

SCHEDULE 4

Regulations 13 and 14

Sampling and analysis

PART 1

General

Samples: general

1.—(1) The local authority must ensure, so far as reasonably practicable, that the appropriate requirements are satisfied when—

- (a) taking, handling, transporting and storing a sample required to be taken in accordance with this Schedule;
- (b) analysing such a sample; or
- (c) causing any such sample to be taken, handled, transported, stored or analysed.

(2) In this paragraph, “the appropriate requirements” means such of the following as are applicable—

- (a) the sample is representative of the quality of the water at the time of sampling;
- (b) the person taking a sample is subject to a system of quality control to an appropriate standard checked from time to time by a suitably accredited body;
- (c) the sample is not contaminated when being taken;
- (d) the sample is kept at such a temperature and in such conditions as secure that there is no material alteration of the concentration or value for the measurement or observation of which the sample is intended;
- (e) the sample is analysed as soon as reasonably practicable after it has been taken—
 - (i) by, or under the supervision of, a person who is competent to perform that task; and
 - (ii) with the use of such equipment as is suitable for the purpose;
- (f) the collection and transportation of samples, or measurements recorded by continuous monitoring must be subject to a system of quality control to an appropriate standard checked from time to time by a suitably accredited body.

(3) When undertaking the activity described in—

- (a) sub-paragraph (1)(a), the local authority must demonstrate compliance with any of EN ISO/IEC 17024, EN ISO/EIC 17025, or another equivalent standard accepted at international level;
- (b) sub-paragraph (1)(b), the local authority must demonstrate compliance with EN ISO/EIC 17025 or another equivalent standard accepted at international level.

(4) Implementation of the requirement in sub-paragraph (3)(a) may be delayed for a period of no more than 24 months beginning on the day on which these Regulations come into force.

(5) In this paragraph, “suitably accredited body” means any person accredited by the United Kingdom Accreditation Service(1).

(1) See S.I. 2009/3155 for the appointment of the United Kingdom Accreditation Service as the national accreditation body.

Analysing samples: microbiological parameters

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.

Analysing samples: chemical and indicator parameters

3.—(1) On or before 31 December 2019, the local authority may apply the method of analysis for chemical and indicator parameters in either sub-paragraph (3) or sub-paragraph (4).

(2) After 31 December 2019, the local authority must apply the method of analysis for chemical and indicator parameters in sub-paragraph (4).

(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 each parameter specified in the first column of Table 3 in Part 2 of this Schedule the method is one that is capable of measuring concentrations equal to—

- (a) the parametric value with a limit of quantification of 30% or less of the relevant parametric value (as contained in Schedule 1), and
- (b) the uncertainty of measurement in the second column of that table.

(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—

- (a) “limit of detection” is—
 - (i) three times the relative within-batch standard deviation of a natural sample containing a low concentration of the parameter; or
 - (ii) five times the relative within-batch standard deviation of a blank sample;
- (b) “precision” (the random error) is twice the standard deviation (within a batch and between batches) of the spread of results about the mean. Acceptable precision is twice the relative standard deviation. Further specifications are set out in ISO 17025;
- (c) “trueness” (the systematic error) is the difference between the mean value of the large number of repeated measurements and the true value. Further specifications are set out in ISO 17025;
- (d) “uncertainty of measurement” is a non-negative parameter characterising the dispersion of the quantity values being measured, based on the information used.

Authorisation of alternative methods of analysis

4.—(1) The Welsh Ministers may authorise a method different from those set out in paragraph 3(2) or 3(3) 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

5.—(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 for microbiological parameters

<i>Parameter</i>	<i>Method</i>
Escherichia coli (E. coli)	EN ISO 9308-1 or EN ISO 9308-2
Enterococci	EN ISO 7899-2
Pseudomonas aeruginosa	EN-ISO 16266
Colony count 22°C — enumeration of culturable microorganisms	EN ISO 6222
Colony count 36°C — enumeration of culturable microorganisms	EN ISO 6222
Clostridium perfringens (including spores)	EN ISO 14189

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Table 2

Prescribed performance characteristics for methods of analysis for chemical and indicator parameters: trueness, precision and limit of detection (on or before 31 December 2019)

<i>Parameter</i>	<i>Trueness % of prescribed concentration or value or specification (except for pH)</i>	<i>Precision % of prescribed concentration or value or specification (except for pH)</i>	<i>Limit of detection % of prescribed concentration or value or specification (except for pH)</i>
Aluminium	10	10	10
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

- (1) The method of analysis should determine total cyanide in all forms.
- (2) EN ISO 8476.
- (3) The performance characteristics apply to each individual pesticide and will depend on the pesticide concerned. Values for the uncertainty of measurement as low as 30% can be achieved for several pesticides, higher values up to 80% may be allowed for a number of pesticides.
- (4) The performance characteristics apply to the individual substances specified at 25% of the parametric value in Table B of Part 1 of Schedule 1.
- (5) The performance characteristics apply to the individual substances specified at 50% of the parametric value in Table B of Part 1 of Schedule 1.
- (6) The performance characteristics apply to the prescribed value of 4 NTU.
- (7) The performance characteristics apply to the specification of 1 NTU for surface waters or ground waters influenced by surface water.

Parameter	Trueness % of prescribed concentration or value or specification (except for pH)	Precision % of prescribed concentration or value or specification (except for pH)	Limit of detection % of prescribed concentration or value or specification (except for pH)
Cyanide ⁽¹⁾	10	10	10
1,2-dichloroethane	25	25	10
Fluoride	10	10	10
Hydrogen ion concentration (expressed in pH units)	0.2 pH	0.2	
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
Oxidisability ⁽²⁾			
Pesticides and related products ⁽³⁾	25	25	25

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

(2) EN ISO 8476.

(3) The performance characteristics apply to each individual pesticide and will depend on the pesticide concerned. Values for the uncertainty of measurement as low as 30% can be achieved for several pesticides, higher values up to 80% may be allowed for a number of pesticides.

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

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

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

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

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Parameter	Trueness % of prescribed concentration or value or specification (except for pH)	Precision % of prescribed concentration or value or specification (except for pH)	Limit of detection % of prescribed concentration or value or specification (except for pH)
Polycyclic aromatic hydrocarbons ⁽⁴⁾	25	25	25
Selenium	10	10	10
Sodium	10	10	10
Sulphate	10	10	10
Tetrachloroethene ⁽⁵⁾	25	25	10
Tetrachloromethane	20	20	20
Trichloroethene ⁽⁵⁾	25	25	10
Trihalomethanes:			
Total ⁽⁴⁾	25	25	10
Turbidity ⁽⁶⁾	10	10	10
Turbidity ⁽⁷⁾	25	25	25

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

(2) EN ISO 8476.

(3) The performance characteristics apply to each individual pesticide and will depend on the pesticide concerned. Values for the uncertainty of measurement as low as 30% can be achieved for several pesticides, higher values up to 80% may be allowed for a number of pesticides.

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

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

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

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

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Table 3**Method of analysis for chemical and indicator parameters: uncertainty of measurement(1)**

<i>Parameter</i>	<i>Uncertainty of measurement</i>
	<i>% of parametric value</i>
	<i>(except for pH)</i>
Aluminium	25
Ammonium	40
Antimony	40
Arsenic	30
Benzene	40
Benzo(a)pyrene ⁽²⁾	50
Boron	25
Bromate	40
Cadmium	25
Chloride	15
Chromium	30
Conductivity	20
Copper	25
Cyanide ⁽³⁾	30
1,2-dichloroethane	40
Fluoride	20
Hydrogen ion concentration pH (expressed in pH units)	0.2
Iron	30
Lead	25
Manganese	30
Mercury	30
Nickel	25
Nitrate	15
Nitrite	20
Oxiedisability ⁽⁴⁾	50

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<i>Parameter</i>	<i>Uncertainty of measurement</i>
	<i>% of parametric value</i>
	<i>(except for pH)</i>
Pesticides ⁽⁵⁾	30
Polycyclic aromatic hydrocarbons ⁽⁶⁾	50
Selenium	40
Sodium	15
Sulphate	15
Tetrachloroethene ⁽⁷⁾	30
Trichloroethene ⁽⁷⁾	40
Trihalomethanes: total ⁽⁶⁾	40
Total organic carbon (TOC) ⁽⁸⁾	30
Turbidity ⁽⁹⁾	30

- (1) The uncertainty of measurement must not be used as an additional tolerance to the parametric values set out in Schedule 1.
- (2) If the value of uncertainty of measurement cannot be met, the best available technique should be selected (up to 60%).
- (3) The method of analysis should determine total cyanide in all forms.
- (4) EN ISO 8476.
- (5) The performance characteristics apply to each individual pesticide and will depend on the pesticide concerned. Values for the uncertainty of measurement as low as 30% can be achieved for several pesticides, higher values up to 80% may be allowed for a number of pesticides.
- (6) The performance characteristics apply to the individual substances specified at 25% of the parametric value in Table B of Part 1 of Schedule 1.
- (7) The performance characteristics apply to the individual substances specified at 50% of the parametric value in Table B of Part 1 of Schedule 1.
- (8) The uncertainty of measurement must be estimated at the level of 3mg/l of TOC. CEN 1484 Guidelines for the determination of TOC and dissolved organic carbon must be used.
- (9) The uncertainty of measurement must be estimated at the level of 1,0 NTU in accordance with EN ISO 7027.

PART 3

Monitoring for indicative dose and analytical performance characteristics

6. A local authority may use reliable screening strategies to indicate the presence of radioactivity in water intended for human consumption.

7. The strategies referred to in paragraph 6 may include screening for—

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- (1)
- (1)
- (1)
- (1)

- (a) certain radionuclides or individual radionuclide; or
- (b) gross alpha activity or gross beta activity (where appropriate gross beta activity may be replaced by residual beta activity after subtraction of the K-40 activity concentration).

Screening for certain radionuclides, or screening for an individual radionuclide

8. If one of the activity concentrations exceeds 20% of the corresponding derived value or the tritium concentration exceeds its parametric value listed in Part 3 of Schedule 1 an analysis of additional radionuclides is required.

9. A local authority must, in deciding which radionuclides require to be measured for each supply, take into account all relevant information about likely sources of radioactivity.

Screening strategies for gross alpha activity and gross beta activity

10. Subject to paragraph 11 the recommended screening levels are—

- (a) 0,1Bq/l for gross alpha activity; and
- (b) 1,0Bq/l for gross beta activity.

11. If the gross alpha activity exceeds 0,1Bq/l or the gross beta activity exceeds 1,0Bq/l, analysis for specific radionuclides is required.

12. The Welsh Ministers may set alternative screening levels for gross alpha activity and gross beta activity where it can be demonstrated by the local authority that the alternative levels are in compliance with an indicative dose of 0,1 mSv.

Calculation of the indicative dose

13. The indicative dose 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(2) ; or
- (b) more recent information recognised by the Welsh Ministers, on the basis of the annual intake of water (730 l for adults).

14. Where the following formula is satisfied, it can be assumed that the indicative dose is less than the parametric value of 0,1 mSv and no further investigation is required—

Derived concentrations for radioactivity in water intended for human consumption (1)

Origin	Nuclide	Derived concentration
Natural	U-238 ³	3,0 Bq/l
	U-234 ³	2,8 Bq/l
	Ra-226	0,5 Bq/l
	Ra-228	0,2 Bq/l
	Pb-210	0,2 Bq/l

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

(2) OJNo. L 159, 29.6.1996, p. 1, prospectively repealed and replaced by Directive 2013/59 Euratom (OJ L 13, 17.1.2014, p. 1) with effect from 6 February 2018.

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Origin	Nuclide	Derived concentration
Artificial	Po-210	0,1 Bq/l
	C-14	240 Bq/l
	Sr-90	4,9 Bq/l
	Pu-239/Pu-240	0,6 Bq/l
	Am-241	0,7 Bq/l
	Co-60	40 Bq/l
	Cs-134	7,2 Bq/l
	Cs-137	11 Bq/l
	I-131	6,2 Bq/l

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

Performance characteristics and methods of analysis

15. 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/l	Note 3
Radon	10 Bq/l	Note 3
gross alpha	0,04 Bq/l	Note 4
gross beta	0,4 Bq/l	Note 4
U-238	0,02 Bq/l	
U-234	0,02 Bq/l	
Ra-226	0,04 Bq/l	
Ra-228	0,02 Bq/l	Note 5
Pb-210	0,02 Bq/l	
Po-210	0,01 Bq/l	
C-14	20 Bq/l	
Sr-90	0,4 Bq/l	
Pu-239/Pu-240	0,04 Bq/l	
Am-241	0,06 Bq/l	
Co-60	0,5 Bq/l	
Cs-134	0,5 Bq/l	
Cs-137	0,5 Bq/l	
I-131	0,5 Bq/l	

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.

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.

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

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/l respectively.

Note 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 not plausible 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.