DRAFT - RSR COMPLEXITY METHODOLOGY

Deciding whether an unsealed sources permit is high complexity

If you undertake any of the following radioactive substances activities then the permit reference is 1.2.8 (Keeping or use of unsealed radioactive sources and subsequent disposal of radioactive waste - high complexity)

- production of radioactive substances (such as in a cyclotron)
- manufacture of gaseous tritium light devices or sources
- disposal of radioactive waste arising from the onshore production of oil and gas not within the confines of a standard rules permit
- receiving radioactive waste for the purposes of treatment and/or disposal, or
- If the disposal ratio as calculated using the RSR complexity methodology is greater than 30000

To calculate the Radioactive Substances Disposal Ratio for your permit please follow the steps below:

1. From the permit for the keeping or use of unsealed radioactive sources and subsequent disposal of radioactive waste, find the maximum annual activity permitted for disposal for each radionuclide and group of radionuclides. Use either the annual limits in the permit or 12 times the monthly limit. Ignore disposals by transfer of radioactive waste.

2. Calculate the ratio of the maximum permitted disposal in your permit to the appropriate value for each radionuclide listed in tables 1 and 2 below.

   For example: Your permit will allow you to dispose of 250GBq (250×10^9Bq) per year of Iodine 131 to sewer. Iodine 131 is in Band 2 in Table 1 and the appropriate value for disposal to sewer is 1×10^7Bq. The calculated ratio for Iodine 131 is therefore 25,000 ($250 \times 10^9 / 1 \times 10^7$).

   For radionuclides authorised as a group the appropriate values are in Table 2. Note that many older permits have a wide variety of different groups in them. Table 3 provides guidance on identifying the revised charging group from the old group. Newer permits will include only the new groups.

   For example if your permit includes the group Iodine Radionuclides with an annual disposal limit to air of 600GBq (600×10^9Bq). Iodine radionuclides is in Group 3 in Table 2 and the appropriate value for disposal to air is 1×10^8Bq. The calculated ratio for Iodine radionuclides is therefore 6,000 ($600 \times 10^9 / 1 \times 10^8$).

3. Sum all ratios for each radionuclide and group of radionuclides.

   Using the examples above the sum of the ratios for Iodine 131 to sewer (25,000) and Iodine radionuclides to air (6,000) would be 31,000

4. If sum of ratios is greater than 30000 then categorise as “high complexity”

TABLE 1

Band 1			
Sewer	1.00E+05Bq		
Water	1.00E+07Bq		
Air	1.00E+06Bq		
Barium 133 (Ba-133)	Cobalt 56 (Co-56)	Polonium 210 (Po-210)	Thallium 204 (Tl-204)
Bismuth 210 (Bi-210)	Cobalt 60 (Co-60)	Protactinium 231 (Pa-231)	Thorium 228 (Th-228)
Cadmium 109 (Cd-109)	Europium 152 (Eu-152)	Radium 224 (Ra-224)	Thorium 232 (Th-232)
Caesium 134 (Cs-134)	Europium 154 (Eu-154)	Radium 226 (Ra-226)	
Caesium 137 (Cs-137)	Holmium 166 (Ho-166)	Radium 228 (Ra-228)	
Californium 252 (Cf-252)	Lead 210 (Pb-210)	Selenium 75 (Se-75)	

Band 2			
Sewer	1.00E+07Bq		
Water	1.00E+07Bq		
Air	1.00E+08Bq		
Actinium 225 (Ac-225)	Gadolinium 148 (Gd-148)	Plutonium 238 (Pu-238)	Strontium 83 (Sr-83)
Actinium 227 (Ac-227)	Gadolinium 153 (Gd-153)	Plutonium 239 (Pu-239)	Strontium 85 (Sr-85)
Americium 241 (Am-241)	Gallium 68 / Germanium 68 (Ge-68 Generator)	Plutonium 240 (Pu-240)	Strontium 90 (Sr-90)
Americium 241:Berylium (Am-241:Be)	Germanium 68 (Ge-68)	Plutonium 242 (Pu-242)	Tantalum 182 (Ta-182)
Americium 243 (Am-243)	Gold 198 (Au-198)	Polonium 208 (Po-208)	Thorium 227 (Th-227)
Bromine 76 (Br-76)	Indium 111 (In-111)	Radium 223 (Ra-223)	Thorium 229 (Th-229)
Bromine 77 (Br-77)	Indium 113m (In-113m)	Rhenium 186 (Re-186)	Thorium 230 (Th-230)
Bromine 82 (Br-82)	Iodine 124 (I-124)	Rubidium 81 / Krypton 81m (Kr-81m Generator)	Thulium 170 (Tm-170)
Caesium 135 (Cs-135)	Iodine 129 (I-129)	Rubidium 81m (Rb-81m)	Tin 113 (Sn-113)
Calcium 41 (Ca-41)	Iodine 131 (I-131)	Rubidium 82 (Rb-82)	Tin 117m (Sn-117m)
Calcium 45 (Ca-45)	Iridium 192 (Ir-192)	Rubidium 82m (Rb-82m)	Tin 119m (Sn-119m)
Cerium 141 (Ce-141)	Iron 55 (Fe-55)	Rubidium 84 (Rb-84)	Tin 121m (Sn-121m)
Cerium 144 (Ce-144)	Iron 59 (Fe-59)	Rubidium 86 (Rb-86)	Uranium 232 (U-232)
Chlorine 36 (Cl-36)	Lanthanum 140 (La-140)	Ruthenium 103 (Ru-103)	Uranium 233 (U-233)
Cobalt 57 (Co-57)	Manganese 52 (Mn-52)	Samarium 151 (Sm-151)	Uranium 234 (U-234)
Cobalt 58 (Co-58)	Manganese 54 (Mn-54)	Scandium 46 (Sc-46)	Uranium 235 (U-235)

Copper 67 (Cu-67)	Neptunium 237 (Np-237)	Silver 110m (Ag-110m)	Uranium 236 (U-236)
Curium 242 (Cm-242)	Nickel 59 (Ni-59)	Sodium 22 (Na-22)	Vanadium 48 (V-48)
Curium 243 (Cm-243)	Phosphorus 32 (P-32)	Sodium 24 (Na-24)	Zinc 62 (Zn-62)
Curium 244 (Cm-244)	Phosphorus 33 (P-33)	Strontium 82 / Rubidium 82 (Rb-82 Generator)	Zinc 65 (Zn-65)
		Band 3	
Sewer	1.00E+09Bq		
Water	1.00E+10Bq		
Air	1.00E+10Bq		
Antimony 122 (Sb-122)	Copper 64 (Cu-64)	Manganese 56 (Mn-56)	Sulphur 35 (S-35)
Antimony 124 (Sb-124)	Erbium 169 (Er-169)	Mercury 203 (Hg-203)	Technetium 94 (Tc-94)
Antimony 125 (Sb-125)	Erbium 171 (Er-171)	Molybdenum 99 / Technetium 99m (Tc-99m Generator)	Technetium 99 (Tc-99)
Argon 41 (Ar-41)	Europium 152m (Eu-152m)	Nickel 63 (Ni-63)	Technetium 99m (Tc-99m)
Arsenic 76 (As-76)	Fluorine 18 (F-18)	Nitrogen 13 (N-13)	Thallium 201 (Tl-201)
Astatine 211 (At-211)	Gallium 67 (Ga-67)	Oxygen 15 (O-15)	Tin 121 (Sn-121)
Barium 137m (Ba-137m)	Germanium 69 (Ge-69)	Palladium 103 (Pd-103)	Tin 125 (Sn-125)
Beryllium 7 (Be-7)	Hydrogen 3 (H-3 Tritium)	Plutonium 241 (Pu-241)	Xenon 133 (Xe-133)
Bismuth 204 (Bi-204)	Iodine 120 (I-120)	Potassium 40 (K-40)	Ytterbium 169 (Yb-169)
Bismuth 205 (Bi-205)	Iodine 123 (I-123)	Potassium 42 (K-42)	Ytterbium 175 (Yb-175)
Bismuth 206 (Bi-206)	Iodine 125 (I-125)	Promethium 147 (Pm147)	Yttrium 86 (Y-86)
Carbon 11 (C-11)	Iron 52 (Fe-52)	Radon 222 (Rn-222)	Yttrium 88 (Y-88)
Carbon 14 (C-14)	Krypton 79 (Kr-79)	Rhenium 188 (Re-188)	Yttrium 90 (Y-90)
Chromium 51 (Cr-51)	Krypton 81 (Kr-81)	Samarium 153 (Sm-153)	Zirconium 89 (Zr-89)
Cobalt 55 (Co-55)	Krypton 85 (Kr-85)	Scandium 47 (Sc-47)	Zirconium 95 (Zr-95)
Copper 61 (Cu-61)	Lutetium 177 (Lu-177)	Strontium 89 (Sr-89)	

TABLE 2				
Group	Sewer	Water	Air	Radionuclides in Group
Group 1	1.00E+08	1.00E+08	1.00E+10	Carbon-14, tritium
Group 2	1.00E+08	1.00E+08	1.00E+10	Carbon-14, tritium, iodine-125, phosphorus-32, sulphur-35
Group 3	1.00E+08	1.00E+08	1.00E+08	Iodine radionuclides
Group 4	1.00E+05	1.00E+07	1.00E+06	Thorium natural
Group 5	1.00E+05	1.00E+07	1.00E+06	Total alpha-emitting radionuclides
Group 6	1.00E+06	1.00E+07	1.00E+08	Total beta/gamma-emitting radionuclides
Group 7	1.00E+09	1.00E+10	1.00E+11	Total positron-emitting radionuclides
Group 8	1.00E+05	1.00E+07	1.00E+06	Total radionuclides
Group 9	1.00E+11	1.00E+12	1.00E+12	Uranium – depleted or natural
Group 10	1.00E+08	1.00E+08	1.00E+07	Uranium – enriched

If a permitted radionuclide or group of radionuclides is not shown in the tables above, then seek advice from us.

Table 3

Old group	New group	Old group	New group
Activated air and coolant - beta/gamma emitting radionuclides	Total beta/gamma-emitting radionuclides	Silver-110m & cobalt-60	Total beta/gamma-emitting radionuclides
Activated dust - beta/gamma emitting radionuclides	Total beta/gamma-emitting radionuclides	Sodium-22 & iron-59	Total beta/gamma-emitting radionuclides
Activation products	Total beta/gamma-emitting radionuclides	Sodium-22 & zinc-65	Total beta/gamma-emitting radionuclides
Activation products - short-lived gaseous	Total beta/gamma-emitting radionuclides	Strontium isotopes & alpha-emitting radionuclides	Total radionuclides
Americium-241 & curium-242	Total alpha-emitting radionuclides	Strontium-90 & alpha-emitting radionuclides	Total radionuclides
Americium-241 mixed with beryllium	Band 2	Sulphur-35 & iodine-125	Total beta/gamma-emitting radionuclides
Americium-241, iron-55, promethium-147 & caesium-137	Total radionuclides	Sulphur-35, carbon-14, chromium-51 & phosphorus-33	Total beta/gamma-emitting radionuclides
Argon and krypton	Total beta/gamma-emitting radionuclides	Thorium - natural	Thorium natural
Bromine-76, 77 & 82	Total beta/gamma-emitting radionuclides	Thorium isotopes	Thorium natural
Bromine-82 & sodium-24	Total beta/gamma-emitting radionuclides	Thorium natural	Thorium natural
Carbon-11 & fluorine-18	Total positron-emitting radionuclides	Total alpha-emitting radionuclides	Total radionuclides
Carbon-14 & other beta-emitting radionuclides	Total beta/gamma-emitting radionuclides	Total alpha-emitting radionuclides - half-life < 3 months	Total radionuclides
Carbon-14 & sulphur-35	Total beta/gamma-emitting radionuclides	Total alpha-emitting radionuclides - half-life > 3 months	Total radionuclides
Carbon-14 and other beta emitters	Total beta/gamma-emitting radionuclides	Total alpha-emitting radionuclides (excluding uranium)	Total radionuclides
Carbon-14, chromium-51, technetium-99 & indium-111	Total beta/gamma-emitting radionuclides	Total alpha-emitting radionuclides (non-uranic)	Total radionuclides
Carbon-14, cobalt-57 & cobalt-58	Total beta/gamma-emitting radionuclides	Total beta/gamma-emitting radionuclides	Total beta/gamma-emitting radionuclides
Chromium-51, manganese-52, cobalt-56, cobalt-57, cobalt-58 & other beta/gamma emitting radionuclides	Total beta/gamma-emitting radionuclides	Total beta/gamma-emitting radionuclides - half-life < 1 day	Total beta/gamma-emitting radionuclides
Chromium-51, rubidium-86 & indium-111	Total beta/gamma-emitting radionuclides	Total beta/gamma-emitting radionuclides - half-life < 3 months	Total radionuclides

Table 3			
Old group	**New group**	**Old group**	**New group**
Cobalt-56, cobalt-57, cobalt-58, manganese-52 & manganese-54	Total beta/gamma-emitting radionuclides	Total beta/gamma-emitting radionuclides - half-life > 1 day	Total radionuclides
Cobalt-57 & cobalt-58	Total beta/gamma-emitting radionuclides	Total beta-emitting radionuclides	Total beta/gamma-emitting radionuclides
Cobalt-57 & cobalt-59	Total beta/gamma-emitting radionuclides	Total beta-emitting radionuclides - half-life < 3 months	Total radionuclides
Curium-242 & curium-243	Total alpha-emitting radionuclides	Total beta-emitting radionuclides - half-life < 8 hours	Total radionuclides
Gallium-67, indium-111, thallium-201 & iodine-131	Total beta/gamma-emitting radionuclides	Total beta-emitting radionuclides - half-life > 1 day	Total radionuclides
Indium-111 & other radionuclides (excluding alpha-emitters)	Total beta/gamma-emitting radionuclides	Total beta-emitting radionuclides - half-life > 3 months	Total radionuclides
Indium-111, gallium-67 & iodine-123	Total beta/gamma-emitting radionuclides	Total beta-emitting radionuclides - half-life > 3 months	Total radionuclides
Indium-111, gallium-67, chromium-51, selenium-75 & thallium-201	Total beta/gamma-emitting radionuclides	Total beta-emitting radionuclides - half-life > 8 hours	Total radionuclides
Indium-111, iodine-125 & iodine-131	Total beta/gamma-emitting radionuclides	Total beta-emitting radionuclides - therapeutic	Total beta/gamma-emitting radionuclides
Indium-113m, bromine-82 & sodium-24	Total beta/gamma-emitting radionuclides	Total beta-emitting radionuclides (>0.4 MeV)	Total beta/gamma-emitting radionuclides
Indium-113m, iodine-123, erbium-171, gallium-67, sodium-24, potassium-42, gold-198, yterrbium-69/175 & iron-59	Total beta/gamma-emitting radionuclides	Total beta-emitting radionuclides (excluding tritium)	Total beta/gamma-emitting radionuclides
Iodine isotopes	Iodine radionuclides	Total beta-emitting radionuclides associated with particulate matter	Total beta/gamma-emitting radionuclides
Iodine isotopes (excluding iodine-131)	Iodine radionuclides	Total halogens	Total beta/gamma-emitting radionuclides
Iodine-123 & iodine-125	Iodine radionuclides	Total noble gases	Total beta/gamma-emitting radionuclides
Iodine-123 & iodine-131	Iodine radionuclides	Total positron emitting radionuclides	Total positron-emitting radionuclides
Iodine-123, iodine-125 & iodine-131	Iodine radionuclides	Total positron-emiting radionuclides - half-life < 2 hours	Total positron-emitting radionuclides

Table 3

Old group	New group	Old group	New group
Iodine-123, iodine-125, iodine-129 & iodine-131	Iodine radionuclides	Total positron-emitting radionuclides - half-life < 2 hours	Total positron-emitting radionuclides
Iodine-124, iodine-125 & iodine-131	Iodine radionuclides	Total radionuclides	Total radionuclides
Iodine-125 & iodine-131	Iodine radionuclides	Total radionuclides - half-life < 1 day	Total radionuclides
Iodine-125 & other iodine isotopes	Iodine radionuclides	Total radionuclides - half-life < 1 year	Total radionuclides
Iodine-131 & other radionuclides (excluding alpha-emitters)	Total beta/gamma-emitting radionuclides	Total radionuclides - half-life < 10 hours	Total radionuclides
Krypton-85, americium-241, iron-55, promethium-147 & caesium-137	Total beta/gamma-emitting radionuclides	Total radionuclides - half-life < 100 days	Total radionuclides
Lanthanum-140 & sodium-24	Total beta/gamma-emitting radionuclides	Total radionuclides - half-life < 30 minutes	Total radionuclides
Lead-210 & daughters	Total alpha-emitting radionuclides	Total radionuclides - half-life < 400 days	Total radionuclides
Low energy (<0.3 MeV) beta-emitting radionuclides	Total beta/gamma-emitting radionuclides	Total radionuclides - half-life < 5 days	Total radionuclides
Mixed radionuclides including americium-241	Total radionuclides	Total radionuclides - half-life < 8 hours	Total radionuclides
Molybdenum-99 & technetium-99m	Total beta/gamma-emitting radionuclides	Total radionuclides - half-life > 100 days	Total radionuclides
Non-uranium alpha emitting radionuclides	Total alpha-emitting radionuclides	Total radionuclides - half-life > 3 hours	Total radionuclides
Other alpha-emitting radionuclides	Total alpha-emitting radionuclides	Total radionuclides - half-life > 400 days	Total radionuclides
Other beta/gamma-emitting radionuclides	Total beta/gamma-emitting radionuclides	Total radionuclides - half-life > 8 hours	Total radionuclides
Other beta/gamma-emitting radionuclides - half-life < 8 days	Total beta/gamma-emitting radionuclides	Total radionuclides - half-life 30 minutes - 3 hours	Total radionuclides
Other beta/gamma-emitting radionuclides - half-life < 8 hours	Total beta/gamma-emitting radionuclides	Total radionuclides - half-life between 5 to 400 days	Total radionuclides
Other beta/gamma-emitting radionuclides - half-life > 8 days	Total beta/gamma-emitting radionuclides	Total radionuclides (excluding alpha-emitters & strontium-90)	Total radionuclides
Other beta/gamma-emitting radionuclides - half-life > 8 hours	Total beta/gamma-emitting radionuclides	Total radionuclides (excluding alpha-emitters)	Total beta/gamma-emitting radionuclides
Other beta/gamma-emitting radionuclides (excluding alpha-emitters)	Total beta/gamma-emitting radionuclides	Total radionuclides (excluding alpha-emitters) - half-life < 30 minutes	Total beta/gamma-emitting radionuclides

Table 3			
Old group	**New group**	**Old group**	**New group**
Other beta-emitting radionuclide - half-life < 3 months	Total radionuclides	Total radionuclides (excluding alpha-emitters) - half-life > 3 hours	Total beta/gamma-emitting radionuclides
Other beta-emitting radionuclide - half-life > 3 months	Total radionuclides	Total radionuclides (excluding alpha-emitters) - half-life 30 minutes - 3 hours	Total beta/gamma-emitting radionuclides
Other beta-emitting radionuclides	Total beta/gamma-emitting radionuclides	Total radionuclides (excluding carbon-14 & tritium) - half-life > 400 days	Total radionuclides
Other beta-emitting radionuclides with max beta energy > than 0.4 MeV	Total beta/gamma-emitting radionuclides	Total radionuclides (excluding sulphur-35)	Total radionuclides
Other gamma-emitting radionuclides	Total radionuclides	Total radionuclides (excluding technetium-99m)	Total radionuclides
Other gases	Total radionuclides	Tritium (excluding tritiated water)	Band 3
Other noble gases	Total beta/gamma-emitting radionuclides	Tritium (in metal foil)	Band 3
Other radionuclides	Total radionuclides	Tritium (insoluble)	Band 3
Other radionuclides - half-life < 1 day	Total radionuclides	Tritium (OBT)	Band 3
Other radionuclides - half-life < 1 year	Total radionuclides	Tritium (soluble)	Band 3
Other radionuclides - half-life < 2 hours	Total radionuclides	Tritium & carbon-14	Carbon-14, tritium
Other radionuclides - half-life < 3 months	Total radionuclides	Tritium & carbon-14 (and iodine-131?)	Total beta/gamma-emitting radionuclides
Other radionuclides - half-life < 8 hours	Total radionuclides	Tritium & iodine-125	Carbon-14, tritium, iodine-125, phosphorus-32, phosphorous-33, sulphur-35
Other radionuclides - half-life > 1 year	Total radionuclides	Tritium & sulphur-35	Carbon-14, tritium, iodine-125, phosphorus-32, phosphorous-33, sulphur-35
Other radionuclides - half-life > 3 months	Total radionuclides	Tritium, carbon-14 & caesium-134	Total beta/gamma-emitting radionuclides
Other radionuclides - half-life > 8 hours	Total radionuclides	Tritium, carbon-14 & iodine-125	Carbon-14, tritium, iodine-125, phosphorus-32, phosphorous-33, sulphur-35
Other radionuclides - half-life < 100 days	Total radionuclides	Tritium, carbon-14 & sulphur-35	Carbon-14, tritium, iodine-125, phosphorus-32,

Table 3			
Old group	**New group**	**Old group**	**New group**
			phosphorous-33, sulphur-35
Other radionuclides - half-life > 100 days	Total radionuclides	Tritium, carbon-14, cobalt-60 & iodine-129	Total beta/gamma-emitting radionuclides
Other radionuclides - transuranics	Total alpha-emitting radionuclides	Tritium, carbon-14, cobalt-60, silver-110m & other beta/gamma-emitting radionuclides	Total beta/gamma-emitting radionuclides
Other radionuclides (excluding alpha emitters)	Total beta/gamma-emitting radionuclides	Tritium, carbon-14, iodine-125 & other radionuclides	Total beta/gamma-emitting radionuclides
Other radionuclides (excluding alpha-emitters & iodine-125)	Total beta/gamma-emitting radionuclides	Tritium, carbon-14, iron-55, cobalt-60, radium-226, thorium-232, uranium and other alpha-emitters & other beta/gamma emitters	Total radionuclides
Other radionuclides (excluding alpha-emitters & strontium-90)	Total beta/gamma-emitting radionuclides	Tritium, carbon-14, nickel-63 & promethium-147	Total beta/gamma-emitting radionuclides
Other radionuclides (excluding alpha-emitters & tritium)	Total beta/gamma-emitting radionuclides	Tritium, carbon-14, phosphorus-32 & iodine-125	Total beta/gamma-emitting radionuclides
Other radionuclides (excluding alpha-emitters)	Total beta/gamma-emitting radionuclides	Tritium, carbon-14, phosphorus-32, phosphorus-33 & sulpur-35	Total beta/gamma-emitting radionuclides
Other radionuclides (excluding alpha-emitters) - half-life < 100 days	Total beta/gamma-emitting radionuclides	Tritium, carbon-14, phosphorus-32, phosphorus-33, sulphur-35 & iodine-125	Total beta/gamma-emitting radionuclides
Other radionuclides (excluding alpha-emitters) - half-life < 2 hours	Total beta/gamma-emitting radionuclides	Tritium, krypton-85 & krypton-79	Total beta/gamma-emitting radionuclides
Other radionuclides (excluding alpha-emitters) - half-life > 100 days	Total beta/gamma-emitting radionuclides	Uranium - depleted	Uranium – depleted or natural
Other radionuclides (excluding alpha-emitters, iodine-125 & iodine-131)	Total beta/gamma-emitting radionuclides	Uranium - depleted or natural	Uranium – depleted or natural
Other radionuclides (excluding alpha-emitters, tritium & carbon-14)	Total beta/gamma-emitting radionuclides	Uranium - enriched	Uranium – enriched
Other radionuclides (excluding cobalt-60)	Total radionuclides	Uranium - natural	Uranium – depleted or natural

Table 3

Old group	New group	Old group	New group
Other radionuclides (excluding indium-111, iodine-131 & alpha-emitters)	Total beta/gamma-emitting radionuclides	Uranium & thorium - natural	Total alpha-emitting radionuclides
Other radionuclides (excluding tritium & caesium-137)	Total radionuclides	Uranium daughters	Total beta/gamma-emitting radionuclides
Other radionuclides (excluding tritium & cobalt-60)	Total radionuclides	Uranium daughters	Total radionuclides
Other radionuclides (excluding tritium, carbon-14 & cobalt-60)	Total radionuclides	Uranium isotopes	Total beta/gamma-emitting radionuclides
Other radionuclides (including strontium-90)	Total radionuclides	Uranium-234 & uranium-235	Total alpha-emitting radionuclides
Oxygen-15, carbon-11, nitrogen-13 & fluorine-18	Total positron-emitting radionuclides	Uranium-238 & daughters	Uranium – depleted or natural
Phosphorus isotopes	Total beta/gamma-emitting radionuclides	Xenon isotopes	Total beta/gamma-emitting radionuclides
Phosphorus-32 & chromium-51	Total beta/gamma-emitting radionuclides	Yttrium-90, cobalt-57, cobalt-58 & phosphorus-32	Total beta/gamma-emitting radionuclides
Phosphorus-32 & phosphorus-33	Total beta/gamma-emitting radionuclides	Zirconium-95 & niobium-95	Total beta/gamma-emitting radionuclides
Phosphorus-32 & strontium-89	Total beta/gamma-emitting radionuclides	Radium-224 & daughters	Total alpha-emitting radionuclides
Phosphorus-32 & sulphur-35	Total beta/gamma-emitting radionuclides	Radium-226 & daughters	Band 1
Phosphorus-32, chlorine-36 & sulphur-35	Total beta/gamma-emitting radionuclides	Radium-228 & daughters	Total alpha-emitting radionuclides
Phosphorus-32, phosphorus-33 & sulphur-35	Total beta/gamma-emitting radionuclides	Radium-233	Band 2
Phosphorus-32, sulphur-35 & chromium-51	Total beta/gamma-emitting radionuclides	Rubidium-81 & krypton-81m	Total beta/gamma-emitting radionuclides
Phosphorus-32, sulphur-35, iodine-125 & iodine-131	Total beta/gamma-emitting radionuclides	Technetium-94 & technetium-94m	Band 3
Phosphorus-33 & indium-111	Total beta/gamma-emitting radionuclides	Technetium-99m & molybdenum-99	Total beta/gamma-emitting radionuclides
Phosphorus-33 & sulphur-35	Total beta/gamma-emitting radionuclides	Thorium-232 & daughters	Band 1
Plutonium isotopes	Total alpha-emitting radionuclides	Tritium	Band 3
Plutonium-alpha	Total alpha-emitting radionuclides	Tritium - organically bound tritium	Band 3
Plutonium-alpha & plutonium-241	Total alpha-emitting radionuclides	Tritium - tritiated water	Band 3

Table 3			
Old group	**New group**	**Old group**	**New group**
Polonium-210 & lead-210	Total alpha-emitting radionuclides	Uranium-234 & uranium-235	Uranium – enriched
Radium isotopes	Total radionuclides	Uranium-238 & daughters	Uranium – depleted or natural
Radium-223 & other alpha-emitting radionuclides	Total alpha-emitting radionuclides	Xenon isotopes	Band 3
Radium-226 & thorium-232	Total alpha-emitting radionuclides	Yttrium-90, cobalt-57, cobalt-58 & phosphorus-32	Band 3
Radium-226 (mixed with beryllium)	Band 1	Zirconium-95 & niobium-95	Band 2
Radium-227 & Thorium-232	Total alpha-emitting radionuclides	Carbon-14, tritium	Carbon-14, tritium
Rubidium-81, rubidium-82m, rubidium-83 & rubidium-84	Total beta/gamma-emitting radionuclides	Carbon-14, tritium, iodine-125, phosphorus-32, phosphorous-33, sulphur-35	Carbon-14, tritium, iodine-125, phosphorus-32, phosphorous-33, sulphur-35
Rubidium-83 & rubidium-84	Total beta/gamma-emitting radionuclides	Iodine radionuclides	Iodine radionuclides
Ruthenium-106 & other radionuclides (excluding alpha-emitters)	Total beta/gamma-emitting radionuclides	Thorium natural	Thorium natural
		Total alpha-emitting radionuclides	Total alpha-emitting radionuclides
		Total beta/gamma-emitting radionuclides	Total beta/gamma-emitting radionuclides
		Total positron-emitting radionuclides	Total positron-emitting radionuclides
		Total radionuclides	Total radionuclides
		Uranium – depleted or natural	Uranium – depleted or natural
		Uranium – enriched	Uranium – enriched
		Carbon-14, tritium, iodine-125, phosphorus-32, sulphur-35	Carbon-14, tritium, iodine-125, phosphorous-33, sulphur-35