SCHEDULE 3 Regulation 12

Sampling and analysis

PART 1

General

Samples: general

1.—(1) A local authority must ensure that each sample is—

(a) taken by a competent person using suitable equipment,

(b) representative of the water at the sampling point at the time of sampling,

(c) not contaminated in the course of being taken,

(d) kept at such a temperature and in such condition as will secure that there is no material change in what is to be measured, and

(e) analysed without delay by a competent person using suitable equipment.

(2) It must ensure that the sample is analysed using a system of analytical quality control.

(3) The system must be subjected to checking by a person who is—

(a) not under the control of either the analyst or the local authority, and

(b) approved by the Secretary of State for that purpose.

Analysing samples

2.—(1) A local authority must ensure that each sample is analysed in accordance with this paragraph.

(2) For each parameter specified in the first column of Table 1 in Part 2 of this Schedule, the method of analysis is specified in the second column of that Table.

(3) For each parameter specified in the first column of Table 2 in Part 2 of this Schedule, the method is one that is capable of—

(a) measuring concentrations and values with the trueness and precision specified in the second and third columns of that Table, and

(b) detecting the parameter at the limit of detection specified in the fourth column of that Table.

(4) For hydrogen ion, the method of analysis must be capable of measuring a value with a trueness of 0.2 pH unit and a precision of 0.2 pH unit.

(5) The method of analysis used for odour and taste parameters must be capable of measuring values equal to the parametric value with a precision of 1 dilution number at 25°C.

(6) For these purposes—

"limit of detection" is —

(a) three times the relative within-batch standard deviation of a natural sample containing a low concentration of the parameter, or

(b) five times the relative within-batch standard deviation of a blank sample;

"precision" (the random error) is twice the standard deviation (within a batch and between batches) of the spread of results about the mean;

"trueness" (the systematic error) is the difference between the mean value of the large number of repeated measurements and the true value.

Authorisation of alternative methods of analysis

3.—(1) The Secretary of State may authorise a method different from that set out in paragraph 2(2) if satisfied that it is at least as reliable.

(2) An authorisation may be time-limited and may be revoked at any time.

Sampling and analysis by persons other than local authorities

4.—(1) A local authority may enter into an arrangement for any person to take and analyse samples on its behalf.

(2) A local authority must not enter into an arrangement under sub-paragraph (1) unless—

(a) it is satisfied that the task will be carried out promptly by a person competent to perform it, and

(b) it has made arrangements that ensure that any breach of these Regulations is communicated to it immediately, and any other result is communicated to it within 28 days.

PART 2

Analytical methods

Table 1

Prescribed methods of analysis

Parameter	*Method*
Clostridium perfringens (including spores)	Membrane filtration followed by anaerobic incubation of the membrane on m-CP agar* at 44 ± 1°C for 21 ± 3 hours. Count opaque yellow colonies that turn pink or red after exposure to ammonium hydroxide vapours for 20 to 30 seconds.
Coliform bacteria and *Escherichia coli (E. coli)*	BS-EN ISO 9308-1 and BS-EN ISO 9308-2
Colony count 22°C-enumeration of culturable microorganisms	BS-EN ISO 6222
Colony count 37°C-enumeration of culturable microorganisms	BS-EN ISO 6222
Enterococci	BS-EN ISO 7899-2
Pseudomonas aeruginosa	BS-EN ISO 12780

***Use the following method to make m-CP agar:**
Make a basal medium consisting of—

Tryptose	30.0g
Yeast extract	20.0g
Sucrose	5.0g
L-cysteine hydrochloride	1.0g
$MgSO_4.7H_2O$	0.1g
Bromocresol purple	40.0mg
Agar	15.0g
Water	1,000.0ml

Dissolve the ingredients of the basal medium; adjust pH to 7.6 and autoclave at 121°C for 15 minutes. Allow the medium to cool.

Dissolve—

D-cycloserine	400.0mg
Polymyxine-B sulphate	25.0mg
Indoxyl-β-D-glucoside	60.0mg

into 8ml sterile water and add it to the medium.

Add to the medium—

Filter-sterilised 0.5% phenolphthalein diphosphate solution	20.0ml
Filter-sterilised 4.5% FeCl3.6H2O	2.0ml

Table 2

Prescribed performance characteristics for methods of analysis

Parameters	*Trueness % of prescribed concentration or value or specification*	*Precision % of prescribed concentration or value or specification*	*Limit of detection % of prescribed concentration or value or specification*
Aluminium	10	10	10

(i) The method of analysis should determine total cyanide in all forms

(ii) The performance characteristics apply to each individual pesticide and will depend on the pesticide concerned.

(iii) The performance characteristics apply to the individual substances specified at 25% of the parametric value in Part I of Table B in Part 1 of Schedule 1.

(iv) The performance characteristics apply to the individual substances specified at 50% of the parametric value in Part I of Table B in Part 1 of Schedule 1.

(v) The performance characteristics apply to the prescribed value of 4 NTU.

(vi) The performance characteristic apply to the specification of 1 NTU for surface waters or ground waters influenced by surface water.

Parameters	*Trueness % of prescribed concentration or value or specification*	*Precision % of prescribed concentration or value or specification*	*Limit of detection % of prescribed concentration or value or specification*
Ammonium	10	10	10
Antimony	25	25	25
Arsenic	10	10	10
Benzene	25	25	25
Benzo(a)pyrene	25	25	25
Boron	10	10	10
Bromate	25	25	25
Cadmium	10	10	10
Chloride	10	10	10
Chromium	10	10	10
Colour	10	10	10
Conductivity	10	10	10
Copper	10	10	10
Cyanide[(i)]	10	10	10
1,2-dichloroethane	25	25	10
Fluoride	10	10	10
Iron	10	10	10
Lead	10	10	10
Manganese	10	10	10
Mercury	20	10	20
Nickel	10	10	10
Nitrate	10	10	10
Nitrite	10	10	10
Pesticides and related products[(ii)]	25	25	25

(i) The method of analysis should determine total cyanide in all forms

(ii) The performance characteristics apply to each individual pesticide and will depend on the pesticide concerned.

(iii) The performance characteristics apply to the individual substances specified at 25% of the parametric value in Part I of Table B in Part 1 of Schedule 1.

(iv) The performance characteristics apply to the individual substances specified at 50% of the parametric value in Part I of Table B in Part 1 of Schedule 1.

(v) The performance characteristics apply to the prescribed value of 4 NTU.

(vi) The performance characteristic apply to the specification of 1 NTU for surface waters or ground waters influenced by surface water.

Parameters	*Trueness % of prescribed concentration or value or specification*	*Precision % of prescribed concentration or value or specification*	*Limit of detection % of prescribed concentration or value or specification*
Polycyclic aromatic hydrocarbons[iii]	25	25	25
Selenium	10	10	10
Sodium	10	10	10
Sulphate	10	10	10
Tetrachloroethene[iv]	25	25	10
Tetrachloromethane	20	20	20
Trichloroethene[iv]	25	25	10
Trihalomethanes: Total[iii]	25	25	10
Turbidity[v]	10	10	10
Turbidity[vi]	25	25	25

(i) The method of analysis should determine total cyanide in all forms

(ii) The performance characteristics apply to each individual pesticide and will depend on the pesticide concerned.

(iii) The performance characteristics apply to the individual substances specified at 25% of the parametric value in Part I of Table B in Part 1 of Schedule 1.

(iv) The performance characteristics apply to the individual substances specified at 50% of the parametric value in Part I of Table B in Part 1 of Schedule 1.

(v) The performance characteristics apply to the prescribed value of 4 NTU.

(vi) The performance characteristic apply to the specification of 1 NTU for surface waters or ground waters influenced by surface water.

PART 3

Monitoring for indicative dose and analytical performance characteristics

Monitoring for compliance with the ID

5.—(1) A local authority may use various reliable screening strategies to indicate the presence of radioactivity in water intended for human consumption.

(2) These strategies may include screening for—

(a) certain radionuclides, or screening for an individual radionuclide;

(b) gross alpha activity or gross beta activity screening.

Screening for certain radionuclides, or screening for an individual radionuclide

6.—(1) If one of the activity concentrations exceeds 20% of the corresponding derived value or the tritium concentration exceeds its parametric value specified in the radioactive parameters table, an analysis of additional radionuclides is required.

(2) A local authority must take into account, in deciding which radionuclides are required to be measured for each supply, all relevant information about likely sources of radioactivity.

Screening strategies for gross alpha activity and gross beta activity

7.—(1) Subject to paragraph 6(1), the recommended screening values are—

(a) 0.1 Bq/l for gross alpha activity, and

(b) 1.0 Bq/l for gross beta activity(**1**).

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

(3) The Secretary of State may set alternative screening levels for gross alpha activity and gross beta activity where it is demonstrated by the local authority that the alternative levels are in compliance with an ID of 0,1 mSv.

(4) The determination by the local authority of which radionuclides to measure must be based on all relevant information about likely sources of radioactivity.

Calculation of the ID

8.—(1) The ID must be calculated from—

(a) the measured radionuclide concentrations and the dose coefficients laid down in Annex III, Table A of Directive 96/29/Euratom laying down basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionising radiation(**2**), or

(b) more recent information recognised by the Secretary of State, on the basis of the annual intake of water (730 litres for adults).

(2) 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—

"$C_i(obs)$" means the observed concentration of radionuclide I;

"$C_i(der)$" means the derived concentration of radionuclide I;

"n" means the number of radionuclides detected.

Derived concentrations for radioactivity in water intend for human consumption(3)

Origin	*Nuclide*	*Derived concentration*
Natural	U-238[(i)]	3,0 Bq/l

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

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

(**2**) OJ No L 159, 29.6.1996, p 1. It is prospectively repealed by Council Directive 2013/59/EURATOM (OJ No L 13, 17.01.2014, p 1 from 6 February 2018.

(**3**) **This Table includes values for the most common natural and artificial radionuclides; these are precise values, calculated for a dose of 0,1 mSv, an annual intake of 730 litres and using the dose coefficients laid down in Annex III, Table A of Directive 96/29/Euratom. Derived concentrations 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 Secretary of State.**

Origin	*Nuclide*	*Derived concentration*
	U-234[(i)]	2,8 Bq/1
	Ra-226	0,5 Bq/1
	Ra-228	0,2 Bq/1
	Pb-210	0,2 Bq/1
	Po-210	0,1 Bq/1
Artificial	C-14	240 Bq/1
	Sr-90	4,9 Bq/1
	Pu-239/Pu-240	0,6 Bq/1
	Am-241	0,7 Bq/1
	Co-60	40 Bq/1
	Cs-134	7,2 Bq/1
	Cs-137	11 Bq/1
	1-131	6,2 Bq/1

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

Performance characteristics and methods of analysis

9. 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—

Parameters and radionuclides	*Limit of detection (Notes 1,2)*	*Notes*
Tritium	10 Bq/1	Note 3
Radon	10 Bq/1	Note 3
gross alpha	0,04 Bq/1	Note 4
gross beta	0,4 Bq/1	Note 4
U-238	0,02 Bq/1	
U-234	0,02 Bq/1	
Ra-226	0,04 Bq/1	
Ra-228	0,02 Bq/1	Note 5
Pb-210	0,02 Bq/1	
Po-210	0,01 Bq/1	
C-14	20 Bq/1	
Sr-90	0,4 Bq/1	
Pu-239/Pu-240	0,04 Bq/1	
Am-241	0,06 Bq/1	
Co-60	0,5 Bq/1	

Parameters and radionuclides	*Limit of detection (Notes 1,2)*	*Notes*
Cs-134	0,5 Bq/1	
Cs-137	0,5 Bq/1	
I-131	0,5 Bq/1	

Note 1: The limit of detection must be calculated according to the ISO standard 11929: Determination of the characteristic limits (decision threshold, detection limit, and limits of confidence interval) for measurements of ionising radiation – Fundamentals and application, with probabilities of errors of 1st and 2nd kind of 0,05 each(**4**).

Note 2: Measurement uncertainties must be calculated and reported as complete standard uncertainties, or as expanded uncertainties with an expansion factor of 1,96 according the ISO Guide for the Expression of Uncertainty in Measurement(**5**).

Note 3: The limit of detection for tritium and for radon is 10% of its parametric value of 100 Bq/1.

Note 4: The limit of detection for gross alpha activity and gross beta activities are 40% of the screening values of 0,1 and 1,0 Bq/1 respectively.

Note 5: This limit of detection applies only to initial screening for ID for a new water source; if initial checking indicates that it is not plausible that Ra-228 exceeds 20% of the derived concentration, the limit of detection may be increased to 0,08 Bq/1 for routine Ra-228 nuclide specific measurements, until a subsequent re-check is required.

(**4**) A copy may be obtained at www.iso.org or from the Drinking Water Inspectorate, Area 7E, 9 Millbank, c/o Nobel House, 17 Smith Square, London, SW1P 3JR.
(**5**) See previous footnote.