

*Table of DOE-STD-1027-92  
Hazard Category 3 Threshold Quantities  
for the ICRP-30 List of 757 Radionuclides  
LANL Fact Sheet*



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TABLE OF DOE-STD-1027-92 HAZARD CATEGORY 3  
THRESHOLD QUANTITIES FOR THE ICRP-30 LIST  
OF 757 RADIONUCLIDES

LANL FACT SHEET

by

Jim Clow, John Elder, George Heindel, William Inkret, and Guthrie Miller

Revised October 16, 2002

**ABSTRACT**

A table of DOE-STD-1027-92<sup>1</sup> Hazard Category 3 threshold quantities, in units of curies and grams, is presented for the International Commission on Radiological Protection-30 (ICRP-30) list of 757 radionuclides.<sup>2</sup> The specific activity (Ci/gm) used to convert the threshold quantities from curies to grams is also calculated and tabulated. The half-life values used to generate the specific activities are those specified in ICRP-30.

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Purpose

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This revision is being issued to correct two specific table entries for the Hazard Category 3 thresholds. These are for tritium (H-3) and californium 249 (Cf-249). The new values for tritium are the consequence of a change directed by DOE that results in values derived by the same method as is used for the other radionuclides. The new value for Cf-249 corrects a typographical error contained in the original version of this report.

Additionally, editorial changes have been included to accurately reflect the current version of DOE-STD-1027-92 (Change Notice No. 1, September 1997).

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Scope

This fact sheet contains a table with the following:

1. Hazard Category 3 Threshold Quantities determined as in DOE-STD-1027-92 and expressed in curies
  2. Hazard Category 3 Threshold Quantities determined as in DOE-STD-1027-92 and expressed in grams
  3. Calculated specific activity (SA) used to convert the Hazard Category 3 Threshold Quantities from units of curies to grams
  4. The radiation-dose pathways that determine threshold quantities
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Background

The Hazard Category 3 Threshold Quantity listed in the DOE-STD-1027-92 document defines the minimum quantity of a radionuclide that would cause a DOE facility to be classified as a Hazard Category 3 nuclear facility. We determined the Hazard Category 3 Threshold Quantities by multiplying by 20 the Environmental Protection Agency (EPA) threshold quantities from 40 CFR 302.4.<sup>3</sup> The method is the same used to calculate the shorter table of values given in DOE-STD-1027-92 Attachment 1.

LANL HSR-3 will issue Fact Sheet revisions as needed.

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Release Pathways

DOE-STD-1027-92 Hazard Category 3 threshold quantities were calculated from the smallest of the EPA release values for the four pathways considered by the EPA. The pathways listed in column 5 are water (w), food (f), direct exposure (d), and inhalation (i); the smallest pathway-release value defines the threshold. Two abbreviations indicate both pathways have equal, minimum release values. See reference number 3 for a complete description of the method used.

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Calculated Threshold  
Values

We placed the DOE-STD-1027-92 threshold values in the table if the quantity was within 5% of our calculated values. HSR-3-calculated thresholds may differ from DOE-STD-1027-92 threshold quantities because the authors chose to carry all calculations to three significant digits instead of two. All of the DOE-Standard-1027-92 Hazard Category 3 threshold quantities expressed in curies agreed with our calculated quantities. However, conversion to grams showed a disagreement for Fe-59. The disagreement is an even multiple of ten (4 orders of magnitude) suggesting a typographical error in the DOE Standard.

There is also a small disagreement in the values for tritium probably due to rounding or truncating.

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Reference numbers in the table refer to Notes, Explanations, and References on page 27.

**DOE-STD-1027-92 Hazard Category 3 Threshold Quantities  
for the ICRP-30 List of 757 Radionuclides**

ICRP-30 Radionuclide	Category 3 Threshold (Curies)	Category 3 Threshold (Grams)	Calculated SA (Ci/gm) <sup>4</sup>	Pathway
H-3	1.66E+04	1.72E+00	9.65E+03	i
Be-7	1.48E+04	4.23E-02	3.50E+05	d
Be-10	1.04E+02	4.65E+03	2.24E-02	i
C-11	3.60E+04	4.29E-05	8.39E+08	d
C-14	4.20E+02	9.40E+01	4.46E+00	i
F-18	7.20E+05	7.57E-03	9.52E+07	i
Na-22	2.40E+02	3.80E-02	6.25E+03	f
Na-24	3.00E+02	3.45E-05	8.70E+06	d
Mg-28	7.40E+02	1.38E-04	5.35E+06	d
Al-26	2.40E+02	1.25E+04	1.92E-02	f
Si-31	3.20E+05	8.30E-03	3.86E+07	i
Si-32	5.20E+01	2.09E+00	2.48E+01	i
P-32	1.20E+01	4.20E-05	2.86E+05	f
P-33	9.40E+01	6.00E-04	1.56E+05	f
S-35	7.80E+01	1.80E-03	4.27E+04	f
Cl-36	3.40E+02	1.00E+04	3.30E-02	f
Cl-38	1.38E+04	1.04E-04	1.33E+08	d
Cl-39	9.00E+03	1.06E-04	8.52E+07	d
Ar-39	4.00E+04	1.17E+03	3.41E+01	d
Ar-41	6.00E+02	1.43E-05	4.18E+07	d
K-40	1.70E+02	2.40E+07	6.99E-06	f
K-42	4.60E+03	7.62E-04	6.04E+06	d
K-43	1.16E+03	3.60E-04	3.23E+06	d
K-44	1.34E+04	6.94E-05	1.93E+08	d
K-45	2.40E+04	1.15E-04	2.09E+08	d
Ca-41	1.60E+03	2.57E+04	6.23E-02	f
Ca-45	1.10E+03	6.20E-02	1.78E+04	f
Ca-47	7.00E+02	1.10E-03	6.13E+05	d
Sc-43	3.80E+04	2.03E-03	1.87E+07	d
Sc-44m	1.90E+03	1.56E-03	1.22E+06	f
Sc-44	2.60E+03	1.43E-04	1.81E+07	d

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Table—Continued

ICRP-30 Radionuclide	Category 3 Threshold (Curies)	Category 3 Threshold (Grams)	Calculated SA (Ci/gm) <sup>4</sup>	Pathway
Sc-46	3.60E+02	1.10E-02	3.39E+04	d
Sc-47	5.80E+03	7.00E-03	8.29E+05	f
Sc-48	2.60E+02	1.74E-04	1.49E+06	d
Sc-49	5.20E+05	7.78E-03	6.68E+07	i
Ti-44	6.20E+01	3.60E-01	1.72E+02	i
Ti-45	3.20E+05	1.41E-02	2.26E+07	i
V-47	8.20E+05	6.68E-03	1.23E+08	i
V-48	6.40E+02	3.80E-03	1.68E+05	f
V-49	4.40E+04	5.45E+00	8.08E+03	f
Cr-48	2.60E+03	9.14E-04	2.84E+06	d
Cr-49	1.96E+05	2.15E-03	9.12E+07	d
Cr-51	2.20E+04	2.40E-01	9.24E+04	d
Mn-51	5.20E+05	6.52E-03	7.98E+07	i
Mn-52m	2.40E+04	1.40E-04	1.71E+08	d
Mn-52	3.40E+02	7.60E-04	4.49E+05	d
Mn-53	3.00E+04	1.64E+07	1.82E-03	f
Mn-54	8.80E+02	1.14E-01	7.74E+03	d
Mn-56	2.80E+03	1.29E-04	2.17E+07	d
Fe-52	1.00E+04	1.37E-03	7.28E+06	d
Fe-55	5.40E+03	2.20E+00	2.41E+03	f
Fe-59	6.00E+02	1.21E-02	4.97E+04	f
Fe-60	1.78E+01	2.99E+02	5.96E-02	f
Co-55	9.80E+02	3.02E-04	3.25E+06	d
Co-56	2.20E+02	7.43E-03	2.96E+04	d
Co-57	6.00E+03	7.09E-01	8.46E+03	d
Co-58m	6.20E+06	1.05E+00	5.91E+06	i
Co-58	9.00E+02	2.83E-02	3.18E+04	d
Co-60m	5.80E+07	1.94E-01	2.99E+08	d
Co-60	2.80E+02	2.50E-01	1.13E+03	d
Co-61	8.00E+04	2.57E-03	3.11E+07	d
Co-62m	2.00E+04	9.17E-05	2.18E+08	d
Ni-56	4.60E+02	1.20E-03	3.82E+05	d
Ni-57	6.00E+02	3.94E-04	1.52E+06	d
Ni-59	1.18E+04	1.46E+05	8.08E-02	f

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Table—Continued

ICRP-30 Radionuclide	Category 3 Threshold (Curies)	Category 3 Threshold (Grams)	Calculated SA (Ci/gm) <sup>4</sup>	Pathway
Ni-63	5.40E+03	9.50E+01	5.91E+01	f
Ni-65	9.00E+03	4.70E-04	1.91E+07	d
Ni-66	1.62E+03	1.86E-03	8.70E+05	f
Cu-60	1.98E+04	1.47E-04	1.35E+08	d
Cu-61	1.64E+04	1.09E-03	1.51E+07	d
Cu-64	1.54E+05	3.99E-02	3.86E+06	f
Cu-67	7.20E+03	9.52E-03	7.56E+05	d
Zn-62	5.20E+03	9.53E-04	5.46E+06	d
Zn-63	1.40E+05	1.79E-03	7.83E+07	d
Zn-65	2.40E+02	2.90E-02	8.24E+03	f
Zn-69m	3.00E+03	9.09E-04	3.30E+06	d
Zn-69	1.04E+06	2.17E-02	4.78E+07	i
Zn-71m	2.20E+03	1.94E-04	1.13E+07	d
Zn-72	4.60E+03	4.91E-03	9.36E+05	f
Ga-65	1.14E+05	5.99E-04	1.90E+08	d
Ga-66	1.10E+03	2.18E-04	5.05E+06	d
Ga-67	4.80E+03	8.03E-03	5.98E+05	d
Ga-68	3.20E+05	7.87E-03	4.07E+07	d
Ga-70	2.00E+06	1.57E-02	1.27E+08	i
Ga-72	7.20E+02	2.33E-04	3.09E+06	d
Ga-73	1.44E+04	1.65E-03	8.75E+06	d
Ge-66	1.68E+04	8.03E-04	2.09E+07	d
Ge-67	1.08E+05	7.20E-04	1.50E+08	d
Ge-68	1.00E+03	1.50E-01	6.67E+03	i
Ge-69	1.02E+03	8.77E-04	1.16E+06	d
Ge-71	4.20E+05	2.69E+00	1.56E+05	i
Ge-75	3.00E+05	9.90E-03	3.03E+07	d
Ge-77	1.92E+03	5.33E-04	3.60E+06	d
Ge-78	3.00E+04	1.08E-03	2.77E+07	d
As-69	1.04E+06	5.80E-03	1.79E+08	i
As-70	5.80E+03	1.14E-04	5.11E+07	d
As-71	3.80E+03	5.58E-03	6.81E+05	d
As-72	1.12E+03	6.69E-04	1.67E+06	d
As-73	5.40E+03	2.42E-01	2.23E+04	f

Continued on next page

Table—Continued

ICRP-30 Radionuclide	Category 3 Threshold (Curies)	Category 3 Threshold (Grams)	Calculated SA (Ci/gm) <sup>4</sup>	Pathway
As-74	1.02E+03	1.03E-02	9.94E+04	f
As-76	2.60E+03	1.66E-03	1.57E+06	d
As-77	2.20E+04	2.10E-02	1.05E+06	f
As-78	7.80E+03	2.93E-04	2.66E+07	d
Se-70	9.20E+04	1.40E-03	6.55E+07	d
Se-73m	3.40E+03	5.15E-05	6.61E+07	d
Se-73	1.90E+03	3.16E-04	6.01E+06	d
Se-75	3.20E+02	2.20E-02	1.45E+04	f
Se-79	3.60E+02	5.17E+03	6.97E-02	f
Se-81m	7.20E+05	1.78E-02	4.05E+07	i
Se-81	2.00E+06	1.59E-02	1.25E+08	i
Se-83	2.00E+04	1.99E-04	1.01E+08	d
Br-74m	6.40E+03	1.05E-04	6.12E+07	d
Br-74	1.92E+04	1.91E-04	1.00E+08	d
Br-75	6.60E+03	2.58E-04	2.56E+07	d
Br-76	5.60E+02	2.20E-04	2.55E+06	d
Br-77	3.00E+03	4.13E-03	7.27E+05	d
Br-80m	1.04E+05	1.17E-02	8.87E+06	i
Br-80	8.00E+05	5.92E-03	1.35E+08	d
Br-82	3.40E+02	3.14E-04	1.08E+06	d
Br-83	6.20E+05	3.92E-02	1.58E+07	i
Br-84	1.38E+04	1.96E-04	7.04E+07	d
Kr-74	6.00E+02	2.71E-06	2.21E+08	d
Kr-76	1.80E+03	6.46E-04	2.79E+06	d
Kr-77	8.00E+02	2.45E-05	3.27E+07	d
Kr-79	4.00E+03	3.53E-03	1.13E+06	d
Kr-81	1.40E+05	6.66E+06	2.10E-02	d
Kr-83m	2.00E+06	9.69E-02	2.06E+07	d
Kr-85m	4.00E+03	4.86E-04	8.23E+06	d
Kr-85	2.00E+04	5.10E+01	3.93E+02	d
Kr-87	1.00E+03	3.53E-05	2.83E+07	d
Kr-88	4.00E+02	3.19E-05	1.25E+07	d
Rb-79	2.40E+04	2.31E-04	1.04E+08	d
Rb-81m	9.60E+04	1.32E-03	7.26E+07	d

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Table—Continued

ICRP-30 Radionuclide	Category 3 Threshold (Curies)	Category 3 Threshold (Grams)	Calculated SA (Ci/gm) <sup>4</sup>	Pathway
Rb-81	5.80E+03	6.86E-04	8.45E+06	d
Rb-82m	7.80E+02	1.27E-04	6.17E+06	d
Rb-83	4.00E+02	2.19E-02	1.83E+04	f
Rb-84	4.00E+02	8.43E-03	4.74E+04	f
Rb-86	5.00E+02	6.14E-03	8.14E+04	f
Rb-87	6.00E+02	6.86E+09	8.75E-08	f
Rb-88	5.80E+04	4.83E-04	1.20E+08	d
Rb-89	2.60E+04	1.87E-04	1.39E+08	d
Sr-80	8.20E+03	3.49E-04	2.35E+07	d
Sr-81	2.60E+04	2.86E-04	9.10E+07	d
Sr-83	2.60E+03	2.23E-03	1.17E+06	d
Sr-85m	5.40E+04	1.70E-03	3.18E+07	d
Sr-85	1.44E+03	6.08E-02	2.37E+04	d
Sr-87m	1.36E+04	1.06E-03	1.28E+07	d
Sr-89	3.40E+02	1.20E-02	2.91E+04	f
Sr-90	1.60E+01	1.20E-01	1.36E+02	f
Sr-91	1.58E+03	4.36E-04	3.63E+06	d
Sr-92	3.40E+03	2.70E-04	1.26E+07	d
Y-86m	7.80E+04	1.71E-03	4.56E+07	d
Y-86	4.60E+02	1.86E-04	2.47E+06	d
Y-87	1.00E+03	2.23E-03	4.49E+05	d
Y-88	2.80E+02	2.01E-02	1.39E+04	d
Y-90m	6.00E+03	5.50E-04	1.09E+07	d
Y-90	1.42E+03	2.61E-03	5.44E+05	f
Y-91m	2.80E+04	6.74E-04	4.16E+07	d
Y-91	3.60E+02	1.50E-02	2.45E+04	f
Y-92	1.40E+04	1.45E-03	9.63E+06	d
Y-93	1.76E+04	5.27E-03	3.34E+06	d
Y-94	2.80E+04	2.67E-04	1.05E+08	d
Y-95	6.20E+04	3.35E-04	1.85E+08	d
Zr-86	4.40E+03	1.99E-03	2.21E+06	d
Zr-88	1.92E+03	1.08E-01	1.78E+04	d
Zr-89	3.20E+03	7.13E-03	4.49E+05	d
Zr-93	6.20E+01	2.50E+04	2.51E-03	i

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Table—Continued

ICRP-30 Radionuclide	Category 3 Threshold (Curies)	Category 3 Threshold (Grams)	Calculated SA (Ci/gm) <sup>4</sup>	Pathway
Zr-95	7.00E+02	3.30E-02	2.15E+04	f
Zr-97	1.38E+03	7.22E-04	1.91E+06	d
Nb-88	1.58E+04	1.06E-04	1.49E+08	d
Nb-89 (66 min)	6.00E+03	1.87E-04	3.20E+07	d
Nb-89 (122 min)	1.62E+04	9.35E-04	1.73E+07	d
Nb-90	3.00E+02	1.26E-04	2.39E+06	d
Nb-93m	2.00E+03	7.07E+00	2.83E+02	i
Nb-94	2.00E+02	1.10E+03	1.87E-01	i
Nb-95m	5.60E+03	1.47E-02	3.81E+05	f
Nb-95	9.60E+02	2.45E-02	3.91E+04	d
Nb-96	4.40E+02	3.15E-04	1.40E+06	d
Nb-97	1.48E+04	5.50E-04	2.69E+07	d
Nb-98	5.20E+05	1.40E-05	3.73E+10	i
Mo-90	2.80E+03	4.56E-04	6.14E+06	d
Mo-93m	8.40E+02	1.71E-04	4.92E+06	d
Mo-93	2.00E+03	1.82E+03	1.10E+00	i
Mo-99	3.40E+03	7.10E-03	4.80E+05	d,f
Mo-101	9.00E+04	7.07E-04	1.27E+08	d
Tc-93m	2.40E+04	5.16E-04	4.65E+07	d
Tc-93	2.80E+03	2.28E-04	1.23E+07	d
Tc-94m	7.40E+03	1.92E-04	3.85E+07	d
Tc-94	9.60E+02	1.41E-04	6.83E+06	d
Tc-96m	9.40E+05	2.47E-02	3.80E+07	d
Tc-96	3.20E+02	1.01E-03	3.18E+05	d
Tc-97m	2.60E+03	1.68E-01	1.55E+04	f
Tc-97	1.78E+04	1.26E+07	1.42E-03	f
Tc-98	4.40E+02	5.06E+05	8.69E-04	f
Tc-99m	1.70E+04	3.23E-03	5.26E+06	d
Tc-99	1.70E+03	1.00E+05	1.70E-02	f
Tc-101	1.62E+05	1.24E-03	1.31E+08	d
Tc-104	2.60E+04	2.62E-04	9.93E+07	d
Ru-94	2.80E+04	7.25E-04	3.86E+07	d

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Table—Continued

ICRP-30 Radionuclide	Category 3 Threshold (Curies)	Category 3 Threshold (Grams)	Calculated SA (Ci/gm) <sup>4</sup>	Pathway
Ru-97	2.40E+03	5.17E-03	4.64E+05	d
Ru-103	1.56E+03	4.83E-02	3.23E+04	d,f
Ru-105	4.00E+03	5.95E-04	6.72E+06	d
Ru-106	1.00E+02	3.00E-02	3.35E+03	i
Rh-99m	4.60E+03	6.83E-04	6.74E+06	d
Rh-99	1.74E+03	2.11E-02	8.24E+04	d
Rh-100	4.20E+02	2.79E-04	1.51E+06	d
Rh-101m	2.80E+03	9.40E-03	2.98E+05	d
Rh-101	1.20E+03	1.08E+00	1.11E+03	f
Rh-102m	6.20E+02	1.00E-01	6.18E+03	f
Rh-102	2.80E+02	2.32E-01	1.21E+03	d
Rh-103m	1.04E+07	3.20E-01	3.25E+07	i
Rh-105	1.18E+04	1.40E-02	8.44E+05	d
Rh-106m	1.96E+03	1.46E-04	1.34E+07	d
Rh-107	1.12E+05	1.38E-03	8.10E+07	d
Pd-100	2.80E+03	7.78E-03	3.60E+05	f
Pd-101	7.40E+03	1.97E-03	3.75E+06	d
Pd-103	6.20E+03	8.29E-02	7.48E+04	f
Pd-107	4.20E+03	8.17E+06	5.14E-04	i
Pd-109	3.00E+04	1.40E-02	2.14E+06	f
Ag-102	1.76E+04	1.23E-04	1.43E+08	d
Ag-103	3.00E+04	1.08E-03	2.78E+07	d
Ag-104m	2.20E+04	4.08E-04	5.40E+07	d
Ag-104	5.80E+04	2.22E-03	2.61E+07	d
Ag-105	1.64E+03	5.41E-02	3.03E+04	d
Ag-106m	2.80E+02	1.91E-03	1.47E+05	d
Ag-106	4.20E+04	5.67E-04	7.40E+07	d
Ag-108m	2.00E+02	7.67E+00	2.61E+01	i
Ag-110m	2.60E+02	5.50E-02	4.75E+03	d
Ag-111	1.44E+03	9.12E-03	1.58E+05	f
Ag-112	7.60E+03	8.47E-04	8.97E+06	d
Ag-115	1.42E+05	1.74E-05	8.18E+09	d
Cd-104	5.40E+04	1.72E-03	3.14E+07	d
Cd-107	3.20E+05	7.09E-02	4.51E+06	d

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Table—Continued

ICRP-30 Radionuclide	Category 3 Threshold (Curies)	Category 3 Threshold (Grams)	Calculated SA (Ci/gm) <sup>4</sup>	Pathway
Cd-109	1.80E+02	7.00E-02	2.58E+03	f
Cd-113m	1.18E+01	5.07E-02	2.33E+02	f
Cd-113	1.10E+01	3.20E+13	3.40E-13	f
Cd-115m	2.20E+02	8.64E-03	2.55E+04	f
Cd-115	2.20E+03	4.31E-03	5.10E+05	d
Cd-117m	1.40E+03	1.76E-04	7.97E+06	d
Cd-117	5.60E+03	5.20E-04	1.08E+07	d
In-109	9.00E+03	1.31E-03	6.85E+06	d
In-110 (69.1 min)	1.36E+04	5.50E-04	2.47E+07	d
In-110 (4.9 hr)	9.00E+02	1.55E-04	5.82E+06	d
In-111	2.20E+03	5.29E-03	4.16E+05	d
In-112	1.18E+06	1.01E-02	1.17E+08	d
In-113m	3.00E+04	1.79E-03	1.67E+07	d
In-114m	2.20E+02	9.50E-03	2.31E+04	f
In-115m	1.78E+04	2.93E-03	6.08E+06	d
In-115	1.04E+01	1.71E+13	6.10E-13	i
In-116m	6.40E+03	2.14E-04	2.99E+07	d
In-117m	1.04E+04	7.54E-04	1.38E+07	d
In-117	2.40E+04	6.54E-04	3.67E+07	d
In-119m	1.04E+06	1.18E-02	8.78E+07	i
Sn-110	1.12E+04	1.57E-03	7.12E+06	d
Sn-111	1.68E+05	3.50E-03	4.80E+07	d
Sn-113	1.30E+03	1.30E-01	1.00E+04	f
Sn-117m	2.20E+03	2.68E-02	8.20E+04	f
Sn-119m	1.86E+03	4.97E-01	3.75E+03	f
Sn-121m	1.78E+03	3.31E+01	5.37E+01	f
Sn-121	4.60E+04	4.81E-02	9.57E+05	f
Sn-123m	1.30E+05	3.41E-03	3.81E+07	d
Sn-123	3.20E+02	3.90E-02	8.22E+03	f
Sn-125	5.60E+02	5.17E-03	1.08E+05	f
Sn-126	1.70E+02	6.00E+03	2.84E-02	f
Sn-127	4.00E+03	3.40E-04	1.18E+07	d

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Table—Continued

ICRP-30 Radionuclide	Category 3 Threshold (Curies)	Category 3 Threshold (Grams)	Calculated SA (Ci/gm) <sup>4</sup>	Pathway
Sn-128	2.20E+04	8.85E-04	2.49E+07	d
Sb-115	4.40E+04	8.56E-04	5.14E+07	d
Sb-116m	4.20E+03	1.56E-04	2.69E+07	d
Sb-116	2.60E+04	2.53E-04	1.03E+08	d
Sb-117	3.00E+04	3.14E-03	9.57E+06	d
Sb-118m	9.80E+02	1.84E-04	5.31E+06	d
Sb-119	5.80E+04	8.39E-02	6.91E+05	f
Sb-120 (16 min)	2.20E+06	2.23E-02	9.86E+07	d
Sb 120 (5.76 day)	3.20E+02	1.69E-03	1.89E+05	d
Sb-122	1.86E+03	4.69E-03	3.96E+05	d
Sb-124m	6.20E+06	8.26E-02	7.51E+07	i
Sb-124	3.60E+02	2.10E-02	1.75E+04	f
Sb-125	1.20E+03	1.16E+00	1.03E+03	f
Sb-126m	2.40E+04	3.06E-04	7.85E+07	d
Sb-126	2.80E+02	3.35E-03	8.36E+04	d
Sb-127	1.32E+03	4.94E-03	2.67E+05	d
Sb-128 (10.4 min)	3.80E+04	2.69E-04	1.41E+08	d
Sb-128 (9.01 hr)	5.60E+02	2.06E-04	2.72E+06	d
Sb-129	2.20E+03	3.91E-04	5.63E+06	d
Sb-130	6.80E+03	1.88E-04	3.62E+07	d
Sb-131	2.40E+04	3.85E-04	6.24E+07	d
Te-116	8.00E+04	7.37E-03	1.09E+07	d
Te-121m	3.20E+02	4.57E-02	7.01E+03	f
Te-121	1.34E+03	2.11E-02	6.35E+04	d
Te-123m	4.00E+02	4.49E-02	8.91E+03	f
Te-123	3.00E+02	1.03E+12	2.91E-10	f
Te-125m	7.20E+02	4.00E-02	1.80E+04	f
Te-127m	4.00E+02	4.24E-02	9.43E+03	f
Te-127	1.44E+05	5.46E-02	2.64E+06	f
Te-129m	4.00E+02	1.30E-02	3.01E+04	f

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Table—Continued

ICRP-30 Radionuclide	Category 3 Threshold (Curies)	Category 3 Threshold (Grams)	Calculated SA (Ci/gm) <sup>4</sup>	Pathway
Te-129	2.20E+05	1.05E-02	2.09E+07	d
Te-131m	8.00E+02	1.00E-03	7.98E+05	d
Te-131	5.20E+04	9.06E-04	5.74E+07	i
Te-132	6.00E+02	1.98E-03	3.04E+05	f
Te-133m	5.20E+04	2.04E-03	2.55E+07	i
Te-133	6.80E+04	5.99E-04	1.14E+08	d
Te-134	2.00E+04	5.96E-04	3.36E+07	d
I-120m	4.20E+03	1.42E-04	2.96E+07	i
I-120	1.86E+03	9.62E-05	1.93E+07	i
I-121	4.20E+03	3.44E-04	1.22E+07	i
I-123	9.00E+02	4.66E-04	1.93E+06	f
I-124	2.40E+00	9.53E-06	2.52E+05	f
I-125	5.60E-01	3.20E-05	1.74E+04	f
I-126	4.60E-01	5.78E-06	7.96E+04	f
I-128	2.00E+04	3.40E-04	5.88E+07	i
I-129	6.00E-02	3.40E+02	1.76E-04	f
I-130	1.26E+02	6.46E-05	1.95E+06	f
I-131	9.20E-01	7.40E-06	1.24E+05	f
I-132m	1.66E+03	9.74E-05	1.70E+07	i
I-132	1.66E+03	1.61E-04	1.03E+07	i
I-133	1.94E+01	1.71E-05	1.13E+06	f
I-134	5.80E+03	2.17E-04	2.67E+07	d
I-135	4.20E+02	1.20E-04	3.51E+06	i
Xe-120	2.00E+03	5.11E-05	3.92E+07	d
Xe-121	4.00E+02	1.03E-05	3.88E+07	d
Xe-122	1.40E+04	1.09E-02	1.28E+06	d
Xe-123	1.20E+03	9.79E-05	1.23E+07	d
Xe-125	4.00E+03	2.71E-03	1.47E+06	d
Xe-127	2.00E+03	7.08E-02	2.82E+04	d
Xe-129m	4.00E+04	3.16E-01	1.27E+05	d
Xe-131m	8.00E+04	9.55E-01	8.38E+04	d
Xe-133m	2.00E+04	4.46E-02	4.49E+05	d
Xe-133	2.00E+04	1.10E-01	1.87E+05	d
Xe-135m	1.80E+03	1.98E-05	9.11E+07	d

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Table—Continued

ICRP-30 Radionuclide	Category 3 Threshold (Curies)	Category 3 Threshold (Grams)	Calculated SA (Ci/gm) <sup>4</sup>	Pathway
Xe-135	2.00E+03	7.83E-04	2.55E+06	d
Xe-138	8.00E+02	8.32E-06	9.62E+07	d
Cs-125	6.20E+04	1.85E-03	3.34E+07	d
Cs-127	6.60E+03	1.67E-03	3.95E+06	d
Cs-129	3.80E+03	5.01E-03	7.58E+05	d
Cs-130	6.00E+05	1.24E-02	4.84E+07	d
Cs-131	2.80E+04	2.72E-01	1.03E+05	f
Cs-132	1.14E+03	7.46E-03	1.53E+05	d
Cs-134m	2.60E+05	3.22E-02	8.07E+06	d
Cs-134	4.20E+01	3.30E-02	1.29E+03	f
Cs-135m	8.60E+03	3.27E-04	2.63E+07	d
Cs-135	4.20E+02	3.65E+05	1.15E-03	f
Cs-136	4.00E+02	5.46E-03	7.33E+04	d
Cs-137	6.00E+01	6.90E-01	8.70E+01	f
Cs-138	1.00E+04	2.36E-04	4.23E+07	d
Ba-126	2.00E+04	1.29E-03	1.55E+07	d
Ba-128	1.90E+03	4.53E-03	4.20E+05	f
Ba-131m	8.20E+05	8.34E-03	9.83E+07	d
Ba-131	1.86E+03	2.20E-02	8.45E+04	d
Ba-133m	1.08E+04	1.78E-02	6.06E+05	f
Ba-133	1.10E+03	4.30E+00	2.50E+02	f
Ba-135m	2.20E+04	2.72E-02	8.09E+05	d
Ba-139	1.98E+05	1.21E-02	1.64E+07	d
Ba-140	6.00E+02	8.20E-03	7.32E+04	f
Ba-141	7.20E+04	9.86E-04	7.30E+07	d
Ba-142	6.80E+04	5.44E-04	1.25E+08	d
La-131	5.00E+04	2.05E-03	2.43E+07	d
La-132	2.00E+03	4.04E-04	4.95E+06	d
La-135	1.16E+05	9.74E-02	1.19E+06	d
La-137	6.20E+02	1.42E+04	4.35E-02	i
La-138	4.20E+01	2.19E+09	1.92E-08	i
La-140	4.00E+02	7.19E-04	5.56E+05	d
La-141	9.40E+04	1.66E-02	5.66E+06	i
La-142	4.60E+03	3.21E-04	1.43E+07	d

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Table—Continued

ICRP-30 Radionuclide	Category 3 Threshold (Curies)	Category 3 Threshold (Grams)	Calculated SA (Ci/gm) <sup>4</sup>	Pathway
La-143	9.40E+05	1.02E-02	9.24E+07	d,i
Ce-134	1.54E+03	4.74E-03	3.25E+05	f
Ce-135	1.58E+03	1.20E-03	1.32E+06	d
Ce-137m	1.22E+04	1.83E-02	6.65E+05	f
Ce-137	1.38E+05	5.43E-02	2.54E+06	d
Ce-139	3.20E+03	4.69E-01	6.82E+03	f
Ce-141	1.00E+03	3.50E-02	2.85E+04	i
Ce-143	3.80E+03	5.72E-03	6.64E+05	d
Ce-144	1.00E+02	3.10E-02	3.19E+03	i
Pr-136	4.60E+04	4.36E-04	1.06E+08	d
Pr-137	3.00E+05	1.67E-02	1.79E+07	d
Pr-138m	2.80E+03	2.59E-04	1.08E+07	d
Pr-139	3.00E+04	6.00E-03	5.00E+06	d
Pr-142m	1.04E+06	1.15E-02	9.07E+07	i
Pr-142	1.06E+04	9.19E-03	1.15E+06	f
Pr-143	1.04E+03	1.54E-02	6.73E+04	f
Pr-144	1.04E+06	1.38E-02	7.56E+07	i
Pr-145	8.20E+04	2.27E-02	3.62E+06	i
Pr-147	9.20E+04	9.78E-04	9.41E+07	d
Nd-136	1.02E+05	3.74E-03	2.73E+07	d
Nd-138	5.20E+04	1.15E-02	4.51E+06	i
Nd-139m	2.20E+03	5.37E-04	4.10E+06	d
Nd-139	2.60E+05	5.71E-03	4.56E+07	d
Nd-141	2.40E+05	2.69E-02	8.93E+06	d
Nd-147	1.28E+03	1.58E-02	8.09E+04	f
Nd-149	1.56E+04	1.28E-03	1.22E+07	d
Nd-151	9.40E+04	9.39E-04	1.00E+08	d
Pm-141	5.40E+04	8.46E-04	6.38E+07	d
Pm-143	2.60E+03	7.54E-01	3.45E+03	d
Pm-144	4.80E+02	1.92E-01	2.50E+03	d
Pm-145	2.00E+03	1.40E+01	1.39E+02	i
Pm-146	4.20E+02	9.49E-01	4.43E+02	i
Pm-147	1.00E+03	9.50E-01	9.27E+02	i
Pm-148m	3.60E+02	1.68E-02	2.14E+04	d

Continued on next page

Table—Continued

ICRP-30 Radionuclide	Category 3 Threshold (Curies)	Category 3 Threshold (Grams)	Calculated SA (Ci/gm) <sup>4</sup>	Pathway
Pm-148	8.20E+02	4.99E-03	1.64E+05	f
Pm-149	4.20E+03	1.06E-02	3.96E+05	f
Pm-150	3.80E+03	4.87E-04	7.80E+06	d
Pm-151	4.20E+03	5.74E-03	7.31E+05	d
Sm-141m	2.00E+04	3.93E-04	5.08E+07	d
Sm-141	6.80E+04	5.20E-04	1.31E+08	d
Sm-142	1.62E+05	8.87E-03	1.83E+07	d
Sm-145	3.60E+03	1.36E+00	2.65E+03	f
Sm-146	4.20E-01	1.77E+04	2.38E-05	i
Sm-147	4.20E-01	1.83E+07	2.30E-08	i
Sm-151	1.00E+03	3.80E+01	2.63E+01	i
Sm-153	9.20E+03	2.10E-02	4.39E+05	f
Sm-155	3.60E+05	6.56E-03	5.49E+07	d
Sm-156	1.40E+04	6.55E-03	2.14E+06	d
Eu-145	6.40E+02	4.22E-03	1.52E+05	d
Eu-146	4.00E+02	2.06E-03	1.94E+05	d
Eu-147	1.76E+03	4.76E-02	3.70E+04	d
Eu-148	3.80E+02	2.35E-02	1.62E+04	d
Eu-149	6.80E+03	7.22E-01	9.41E+03	f
Eu-150	4.00E+04	2.41E-02	1.66E+06	d
(12.6 hr)				
Eu-150	2.00E+02	2.87E+00	6.97E+01	i
(34.2 yr)				
Eu-152m	5.60E+03	2.53E-03	2.21E+06	d
Eu-152	2.00E+02	1.20E+00	1.77E+02	i
Eu-154	2.00E+02	7.60E-01	2.64E+02	i
Eu-155	9.40E+02	2.00E+00	4.65E+02	i
Eu-156	4.60E+02	8.35E-03	5.51E+04	d
Eu-157	9.80E+02	7.44E-04	1.32E+06	d
Eu-158	2.00E+04	7.71E-04	2.59E+07	d
Gd-145	1.66E+04	2.93E-04	5.66E+07	d
Gd-146	7.40E+02	4.00E-02	1.85E+04	f
Gd-147	8.60E+02	1.54E-03	5.60E+05	d
Gd-148	8.20E-02	3.16E-03	2.60E+01	i

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Table—Continued

ICRP-30 Radionuclide	Category 3 Threshold (Curies)	Category 3 Threshold (Grams)	Calculated SA (Ci/gm) <sup>4</sup>	Pathway
Gd-149	2.20E+03	2.36E-02	9.32E+04	d
Gd-151	4.00E+03	5.55E-01	7.21E+03	f
Gd-152	1.04E-01	4.77E+09	2.18E-11	i
Gd-153	1.00E+03	2.80E-01	3.53E+03	i
Gd-159	2.80E+04	2.64E-02	1.06E+06	d
Tb-147	3.80E+03	2.94E-04	1.29E+07	d
Tb-149	3.40E+03	6.71E-04	5.07E+06	d
Tb-150	4.40E+03	6.88E-04	6.39E+06	d
Tb-151	1.70E+03	1.44E-03	1.18E+06	d
Tb-153	6.00E+03	1.64E-02	3.65E+05	d
Tb-154	6.40E+02	6.73E-04	9.51E+05	d
Tb-155	8.80E+03	5.56E-02	1.58E+05	d
Tb-156m (5.0 hr)	3.20E+05	7.96E-02	4.02E+06	i
Tb-156m (24.4 hr)	6.00E+04	7.29E-02	8.24E+05	f
Tb-156	5.00E+02	3.19E-03	1.57E+05	d
Tb-157	3.20E+03	2.11E+02	1.52E+01	i
Tb-158	2.00E+02	1.33E+01	1.51E+01	i
Tb-160	5.60E+02	5.00E-02	1.13E+04	f
Tb-161	3.40E+03	2.90E-02	1.17E+05	f
Dy-155	4.00E+03	1.98E-03	2.02E+06	d
Dy-157	5.60E+03	2.27E-03	2.46E+06	d
Dy-159	2.40E+03	4.22E-01	5.69E+03	d
Dy-165	3.20E+05	3.93E-02	8.14E+06	d
Dy-166	1.74E+03	7.52E-03	2.31E+05	f
Ho-155	1.56E+05	6.17E-03	2.53E+07	d
Ho-157	1.82E+05	1.91E-03	9.50E+07	d
Ho-159	1.08E+05	3.01E-03	3.58E+07	d
Ho-161	9.00E+05	1.16E-01	7.79E+06	d
Ho-162m	2.20E+04	1.29E-03	1.71E+07	d
Ho-162	7.20E+05	9.30E-03	7.74E+07	d
Ho-164m	3.20E+06	1.05E-01	3.06E+07	i
Ho-164	6.20E+06	1.57E-01	3.95E+07	i

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Table—Continued

ICRP-30 Radionuclide	Category 3 Threshold (Curies)	Category 3 Threshold (Grams)	Calculated SA (Ci/gm) <sup>4</sup>	Pathway
Ho-166m	7.20E+01	4.00E+01	1.80E+00	i
Ho-166	6.80E+03	9.65E-03	7.05E+05	f
Ho-167	1.22E+04	2.01E-03	6.06E+06	d
Er-161	6.60E+03	1.10E-03	6.01E+06	d
Er-165	1.14E+06	6.22E-01	1.83E+06	f
Er-169	4.20E+03	5.05E-02	8.31E+04	f
Er-171	5.40E+03	2.22E-03	2.44E+06	d
Er-172	1.70E+03	4.60E-03	3.70E+05	d
Tm-162	4.20E+04	7.85E-04	5.35E+07	d
Tm-166	9.20E+02	3.75E-04	2.45E+06	d
Tm-167	2.80E+03	3.31E-02	8.46E+04	f
Tm-170	5.20E+02	8.70E-02	5.97E+03	f
Tm-171	3.20E+03	2.94E+00	1.09E+03	i
Tm-172	2.40E+03	8.38E-03	2.87E+05	d,f
Tm-173	4.40E+03	2.00E-03	2.20E+06	d
Tm-175	5.80E+04	8.20E-04	7.07E+07	d
Yb-162	4.40E+05	7.16E-03	6.14E+07	d
Yb-166	8.40E+02	2.52E-03	3.33E+05	d
Yb-167	3.00E+05	4.66E-03	6.43E+07	d
Yb-169	1.64E+03	6.79E-02	2.41E+04	f
Yb-175	7.40E+03	4.16E-02	1.78E+05	f
Yb-177	4.40E+04	4.72E-03	9.32E+06	d
Yb-178	4.20E+05	2.94E-02	1.43E+07	i
Lu-169	1.54E+03	2.83E-03	5.45E+05	d
Lu-170	5.00E+02	1.30E-03	3.84E+05	d
Lu-171	1.40E+03	1.51E-02	9.29E+04	d
Lu-172	4.80E+02	4.24E-03	1.13E+05	d
Lu-173	3.00E+03	1.99E+00	1.51E+03	f
Lu-174m	1.30E+03	2.46E-01	5.29E+03	f
Lu-174	1.04E+03	1.67E+00	6.21E+02	i
Lu-176m	2.00E+05	4.13E-02	4.84E+06	i
Lu-176	5.20E+01	9.21E+08	5.65E-08	i
Lu-177m	4.40E+02	9.60E-02	4.59E+03	f
Lu-177	3.40E+03	3.09E-02	1.10E+05	f

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Table—Continued

ICRP-30 Radionuclide	Category 3 Threshold (Curies)	Category 3 Threshold (Grams)	Calculated SA (Ci/gm) <sup>4</sup>	Pathway
Lu-178m	7.20E+05	1.55E-02	4.65E+07	d
Lu-178	2.60E+05	6.99E-03	3.72E+07	d
Lu-179	1.02E+05	2.67E-02	3.82E+06	d
Hf-170	2.80E+03	2.43E-03	1.15E+06	d
Hf-172	9.40E+01	8.45E-02	1.11E+03	i
Hf-173	3.20E+03	4.24E-03	7.55E+05	d
Hf-175	2.00E+03	1.88E-01	1.07E+04	f
Hf-177m	6.20E+05	3.00E-02	2.07E+07	i
Hf-178m	1.04E+01	1.60E-01	6.48E+01	i
Hf-179m	3.20E+03	1.10E-01	2.91E+04	i
Hf-180m	2.40E+03	7.58E-04	3.17E+06	d
Hf-181	7.60E+02	4.50E-02	1.70E+04	f
Hf-182m	1.34E+04	7.98E-04	1.68E+07	d
Hf-182	8.20E+00	3.76E+04	2.18E-04	i
Hf-183	1.58E+04	9.84E-04	1.61E+07	d
Hf-184	1.34E+04	3.24E-03	4.13E+06	d
Ta-172	1.58E+04	5.32E-04	2.97E+07	d
Ta-173	9.80E+03	1.97E-03	4.96E+06	d
Ta-174	1.92E+04	1.28E-03	1.50E+07	d
Ta-175	3.80E+03	2.23E-03	1.71E+06	d
Ta-176	1.20E+03	5.44E-04	2.20E+06	d
Ta-177	5.40E+04	1.73E-01	3.13E+05	d
Ta-178	1.12E+06	1.40E-01	8.01E+06	d
Ta-179	3.00E+04	2.73E+01	1.10E+03	w
Ta-180m	3.20E+05	1.49E-01	2.15E+06	d
Ta-180	2.00E+03	1.01E+13	1.99E-10	i
Ta-182m	2.40E+05	3.68E-03	6.52E+07	d
Ta-182	6.20E+02	9.94E-02	6.24E+03	d
Ta-183	3.60E+03	2.57E-02	1.40E+05	d
Ta-184	1.08E+03	5.52E-04	1.96E+06	d
Ta-185	1.34E+05	6.46E-03	2.07E+07	d
Ta-186	5.40E+04	5.61E-04	9.63E+07	d
W-176	4.20E+04	5.42E-03	7.74E+06	d
W-177	1.14E+04	1.45E-03	7.87E+06	d

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Table—Continued

ICRP-30 Radionuclide	Category 3 Threshold (Curies)	Category 3 Threshold (Grams)	Calculated SA (Ci/gm) <sup>4</sup>	Pathway
W-178	4.60E+03	1.36E-01	3.38E+04	f
W-179	2.00E+07	7.14E-01	2.80E+07	i
W-181	1.30E+04	2.18E+00	5.95E+03	f
W-185	1.38E+03	1.47E-01	9.40E+03	f
W-187	2.20E+03	3.14E-03	7.01E+05	d
W-188	2.80E+02	2.80E-02	1.00E+04	f
Re-177	1.22E+05	1.61E-03	7.59E+07	d
Re-178	9.20E+04	1.15E-03	8.00E+07	d
Re-181	2.20E+03	2.54E-03	8.66E+05	d
Re-182	1.38E+03	1.02E-03	1.36E+06	d
(12.7 hr)				
Re-182	5.00E+02	1.86E-03	2.69E+05	d
(64.0 hr)				
Re-184m	1.22E+03	2.84E-01	4.30E+03	f
Re-184	9.00E+02	4.82E-02	1.87E+04	d
Re-186m	5.60E+02	5.82E+04	9.61E-03	f
Re-186	5.00E+03	2.69E-02	1.86E+05	f
Re-187	3.40E+05	8.89E+12	3.83E-08	f
Re-188m	1.04E+06	1.93E-02	5.38E+07	i
Re-188	2.20E+04	2.24E-02	9.82E+05	f
Re-189	2.40E+04	3.52E-02	6.82E+05	d
Os-180	4.20E+06	8.84E-02	4.75E+07	i
Os-181	8.80E+03	8.89E-04	9.90E+06	d
Os-182	2.80E+03	3.58E-03	7.83E+05	d
Os-185	1.10E+03	1.47E-01	7.51E+03	d
Os-189m	2.00E+06	7.24E-01	2.76E+06	i
Os-191m	1.50E+05	1.19E-01	1.26E+06	f
Os-191	2.20E+03	4.96E-02	4.44E+04	f
Os-193	1.34E+04	2.48E-02	5.41E+05	f
Os-194	8.20E+01	2.67E-01	3.07E+02	i
Ir-182	9.40E+04	1.36E-03	6.89E+07	d
Ir-184	3.20E+03	5.67E-04	5.64E+06	d
Ir-185	2.60E+03	2.15E-03	1.21E+06	d
Ir-186	1.08E+03	1.01E-03	1.07E+06	d

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Table—Continued

ICRP-30 Radionuclide	Category 3 Threshold (Curies)	Category 3 Threshold (Grams)	Calculated SA (Ci/gm) <sup>4</sup>	Pathway
Ir-187	7.40E+03	4.63E-03	1.60E+06	d
Ir-188	5.40E+02	1.34E-03	4.02E+05	d
Ir-189	1.26E+04	2.43E-01	5.19E+04	w
Ir-190m	2.00E+07	1.45E+00	1.38E+07	i
Ir-190	6.80E+02	1.20E-02	5.68E+04	d
Ir-192m	2.00E+03	2.59E+02	7.73E+00	i
Ir-192	9.40E+02	1.00E-01	9.19E+03	d
Ir-194m	3.20E+02	8.13E-02	3.94E+03	d
Ir-194	1.42E+04	1.68E-02	8.44E+05	d
Ir-195m	1.10E+04	2.60E-03	4.23E+06	d
Ir-195	3.00E+05	4.67E-02	6.43E+06	d
Pt-186	8.00E+03	9.49E-04	8.43E+06	d
Pt-188	2.60E+03	3.82E-02	6.81E+04	f
Pt-189	8.80E+03	5.77E-03	1.53E+06	d
Pt-191	4.40E+03	1.81E-02	2.43E+05	d
Pt-193m	7.20E+03	4.61E-02	1.56E+05	f
Pt-193	2.40E+04	6.48E+02	3.71E+01	f
Pt-195m	5.00E+03	3.00E-02	1.67E+05	f
Pt-197m	1.98E+05	1.96E-02	1.01E+07	d
Pt-197	3.20E+04	3.68E-02	8.70E+05	f
Pt-199	1.34E+05	4.37E-03	3.07E+07	d
Pt-200	1.58E+04	1.26E-02	1.25E+06	f
Au-193	1.72E+04	1.87E-02	9.20E+05	d
Au-194	1.16E+03	2.84E-03	4.09E+05	d
Au-195	3.20E+03	8.74E-01	3.66E+03	f
Au-198m	1.76E+03	6.14E-03	2.87E+05	d
Au-198	2.00E+03	8.20E-03	2.45E+05	d
Au-199	9.20E+03	4.40E-02	2.09E+05	f
Au-200m	5.60E+02	6.68E-04	8.38E+05	d
Au-200	6.20E+04	3.19E-03	1.94E+07	d
Au-201	8.40E+05	2.37E-02	3.54E+07	d
Hg-193m	1.08E+03	7.38E-04	1.46E+06	d
Hg-193	4.40E+03	9.48E-04	4.64E+06	d
Hg-194	1.16E+01	1.64E+00	7.09E+00	f

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Table—Continued

ICRP-30 Radionuclide	Category 3 Threshold (Curies)	Category 3 Threshold (Grams)	Calculated SA (Ci/gm) <sup>4</sup>	Pathway
Hg-195m	5.00E+03	1.29E-02	3.86E+05	d
Hg-195	1.28E+04	7.89E-03	1.62E+06	d
Hg-197m	2.20E+04	3.29E-02	6.68E+05	f
Hg-197	2.00E+04	8.06E-02	2.48E+05	f
Hg-199m	1.26E+05	5.68E-03	2.22E+07	d
Hg-203	3.60E+02	2.61E-02	1.38E+04	f
Tl-194m	1.06E+04	3.59E-04	2.96E+07	d
Tl-194	3.00E+04	1.02E-03	2.94E+07	d
Tl-195	1.64E+04	1.18E-03	1.39E+07	d
Tl-197	1.64E+04	2.93E-03	5.60E+06	d
Tl-198m	6.20E+03	7.32E-04	8.46E+06	d
Tl-198	1.66E+03	5.56E-04	2.99E+06	d
Tl-199	1.14E+04	5.37E-03	2.12E+06	d
Tl-200	9.20E+02	1.53E-03	6.01E+05	d
Tl-201	4.20E+04	1.97E-01	2.13E+05	d
Tl-202	1.84E+03	3.48E-02	5.29E+04	d
Tl-204	1.20E+03	2.59E+00	4.64E+02	f
Pb-195m	4.40E+04	7.21E-04	6.10E+07	d
Pb-198	1.46E+04	2.21E-03	6.60E+06	d
Pb-199	1.06E+04	1.01E-03	1.05E+07	d
Pb-200	9.40E+03	1.29E-02	7.29E+05	d
Pb-201	2.80E+03	1.69E-03	1.66E+06	d
Pb-202m	1.74E+03	4.06E-04	4.29E+06	d
Pb-202	6.00E+01	1.02E+04	5.90E-03	f
Pb-203	3.60E+03	1.21E-02	2.97E+05	d
Pb-205	2.40E+03	1.97E+07	1.22E-04	f
Pb-209	6.20E+05	1.34E-01	4.61E+06	i
Pb-210	3.60E-01	4.70E-03	7.64E+01	f
Pb-211	6.20E+03	2.51E-04	2.47E+07	i
Pb-212	3.20E+02	2.30E-04	1.39E+06	i
Pb-214	8.20E+03	2.50E-04	3.28E+07	i
Bi-200	9.40E+03	3.64E-04	2.58E+07	d
Bi-201	9.40E+03	1.09E-03	8.66E+06	d
Bi-202	2.00E+04	2.15E-03	9.29E+06	d

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Table—Continued

ICRP-30 Radionuclide	Category 3 Threshold (Curies)	Category 3 Threshold (Grams)	Calculated SA (Ci/gm) <sup>4</sup>	Pathway
Bi-203	8.40E+02	6.40E-04	1.31E+06	d
Bi-205	8.80E+02	2.11E-02	4.16E+04	d
Bi-206	2.40E+02	2.36E-03	1.02E+05	d
Bi-207	5.00E+02	1.10E+01	4.55E+01	d
Bi-210m	7.20E+00	1.27E+04	5.68E-04	i
Bi-210	3.20E+02	2.60E-03	1.24E+05	i
Bi-212	2.00E+03	1.37E-04	1.46E+07	i
Bi-213	3.20E+03	1.65E-04	1.93E+07	i
Bi-214	8.20E+03	1.86E-04	4.42E+07	i
Po-203	1.76E+04	6.97E-04	2.52E+07	d
Po-205	5.40E+03	6.36E-04	8.49E+06	d
Po-207	1.88E+03	7.24E-04	2.60E+06	d
Po-210	1.90E+00	4.20E-04	4.49E+03	f
At-207	7.40E+03	8.80E-04	8.41E+06	d
At-211	5.20E+03	2.52E-03	2.06E+06	i
Rn-220	2.00E+00	2.17E-09	9.22E+08	i
Rn-222	1.00E+01	6.50E-05	1.54E+05	i
Fr-222	5.20E+03	8.84E-05	5.88E+07	i
Fr-223	8.20E+03	2.12E-04	3.87E+07	i
Ra-223	6.20E+01	1.20E-03	5.12E+04	f
Ra-224	2.00E+02	1.20E-03	1.59E+05	i
Ra-225	7.20E+01	1.80E-03	3.92E+04	i
Ra-226	1.20E+01	1.21E+01	9.89E-01	f
Ra-227	1.50E+05	7.64E-03	1.96E+07	d
Ra-228	1.20E+01	4.40E-02	2.73E+02	f
Ac-224	3.20E+03	6.63E-04	4.83E+06	i
Ac-225	3.20E+01	5.50E-04	5.80E+04	i
Ac-226	3.20E+02	6.69E-04	4.78E+05	i
Ac-227	4.20E-02	5.80E-04	7.24E+01	i
Ac-228	9.40E+02	4.19E-04	2.24E+06	i
Th-226	1.04E+04	3.86E-04	2.69E+07	i
Th-227	3.20E+01	1.04E-03	3.07E+04	i
Th-228	1.00E+00	1.20E-03	8.20E+02	i
Th-229	9.40E-02	4.42E-01	2.13E-01	i

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Table—Continued

ICRP-30 Radionuclide	Category 3 Threshold (Curies)	Category 3 Threshold (Grams)	Calculated SA (Ci/gm) <sup>4</sup>	Pathway
Th-230	6.20E-01	3.10E+01	2.02E-02	i
Th-231	1.20E+04	2.26E-02	5.32E+05	d
Th-232	1.00E-01	9.10E+05	1.09E-07	i
Th-234	2.80E+03	1.21E-01	2.32E+04	f
Pa-227	1.04E+04	4.81E-04	2.16E+07	i
Pa-228	1.04E+03	1.66E-03	6.25E+05	i
Pa-230	4.20E+02	1.29E-02	3.26E+04	i
Pa-231	2.00E-01	4.23E+00	4.73E-02	i
Pa-232	1.02E+03	2.37E-03	4.30E+05	d
Pa-233	4.60E+03	2.22E-01	2.08E+04	d
Pa-234	1.52E+03	7.60E-04	2.00E+06	d
U-230	3.20E+01	1.17E-03	2.73E+04	i
U-231	9.80E+04	7.28E-01	1.35E+05	f
U-232	8.20E-01	3.81E-02	2.15E+01	i
U-233	4.20E+00	4.40E+02	9.68E-03	i
U-234	4.20E+00	6.70E+02	6.25E-03	i
U-235	4.20E+00	1.90E+06	2.16E-06	i
U-236	4.20E+00	6.49E+04	6.47E-05	i
U-237	1.44E+04	1.76E-01	8.16E+04	d
U-238	4.20E+00	1.30E+07	3.36E-07	i
U-239	7.00E+06	2.09E-01	3.34E+07	d
U-240	1.40E+05	1.51E-01	9.26E+05	f
Np-232	5.00E+04	9.07E-04	5.51E+07	d
Np-233	3.00E+06	1.35E-01	2.23E+07	d
Np-234	7.80E+02	6.15E-03	1.27E+05	d
Np-235	6.20E+04	4.42E+01	1.40E+03	f
Np-236 (1.2 E+5 yr)	2.40E+00	1.90E+02	1.26E-02	f
Np-236 (22.5 hr)	4.20E+03	7.11E-03	5.90E+05	i
Np-237	4.20E-01	6.00E+02	7.05E-04	f
Np-238	1.30E+03	5.00E-03	2.59E+05	d
Np-239	7.80E+03	3.36E-02	2.32E+05	d
Np-240	1.08E+04	8.96E-04	1.21E+07	d

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Table—Continued

ICRP-30 Radionuclide	Category 3 Threshold (Curies)	Category 3 Threshold (Grams)	Calculated SA (Ci/gm) <sup>4</sup>	Pathway
Pu-234	2.00E+04	1.31E-02	1.52E+06	i
Pu-235	3.20E+08	1.01E+01	3.16E+07	i
Pu-236	2.00E+00	3.76E-03	5.32E+02	i
Pu-237	7.60E+04	6.25E+00	1.22E+04	f
Pu-238	6.20E-01	3.60E-02	1.71E+01	i
Pu-239	5.20E-01	8.40E+00	6.22E-02	i
Pu-240	5.20E-01	2.28E+00	2.28E-01	i
Pu-241	3.20E+01	3.10E-01	1.03E+02	i
Pu-242	6.20E-01	1.58E+02	3.93E-03	i
Pu-243	1.14E+05	4.38E-02	2.60E+06	d
Pu-244	6.20E-01	3.49E+04	1.77E-05	i
Pu-245	6.20E+03	5.09E-03	1.22E+06	d
Am-237	4.20E+04	3.86E-03	1.09E+07	d
Am-238	1.06E+04	1.31E-03	8.06E+06	d
Am-239	1.60E+04	1.45E-02	1.10E+06	d
Am-240	9.00E+02	3.50E-03	2.57E+05	d
Am-241	5.20E-01	1.50E-01	3.43E+00	i
Am-242m	5.20E-01	5.30E-02	9.72E+00	i
Am-242	8.20E+03	1.01E-02	8.09E+05	i
Am-243	5.20E-01	2.60E+00	1.99E-01	i
Am-244m	4.20E+05	1.42E-02	2.96E+07	i
Am-244	1.88E+03	1.48E-03	1.27E+06	d
Am-245	3.40E+05	5.45E-02	6.24E+06	d
Am-246m	3.40E+04	1.11E-03	3.06E+07	d
Am-246	3.00E+04	1.53E-03	1.96E+07	d
Cm-238	1.04E+05	1.89E-02	5.49E+06	i
Cm-240	5.20E+01	2.58E-03	2.02E+04	i
Cm-241	1.90E+03	1.15E-01	1.65E+04	d
Cm-242	3.20E+01	9.70E-03	3.31E+03	i
Cm-243	8.20E-01	1.59E-02	5.16E+01	i
Cm-244	1.04E+00	1.28E-02	8.09E+01	i
Cm-245	5.20E-01	3.00E+00	1.72E-01	i
Cm-246	5.20E-01	1.69E+00	3.07E-01	i
Cm-247	6.20E-01	6.68E+03	9.28E-05	i

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Table—Continued

ICRP-30 Radionuclide	Category 3 Threshold (Curies)	Category 3 Threshold (Grams)	Calculated SA (Ci/gm) <sup>4</sup>	Pathway
Cm-248	1.04E-01	2.44E+01	4.25E-03	i
Cm-249	6.20E+05	5.27E-02	1.18E+07	d
Bk-245	9.20E+03	8.53E-02	1.08E+05	d
Bk-246	1.20E+03	4.14E-03	2.90E+05	d
Bk-247	5.20E-01	4.96E-01	1.05E+00	i
Bk-249	2.00E+01	1.22E-02	1.64E+03	i
Bk-250	4.20E+03	1.08E-03	3.89E+06	d,i
Cf-244	6.20E+04	1.56E-03	3.97E+07	i
Cf-246	9.40E+02	2.63E-03	3.57E+05	i
Cf-248	9.40E+00	5.95E-03	1.58E+03	i
Cf-249	5.20E-01	1.27E-01	4.10E+00	i
Cf-250	1.04E+00	9.51E-03	1.09E+02	i
Cf-251	5.20E-01	3.28E-01	1.59E+00	i
Cf-252	3.20E+00	5.95E-03	5.38E+02	i
Cf-253	2.00E+02	6.90E-03	2.90E+04	i
Cf-254	2.00E+00	2.35E-04	8.50E+03	i
Es-250	1.64E+03	2.75E-04	5.97E+06	d
Es-251	1.04E+05	2.75E-01	3.78E+05	i
Es-253	2.00E+02	7.93E-03	2.52E+04	i
Es-254m	1.04E+02	3.31E-04	3.14E+05	i
Es-254	1.04E+01	5.58E-03	1.86E+03	i
Fm-252	1.04E+03	1.90E-03	5.48E+05	i
Fm-253	1.04E+03	6.04E-03	1.72E+05	i
Fm-254	1.04E+04	2.73E-03	3.81E+06	i
Fm-255	2.00E+03	3.27E-03	6.13E+05	i
Fm-257	2.00E+01	3.96E-03	5.06E+03	i
Md-257	1.04E+04	4.43E-03	2.35E+06	i
Md-258	3.20E+01	3.48E-03	9.21E+03	i

## Notes, Explanations, and References

1. DOE-STD-1027-92 "Hazard Categorization and Accident Analysis Techniques for Compliance with Doe Order 5480.23, Nuclear Safety Analysis Reports", December 1992, Change Notice No. 1, September 1997.
2. International Commission on Radiological Protection, *Limits for Intakes of Radionuclides by Workers*, ICRP Publication 30, Vols. I-IV, (Pergamon, Oxford 1980).
3. ICF Incorporated and C-E Environmental, EPA Contract 68-03-3452 "Technical Background Document to Support Final Rulemaking Pursuant to Section 102 of the Comprehensive Environmental Response, Compensation, and Liability Act: Radionuclides. (CERCLA 40 CFR 302.4) A report to the Emergency Response Division, Office of Emergency and Remedial Response, U.S. Environmental Protection Agency (February 1989).
4. LANL calculated the SAs in Ci/gm directly from the half-life and atomic weight. The SA values in the table were calculated using the following formula:

$T_{1/2}$  = half-life (yr)

AW = atomic weight of the isotope

$N_o = 6.023 \times 10^{23}$  = Avagadro's Number

$SA(\text{Bq/gm}) = (0.693 \times N_o) / (AW \times T_{1/2} \times 3.154 \times 10^7 \text{ sec/yr})$ , and

$SA(\text{Ci/gm}) = SA(\text{Bq/gm}) / (3.7 \times 10^{10} \text{ Bq/Ci})$ .