	1123.53	4,896 ± 70	-832 ± 450	Bi214@1120.3	-3.048
1772.0	20.28	1753.21	2,394 ± 49	-123 ± 330	Bi214@1764.5	-0.282

Radiation Science, Inc.

MCA2100R / QuantumNaI Report

ID: HMI Sample Location #9, 0 to 1 ft,

File: HMI #9 0-1.ANS Date: October 17, 2002 10:32:07
LT: 3,600.00 RT: 3,602.25 DT: 0.1 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226	1.600E+03 Y	A		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	
190.8	3.50	190.76	8,109 ± 90	

Activity = 0.000 ± 0.000 pCi/gm

NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
-22 ± 268	Ra226@ 186.1	-5.55E-02

Pb212	10.640 H	B-		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	
249.7	43.30	243.53	13,810 ± 118	

Activity = 0.203 ± 0.116 pCi/gm

NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
879 ± 501	Pb212@ 238.6	0.203

Pb214	26.800 M	B-		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	
302.8	18.50	302.84	11,225 ± 106	
360.8	35.80	367.84	8,389 ± 92	

Activity = 0.000 ± 0.000 pCi/gm

NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
-138 ± 461	Pb214@ 295.2	-8.57E-02
-520 ± 398	Pb214@ 351.9	-0.192

Ac228	6.150 H	B-		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	
468.4	4.44	462.21	5,475 ± 74	
940.4	69.22	933.51	10,166 ± 101	

Activity = 0.000 ± 0.000 pCi/gm

NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
-95 ± 295	Ac228@ 463.0	-0.369
-223 ± 722	Ac228@ 939.6	-0.106

Tl208	3.053 M	B-		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	
524.1	22.60	517.44	5,984 ± 77	
2534.1	99.16	2576.81	2,280 ± 48	

Activity = 5.00E-02 ± 3.63E-02 pCi/g

NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
-467 ± 295	Tl208@ 510.8	-0.395
285 ± 205	Tl208@2614.5	5.00E-02

Bi212	60.550 M	B-		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	
770.0	7.68	782.42	9,569 ± 98	

Activity = 0.000 ± 0.000 pCi/gm

NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
-267 ± 679	Bi212@ 756.4	-0.961

Bi214	19.900 M	B-		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	
1129.3	16.44	1113.41	4,839 ± 70	
1772.0	20.28	1750.35	2,327 ± 48	

Activity = 0.000 ± 0.000 pCi/gm

NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
-167 ± 434	Bi214@1120.3	-0.345
-368 ± 336	Bi214@1764.5	-0.476

Radiation Science, Inc.

MCA2100R / QuantumNaI Report

ID: HMI Sample Location #9, 1 to 2 ft.

File: HMI #9 1-2.ANS Date: October 17, 2002 11:37:29
LT: 3,600.00 RT: 3,606.01 DT: 0.2 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226 1.600E+03 Y A — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
191.3	3.50	190.76	19,196 ± 139	154 ± 340	Ra226@ 186.1	0.388

Pb212 10.640 H B- — Activity = 6.565 ± 0.468 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
241.9	43.30	239.90	74,093 ± 272	28,451 ± 735	Pb212@ 238.6	6.565

Pb214 26.800 M B- — Activity = 0.661 ± 0.221 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
302.8	18.50	295.45	33,364 ± 183	-1,911 ± 652	Pb214@ 295.2	-1.187
341.4	35.80	348.14	29,760 ± 173	1,787 ± 576	Pb214@ 351.9	0.661

Ac228 6.150 H B- — Activity = 5.388 ± 0.765 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
468.4	4.44	463.00	12,488 ± 112	-5 ± 377	Ac228@ 463.0	-1.94E-02
924.7	69.22	920.42	30,349 ± 174	11,364 ± 884	Ac228@ 939.6	5.388

Tl208 3.053 M B- — Activity = 0.228 ± 5.98E-02 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
524.1	22.60	513.14	12,664 ± 113	-556 ± 375	Tl208@ 510.8	-0.470
2532.1	99.16	2556.31	5,065 ± 71	1,303 ± 308	Tl208@2614.5	0.228

Bi212 60.550 M B- — Activity = 8.522 ± 3.279 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
742.0	7.68	737.86	22,036 ± 148	2,368 ± 833	Bi212@ 756.4	8.522

Bi214 19.900 M B- — Activity = 0.551 ± 0.497 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1129.3	16.44	1108.96	8,334 ± 91	-143 ± 510	Bi214@1120.3	-0.296
1727.9	20.28	1727.92	4,269 ± 65	426 ± 380	Bi214@1764.5	0.551

Radiation Science, Inc.

MCA2100R / QuantumNaI Report

ID: HMI Sample Location #9, 2 to 3 ft.

File: HMI #9 2-3.ANS Date: October 17, 2002 12:59:52
LT: 3,600.00 RT: 3,601.79 DT: 0.0 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226	1.600E+03 Y	A		Activity = 0.179 ± 0.651 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
191.5	3.50	190.76	6,930 ± 83	71 ± 258	Ra226@ 186.1	0.179
Pb212	10.640 H	B-		Activity = 0.438 ± 0.117 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
247.0	43.30	241.84	13,669 ± 117	1,900 ± 493	Pb212@ 238.6	0.438
Pb214	26.800 M	B-		Activity = 0.000 ± 0.000 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
302.8	18.50	302.84	9,944 ± 100	-147 ± 448	Pb214@ 295.2	-9.13E-02
360.8	35.80	359.09	8,093 ± 90	-104 ± 390	Pb214@ 351.9	-3.85E-02
Ac228	6.150 H	B-		Activity = 0.000 ± 0.000 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
468.4	4.44	468.38	4,046 ± 64	-313 ± 277	Ac228@ 463.0	-1.216
940.4	69.22	930.01	6,869 ± 83	-216 ± 652	Ac228@ 939.6	-0.102
Tl208	3.053 M	B-		Activity = 0.000 ± 0.000 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
524.1	22.60	516.22	3,945 ± 63	-742 ± 269	Tl208@ 510.8	-0.627
2598.2	99.16	2575.24	849 ± 29	-1,118 ± 199	Tl208@2614.5	-0.196
Bi212	60.550 M	B-		Activity = 0.940 ± 2.214 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
773.0	7.68	768.12	6,497 ± 81	261 ± 614	Bi212@ 756.4	0.940
Bi214	19.900 M	B-		Activity = 0.779 ± 0.813 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1116.7	16.44	1123.89	3,433 ± 59	377 ± 386	Bi214@1120.3	0.779
1772.0	20.28	1746.99	1,254 ± 35	-116 ± 280	Bi214@1764.5	-0.149

Radiation Science, Inc.

MCA2100R / QuantumNaI Report

ID: HMI Sample Location #9, 3 to 4 ft.

File: HMI #9 3-4.ANS Date: October 17, 2002 14:05:51
LT: 3,600.00 RT: 3,601.73 DT: 0.0 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226 1.600E+03 Y A — Activity = 0.223 ± 0.569 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
190.8	3.50	190.76	6,840 ± 83	101 ± 257	Ra226@ 186.1	0.223

Pb212 10.640 H B- — Activity = 0.386 ± 0.102 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
244.1	43.30	241.64	12,812 ± 113	1,911 ± 486	Pb212@ 238.6	0.386

Pb214 26.800 M B- — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
302.8	18.50	302.84	9,495 ± 97	-580 ± 447	Pb214@ 295.2	-0.316
360.8	35.80	362.04	7,553 ± 87	-68 ± 383	Pb214@ 351.9	-2.21E-02

Ac228 6.150 H B- — Activity = 8.73E-02 ± 0.264 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
468.4	4.44	468.38	3,987 ± 63	-456 ± 278	Ac228@ 463.0	-1.552
940.4	69.22	923.31	6,539 ± 81	210 ± 635	Ac228@ 939.6	8.73E-02

Tl208 3.053 M B- — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
524.1	22.60	520.67	3,869 ± 62	-335 ± 262	Tl208@ 510.8	-0.248
2598.2	99.16	2568.87	826 ± 29	-1,169 ± 201	Tl208@2614.5	-0.180

Bi212 60.550 M B- — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
770.0	7.68	768.00	6,324 ± 80	-204 ± 619	Bi212@ 756.4	-0.645

Bi214 19.900 M B- — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1129.3	16.44	1113.58	3,289 ± 57	-138 ± 395	Bi214@1120.3	-0.249
1772.0	20.28	1733.99	1,230 ± 35	-88 ± 278	Bi214@1764.5	-0.100

Radiation Science, Inc.

MCA2100R / QuantumNaI Report

ID: HMI Sample Location #10, 0 to 1 ft.

File: HMI #10 0-1.ANS Date: October 17, 2002 15:12:43
LT: 3,600.00 RT: 3,609.70 DT: 0.3 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226	1.600E+03 Y	A		Activity = 4.524 ± 1.076 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
190.3	3.50	188.95	35,517 ± 188	1,826 ± 419	Ra226@ 186.1	4.524
Pb212	10.640 H	B-		Activity = 9.134 ± 0.638 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
242.3	43.30	240.54	113,944 ± 338	40,281 ± 881	Pb212@ 238.6	9.134
Pb214	26.800 M	B-		Activity = 6.089 ± 0.562 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
287.8	18.50	296.79	68,926 ± 263	3,979 ± 836	Pb214@ 295.2	2.430
355.5	35.80	353.92	70,496 ± 266	18,667 ± 751	Pb214@ 351.9	6.790
Ac228	6.150 H	B-		Activity = 6.521 ± 0.873 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
463.5	4.44	461.47	18,299 ± 135	808 ± 428	Ac228@ 463.0	3.084
926.7	69.22	923.86	45,302 ± 213	14,977 ± 1,055	Ac228@ 939.6	6.979
Tl208	3.053 M	B-		Activity = 0.291 ± 6.74E-02 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
504.4	22.60	512.72	18,544 ± 136	501 ± 425	Tl208@ 510.8	0.416
2558.5	99.16	2561.74	6,191 ± 79	1,688 ± 342	Tl208@2614.5	0.291
Bi212	60.550 M	B-		Activity = 13.785 ± 4.121 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
755.0	7.68	753.91	36,098 ± 190	3,897 ± 995	Bi212@ 756.4	13.785
Bi214	19.900 M	B-		Activity = 4.181 ± 0.850 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1106.7	16.44	1107.56	17,952 ± 134	2,572 ± 635	Bi214@1120.3	5.224
1734.9	20.28	1729.43	10,755 ± 104	2,654 ± 509	Bi214@1764.5	3.371

Radiation Science, Inc.

MCA2100R / QuantumNaI Report

ID: HMI Sample Location #10, 1 to 2 ft.

File: HMI #10 1-2.ANS Date: October 17, 2002 16:17:59
LT: 3,600.00 RT: 3,605.47 DT: 0.2 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226 1.600E+03 Y A — Activity = 1.341 ± 0.787 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
189.7	3.50	189.27	19,135 ± 138	579 ± 338	Ra226@ 186.1	1.341

Pb212 10.640 H B- — Activity = 4.427 ± 0.328 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
243.4	43.30	241.72	59,414 ± 244	20,877 ± 690	Pb212@ 238.6	4.427

Pb214 26.800 M B- — Activity = 2.711 ± 0.261 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
297.8	18.50	298.39	35,958 ± 190	3,667 ± 636	Pb214@ 295.2	2.094
356.5	35.80	354.97	35,783 ± 189	8,666 ± 575	Pb214@ 351.9	2.948

Ac228 6.150 H B- — Activity = 2.914 ± 0.509 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
468.4	4.44	463.55	10,498 ± 102	105 ± 354	Ac228@ 463.0	0.375
930.4	69.22	927.54	24,161 ± 155	6,688 ± 856	Ac228@ 939.6	2.914

Tl208 3.053 M B- — Activity = 0.443 ± 0.270 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
517.4	22.60	513.14	10,528 ± 103	570 ± 340	Tl208@ 510.8	0.443
2598.2	99.16	2571.10	3,316 ± 58	10 ± 283	Tl208@2614.5	1.61E-03

Bi212 60.550 M B- — Activity = 9.420 ± 3.011 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
769.7	7.68	759.97	19,861 ± 141	2,848 ± 795	Bi212@ 756.4	9.420

Bi214 19.900 M B- — Activity = 1.969 ± 0.540 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1114.1	16.44	1112.52	10,020 ± 100	1,290 ± 516	Bi214@1120.3	2.450
1742.7	20.28	1739.29	5,295 ± 73	1,376 ± 384	Bi214@1764.5	1.634

Radiation Science, Inc.

MCA2100R / QuantumNaI Report

ID: HMI Sample Location #11, 0 to 1 ft.

File: HMI #11 0-1.ANS Date: October 17, 2002 17:34:16
LT: 3,600.00 RT: 3,634.12 DT: 0.9 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226	1.600E+03 Y	A		Activity = 17.889 ± 2.018 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
189.8	3.50	188.75	128,226 ± 358	7,721 ± 727	Ra226@ 186.1	17.889
Pb212	10.640 H	B-		Activity = 39.066 ± 2.615 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
242.6	43.30	241.46	460,850 ± 679	184,215 ± 1,595	Pb212@ 238.6	39.066
Pb214	26.800 M	B-		Activity = 28.310 ± 2.293 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
295.5	18.50	298.17	266,155 ± 516	26,256 ± 1,515	Pb214@ 295.2	14.994
357.0	35.80	355.13	283,207 ± 532	93,210 ± 1,372	Pb214@ 351.9	31.707
Ac228	6.150 H	B-		Activity = 30.224 ± 3.524 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
469.3	4.44	466.59	70,472 ± 265	3,498 ± 763	Ac228@ 463.0	12.487
934.3	69.22	930.67	182,108 ± 427	74,027 ± 1,851	Ac228@ 939.6	32.259
Tl208	3.053 M	B-		Activity = 2.840 ± 0.295 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
518.9	22.60	517.08	70,930 ± 266	6,022 ± 749	Tl208@ 510.8	4.680
2586.5	99.16	2582.02	26,597 ± 163	13,344 ± 622	Tl208@2614.5	2.151
Bi212	60.550 M	B-		Activity = 62.60 ± 11.325 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
760.6	7.68	757.72	138,828 ± 373	18,922 ± 1,751	Bi212@ 756.4	62.60
Bi214	19.900 M	B-		Activity = 24.676 ± 3.528 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1118.9	16.44	1116.61	66,374 ± 258	16,869 ± 1,057	Bi214@1120.3	32.046
1750.4	20.28	1744.33	42,507 ± 206	14,847 ± 889	Bi214@1764.5	17.637

Radiation Science, Inc.

MCA2100R / QuantumNaI Report

ID: HMI Sample Location #11, 1 to 2 ft.

File: HMI #11 1-2.ANS Date: October 17, 2002 19:06:48
LT: 3,600.00 RT: 3,664.89 DT: 1.8 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226	1.600E+03 Y	A		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)
190.6	3.50	190.44	259,649 ± 510	18,142 ± 1,012

Activity = 27.250 ± 2.273 pCi/gm

ROI ASSIGNMENT	Activity (pCi/gm)
Ra226@ 186.1	27.250

Pb212	10.640 H	B-		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)
244.4	43.30	243.84	874,960 ± 935	338,800 ± 2,185

Activity = 46.58 ± 3.106 pCi/gm

ROI ASSIGNMENT	Activity (pCi/gm)
Pb212@ 238.6	46.58

Pb214	26.800 M	B-		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)
301.2	18.50	301.02	529,536 ± 728	80,429 ± 2,057
359.3	35.80	358.59	570,106 ± 755	211,269 ± 1,876

Activity = 42.26 ± 3.151 pCi/gm

ROI ASSIGNMENT	Activity (pCi/gm)
Pb214@ 295.2	29.776
Pb214@ 351.9	46.59

Ac228	6.150 H	B-		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)
469.4	4.44	468.73	135,617 ± 368	9,780 ± 1,029
940.2	69.22	938.04	344,612 ± 587	136,907 ± 2,526

Activity = 36.284 ± 3.989 pCi/gm

ROI ASSIGNMENT	Activity (pCi/gm)
Ac228@ 463.0	22.634
Ac228@ 939.6	38.677

Tl208	3.053 M	B-		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)
521.8	22.60	519.82	136,863 ± 370	13,407 ± 1,018
2602.0	99.16	2601.92	49,399 ± 222	28,452 ± 793

Activity = 3.988 ± 0.366 pCi/gm

ROI ASSIGNMENT	Activity (pCi/gm)
Tl208@ 510.8	6.754
Tl208@2614.5	2.973

Bi212	60.550 M	B-		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)
766.1	7.68	764.92	266,835 ± 517	44,464 ± 2,345

Activity = 95.36 ± 15.654 pCi/gm

ROI ASSIGNMENT	Activity (pCi/gm)
Bi212@ 756.4	95.36

Bi214	19.900 M	B-		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)
1125.8	16.44	1124.83	129,823 ± 360	39,563 ± 1,406
1761.2	20.28	1758.80	85,946 ± 293	32,710 ± 1,219

Activity = 37.237 ± 5.332 pCi/gm

ROI ASSIGNMENT	Activity (pCi/gm)
Bi214@1120.3	48.72
Bi214@1764.5	25.191

Radiation Science, Inc.

MCA2100R / QuantumNaI Report

ID: HMI Sample Location #11, 2 to 3 ft.

File: HMI #11 2-3.ANS Date: October 17, 2002 20:28:41
LT: 3,600.00 RT: 3,610.72 DT: 0.3 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226	1.600E+03 Y	A		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	
189.8	3.50	188.04	37,877 ± 195	
			Activity = 6.515 ± 1.194 pCi/gm	
			NET (cnts) / ROI ASSIGNMENT / Activity (pCi/gm)	
			2,482 ± 428 / Ra226@ 186.1 / 6.515	
Pb212	10.640 H	B-		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	
241.9	43.30	240.45	126,456 ± 356	
			Activity = 11.131 ± 0.771 pCi/gm	
			NET (cnts) / ROI ASSIGNMENT / Activity (pCi/gm)	
			46,325 ± 913 / Pb212@ 238.6 / 11.131	
Pb214	26.800 M	B-		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	
295.8	18.50	296.47	71,449 ± 267	
353.2	35.80	353.76	79,326 ± 282	
			Activity = 9.500 ± 0.820 pCi/gm	
			NET (cnts) / ROI ASSIGNMENT / Activity (pCi/gm)	
			6,484 ± 810 / Pb214@ 295.2 / 4.195	
			27,598 ± 739 / Pb214@ 351.9 / 10.637	
Ac228	6.150 H	B-		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	
462.5	4.44	463.24	20,465 ± 143	
929.9	69.22	926.42	50,378 ± 224	
			Activity = 8.570 ± 1.087 pCi/gm	
			NET (cnts) / ROI ASSIGNMENT / Activity (pCi/gm)	
			1,105 ± 445 / Ac228@ 463.0 / 4.469	
			18,572 ± 1,095 / Ac228@ 939.6 / 9.169	
Tl208	3.053 M	B-		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	
510.7	22.60	515.06	22,166 ± 149	
2557.3	99.16	2564.51	7,247 ± 85	
			Activity = 0.631 ± 0.116 pCi/gm	
			NET (cnts) / ROI ASSIGNMENT / Activity (pCi/gm)	
			1,125 ± 473 / Tl208@ 510.8 / 0.991	
			2,910 ± 339 / Tl208@2614.5 / 0.531	
Bi212	60.550 M	B-		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	
752.6	7.68	755.07	40,190 ± 200	
			Activity = 22.812 ± 5.250 pCi/gm	
			NET (cnts) / ROI ASSIGNMENT / Activity (pCi/gm)	
			6,086 ± 1,033 / Bi212@ 756.4 / 22.812	
Bi214	19.900 M	B-		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	
1110.3	16.44	1108.43	20,186 ± 142	
1738.9	18.24	1732.59	12,132 ± 110	
			Activity = 8.263 ± 1.360 pCi/gm	
			NET (cnts) / ROI ASSIGNMENT / Activity (pCi/gm)	
			4,770 ± 649 / Bi214@1120.3 / 10.267	
			4,248 ± 541 / Bi214@1764.5 / 6.388	

Radiation Science, Inc.

MCA2100R / QuantumNaI Report

ID: HMI Sample Location #11, 3 to 4 ft.

File: HMI #11 3-4.ANS Date: October 18, 2002 10:43:16
LT: 3,533.78 RT: 3,535.49 DT: 0.0 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226	1.600E+03 Y	A		Activity = 0.000 ± 0.000 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
190.8	3.50	190.76	6,428 ± 80	-232 ± 253	Ra226@ 186.1	-0.715
Pb212	10.640 H	B-		Activity = 0.338 ± 0.147 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
242.9	43.30	240.61	14,106 ± 119	1,198 ± 515	Pb212@ 238.6	0.338
Pb214	26.800 M	B-		Activity = 0.287 ± 0.249 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
305.9	18.50	302.78	9,464 ± 97	479 ± 433	Pb214@ 295.2	0.364
360.8	35.80	356.38	7,729 ± 88	147 ± 379	Pb214@ 351.9	6.64E-02
Ac228	6.150 H	B-		Activity = 0.000 ± 0.000 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
468.4	4.44	468.38	3,886 ± 62	-532 ± 275	Ac228@ 463.0	-2.528
940.4	69.22	927.13	6,679 ± 82	-912 ± 656	Ac228@ 939.6	-0.529
Tl208	3.053 M	B-		Activity = 0.000 ± 0.000 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
524.1	22.60	516.53	3,951 ± 63	-245 ± 260	Tl208@ 510.8	-0.253
2594.6	99.16	2561.18	819 ± 29	-1,046 ± 207	Tl208@2614.5	-0.224
Bi212	60.550 M	B-		Activity = 0.000 ± 0.000 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
770.0	7.68	759.05	6,255 ± 79	-116 ± 609	Bi212@ 756.4	-0.512
Bi214	19.900 M	B-		Activity = 0.415 ± 0.488 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1092.2	16.44	1116.59	3,370 ± 58	145 ± 386	Bi214@1120.3	0.367
1734.7	18.24	1724.35	1,324 ± 36	248 ± 309	Bi214@1764.5	0.438

Radiation Science, Inc.

MCA2100R / QuantumNaI Report

ID: HMI Sample Location #12, 0 to 1 ft.

File: HMI #12 0-1.ANS Date: October 18, 2002 11:58:36
LT: 3,600.00 RT: 3,615.81 DT: 0.4 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226	1.600E+03 Y	A		Activity = 0.000 ± 0.000 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
190.8	3.50	190.76	48,899 ± 221	-932 ± 487	Ra226@ 186.1	-3.223
Pb212	10.640 H	B-		Activity = 34.272 ± 2.305 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
237.5	43.30	238.38	239,301 ± 489	108,276 ± 1,174	Pb212@ 238.6	34.272
Pb214	26.800 M	B-		Activity = 13.746 ± 1.295 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
301.3	18.50	293.29	89,140 ± 299	-3,238 ± 938	Pb214@ 295.2	-2.759
346.7	35.80	345.56	99,443 ± 315	27,074 ± 852	Pb214@ 351.9	13.746
Ac228	6.150 H	B-		Activity = 23.193 ± 2.783 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
463.8	4.44	463.73	32,546 ± 180	1,628 ± 542	Ac228@ 463.0	8.675
922.1	69.22	916.57	88,902 ± 298	38,009 ± 1,332	Ac228@ 939.6	24.722
Tl208	3.053 M	B-		Activity = 1.994 ± 0.244 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
510.7	22.60	511.93	33,468 ± 183	2,530 ± 540	Tl208@ 510.8	2.935
2546.6	99.16	2545.66	15,379 ± 124	7,028 ± 483	Tl208@2614.5	1.691
Bi212	60.550 M	B-		Activity = 33.740 ± 7.960 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
744.9	7.68	736.42	59,920 ± 245	6,833 ± 1,213	Bi212@ 756.4	33.740
Bi214	19.900 M	B-		Activity = 10.276 ± 2.014 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1103.0	16.44	1102.51	23,941 ± 155	4,765 ± 707	Bi214@1120.3	13.511
1733.7	18.24	1723.39	13,382 ± 116	3,034 ± 594	Bi214@1764.5	6.011

Radiation Science, Inc.

NaI Gamma Spectroscopy Report

ID: HMI Sample Location #12, 1 to 2ft.

File: HMI #12 1-2.ANS Date: October 20, 2002 14:28:47
LT: 3,600.00 RT: 3,601.78 DT: 0.0 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226 1.600E+03 Y A — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
190.8	3.50	190.76	6,583 ± 81	-30 ± 256	Ra226@ 186.1	-0.102

Pb212 10.640 H B- — Activity = 0.675 ± 0.160 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
246.9	43.30	243.02	13,703 ± 117	2,165 ± 491	Pb212@ 238.6	0.675

Pb214 26.800 M B- — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
302.8	18.50	304.07	9,879 ± 99	-20 ± 446	Pb214@ 295.2	-1.68E-02
360.8	35.80	359.53	8,128 ± 90	-269 ± 392	Pb214@ 351.9	-0.135

Ac228 6.150 H B- — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
468.4	4.44	468.38	3,998 ± 63	-277 ± 276	Ac228@ 463.0	-1.454
940.4	117.13	935.06	6,967 ± 83	-454 ± 659	Ac228@ 939.6	-0.172

Tl208 3.053 M B- — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
524.1	22.60	524.07	4,183 ± 65	-224 ± 266	Tl208@ 510.8	-0.256
2598.2	99.16	2586.16	927 ± 30	-897 ± 189	Tl208@2614.5	-0.213

Bi212 60.550 M B- — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
770.0	15.36	769.98	6,619 ± 81	-202 ± 624	Bi212@ 756.4	-0.498

Bi214 19.900 M B- — Activity = 0.473 ± 1.106 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1090.3	16.44	1121.91	3,557 ± 60	170 ± 394	Bi214@1120.3	0.473
1772.0	20.28	1746.39	1,271 ± 36	-201 ± 285	Bi214@1764.5	-0.350

Radiation Science, Inc.

NaI Gamma Spectroscopy Report

ID: HMI Sample Location #2, 2 to 3 ft.

File: HMI #2 2-3.ANS Date: October 14, 2002 08:34:14
LT: 3,600.00 RT: 3,602.57 DT: 0.1 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226	1.600E+03 Y	A		Activity = 1.280 ± 1.003 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
188.4	3.50	190.76	9,798 ± 99	356 ± 278	Ra226@ 186.1	1.280
Pb212	10.640 H	B-		Activity = 0.421 ± 0.177 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
246.6	43.30	240.67	17,985 ± 134	1,281 ± 531	Pb212@ 238.6	0.421
Pb214	26.800 M	B-		Activity = 0.000 ± 0.000 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
302.8	18.50	304.72	13,459 ± 116	-232 ± 483	Pb214@ 295.2	-0.206
360.8	35.80	353.17	10,625 ± 103	-132 ± 418	Pb214@ 351.9	-6.97E-02
Ac228	6.150 H	B-		Activity = 0.000 ± 0.000 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
468.4	4.44	468.38	5,687 ± 75	-422 ± 301	Ac228@ 463.0	-2.337
940.4	117.13	941.44	10,470 ± 102	-899 ± 741	Ac228@ 939.6	-0.359
Tl208	3.053 M	B-		Activity = 1.25E-02 ± 5.50E-02 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
524.1	22.60	519.88	6,105 ± 78	-157 ± 292	Tl208@ 510.8	-0.189
2598.2	99.16	2590.95	2,273 ± 48	50 ± 220	Tl208@2614.5	1.25E-02
Bi212	60.550 M	B-		Activity = 0.448 ± 1.767 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
770.0	15.36	784.05	10,031 ± 100	173 ± 680	Bi212@ 756.4	0.448
Bi214	19.900 M	B-		Activity = 0.488 ± 1.280 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1099.0	16.44	1132.11	5,113 ± 72	166 ± 433	Bi214@1120.3	0.488
1772.0	20.28	1758.35	2,320 ± 48	-325 ± 335	Bi214@1764.5	-0.598

Radiation Science, Inc.

NaI Gamma Spectroscopy Report

ID: HMI Sample Location #12, 3 to 4 ft.

File: HMI #12 3-4.ANS Date: October 18, 2002 19:59:14
LT: 3,600.00 RT: 3,601.67 DT: 0.0 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226	1.600E+03 Y	A		Activity = 0.426 ± 0.563 pCi/gm		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
184.5	3.50	190.76	6,548 ± 81	193 ± 255	Ra226@ 186.1	0.426
Pb212	10.640 H	B-		Activity = 0.165 ± 9.93E-02 pCi/gm		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
247.9	43.30	243.72	12,094 ± 110	815 ± 488	Pb212@ 238.6	0.165
Pb214	26.800 M	B-		Activity = 0.000 ± 0.000 pCi/gm		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
302.8	18.50	302.84	9,170 ± 96	-729 ± 445	Pb214@ 295.2	-0.397
360.8	35.80	358.66	7,304 ± 85	-533 ± 385	Pb214@ 351.9	-0.173
Ac228	6.150 H	B-		Activity = 0.790 ± 0.914 pCi/gm		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
469.9	4.44	468.38	3,835 ± 62	232 ± 267	Ac228@ 463.0	0.790
940.4	117.13	939.83	6,360 ± 80	-137 ± 639	Ac228@ 939.6	-3.36E-02
Tl208	3.053 M	B-		Activity = 0.000 ± 0.000 pCi/gm		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
524.1	22.60	523.34	3,838 ± 62	-562 ± 265	Tl208@ 510.8	-0.416
2598.2	99.16	2577.75	858 ± 29	-938 ± 186	Tl208@2614.5	-0.144
Bi212	60.550 M	B-		Activity = 0.000 ± 0.000 pCi/gm		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
770.0	15.36	769.98	6,043 ± 78	-621 ± 621	Bi212@ 756.4	-0.991
Bi214	19.900 M	B-		Activity = 0.000 ± 0.000 pCi/gm		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1129.3	16.44	1112.92	3,173 ± 56	-293 ± 396	Bi214@1120.3	-0.530
1772.0	20.28	1742.91	1,224 ± 35	-69 ± 276	Bi214@1764.5	-7.82E-02

Radiation Science, Inc.

NaI Gamma Spectroscopy Report

ID: HMI Sample Location #13, 0 to 1 ft.

File: HMI #13 0-1.ANS Date: October 19, 2002 09:43:25
LT: 1,800.00 RT: 1,838.21 DT: 2.1 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226 1.600E+03 Y A — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
192.4	3.50	190.76	118,372 ± 344	419 ± 694	Ra226@ 186.1	2.679

Pb212 10.640 H B- — Activity = 174.9 ± 11.652 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
243.7	43.30	242.73	616,592 ± 785	298,872 ± 1,697	Pb212@ 238.6	174.9

Pb214 26.800 M B- — Activity = 49.54 ± 4.570 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
302.8	18.50	297.97	236,969 ± 487	-1,772 ± 1,474	Pb214@ 295.2	-2.793
355.9	35.80	352.21	239,119 ± 489	52,769 ± 1,322	Pb214@ 351.9	49.54

Ac228 6.150 H B- — Activity = 82.49 ± 8.513 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
469.9	4.44	469.86	82,327 ± 287	6,707 ± 789	Ac228@ 463.0	66.08
940.5	117.13	936.83	247,267 ± 497	119,377 ± 1,968	Ac228@ 939.6	84.79

Tl208 3.053 M B- — Activity = 12.922 ± 1.203 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
521.8	22.60	520.14	87,664 ± 296	8,863 ± 804	Tl208@ 510.8	19.008
2606.0	99.16	2611.48	43,694 ± 209	24,328 ± 762	Tl208@2614.5	10.821

Bi212 60.550 M B- — Activity = 105.7 ± 15.182 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
753.2	15.36	750.29	157,965 ± 397	22,862 ± 1,804	Bi212@ 756.4	105.7

Bi214 19.900 M B- — Activity = 47.85 ± 8.924 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1126.1	16.44	1123.08	56,580 ± 238	12,133 ± 971	Bi214@1120.3	63.61
1770.7	20.28	1768.41	32,718 ± 181	5,858 ± 852	Bi214@1764.5	19.204

Radiation Science, Inc.

NaI Gamma Spectroscopy Report

ID: HMI Sample Location #13, 1 to 2 ft.

File: HMI #13 1-2.ANS Date: October 19, 2002 10:17:50
LT: 3,600.00 RT: 3,608.65 DT: 0.2 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226	1.600E+03 Y	A		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	
190.6	3.50	190.58	25,602 ± 160	

Activity = 2.721 ± 1.204 pCi/gm

NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
851 ± 373	Ra226@ 186.1	2.721

Pb212	10.640 H	B-		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	
244.0	43.30	243.27	117,004 ± 342	

Activity = 15.835 ± 1.079 pCi/gm

NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
54,114 ± 839	Pb212@ 238.6	15.835

Pb214	26.800 M	B-		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	
302.8	18.50	298.93	48,568 ± 220	
352.7	35.80	352.06	49,837 ± 223	

Activity = 6.301 ± 0.634 pCi/gm

NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
-931 ± 745	Pb214@ 295.2	-0.734
13,425 ± 634	Pb214@ 351.9	6.301

Ac228	6.150 H	B-		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	
468.8	4.44	465.63	17,124 ± 131	
938.2	117.13	933.69	47,413 ± 218	

Activity = 6.713 ± 0.808 pCi/gm

NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
767 ± 417	Ac228@ 463.0	3.778
19,692 ± 1,021	Ac228@ 939.6	6.993

Tl208	3.053 M	B-		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	
513.8	22.60	517.12	18,153 ± 135	
2599.4	99.16	2594.08	8,188 ± 90	

Activity = 0.859 ± 0.124 pCi/gm

NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
810 ± 419	Tl208@ 510.8	0.869
3,856 ± 338	Tl208@2614.5	0.858

Bi212	60.550 M	B-		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	
757.5	15.36	752.30	32,167 ± 179	

Activity = 9.960 ± 2.486 pCi/gm

NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
4,309 ± 943	Bi212@ 756.4	9.960

Bi214	19.900 M	B-		
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	
1118.6	16.44	1118.54	12,603 ± 112	
1753.4	20.28	1756.99	6,720 ± 82	

Activity = 6.366 ± 1.610 pCi/gm

NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
3,054 ± 534	Bi214@1120.3	8.004
837 ± 446	Bi214@1764.5	1.372

Radiation Science, Inc.

NaI Gamma Spectroscopy Report

ID: HMI Sample Location #13, 2 to 3 ft.

File: HMI #13 2-3.ANS Date: October 19, 2002 11:46:57
LT: 3,600.00 RT: 3,601.82 DT: 0.1 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226	1.600E+03 Y	A		Activity = 0.255 ± 0.701 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
186.4	3.50	190.76	6,974 ± 84	94 ± 259	Ra226@ 186.1	0.255
Pb212	10.640 H	B-		Activity = 0.628 ± 0.129 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
247.2	43.30	243.81	14,108 ± 119	2,528 ± 492	Pb212@ 238.6	0.628
Pb214	26.800 M	B-		Activity = 0.261 ± 0.192 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
302.8	18.50	304.58	10,355 ± 102	528 ± 446	Pb214@ 295.2	0.353
340.1	35.80	359.80	8,472 ± 92	299 ± 390	Pb214@ 351.9	0.119
Ac228	6.150 H	B-		Activity = 0.000 ± 0.000 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
468.4	4.44	462.73	4,074 ± 64	-257 ± 277	Ac228@ 463.0	-1.074
940.4	117.13	934.85	7,058 ± 84	-279 ± 657	Ac228@ 939.6	-8.41E-02
Tl208	3.053 M	B-		Activity = 0.000 ± 0.000 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
524.1	22.60	514.79	4,178 ± 65	-551 ± 270	Tl208@ 510.8	-0.501
2598.2	99.16	2595.46	997 ± 32	-998 ± 201	Tl208@2614.5	-0.188
Bi212	60.550 M	B-		Activity = 0.671 ± 1.215 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
816.8	15.36	784.64	6,803 ± 82	342 ± 618	Bi212@ 756.4	0.671
Bi214	19.900 M	B-		Activity = 0.364 ± 0.880 pCi/gm	
ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1120.8	16.44	1118.00	3,551 ± 60	164 ± 394	Bi214@1120.3	0.364
1772.0	20.28	1751.04	1,414 ± 38	-134 ± 288	Bi214@1764.5	-0.186

Radiation Science, Inc.

NaI Gamma Spectroscopy Report

ID: HMI Sample Location #13, 3 to 4 ft.

File: HMI #13 3-4.ANS Date: October 19, 2002 14:27:03
LT: 3,600.00 RT: 3,601.83 DT: 0.1 %

Library: Natural.mdb

Library efficiencies were ignored

Activities reported as of Measurement Date.

NUCLIDES ANALYZED

Ra226 1.600E+03 Y A — Activity = 0.160 ± 0.520 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
190.8	3.50	190.76	7,131 ± 84	80 ± 260	Ra226@ 186.1	0.160

Pb212 10.640 H B- — Activity = 0.434 ± 9.50E-02 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
244.9	43.30	241.49	14,252 ± 119	2,371 ± 494	Pb212@ 238.6	0.434

Pb214 26.800 M B- — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
302.8	18.50	302.84	10,328 ± 102	-515 ± 455	Pb214@ 295.2	-0.254
360.8	35.80	361.43	8,455 ± 92	-182 ± 395	Pb214@ 351.9	-5.35E-02

Ac228 6.150 H B- — Activity = 9.98E-02 ± 0.144 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
468.4	4.44	468.38	4,062 ± 64	-227 ± 276	Ac228@ 463.0	-0.700
936.1	117.13	938.22	7,226 ± 85	449 ± 645	Ac228@ 939.6	9.98E-02

Tl208 3.053 M B- — Activity = 0.000 ± 0.000 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
524.1	22.60	524.98	4,055 ± 64	-415 ± 266	Tl208@ 510.8	-0.279
2598.2	99.16	2575.10	903 ± 30	-893 ± 187	Tl208@2614.5	-0.124

Bi212 60.550 M B- — Activity = 0.556 ± 0.891 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
776.1	15.36	780.43	6,643 ± 82	385 ± 614	Bi212@ 756.4	0.556

Bi214 19.900 M B- — Activity = 0.929 ± 0.659 pCi/gm

ROI CENTROID	RAD INT	CENTER (keV)	GROSS (cnts)	NET (cnts)	ROI ASSIGNMENT	Activity (pCi/gm)
1117.6	16.44	1117.70	3,583 ± 60	566 ± 385	Bi214@1120.3	0.929
1772.0	20.28	1748.29	1,339 ± 37	-388 ± 296	Bi214@1764.5	-0.398