

## MAGILL HALL FIRST FLOOR NORTHWEST

### (SURVEY UNITS 20 THROUGH 31)

Magill Hall First Floor Northwest includes Rooms 100, 100A, 100H, 104, 104A, 108 (includes 108B), 108A, 112 (includes 112B and 112C), 112A, 144A, 148, and 148A. The floors within these areas were classified as MARSSIM Class 2 areas. The walls were classified as MARSSIM Class 2 areas or MARSSIM Class 3 areas (see Table A4.1). Figures (including sample locations) are included in Attachment A-4-1. Radiologically impacted areas were divided into SUs based on MARSSIM-recommended size constraints, resulting in a total of 17 SUs (SU-20 through SU-31) in the area identified herein as Magill Hall First Floor Northwest. Survey data from the floors, walls, and ceiling tiles are located in Tables A4.2 through A4.13.

**Overview of Surveys Performed.** Ludlum Model 43-89 dual phosphor ZnS detectors coupled with Ludlum Model 2360 scalers were used for the collection of quantitative alpha/beta scan surveys and fixed-point (i.e., static) measurements. The alpha/beta static measurements were performed at systematic locations for MARSSIM Class 2 areas and at randomly generated locations for Class 3 areas. Given that scan surveys did not detect the presence of activity that was elevated with respect to the investigation level, biased fixed-point measurements were not necessary. Removable contamination measurements (i.e., swipes) were also collected at each static location to quantify residual removable activity. The swipes were counted using a Ludlum Model 43-10-1 alpha/beta sample counter. QA/QC information relative to the instruments used is contained in Section 5.0 of the main text and in Appendix C.

**Table A4.1 Magill Hall First Floor Northwest Summary Table**

Room Number/ Description	Area (m <sup>2</sup> )	Walls <sup>a</sup>		Floors	
		Included (Yes/No)	MARSSIM Classification	Included (Yes/No)	MARSSIM Classification
Lobby 100H	56	Yes	Class 2 <sup>a</sup>	Yes	Class 2
Classroom 100	118	Yes	Class 3 <sup>b</sup>	Yes	Class 2
Storage 100A	7			Yes	Class 2
Lab 104	117			Yes	Class 2
Storage 104A	21			Yes	Class 2
Classroom 108, Closet 108B <sup>b</sup>	111			Yes	Class 2
Storage 108A	6			Yes	Class 2
Classroom 112, Closets 112B and 112C	114			Yes	Class 2
Storage 112A	22			Yes	Class 2
Storage 144A	7			Yes	Class 2
Classroom 148	118			Yes	Class 2
Storage 148A	22			Yes	Class 2

<sup>a</sup> The walls of Room 100H were evaluated with SU-5 of the First Floor Corridor and are included in Attachment 1.

<sup>b</sup> Areas were combined for the MARSSIM Class 3 Wall Surveys.

**Fixed-Point Measurements.** Fixed-point measurements were obtained from MARSSIM Class 2 (systematic - random start triangular grid) or MARSSIM Class 3 (random) locations. Class 3 fixed-point measurements were obtained from random locations, with emphasis on areas with a greater likelihood of residual activity. Results of the static measurements are listed in Tables A4.2 through A4.13, and locations are shown on Figures A4.1 through A4.12. All alpha results were below the site-specific alpha DCGL of 1,160 dpm/100 cm<sup>2</sup> for Am-241. Residual beta activity was compliant with both the Cs-137 surface contamination level of 5,000 dpm/100 cm<sup>2</sup> specified in AEC Regulatory Guide 1.86 (AEC 1974) and the NRC screening level DCGL of 28,000 dpm/100 cm<sup>2</sup> cited in Table 5.19 of NUREG-5512 (NRC 1999) for Cs-137 on structures.

**Table A4.2. SU-20. Room 100 Class 2 Floor Measurements**

Sample Number	Survey Surface	Location	Total Alpha Activity (dpm/100 cm <sup>2</sup> )	Total Beta Activity (dpm/100 cm <sup>2</sup> )	Removable Alpha Activity (dpm/100 cm <sup>2</sup> )	Removable Beta Activity (dpm/100 cm <sup>2</sup> )
1	Linoleum	100	95	1,846	3	20
2	Linoleum	100	9	742	-1	-23
3	Linoleum	100	-4	725	-1	3
4	Linoleum	100	21	1,130	-1	-8
5	Linoleum	100	9	431	-1	-28
6	Linoleum	100	9	750	-1	0
7	Linoleum	100	9	535	-1	-8
8	Linoleum	100	9	1,630	-1	-20
9	Linoleum	100	21	587	-1	-3
10	Linoleum	100	-4	1,026	-1	-17
11	Linoleum	100	9	1,018	-1	-34

The MDC is the minimum detectable concentration on a surface that an instrument is expected to detect with 95 percent confidence.

The instrument MDCs for fixed measurements 1-11 are 60 dpm/100 cm<sup>2</sup> (alpha) and 236 dpm/100 cm<sup>2</sup> (beta); and the MDCs for removable samples 1-11 are 14 dpm/100 cm<sup>2</sup> (alpha) and 74 dpm/100 cm<sup>2</sup> (beta).

Negative results indicate results that are below background for the respective building material.

**Table A4.3. SU-21 Room 100A Class 2 Floor Measurements**

Sample Number	Survey Surface	Location	Total Alpha Activity (dpm/100 cm <sup>2</sup> )	Total Beta Activity (dpm/100 cm <sup>2</sup> )	Removable Alpha Activity (dpm/100 cm <sup>2</sup> )	Removable Beta Activity (dpm/100 cm <sup>2</sup> )
1	Linoleum	100a	21	1,665	-1	6
2	Linoleum	100a	33	1,535	-1	-23
3	Linoleum	100a	33	1,863	-1	-14
4	Linoleum	100a	9	1,302	-1	-14
5	Linoleum	100a	46	1,328	-1	8
6	Linoleum	100a	33	1,389	-1	-6
7	Linoleum	100a	33	1,716	6	6
8	Linoleum	100a	9	1,673	-1	23
9	Linoleum	100a	9	664	-1	-6

The MDC is the minimum detectable concentration on a surface that an instrument is expected to detect with 95 percent confidence.

The instrument MDCs for fixed measurements 1-9 are 60 dpm/100 cm<sup>2</sup> (alpha) and 236 dpm/100 cm<sup>2</sup> (beta); and the MDCs for removable samples 1-9 are 14 dpm/100 cm<sup>2</sup> (alpha) and 74 dpm/100 cm<sup>2</sup> (beta).

Negative results indicate results that are below background for the respective building material.

**Table A4.4. SU-22 Lobby 100H Class 2 Floor Measurements**

Sample Number	Survey Surface	Location	Total Alpha Activity (dpm/100 cm <sup>2</sup> )	Total Beta Activity (dpm/100 cm <sup>2</sup> )	Removable Alpha Activity (dpm/100 cm <sup>2</sup> )	Removable Beta Activity (dpm/100 cm <sup>2</sup> )
1	Linoleum	100h	-5	581	0	-13
2	Linoleum	100h	8	493	0	1
3	Linoleum	100h	8	1,118	0	-13
4	Linoleum	100h	8	756	3	-33
5	Linoleum	100h	8	833	0	-24
6	Concrete Stairs	100h	-5	756	0	1
7	Linoleum	100h	8	789	0	15
8	Metal Stair Rail	100h	20	964	0	4
9	Linoleum	100h	-5	493	3	-30
10	Linoleum	100h	8	778	0	12
11	Linoleum	100h	8	833	0	4
12	Linoleum	100h	-5	679	0	-27
13	Linoleum	100h	-5	822	0	-19

The MDC is the minimum detectable concentration on a surface that an instrument is expected to detect with 95 percent confidence.

The instrument MDCs for fixed measurements 1-13 are 21 dpm/100 cm<sup>2</sup> (alpha) and 256 dpm/100 cm<sup>2</sup> (beta); and the MDCs for removable samples 1-13 are 18 dpm/100 cm<sup>2</sup> (alpha) and 212 dpm/100 cm<sup>2</sup> (beta).

Negative results indicate results that are below background for the respective building material.

**Table A4.5. SU-23 Room 104 Class 2 Floor Measurements**

Sample Number	Survey Surface	Location	Total Alpha Activity (dpm/100 cm <sup>2</sup> )	Total Beta Activity (dpm/100 cm <sup>2</sup> )	Removable Alpha Activity (dpm/100 cm <sup>2</sup> )	Removable Beta Activity (dpm/100 cm <sup>2</sup> )
1	Linoleum	104	7	831	-1	0
2	Linoleum	104	22	933	-1	9
3	Linoleum	104	22	851	-1	-3
4	Linoleum	104	-7	1,169	-1	-12
5	Linoleum	104	7	831	3	6
6	Linoleum	104	7	585	3	-9
7	Linoleum	104	22	708	-1	9
8	Linoleum	104	37	862	-1	-3
9	Linoleum	104	-7	1,108	-1	-12
10	Linoleum	104	7	933	-1	-15

The MDC is the minimum detectable concentration on a surface that an instrument is expected to detect with 95 percent confidence.

The instrument MDCs for fixed measurements 1-10 are 58 dpm/100 cm<sup>2</sup> (alpha) and 233 dpm/100 cm<sup>2</sup> (beta); and the MDCs for removable samples 1-10 are 15 dpm/100 cm<sup>2</sup> (alpha) and 75 dpm/100 cm<sup>2</sup> (beta).

Negative results indicate results that are below background for the respective building material.

**Table A4.6. SU-24 Room 104A Class 2 Floor Measurements**

Sample Number	Survey Surface	Location	Total Alpha Activity (dpm/100 cm <sup>2</sup> )	Total Beta Activity (dpm/100 cm <sup>2</sup> )	Removable Alpha Activity (dpm/100 cm <sup>2</sup> )	Removable Beta Activity (dpm/100 cm <sup>2</sup> )
1	Linoleum	104a	21	1,294	3	-31
2	Linoleum	104a	9	1,423	3	-45
3	Linoleum	104a	46	1,337	-1	37
4	Linoleum	104a	33	1,846	-1	-23
5	Linoleum	104a	33	1,397	-1	-3
6	Linoleum	104a	-4	1,846	-1	23
7	Linoleum	104a	21	1,915	-1	11
8	Linoleum	104a	33	1,587	-1	-8
9	Linoleum	104a	21	1,941	-1	-11
10	Linoleum	104a	46	1,941	-1	25

The MDC is the minimum detectable concentration on a surface that an instrument is expected to detect with 95 percent confidence.

The instrument MDCs for fixed measurements 1-10 are 60 dpm/100 cm<sup>2</sup> (alpha) and 236 dpm/100 cm<sup>2</sup> (beta); and the MDCs for removable samples 1-10 are 14 dpm/100 cm<sup>2</sup> (alpha) and 74 dpm/100 cm<sup>2</sup> (beta).

Negative results indicate results that are below background for the respective building material.

**Table A4.7. SU-25 Room 108 Class 2 Floor Measurements**

Sample Number	Survey Surface	Location	Total Alpha Activity (dpm/100 cm <sup>2</sup> )	Total Beta Activity (dpm/100 cm <sup>2</sup> )	Removable Alpha Activity (dpm/100 cm <sup>2</sup> )	Removable Beta Activity (dpm/100 cm <sup>2</sup> )
1	Linoleum	108	33	112	-1	-35
2	Linoleum	108	-4	500	3	3
3	Linoleum	108	-4	267	3	6
4	Linoleum	108	-4	863	-1	0
5	Linoleum	108	-4	492	3	-20
6	Linoleum	108	21	1,371	-1	0
7	Linoleum	108	9	673	-1	18
8	Linoleum	108	21	405	-1	0
9	Linoleum	108	-4	518	-1	35

The MDC is the minimum detectable concentration on a surface that an instrument is expected to detect with 95 percent confidence.

The instrument MDCs for fixed measurements 1-9 are 60 dpm/100 cm<sup>2</sup> (alpha) and 236 dpm/100 cm<sup>2</sup> (beta); and the MDCs for removable samples 1-9 are 15 dpm/100 cm<sup>2</sup> (alpha) and 75 dpm/100 cm<sup>2</sup> (beta).

Negative results indicate results that are below background for the respective building material.

**Table A4.8. SU-26 Room 108A Class 2 Floor Measurements**

Sample Number	Survey Surface	Location	Total Alpha Activity (dpm/100 cm <sup>2</sup> )	Total Beta Activity (dpm/100 cm <sup>2</sup> )	Removable Alpha Activity (dpm/100 cm <sup>2</sup> )	Removable Beta Activity (dpm/100 cm <sup>2</sup> )
1	Linoleum	108a	70	1,622	-1	-3
2	Linoleum	108a	-4	1,380	-1	3
3	Linoleum	108a	-4	1,484	-1	-18
4	Linoleum	108a	33	1,449	-1	-9
5	Linoleum	108a	9	1,725	-1	3
6	Linoleum	108a	9	1,613	-1	-15
7	Linoleum	108a	9	1,751	-1	-35
8	Linoleum	108a	21	1,691	3	-3
9	Linoleum	108a	33	1,734	-1	6
10	Linoleum	108a	46	2,010	-1	-20

The MDC is the minimum detectable concentration on a surface that an instrument is expected to detect with 95 percent confidence.

The instrument MDCs for fixed measurements 1-10 are 60 dpm/100 cm<sup>2</sup> (alpha) and 236 dpm/100 cm<sup>2</sup> (beta); and the MDCs for removable samples 1-10 are 15 dpm/100 cm<sup>2</sup> (alpha) and 75 dpm/100 cm<sup>2</sup> (beta).

Negative results indicate results that are below background for the respective building material.

**Table A4.9. SU-27 Room 112 Class 2 Floor Measurements**

Sample Number	Survey Surface	Location	Total Alpha Activity (dpm/100 cm <sup>2</sup> )	Total Beta Activity (dpm/100 cm <sup>2</sup> )	Removable Alpha Activity (dpm/100 cm <sup>2</sup> )	Removable Beta Activity (dpm/100 cm <sup>2</sup> )
1	Linoleum	112	-4	431	-1	8
2	Linoleum	112	-4	311	-1	-17
3	Linoleum	112	-4	233	3	37
4	Linoleum	112	9	457	-1	-6
5	Linoleum	112	9	388	-1	-14
6	Linoleum	112	33	129	-1	-6
7	Linoleum	112	9	345	-1	-11
8	Linoleum	112	9	638	-1	-11
9	Linoleum	112	21	595	3	-20
10	Linoleum	112	21	656	-1	11

The MDC is the minimum detectable concentration on a surface that an instrument is expected to detect with 95 percent confidence.

The instrument MDCs for fixed measurements 1-10 are 60 dpm/100 cm<sup>2</sup> (alpha) and 236 dpm/100 cm<sup>2</sup> (beta); and the MDCs for removable samples 1-10 are 15 dpm/100 cm<sup>2</sup> (alpha) and 75 dpm/100 cm<sup>2</sup> (beta).

Negative results indicate results that are below background for the respective building material.

**Table A4.10. SU-28 Room 112A Class 2 Floor Measurements**

Sample Number	Survey Surface	Location	Total Alpha Activity (dpm/100 cm <sup>2</sup> )	Total Beta Activity (dpm/100 cm <sup>2</sup> )	Removable Alpha Activity (dpm/100 cm <sup>2</sup> )	Removable Beta Activity (dpm/100 cm <sup>2</sup> )
1	Linoleum	112a	21	966	-1	-20
2	Linoleum	112a	-4	1,018	-1	-35
3	Linoleum	112a	58	1,492	3	26
4	Linoleum	112a	46	1,440	-1	18
5	Linoleum	112a	21	2,113	3	-29
6	Linoleum	112a	-4	1,535	-1	12
7	Linoleum	112a	9	2,174	-1	38
8	Linoleum	112a	-4	1,984	-1	-29
9	Linoleum	112a	-4	2,208	3	26

The MDC is the minimum detectable concentration on a surface, that an instrument is expected to detect with 95 percent confidence.

The instrument MDCs for fixed measurements 1-9 are 60 dpm/100 cm<sup>2</sup> (alpha) and 236 dpm/100 cm<sup>2</sup> (beta); and the MDCs for removable samples 1-9 are 15 (alpha) and 75 dpm/100 cm<sup>2</sup> (beta).

Negative results indicate results that are below background for the respective building material.

The walls of the rooms listed in Table A4.11 below were surveyed as one MARSSIM Class 3 SU. The area of this SU is 770 m<sup>2</sup>.

**Table A4.11. SU-29 Rooms 100, 100A, 104, 104A, 108, 108A, 112, 112A, 144A, 148 and 148A Class 3 Wall Measurements**

Sample Number	Survey Surface	Location	Total Alpha Activity (dpm/100 cm <sup>2</sup> )	Total Beta Activity (dpm/100 cm <sup>2</sup> )	Removable Alpha Activity (dpm/100 cm <sup>2</sup> )	Removable Beta Activity (dpm/100 cm <sup>2</sup> )
1	Drywall	108	9	354	3	-7
2	Drywall	112a	9	906	-1	2
3	Drywall	112	9	587	-1	-1
4	Drywall	108a	33	897	3	8
5	Drywall	148a	-7	697	-1	3
6	Drywall	148	22	872	3	15
7	Drywall	104	7	1,169	3	-15
8	Drywall	100a	7	1,815	3	-6
9	Drywall	104a	37	1,754	-1	0
10	Drywall	100	7	2,215	3	-12

The MDC is the minimum detectable concentration on a surface, that an instrument is expected to detect with 95 percent confidence.

The instrument MDCs for fixed measurements 1-10 are 60 dpm/100 cm<sup>2</sup> (alpha) and 236 dpm/100 cm<sup>2</sup> (beta); and the MDCs for removable samples 1-10 are 15 dpm/100 cm<sup>2</sup> (alpha) and 75 dpm/100 cm<sup>2</sup> (beta).

Negative results indicate results that are below background for the respective building material.

**Table A4.12. SU-30 Rooms 144A and 148A Class 2 Floor Measurements**

Sample Number	Survey Surface	Location	Total Alpha Activity (dpm/100 cm <sup>2</sup> )	Total Beta Activity (dpm/100 cm <sup>2</sup> )	Removable Alpha Activity (dpm/100 cm <sup>2</sup> )	Removable Beta Activity (dpm/100 cm <sup>2</sup> )
1	Concrete	148a	33	910	0	-2
2	Concrete	148a	46	1,578	0	-24
3	Concrete	148a	58	1,732	0	-38
4	Concrete	148a	46	1,578	0	15
5	Concrete	144a	8	1,885	3	-8
6	Concrete	144a	-5	1,567	0	-19
7	Concrete	148a	33	1,381	3	-8
8	Concrete	148a	46	1,359	0	-41
9	Concrete	148a	46	1,995	0	-2
10	Concrete	148a	33	1,863	0	-13
11	Concrete	148a	8	1,589	0	-8
12	Concrete	144a	-5	1,403	0	6

The MDC is the minimum detectable concentration on a surface that an instrument is expected to detect with 95 percent confidence.

The instrument MDCs for fixed measurements 1-12 are 21 dpm/100 cm<sup>2</sup> (alpha) and 256 dpm/100 cm<sup>2</sup> (beta); the MDCs for removable samples 1-12 are 18 dpm/100 cm<sup>2</sup> (alpha) and 212 dpm/100 cm<sup>2</sup> (beta); and the MDCs for the QC measurement #1 are 54 dpm/100 cm<sup>2</sup> (alpha) and 223 dpm/100 cm<sup>2</sup> (beta).

Negative results indicate results that are below background for the respective building material.

N/A – Not Applicable

**Table A4.13. SU-31 Room 148 Class 2 Floor Measurements**

Sample Number	Survey Surface	Location	Total Alpha Activity (dpm/100 cm <sup>2</sup> )	Total Beta Activity (dpm/100 cm <sup>2</sup> )	Removable Alpha Activity (dpm/100 cm <sup>2</sup> )	Removable Beta Activity (dpm/100 cm <sup>2</sup> )
1	Linoleum	148	8	888	3	4
2	Linoleum	148	8	745	0	-21
3	Linoleum	148	8	833	3	-30
4	Linoleum	148	8	603	0	-41
5	Linoleum	148	-5	658	3	-24
6	Linoleum	148	20	592	0	1
7	Linoleum	148	46	438	0	4
8	Linoleum	148	-5	625	0	-5
9	Linoleum	148	8	570	0	-8
10	Linoleum	148	20	712	3	26

**Table A4.13. SU-31 Room 148 Class 2 Floor Measurements (Continued)**

Sample Number	Survey Surface	Location	Total Alpha Activity (dpm/100 cm <sup>2</sup> )	Total Beta Activity (dpm/100 cm <sup>2</sup> )	Removable Alpha Activity (dpm/100 cm <sup>2</sup> )	Removable Beta Activity (dpm/100 cm <sup>2</sup> )
11	Linoleum	148	20	1,162	0	-35
12	Linoleum	148	33	548	0	-49
13	Linoleum	148	-5	438	3	20
14	Linoleum	148	-5	537	0	-8

The MDC is the minimum detectable concentration on a surface that an instrument is expected to detect with 95 percent confidence.

The instrument MDCs for fixed measurements 1-14 are 21 (alpha) and 256 dpm/100 cm<sup>2</sup> (beta); and the MDCs for removable samples 1-14 are 18 dpm/100 cm<sup>2</sup> (alpha) and 212 dpm/100 cm<sup>2</sup> (beta); and the MDCs for the QC measurement #1 are 54 dpm/100 cm<sup>2</sup> (alpha) and 223 dpm/100 cm<sup>2</sup> (beta).

Negative results indicate results that are below background for the respective building material.

N/A – Not Applicable

**Summary.** Residual levels of radioactivity in the Magill Hall First Floor Northwest clearly demonstrate that residual concentrations of radionuclide COPCs achieve the site-specific alpha DCGL of 1,160 dpm/100 cm<sup>2</sup> and the most restrictive beta DCGL of 5,000 dpm/100 cm<sup>2</sup> for Cs-137. In addition, the actual percentage of removable activity was determined to be approximately 3 percent.

Given these results, it is clearly demonstrated that the null hypothesis (i.e., that the Magill Hall First Floor Northwest exceeds DCGLs) is rejected. Review of survey data supports the conclusion that the Magill Hall First Floor Northwest contains an adequate number of samples; a sufficient percentage has been scanned; and it has been appropriately classified consistent with MARSSIM requirements using the process noted in Section 4.0 of the main text of this document. All scan and fixed measurement results collected from the Magill Hall First Floor Northwest were below the DCGL<sub>w</sub>. As such, formal assessment using the Sign Test is not required.

**Conclusion.** Levels of radioactivity in the Magill Hall First Floor Northwest achieve criteria for unrestricted release consistent with the provisions of 10 *CFR* 20, Subpart E.

**ATTACHMENT A-4-1**

**FIGURES**

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