

SCHEDULE 4

Sampling and Analysis

PART 3

Monitoring for Indicative Dose and Analytical Performance Characteristics

Monitoring for Compliance with the ID

6. Screening strategy for gross alpha activity and gross beta activity (1) may be used to monitor for the parametric indicator value for indicative dose.

If the gross alpha activity is less than 0.1 Bq/l and the gross beta activity is less than 1.0 Bq/l, it may be assumed that the total indicative dose is less than 0.1 mSv and radiological investigation is not needed unless it is known from other sources of information that specific radionuclides are present in water that are liable to cause an excess of 0.1 mSv.

If the gross alpha activity exceeds 0.1Bq/l or the gross beta activity exceeds 1.0Bq/l, analysis for specific radionuclides is required.

The radionuclides to be measured must be based on all relevant information about likely sources of radioactivity.

Calculation of the ID

7. The ID must be calculated from the measured radionuclide concentrations and the dose coefficients laid down in Annex III, Table A of Directive 96/29/Euratom(2) or more recent information recognised by the Department, on the basis of the annual intake of water (730l for adults).

Where the following formula is satisfied, it can be assumed that the ID is less than the parametric value of 0.1mSv and no further investigation is required.

$$\sum_{i=1}^n \frac{C_i(\text{obs})}{C_i(\text{der})} \leq 1$$

where

$C_i(\text{obs})$ = observed concentration of radionuclide i

$C_i(\text{der})$ = derived concentration of radionuclide i (see Table D)

n = number of radionuclides detected.

(1) Where appropriate gross beta activity may be replaced by residual beta activity after subtraction of the K-40 activity concentration.

(2) O.J. No. L159, 29.6.96, P. 27

Status: This is the original version (as it was originally made).

TABLE D

Derived concentrations for radioactivity in water intended for human consumption

<i>Origin</i>	<i>Radionuclide⁽¹⁾</i>	<i>Derived concentration (Bq/l)</i>
Natural	U-238 ⁽²⁾	3.0
	U-234 ⁽²⁾	2.8
	Ra-226	0.5
	Ra-228	0.2
	Pb-210	0.2
	Po-210	0.1
Artificial	C-14	240
	Sr-90	4.9
	Pu-239 / Pu-240	0.6
	Am-241	0.7
	Co-60	40
	Cs-134	7.2
	Cs-137	11
	I-131	6.2

(1) This table includes values for the most common natural and artificial radionuclides; these are precise values, calculated for a dose of 0.1mSV, an annual intake of 730 litres and using the dose coefficients laid down in Annex III, Table A of Directive 96/29/Euratom; derived concentration for other radionuclides can be calculated on the same basis, and values can be updated on the basis of more recent information recognised by the Department.

(2) This allows only for the radiological properties of uranium, not for its chemical toxicity.

Performance characteristics and method of analysis.

8. For the following parameters and radionuclides, the method of analysis used must, as a minimum be capable of measuring activity concentrations with a limit of detection specified below in Table E:

TABLE E

<i>Parameters and radiouclides</i>	<i>Limit of detection⁽¹⁾⁽²⁾</i>
Tritium	10 Bg/l ⁽³⁾
Radon	10 Bg/l ⁽³⁾
gross alpha activity	0.04 Bg/l ⁽⁴⁾
gross beta activity	0.4 Bg/l ⁽⁴⁾
U-238	0.02 Bg/l
U-234	0.02 Bg/l

<i>Parameters and radiouclides</i>	<i>Limit of detection⁽¹⁾⁽²⁾</i>
Ra-226	0.04 Bg/l
Ra-228	0.02 Bg/l ⁽⁵⁾
Pb-210	0.02 Bg/l
Po-210	0.01 Bg/l
C-14	20 Bg/l
Sr-90	0.4 Bg/l
Pu-239/Pu-240	0.04 Bg/l
Am-241	0.06 Bg/l
Co-60	0.5 Bg/l
Cs-134	0.5 Bg/l
Cs-137	0.5 Bg/l
I-131	0.5 Bg/l

- (1) The limit of detection must be calculated according to the ISO standard 11929:2010 entitled “Determination of the characteristic limits (decision threshold, detection limit and limits of the confidence interval) for measurements of ionising radiation - Fundamentals and application”, with probabilities of errors of 1st and 2nd kind of 0.05 each.
- (2) Measurement uncertainties must be calculated and reported as complete standard uncertainties, or as expanded standard uncertainties with an expansion factor of 1.96, according to the ISO IEC Guide 98-3:2008 entitled “Guide to the expression of uncertainty in measurement”.
- (3) The limit of detection for tritium and for radon is 10% of the corresponding parametric value of 100 Bg/l.
- (4) The limit of detection for gross alpha activity and gross beta activities is 40% of the screening values of 0.1 Bq/l and 1.0 Bq/l respectively.
- (5) This limit of detection applies only to initial screening for indicative dose for a new water source. If initial checking indicates that it is unlikely that Ra-228 exceeds 20% of the derived concentration, the limit of detection may be increased to 0.08 Bq/l for routine Ra-228 nuclide specific measurements, until a subsequent re-check is required.