**Section 611.TABLE R Radionuclide Conversion Factors**

Derived Concentrations (pCi•L‑1) of Beta and Photon Emitters in Drinking Water Yielding a Dose of 4 mrem•y‑1 to the Total Body or to Any Critical Organ as Defined in NBS Handbook 69

Conversion Factor

Radionuclide (Isotopic Symbol) (pCi•L‑1/4 mrem•y‑1)

Antimony-122 $()$ 90

Antimony-124 $()$ 60

Antimony-125 $()$ 300

Arsenic-73 $()$ 1,000

Arsenic-74 $()$ 100

Arsenic-76 $()$ 60

Arsenic-77 $()$ 200

Barium-131 $()$ 600

Barium-140 $()$ 90

Berkelium-249 $()$ 2,000

Beryllium-7 $()$ 6,000

Bismuth-206 $()$ 100

Bismuth-207 $()$ 200

Bromine-82 $()$ 100

Cadmium-109 $()$ 600

Cadmium-115 $()$ 90

Cadmium-115m $()$ 90

Calcium-45 $()$ 10

Calcium-47 $()$ 80

Carbon-14 (14C) $()$ 2,000

Cerium-141 $()$ 300

Cerium-143 $()$ 100

Cerium-144 $()$ 30

Cesium-131 $()$ 20,000

Cesium-134 $()$ 80

Cesium-134m $()$ 20,000

Cesium-135 $()$ 900

Cesium-136 $()$ 800

Cesium-137 $()$ 200

Chlorine-36 $()$ 700

Chlorine-38 $()$ 1,000

Chromium-51 $()$ 6,000

Cobalt-57 $()$ 1,000

Cobalt-58 $()$ 300

Cobalt-58m $()$ 9,000

Cobalt-60 $()$ 100

Copper-64 $()$ 900

Dysprosium-165 $()$ 1,000

Dysprosium-166 $()$ 100

Erbium-169 $()$ 300

Erbium-171 $()$ 300

Europium-152 $()$ 200

Europium-154 $()$ 60

Europium-155 $()$ 600

Fluorine-18 $()$ 2,000

Gadolinium-153 $()$ 600

Gadolinium-159 $()$ 200

Gallium-72 $()$ 100

Germanium-71 $()$ 6,000

Gold-196 (196Au) $()$ 600

Gold-198 (198Au) $()$ 100

Gold-199 (199Au) $()$ 600

Hafmium-181 $()$ 200

Holmium-166 $()$ 90

Hydrogen-3 (Tritium) $()$ 20,000

Indium-113m $()$ 3,000

Indium-114m $()$ 60

Indium-115 $()$ 300

Indium-115 m $()$ 1,000

Iodine-126 $()$ 3

Iodine-129 $()$ 1

Iodine-131 $()$ 3

Iodine-132 $()$ 90

Iodine-133 $()$ 10

Iodine-134 $()$ 100

Iodine-135 $()$ 30

Iridium-190 $()$ 600

Iridium-192 $()$ 100

Iridium-194 $()$ 90

Iron-55 $()$ 2,000

Iron-59 $()$ 200

Lanthanum-140 $()$ 60

Lead-203 $()$ 1,000

Lutetium-177 $()$ 300

Manganese-52 $()$ 90

Manganese-54 $()$ 300

Manganese-56 $()$ 300

Mercury-197 $()$ 900

Mercury-197m $()$ 600

Mercury-203 $()$ 60

Molybdenum-99 $()$ 600

Neodymium-147 $()$ 200

Neodymium-149 $()$ 900

Neptunium-239 $()$ 300

Nickel-59 $()$ 300

Nickel-63 $()$ 50

Nickel-65 $()$ 300

Niobium-93m $()$ 1,000

Niobium-95 $()$ 300

Niobium-97 $()$ 3,000

Osmium-185 $()$ 200

Osmium-191 $()$ 600

Osmium-191m $()$ 9,000

Osmium-193 $()$ 200

Palladium-103 $()$ 900

Palladium-109 $()$ 300

Phosphorus-32 $()$ 30

Platinum-191 $()$ 300

Platinum-193 $()$ 3,000

Platinum-193m $()$ 3,000

Platinum-197 $()$ 300

Platinum-197m $()$ 3,000

Plutonium-241 $()$ 300

Potassium-42 $()$ 900

Praseodymium-142 $()$ 90

Praseodymium-143 $()$ 100

Promethium-147 $()$ 600

Promethium-149 $()$ 100

Protactinium-230 $()$ 600

Protactinium-233 $()$ 300

Rhenium-186 $()$ 300

Rhenium-187 $()$ 9,000

Rhenium-188 $()$ 200

Rhodium-103m $()$ 30,000

Rhodium-105 $()$ 300

Rubidium-86 $()$ 600

Rubidium-87 $()$ 300

Ruthenium-97 $()$ 1,000

Ruthenium-103 $()$ 200

Ruthenium-105 $()$ 200

Ruthenium-106 $()$ 30

Samarium-151 $()$ 1,000

Samarium-153 $()$ 200

Scandium-46 $()$ 100

Scandium-47 $()$ 300

Scandium-48 $()$ 80

Selenium-75 $()$ 900

Silicon-31 $()$ 3,000

Silver-105 $()$ 300

Silver-110m $()$ 90

Silver-111 $()$ 100

Sodium-22 $()$ 400

Sodium-24 $()$ 600

Strontium-85 $()$ 900

Strontium-85m $()$ 20,000

Strontium-89 $() Bone$ 20

Strontium-90 $()$ 8

Strontium-91 $()$ 200

Strontium-92 $()$ 200

Sulfur-35 (inorganic) $()$ 500

Tantalum-182 $()$ 100

Technetium-96 $()$ 300

Technetium-96m $()$ 30,000

Technetium-97 $()$ 6,000

Technetium-97m $()$ 1,000

Technetium-99 $()$ 900

Technetium-99m $()$ 20,000

Tellurium-125m $()$ 600

Tellurium-127 $()$ 900

Tellurium-127m $()$ 200

Tellurium-129 $()$ 2,000

Tellurium-129m $()$ 90

Tellurium-131m $()$ 200

Tellurium-132 $()$ 90

Terbium-160 $()$ 100

Thallium-200 $()$ 1,000

Thallium-201 $()$ 900

Thallium-202 $()$ 300

Thallium-204 $()$ 300

Thulium-170 $()$ 100

Thulium-171 $()$ 1,000

Tin-113 $()$ 300

Tin-125 $()$ 60

Tungsten-181 $()$ 1,000

Tungsten-185 $()$ 300

Tungsten-187 $()$ 200

Vanadium-48 $()$ 90

Ytterbium-175 $()$ 300

Yttrium-90 $()$ 60

Yttrium-91 $()$ 90

Yttrium-91m $()$ 9,000

Yttrium-92 $()$ 200

Yttrium-93 $()$ 90

Zinc-65 $()$ 300

Zinc-69 $()$ 6,000

Zinc-69m $()$ 200

Zirconium-93 $()$ 2,000

Zirconium-95 $()$ 200

Zirconium-97 $()$ 60

BOARD NOTE: This Table R derives from Table VI-2 (Annual Average Concentrations Yielding 4 Millirem per Year for a Two Liter Daily Intake), Statement of Basis and Purpose for the National Primary Drinking Water Regulations − Radionuclides, USEPA, Office of Radiation Protection (July 9, 1976), at 87-94, and Appendix I (Comparison of Derived Values of Beta and Photon Emitters), Implementation Guidance for Radionuclides, USEPA, Office of Ground Water and Drinking Water, EPA 816-F-00-002 (March 2002). USEPA based these values on NBS Handbook 69 (63), incorporated by reference in Section 611.102.

Calculating compliance with Section 611.330(d) under Section 611.742 requires dividing the measured concentration for each radionuclide by the appropriate conversion factor to determine its calculated fractional contribution to the total annual exposure limit of 4 mrem/yr:

$$\frac{Sample Concentration (pCi•Ll^{1})}{Conversion Factor (pCi•Ll^{1}/4 mrem•yr^{1})}$$

The supplier then sums the fractional contributions for all radionuclides to determine the total fraction of the maximum exposure limit:

$$Total Fraction of Maximum Exposure Limit for All Radionuclides Present$$

$$=\sum\_{Isotope 1}^{Isotope n}Fraction of Maximum Exposure Limit for Each Radionuclide$$

A sum of fractions result exceeding 1.00 exceeds the 4 mrem/yr standard in Section 611.330(d).

The total exposure is this sum of fractions (i.e., the total fraction of maximum exposure limit) times 4 mrem•yr‑1.

See Statement of Basis and Purpose for the National Primary Drinking Water Regulations − Radionuclides, USEPA, Office of Radiation Protection (July 9, 1976), at 80-86, and Implementation Guidance for Radionuclides, USEPA, Office of Ground Water and Drinking Water, EPA 816-F-00-002 (March 2002), pp. II-5 and II-6.

(Source: Added at 47 Ill. Reg. 16486, effective November 2, 2023)