GUIDANCE ON THE IMPLEMENTATION OF THE PUBLIC WATER SUPPLIES (SCOTLAND) REGULATIONS 2014 (as amended 2022)

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INTRODUCTION

i. Purpose of this document

This document provides guidance and information on the implementation of The Public Water Supplies (Scotland) 2014 Regulations (as amended). It does not purport to offer any authoritative interpretation of the Regulations. It is recognised that it may contain omissions and that some of the advice contained herein will need to be modified or updated in light of experience gained with implementing the Regulations or as and when further guidance on interpretation of the Drinking Water Directive is published by the European Commission.

These regulations apply to Scottish Water who supply 97% of the Scottish population with drinking water. Unless otherwise specified, reference within this section to "the Regulations" means the Public Water Supplies (Scotland) 2014 Regulations as amended. These Regulations replace The Water Supply (Water Quality (Scotland) Regulations 2001 and the parts of the Water Quality (Scotland) Regulations 2010 which relate to public supplies.

The Drinking Water Quality Regulator for Scotland (DWQR) has the general function to ensure that duties imposed on Scottish Water in relation to the quality of water supplied for human consumption are complied.

ii. The Regulatory Framework.

The following legal instruments and associated documents provide the regulatory framework for the quality of drinking water supplies in Scotland. Copies of all these documents are available on DWQR's website (www.dwqr.scot).

DIRECTIVE (EU) 2020/2184 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 December 2020 on the quality of water intended for human consumption (recast) – sets standards for drinking water quality to apply in all member states, implemented in Scotland through the drinking water quality regulations cited below.

The Water (Scotland) Act 1980 (the Act) – the primary legislation which enables Regulations to be made and contains the duties of Scottish Water, Scottish Ministers and local authorities.

The Water Industry (Scotland) Act 2002 (the 2002 Act) – the primary legislation which established Scottish Water, the Water Industry Commissioner for Scotland (WICS) and the Drinking Water Quality Regulator for Scotland (DWQR). The 2002 Act sets out DWQR's general functions and powers.

The Water Resources (Scotland) Act 2013 – this act takes forward the Scottish Government's wish that Scotland makes every effort to utilise fully it's abundant water resources. It gives Scottish Water powers to monitor and manage the quality of water in the water environment that is likely to be used for human consumption

The Public Supplies (Scotland) Regulations 2014 set out Scottish Water's duties in relation to drinking water quality, set standards and frequency for monitoring for a range of parameters derived from the Directive, and also implementing domestic requirements.

The Private and Public Water Supplies (Miscellaneous Amendments) (Scotland) 2015 implement European Union Directive 2013/51/EURATOM which lays down requirements for the protection of the health of the general public with regard to radioactive substances in water used for human consumption purposes, in particular by the inclusion of an indicator parameter for radon with a threshold value set at 100 Bq/l.

The Public Water Supplies (Scotland) Amendment Regulations 2022 implement certain requirements of the recast Drinking Water Directive 2020/2184. The principal Regulations are amended to include new chemical parameters and updated indicator parameters and the applicable methods of analysis. The inclusion of these parameters ensures that the requirements in the principal Regulations keep pace with the latest advice on health-based standards for drinking water. The recast Directive also introduces new specifications on when a water supplier may deviate, following a risk assessment, from minimum sampling frequencies of drinking water and the requirement that water suppliers maintain an operational monitoring programme. These requirements are introduced to ensure that levels of monitoring are proportionate to the risks identified through the risk assessment process.

PART 2 – WATER SUPPLY ZONES

Regulation 3 – Water supply zones

Regulation 3 sets out how Scottish Water should designate and name its water supply zones for the year. These should not be greater than 100,000 population and Scottish Water may not vary these designations once the year has commenced. This regulation also introduces a new requirement to ensure that a water supply zone does not include any areas with significant variations in water quality. This requirement will be met if a zone is served only by a single source. A source could be the outlet of a water treatment works, a pumping station, a blending point or a service reservoir.

Many water supply zones in Scotland will be supplied by a single, discrete source, but in some areas, it is recognised that supply arrangements are more complex. If a supply zone is supplied with a blend from a number of treatment works, then it is not anticipated that the blend will vary considerably to the extent of significantly changing, for example, the hardness of the water.

DWQR recognises that Scottish Water may have to take temporary operational action to maintain water supplies that could involve the introduction of water from sources not designated for that supply zone. Such temporary measures should not influence the annual designation of water supply zones. If permanent changes have to be made to the sources that supply a zones, or to the delineation of that zone, the designation can only be changed for the next calendar year.

PART 3 – WHOLESOMENESS OF PUBLIC WATER SUPPLIES

Regulation 4 – Wholesomeness

Regulations 4(1) and 4(2) provide the definition of wholesomeness. Part VIA of the Water Scotland Act 1980 places a duty on Scottish Water to supply wholesome water. Whenever Scottish Water provides a water to consumers for the purposes of drinking, cooking, food preparation or other domestic purposes (including the maintenance of personal hygiene), or to premises for food production purposes then this water must meet the wholesomeness requirements regardless of whether this is via a piped supply system, tanker, bottle or other container.

Water is considered to be wholesome if it does not contravene the prescribed maximum values in respect of various properties, elements, organisms and substances, or in some cases minimum concentrations or values (PCV). The majority of PCVs are specified in Tables A and B of the regulations, though Regulation 4 also specifies some.

Regulation 4(2) covers the situation for micro-organisms, substances or parasites for which no standard has been set, but if present in water would constitute a potential danger to human health. Scottish Water should familiarise themselves with specific guidance issued by DWQR on particular substances which is available on the DWQR website, and also take into consideration expert opinion from Health Protection Scotland and information such as that published in the World Health Organisation (WHO) Guidelines for Drinking Water Quality.

Point of compliance

Tables A and B in Schedule 1 define the point of compliance for specified parameters. In the majority of cases this is the consumer's tap. The consumer's tap is not defined in the Regulations. Scottish Water should assume that the consumer's tap to be used for monitoring to determine compliance with the standards are those taps that are normally used for drinking, cooking, food preparation or other domestic purposes, irrespective of whether any upstream devices such as softeners or filters are present. In a domestic property this tap is normally the kitchen cold water tap. In non-domestic properties (including public buildings) the sampler should seek to determine from the occupier or owner which tap is normally used for drinking and food preparation (or supply to the public) and should sample from that tap.

It is known that the presence of upstream "point of use" device or the nature of the tap can influence the quality of water, and the sampler should record these details to assist in any subsequent investigation of adverse results. If prior to the collection of a sample, the sampler becomes aware that an upstream device is present, or there are unusual fittings on the tap which cannot be removed to facilitate tap cleansing, they can select another nearby property to be sampled. In these circumstances, samples must still be taken from the original property

and arrangements made for appropriate advice to be given to the owner/occupier, including as necessary a water bye-laws inspection.

It is a long-established practice to “disinfect” the sample tap before sampling for microbiological parameters. DWQR expects Scottish Water to utilise the industry best practice in this regard as set out the Microbiology of Drinking Water.

PART 4 – MONITORING OF PUBLIC WATER SUPPLIES

Regulation 5 – Monitoring

Regulation 5 sets out that Scottish Water must carry out regular monitoring of the water supply to ensure that the water meets the water quality standards and that this is representative of quality of the water consumed throughout the year.

Where Scottish Water has reason to suspect that the water contains a substance that is not listed in Table A, Table B or Table C and poses a potential danger to human health, monitoring should be carried out to establish whether a substance does pose a danger at the point of compliance.

Regulation 5(3) states that Scottish Water must ensure that, where disinfection forms part of the preparation and distribution of water, the efficiency of this disinfection should be verified, and disinfection by-products be kept as low as possible. Further guidance on disinfection and disinfection by-products can be found in the guidance for Regulation 29 – Treatment of Raw Water

Regulation 6 – Monitoring Programmes

Regulation 6 states that Scottish Water must implement a monitoring programme for each water supply zone and must meet the requirements of Schedule 1A. Furthermore, each monitoring programme and sampling points for these must meet the relevant requirements in Regulation 5, Regulations 11 to 14 and Regulation 16

Scottish Water may programme and analyse more than the minimum number specified for any parameter to ensure that the minimum sampling and analysis requirement is met. However, for regulatory reporting purposes, must only flag in the data return as scheduled Regulatory samples the minimum number for compliance reporting purposes

It is recognised that Scottish Water will wish to carry out some additional sampling to provide additional information on the quality of water supplies. Scottish Water may prefer to manage such monitoring within a separate operational sampling programme with individual samples identified by a separate sample purpose code.

Scottish Water may carry out sampling for both compliance and operational purposes on the same sampling occasion provided that the samples taken are identified by separate unique sample numbers or other auditable process (with the appropriate sample reason).

The amending regulations allow parameters to be removed from sampling programmes flowing risk assessment, as well as maintaining the provision for allowing a reduction in standard sampling frequencies.

DWQR does not consider the monitoring of *Clostridium perfringens* at consumer's taps to be consistent with the primary role of these organisms as an indicator of remote or historic faecal contamination which has its greatest use as an indicator of the adequacy of the operation of water treatment. Accordingly Scottish Water are advised not to routinely include this parameter in water supply zone compliance monitoring.

Regardless of the sampling location, it is **imperative** that Scottish Water's response to an unsatisfactory result includes a comprehensive investigation into the efficacy and performance of the treatment process of the supplying works.

It should be noted that testing in zones for *Clostridium perfringens* has merits as an investigational tool and should continue to be used when following up failures for *E.coli* or enterococci at service reservoirs and consumer's taps.

Regulation 11 – Sampling at Treatment Works

Regulation 11 sets out the requirements for sampling from water treatment works and the criteria for reducing the number of samples to be taken.

The sampling point for a water treatment works should be located so as to provide a representative sample of the water flowing into distribution. The sample point should be downstream of all treatment processes including blending and any storage in final water storage reservoirs at the treatment works.

Where the treatment stream within a works divides in such a way that a single final water compliance point will not be representative of all water leaving the works (i.e. there are different treatment streams which leave the works through different outlet mains), then one or more sampling points will be required.

All treatment works sample points should be fitted with metal sampling taps of a hygienic design which do not have attachments or inserts. Water should be supplied to the tap through a sampling line of suitable material. The sampling line should be as short as possible and should ideally be a dedicated line without any take offs. Sample taps and sample line materials should be approved by WRAS.

Regulation 11(1) requires Scottish water to ensure that samples for *E. coli*, coliform bacteria, colony counts, residual disinfectant, turbidity and nitrite are taken at the required frequency from the point at which water leaves each treatment works. The frequencies are set out in Table 4 of Schedule 2. All six parameters should be monitored at the flow related frequencies set out against them. Nitrite should be monitored at the frequency specified for item 5 in the table where chloramination is practiced, or at the frequency specified for item 7 in the table where this is not the case.

Example A

A water treatment works, which practises chloramination, has an annual average output of 25,000 m3/d and supplies three water supply zones with populations of WSZ1 25,000, WSZ2 35,000, and WSZ3 65,000.
Monitoring required at WTW
Nitrite (against standard of 0.1mg/l) – 104 samples per annum (standard frequency)
Check monitoring required in water supply zones
Nitrite (against standard of 0.5mg/l) and nitrate (against standard of 50 mg/l)
WSZ1 – 24 samples per annum (at standard frequency)
WSZ2 – 36 samples per annum (at standard frequency)
WSZ3 – 52 samples per annum (at standard frequency)

Example B

A water treatment works, which does not practise chloramination, has an annual average output of 10,000 m3/d and supplies two water supply zones with populations of WSZ1 4,000 and WSZ2 56,000.

Audit monitoring required at WTW
Nitrite (against standard of 0.1mg/l) – 8 samples per annum
Audit monitoring required in water supply zones
Nitrite (against standard of 0.5mg/l) and nitrate (against standard of 50 mg/l)
WSZ1 – 4 samples per annum
WSZ2 – 8 samples per annum

Regulation 11(2) provides for a reduced frequency of sampling for coliform bacteria, e. coli, nitrite, colony count and turbidity. The regulations set out the criteria which must be used to determine if a reduced sampling frequency is appropriate.

Regulation 11(3) provides for a reduced number of samples for the coliform bacteria parameter and the *E. coli* parameter only when Scottish water is of the opinion:

(a) that there is no foreseeable risk that the supply will exceed the maximum concentration for the parameter; or
(b) that the treatment works is at all times designed, maintained and operated in a way that fully complies with regulation 29 and, in the event of a failure of the treatment processes, water that has not been adequately treated and disinfected cannot enter the supply.

In respect of 11(3) (a) above, Scottish water would be expected to take into account all relevant factors identified through its regulatory risk assessment which will include the following factors:

(i) risk factors and activities in the catchment from which the water source is drawn;
(ii) the concentrations of the parameter in the raw water;

(iii) the nature and capability of the treatment processes at the works; and
(iv) the concentration of the parameter in the water leaving the treatment works over the previous two years.

In respect of 11(3) (b), this requirement would be met when:

(i) a treatment works automatically shuts down almost immediately after a disinfection failure is detected through appropriate alarms; or
(ii) procedures are in place for a treatment works to be manually shut down almost immediately after an appropriate alarm warning of a failure of adequate treatment and disinfection.

It is unlikely that a reduced frequency could be applied to only one of the coliform bacteria or *E. coli* parameters.

Regulations 11(2) and 11(3) deal with the adoption of reduced frequency monitoring. Where there is a failure to meet the PCV or an exceedance of an indicator parameter value occurs at a treatment works where reduced frequency monitoring has been adopted, sampling should be increased to the standard frequency on a pro rata basis for the remainder of that year and the two following calendar years.

Sampling frequencies are normally based on the volume of water supplied in m^3/day. Sampling frequencies should be based on the average daily output from the works during the previous calendar year except where it is known that the current year's average daily output will be significantly different from the previous year's average daily output. Where there is more than one outlet at a works requiring separate sampling points (as explained in earlier sections), the sampling frequency should be determined separately for each sampling point based on the average daily output at each point.

Normally Scottish Water would be expected to establish prior to the start of the calendar year, their annual sampling frequency for each works based on the previous year's average daily output from the works or the anticipated average daily output for the current year. If Scottish Water has treatment works whose output may vary considerably at different times of the year for extended periods, they should consider adjusting the frequencies in accordance with the average daily output for those periods.

Regulation 11(4) requires samples to be taken at regular intervals. For water treatment works sampling frequencies may range from 2 to 2,190 per annum. A sample frequency of 365 per annum requires a sample to be taken on each calendar day of the year (and should include February 29 in each leap year). For sample frequencies in excess of 365 per annum, samples should be taken over as large a daily span as is possible. They do not have to be spread at exactly equal intervals but should be broadly spread to be representative of any potential changes in water quality during the day. There must be a mechanism to pre-determine the time of sampling

For works on daily sampling, if Scottish Water fails to take or analyse a sample through no fault of its own e.g. a dropped sample bottle, it will be expected to reschedule a further

sample for the same day if possible or the following day. On the following day the resample should be taken at a significant time interval before or after the sample programmed for that day. Since the Regulations require the frequencies to be met on an annual basis rescheduling does not constitute a shortfall. Provided the resampling is as described above an occasional occurrence will not be regarded as a failure to meet the regularity requirement.

For sampling purposes, a treatment works is considered to be in service on every day (midnight to midnight) that any treated water is supplied from the works.

Regulation 12 – Sampling at Service Reservoirs

Regulation 12 requires Scottish Water to take a sample from every reservoir every week it is in use. These samples must be analysed for coliform bacteria, *E. coli*, colony counts and residual disinfectant.

The Regulations define a service reservoir as any structure in which a reserve of treated water is contained and stored for the purposes of meeting a variable demand for the supply of water. The definition specifically excludes any structure at a water treatment works such as final water storage reservoirs. Temporary structures such as static tanks or tankers that are connected to the distribution system and are being used as service reservoirs are included in this definition and as such should be sampled every week they are in use.

Break pressure tanks should not be designated as service reservoirs unless they are designed to provide strategic storage. DWQR expects Scottish Water to include the sampling of such tanks in its operation monitoring programme.

Sampling points at service reservoirs should be located so as to provide a representative sample of the water flowing into distribution. Where a service reservoir has more than one compartment with its own water inlet and outlet and the compartments are not connected hydraulically to any other compartment, then each compartment should be regarded as a single reservoir and have its own designated sampling point. Where a service reservoir has a single main that serves as a common inlet and outlet, Scottish Water must have in place arrangements to ensure that samples are only taken which the main is acting as an outlet. Where this is not practical, alternative representative sampling arrangements can be made.

All sampling points should be fitted with metal sampling taps of a hygienic design which do not have attachments or inserts. Water should be supplied to the tap through a sampling line of suitable material. The sampling line should be as short as possible and should ideally be a dedicated line without any take offs. Sample taps and sample line materials should be approved by WRAS.

Ideally the day within each week that the sample is taken should be randomised. However, it is recognised that it may not be practicable to fully randomise the day of sampling and in such cases the sampling programme should be managed to ensure some variation in the day of the week in which the sample is taken.

If Scottish Water fails to take or analyse a sample through no fault of its own e.g. a broken sample bottle, it will be expected to reschedule a further sample for the same week. In exceptional circumstances, if a sample cannot be programmed the same week DWQR may take a pragmatic view of the shortfall, provided the resample is scheduled for the following week on a day separate from and not consecutive to the day of the sample programmed for that week.

Regulation 13 – Sampling: water supplied by tanker

Regulation 13 requires Scottish Water to take samples from "Tankers" in specified circumstances. Within Scotland water is not normally distributed by tanker except in exceptional circumstances where the security of the normal supply through the distribution system is compromised by drought, high demand or operational incident. The regulations do not specify monitoring requirements for water supplied by means of bottles.

For regulatory purposes, a "Tanker" and a "Mobile Tanker" are determined by where the point of compliance for sampling purposes is. The point of compliance for a "Tanker" will be from the tap on the tank or bowser itself.

"Tanker" means a container of water (including static tanks, bowsers or HGV tankers), which is not connected into the public water supply system. For example, it may be necessary for Scottish Water to deploy a bowser in a street if consumers are likely to be without water for a prolonged period of time. In this situation, the bowser is left in the street for consumers to obtain water from and, as a result, the point of compliance for sampling is from the tap on the bowser, rather than from consumer's taps.

Regulation 13 sets out the requirements of sampling water which is supplied by a "Tanker". Tankers should only be filled with wholesome water from a known source and Scottish Water should ensure they have in place appropriate arrangements for the cleaning, disinfection and storage of tankers. The regulations require that samples are taken from each tanker once it has been filled with water, within 24 hours of the deployment of the tanker, and every 24 hours until the tanker is stopped. As the tanker is a standalone structure and not connected into the public supply network, the point of compliance for sampling under Regulation 13 is from the tap on the tanker itself.

The regulations require the first sample taken for each deployment of a tanker to analyse for *E. coli*, hydrogen ion and conductivity. The second and any subsequent samples taken through the duration of deployment must be analysed for compliance with all parameters in Tables A, B and C of Schedule 1.

Regulation 13A – Sampling: water supplied by mobile tanker

Regulation 13A sets out the requirements of sampling water which is supplied by a "Mobile Tanker". Regulation 13A(5) defines a mobile tanker as a container of water, which is used to

distribute water for human consumption purposes that has been treated and transported from one part of the public water supply system to another. The point of compliance for a "Mobile Tanker" is from downstream in the public supply network (Treatment Works, Service Reservoir or Consumer Tap).

It may be necessary for Scottish Water to directly inject water from a container into a service reservoir to augment the supply of water within the public system. In this situation, water is injected directly into the public system, providing consumers with running water from their taps. As a result, the point of compliance for sampling is from the treatment works, service reservoir or consumer's taps downstream of the tanker discharge.

Where there is a static tank or tanker that is connected to the distribution system and is being used via a semi-permanent connection to create additional storage as a service reservoir, this requires a full written risk assessment along with an inspection and sample programme under regulation 6.

"Mobile Tankers" should only be filled with wholesome water from a known source and Scottish Water should ensure they have in place appropriate arrangements for the cleaning, disinfection and storage of tankers. Regulation 13A(2) requires that samples for residual disinfectant must be taken when each tanker is filled and immediately before the tanker is distributed. Should a significant reduction in chlorine residual occur in the water in the tanker during transit, the water shall not be discharged into the receiving water supply system. It is for Scottish Water to determine what constitutes significant, however this shall be documented in procedures and guidance provided to staff.

Regulation 13A(3) set out that a sample must be taken and analysed for *E. coli* and Coliform bacteria when the water is put into a tanker. It is common practice that during mobile tankering operations, a mobile tanker will fill up multiple times from the same location. Where this is the case, Regulation 13A(4) sets out that where a sample has already been taken under Regulation 13A(3), a second and subsequent sample is not required within a period of 24 hours. If water continues to be put into mobile tankers from the same location for more than 24 hours, subsequent samples are required for each 24-hour period.

It has become apparent that the practice of mobile tankering has become more prevalent and *Information Letter 2021/1: The Augmentation of Drinking Water supplies by Tanker* sets out further guidance on DWQR's expectations in relation to mobile tankering including staff training, equipment use, and care to be taken throughout every stage of the process to avoid contamination or disturbance of sediment within the donor and receiving areas of the public supply system.

Regulation 14 – Sampling: New Sources

Regulation 14 sets out the regime for sampling from new sources. This regulation applies to any source of water that has not been used at any time since the date on which the regulations came into force. This regulation also applies to any source of water that has been

used previously but not used during the 6 months prior to the date on which Scottish Water proposes to use it.

Regulation 14 outlines the sampling requirement for:

i. sources that have not been used at any time in the six months preceding 1 Jan 2015; and
ii. sources that have previously been used, but not used for a period of six months.

Those in category (i) must be sampled before they are put into supply and those in category (ii) may be sampled as soon as practicable after the source is put into supply.

Regulation 14(1)(a) relates to completely new sources which have never been used for the supply of drinking water previously. It does not apply to an existing source which has been out of use for 6 months prior to 1 January 2015, such a source would fall into the requirements relating to regulation 14(1)(b). The intent of this regulation is to ensure that a new source has a risk assessment completed and is sampled prior to use. An existing source that has not previously been used in the past six months can be brought into service provided that it is sampled as soon as reasonably practicable.

However Scottish Water should consider how regulations 17 (Scottish Water to investigate failures), 30 (risk assessments of WTWs and supplies) and 31 (procedure following risk assessment) might change their approach to sampling of sources as set out in regulation 14 (sampling of new source).

The sampling for a source in regulation 14(1)(a) must include all the parameters in Schedules 1 and 2 of the regulations and any other element, substance or organisms likely to make the supply unwholesome. The sampling for sources in regulation 14(1)(b) must include the parameters in Table A of Schedule 1, conductivity, hydrogen ion, turbidity, and any other parameter that Scottish water considers is likely to have changed since the supply was last used.

There is no regulation 14 requirement to sample sources which have been out of supply for less than six months when they are first used again. However Scottish Water would be prudent to conduct some monitoring for key parameters prior to introducing such sources, dependent on the time since the source was last in use. All such sources must be included within the regulatory risk assessment for the treatment works and associated supply system. The risk assessment should inform the selection of monitoring parameters. Scottish Water should make sure that the parameters in their regulation 16 (raw water) monitoring programme are appropriate for when intermittent sources are in use, as well as at other times.

Sources that have not been used for over six months but have been used since 1 January 2015 must be subject to limited monitoring after return to supply. The scope of the monitoring required should be informed by the regulatory risk assessment for the treatment works and the associated supply system. Depending on the circumstances, the risk assessment may require revision, although Scottish Water should have ensured that each risk assessment, when first prepared, recognises the hazards potentially involved with the bringing back online

of all existing standby or emergency sources. Scottish Water should make sure that the parameters in their regulation 16 (raw water) monitoring programme are appropriate for when standby sources are in use, as well as at other times.

Regulation 14 requires new sources to be subjected to full monitoring prior to introduction into supply. Additionally, regulation 14 specifies that such a source cannot be used until a regulation 30 risk assessment has been carried out and one month has elapsed from receipt by DWQR of a regulation 30 risk assessment report. However, there is an exception allowed within the regulations for circumstances whereby the source is required as a matter of urgency in order to prevent an unexpected interruption in piped supply to consumers although a risk assessment under regulation 30 would still be required before the supply is made. As a matter of good practice it is expected that development of new sources would be informed by relevant historic data under the current and previous regulations, as well as contemporaneous data. Scottish Water will need to review and, if needs be, adjust their regulation 16 (raw water) monitoring programme when they introduce a new source.

Regulation 14A – Methods of Analysis

Regulation 14A refers to methods of analysing samples of the water. Further guidance on methods for individual parameters can be found in schedule 3 of the regulations.
Guidance for applying uncertainty of measurement is given in schedule 3 of this document.

Regulation 15 – Collection and Analysis of samples

Regulation 15 specifies the minimum quality requirements for the taking, handling, storage and analysis of samples taken for the regulatory monitoring of water supplies. These requirements are set out in regulation 15(2). Regulation 15(4) sets out the requirement for the retention of records to demonstrate that the sampling, transport, storage and analysis of each sample complied with the requirements. Other paragraphs cover definitions and the procedure for authorising the use of alternative methods for microbiological analysis.

Regulations 15(2)(a) and 15(2)(b) require that the sample is representative of the quality of the water being sampled at the time of sampling and that the sample is not subject to contamination when being taken. Regulation 15(2)(c) specifies that samples must be kept in conditions that will ensure that the sample does not deteriorate in any significant way between sampling and the commencement of analysis.

Scottish Water, or their sampling contractor, should produce a comprehensive sampling manual setting out the procedures and precautions to be adopted for each parameter or group of parameters. Guidance on all aspects of sampling can be found in the BS EN ISO 5667 series of Standards.

As a minimum, the sampling manual should include relevant information on the types of sample bottle, the preparation of sample bottles, the sampling procedures and the transportation of samples. Details of recommended sampling procedures are given in the Microbiology of Drinking Water and BS EN ISO 19458.

The nature of parameters varies widely, and a range of sample containers, cleaning regimes, and methods of sample preservation and storage will be required. For example, mercury is highly volatile even at low temperatures, and requires the addition of preservative at the time of sampling. Polycyclic aromatic hydrocarbons react with chlorine and are light-sensitive and require the immediate destruction of chlorine and storage in the dark. Other parameters are volatile or subject to biological degradation and require immediate refrigeration.

As a minimum the sampling manual should specify:

i. the types of bottles or containers, their means of and type of closures and the purposes for which they are to be used;

ii. where relevant, the cleaning procedure and shelf life for bottles, containers and closures used for each parameter, including the amount and type of preservative to be added;

iii. the sampling procedure for each parameter, including the type of sample to be collected (e.g. first draw, flushed, stagnation) and the procedure for collecting samples for different parameters;

iv. the order of sampling; and

v. the conditions of storage and transport of samples and the maximum time that can elapse before analysis should commence, for each parameter.

Further general information on sampling procedures is given in booklets published by the Standing Committee of Analysts. Detailed information for individual parameters or groups of parameters is also given in the individual booklets published by the Standing Committee of Analysts.

In order to carry out sampling correctly it is essential that all samplers are fully trained and have been authorised as competent before they are allowed to work unsupervised. Scottish Water or its sampling contractor should produce a comprehensive sampler training programme to cover all aspects of sampling.

Once trained, all samplers' performance should be monitored and subject to regular audit. Monitoring and audit procedures and criteria for satisfactory performance and policy on retraining should be documented. A training record should be produced for each sampler detailing the training given, with dates and assessment of competence, results of any audits, any retraining or further training given and any re-assessment of competence.

Regulation 15(2)(d) requires that all samples are analysed as soon as possible after they have been taken, by and under the supervision of a competent person using suitable equipment. Detailed advice on this part of the regulations is given in Information Letter 2007/5 (though this letter refers to the previous 2001 Regulations, the advice provided remains current and relevant to these Regulations)
http://dwqr.scot/media/11371/information-letter-2007-5-guidance-on-interpretation-of-reg-16-2-d-i-of-the-water-supply-water-quality-scotland-regs-2001.pdf

PART 5 – DRINKING WATER PROTECTED AREAS

Regulation 16 – Drinking water abstraction points and monitoring sites.

Regulation 16 concerns the collection and analysis of samples of raw water used by Scottish Water for regulation 4(1) purposes. The purpose of this sampling is primarily to provide information to inform regulatory risk assessments.

Scottish Water is required to identify every abstraction point from which water is drawn for regulation 4(1) purposes. As part of each regulatory risk assessment DWQR expects Scottish Water to document every licensed abstraction point irrespective of whether a source is used continuously, intermittently or as standby and emergency sources. However, for the purpose of collecting samples of raw water, Scottish Water may use a sample point located at the treatment works end of any pipe or set of pipes conveying water from the abstraction point(s) (usually such a sample point is known as the combined inlet to the works). If a single combined inlet sample point is not located so as to be representative of all the water that may enter the treatment works, then Scottish Water will need to use more than one sample point. These may be located either at the individual abstraction point(s) or at the treatment works end of each pipe conveying water from an abstraction point to the treatment works.

Every sample point must have a unique reference number and its relationship to licensed abstraction points and the aquifer or the body of surface water must be recorded. When selecting sample points, Scottish Water must ensure that they are located upstream of any treatment intended to modify water quality in respect of any parameter, substance, micro-organism or parasite. Treatment in this context includes blending where this is undertaken deliberately to modify the quality of water e.g. blending of high nitrate water with water from a low nitrate source, it also includes dosing to adjust the concentration of fluoride or alter the pH.

Regulations 16(3) and 16(4) give Scottish Ministers the power to specify the number of raw water samples to be taken and the nature of the analysis to be carried out and to change these requirements. DWQR will form a view as to the need for such notices following assessment of Scottish Water's regulation 30 risk assessment reports and the raw water monitoring data submitted by Scottish Water and inform Scottish Ministers accordingly.

Regulation 16(5) sets minimum sampling frequencies for surface water which derive from the Water Framework Directive but in practice it is expected that Scottish Water will exceed these frequencies when considering what sampling frequency is necessary to inform their decisions regarding the level of treatment necessary to demonstrate compliance with regulation 29 and to support regulatory risk assessments.

The regulations do not specify a minimum sampling frequency for raw waters from groundwater sources. However Scottish Water are expected to take into consideration

historical water quality trends, monitoring data available from other bodies (such as SEPA) and established practice for determination of sampling programmes to indicate changes or trends in raw water quality.

Scottish Water should submit raw water monitoring data to DWQR on an annual basis. DWQR will share Scottish Water's raw water data with SEPA in line with the principles of better regulation for the purposes of contributing to the UK monitoring under Article 7 of the Water Framework Directive. Scottish Water should ensure that they have in place local arrangements for the sharing of other data or information required for the assessment of risks as part of their regulatory risk assessments (see later sections).

PART 6 – INVESTIGATION AND REMEDIAL ACTION

This Part of the Regulations sets out the duties of Scottish Water with regard to investigation, reporting and remedial action. It also sets out powers that Scottish Ministers and the Drinking Water Quality Regulator for Scotland have in this regard.

In the event of a drinking water quality failure, or other evidence to indicate a likely failure, Scottish Water must investigate that failure. They must establish whether the failure constitutes a potential danger to health and the reasons for the failure. Scottish Water must also assess whether the failure was due to the domestic distribution system either in private premises or in a building where water is made available to the public. The regulations set out the duties that Scottish Water has; to notify consumers; to protect health; to restore water quality and inform relevant bodies of the investigation and remedial actions taken.

The Regulations provide a definition of premises which is not restricted to buildings, but which includes land, tents, vans, sheds and similar structures.

Regulation 17 – Scottish Water to Investigate immediately any failure or likely failure

Regulation 17(1) requires Scottish Water where they have reason to believe that the water supplied failed, is failing, or is likely to fail, to meet the standards of wholesomeness specified in regulation 4 and Table C Schedule 1, to immediately investigate the cause of that failure or likely failure and take the necessary action.

The definition of a failure is clear. It is when the analysis of a sample taken as required by the Regulations exceeds a concentration or value specified for the parameters in Schedule 1 of the Regulations. However, the terms of “likely to fail” or “likely failure” are not defined in the Regulations.

Scottish Water may have reason to believe that the water supplied is likely to fail in the following circumstances:

i. there is evidence from the analysis of samples taken as required by the Regulations that the trend in the concentration or value of a particular parameter is generally and steadily increasing (or decreasing) towards the prescribed concentration or value and if that trend continues the water is likely to fail to meet the prescribed concentration or value in the future;
ii. there is evidence from the analysis of non-regulatory samples such as operational control samples or samples taken in response to events or consumer complaints that the prescribed concentration or value has been breached;

iii. there is evidence from the analysis of non-regulatory samples such as operational control samples or samples taken in response to events or consumer complaints that the concentration or value is generally and steadily increasing (or decreasing) towards the prescribed concentration or value, and if that trend continues the water will fail to meet the prescribed concentration or value in the future.
iv. there is evidence from consumer complaints that there is a risk that the water in supply may be unwholesome
v. there is a risk that the water may be unwholesome as a consequence of a failure of a water treatment process, interruption to supply, or ingress into the distribution network

Regulation 17(2) sets out what Scottish Water must establish:

i. The parameter or other element, organism or substance to which the failure relates
ii. The cause and extent of the failure
iii. Establish whether the water in the premises is supplied to the public
iv. Whether the failure is due to the domestic distribution system in premises, or to the maintenance of that system
v. Whether the failure constitutes a potential danger to human health

Regulation 17(3) allows for Scottish Water to recover costs reasonably incurred during the investigation of a failure or likely failure of a domestic distribution system in premises where water is supplied to the public. Scottish Water can't recover costs in relation to byelaws inspections, however, this provision has been included to allow Scottish Water to recover any costs over and above these costs. These costs are recoverable from the person responsible for the domestic distribution system.

Reasonable costs are not defined in Regulations, this is something for Scottish Water to determine and provide auditable data to substantiate any costs incurred.

Regulation 18 – Scottish Water to notify immediately any potential danger to human health

If Scottish Water establishes under Regulation 17 that a failure poses a potential danger to human health, then Regulation 18 stipulates that they must by a notice immediately notify:

- The Drinking Water Quality Regulator for Scotland
- Scottish Ministers
- Each local authority for the area in which the potential danger occurs
- The consumers supplied by the water in question and who are likely to be affected by the failure

Regulation 18(2) states that the notice from Scottish Water should inform the consumer in simple layman's terms:

- The cause and extent of the failure
- That the failure constitutes a potential danger to human health
- Of any remedial action taken, or to be taken, by Scottish Water
- inform the consumer of the steps he/she should take. These steps will depend on the nature of the parameter and the cause and extent of the failure. Examples of the steps that Scottish Water may consider are:

i. failures of microbiological parameters – advise boiling water for drinking and food preparation pending investigation of the problem – a plumbing inspection may assist in the investigation - where the failure is associated with an individual fitting advise repair or replacement of the pipework or fitting causing the problem.

ii. failures of the lead parameter (or other plumbing metals) – advise drawing off the water standing in the pipework and using for purposes other than drinking or food preparation – advise consideration of replacing the pipework in the premises contributing to the failure.

iii. failures of other parameters are likely to be caused by ingress to the pipework in the consumer's premises (by permeation, leaking pipes or back siphonage) – advise where necessary and appropriate, boiling water for drinking and food preparation or not to use water for drinking and food preparation – advise a plumbing inspection - where the failure is associated with an individual fitting advise repair or replacement of the pipework or fitting causing the problem.

Regulation 19 – Scottish Water to report on its investigation etc

Regulation 19 requires Scottish Water as soon as possible to report the findings of its investigation referred to in Regulation 17(1) to:

- The Drinking Water Quality Regulator for Scotland
- Scottish Ministers
- If the failure is in a building where water is supplied to the public, each local authority for the area in which the premises is located

The Report must specify:

- Whether the failure or likely failure is in relation to wholesomeness standards (Regulation 4) or a parameter in Table C of Schedule 1
- The parameter or other element, organism or substance to which the failure relates
- The cause and extent of the failure
- Whether the failure is due to a domestic distribution system in premises where water is supplied to the public, or to the maintenance of that system
- Whether the failure constitutes a potential danger to human health
- Whether the failure has ceased, if so, is it likely to recur
- Any action Scottish Water considers must be taken to restore the quality of water and meets the wholesomeness standard, protect human health until the quality of water has been restored, minimise risk and any action taken or to be taken by Scottish Water.

The nature of a public building means that the members of the public consuming water on the premises will vary. Scottish Water are expected to take a pragmatic view as how best to ensure the effective communication of this information to consumers who may use the public building. For example, the head-teacher (in the case of a school) or the building manager (of a hospital or other public building) may be best placed to ensure that appropriate advice is communicated to potential consumers. Scottish Water should work with the building owners/occupiers or facilities management representatives to ensure that appropriate steps are taken to make consumers aware of the remedial action taken – for example publication of the notice on a public information board, or in the proximity of the main drinking water facilities.

In the event that Scottish Water have communicated the findings of their investigation of water quality failures in a public building to those persons described above, the Drinking Water Quality Regulator for Scotland or Scottish Ministers, may, by notice, inform Scottish Water of additional persons or bodies that must be informed by notice of the failure. This notice must contain:

- The cause and extent of the failure
- That the failure constitutes a potential danger to human health
- Any remedial action taken, or to be taken, by Scottish Water
- inform the consumer of the steps he/she should take. These steps will depend on the nature of the parameter and the cause and extent of the failure.

Regulation 20 – Scottish Water to restore water quality

Regulation 20 places a clear duty on Scottish Water to take the necessary remedial action to restore water quality, as soon as possible, once it has determined that a failure is on-going. If the failure is a breach of the standard for copper or lead, Scottish Water must take action to modify or replace such of its pipes and associated fittings as it knows or has reason to believe are contributing lead or copper in the water supplied.

Unless classified as trivial, Scottish Water must inform those of its consumers to whom it supplies the water in question, and who are likely to be affected by the failure, of any remedial action taken by it.

The determination of triviality is a matter for the DWQR. In making this determination DWQR will consider the likelihood of re-occurrence, the severity of the breach and the potential risks to health.

The DWQR and the Scottish Ministers must, in the exercise of their enforcement functions, give priority to enforcement action having regard, among other things, to:

- the extent to which the prescribed concentration or value for a parameter (in Table A, Table B and Table C) has been exceeded; and
- the potential danger to human health.

Where the investigation establishes that the failure in question is due to a domestic distribution system in premises where water is supplied to the public (or to the maintenance of that system), Scottish Water do not have to take remedial action to restore water quality, however, the local authority must, under section 76FB of the 1980 Act(**1**), require the person who owns or is otherwise responsible for that system to take any such remedial action as is required by that paragraph.

Where remedial action is required due to Byelaws non-compliance, Scottish Water has the responsibility of ensuring the necessary remedial action is taken.

Where the investigation establishes that the failure in question is due to a private domestic distribution system (or to the maintenance of that system) and there is a risk that the water in question is failing or will fail to satisfy a requirement of regulation 4(2) or meet the prescribed concentration or value for a parameter in Table C, Scottish Water must ensure that:

- appropriate measures are taken to reduce or eliminate that risk (such as advising the owner and any occupiers of the premises served by the private domestic distribution system in question of any possible remedial action that they could take); and/or
- other measures (such as appropriate treatment techniques) are taken to change the nature or properties of the water before it is supplied so as to reduce or eliminate that risk.

Regulation 21 – Scottish Water to protect human health

Regulation 21 places specific duties on Scottish Water as regards the protection of health in certain circumstances. Where an investigation under Regulation 17 establishes that the failure in question is on-going and constitutes a potential danger to human health, Scottish Water must:

- take such action as is necessary to protect human health from that danger (such as isolating anything that appears to be affecting, or may affect, the quality of the water).
- decide what action should be taken to comply
- bear in mind the risks to human health which would be caused by an interruption of the supply or a restriction in the use of water intended for human consumption.

Where the investigation establishes that the failure in question is due to a domestic distribution system in premises where water is supplied to the public (or to the maintenance of that system), a local authority must, under section 76FB of the 1980 Act, require the person who owns or is otherwise responsible for that system to take any such action as is required by that paragraph.

Regulation 22 – Powers to require further action by Scottish Water

Regulation 22 creates an additional power to serve notice for the Drinking water quality Regulator for Scotland. If an investigation carried out under Regulation 17 establishes that the failure in question is due to a failure to satisfy the prescribed concentration or value for a parameter in Table B; and the Drinking Water Quality Regulator for Scotland considers that the failure in respect of that parameter is not trivial and is likely to recur, the Regulator may, by notice given to Scottish Water, require it to seek a departure in accordance with regulation 24(1).

Additionally, where the Drinking Water Quality Regulator for Scotland considers that a failure is not trivial, it may by notice given to Scottish Water require Scottish Water to take such action as the Regulator may specify in the notice to:

- restore, as soon as possible, the quality of the water in question so that it satisfies the requirements of regulation 4(2);
- to protect human health until the quality of the water is restored; and
- to minimise the risk of the water failing to satisfy any such requirement.

This Regulation does not replace the powers of enforcement conferred onto the Regulator by Part 2 of the Water Industry (Scotland) Act 2002.

Scottish Water must comply with a notice given to it.

Regulation 23 – Power to direct local authorities in relation to domestic distributions systems

Where Scottish Water investigates a failure or apprehended failure for the purposes of regulation 17(1); and that investigation establishes that the failure is due to a domestic distribution system in premises where water is supplied to the public (or to the maintenance of that system), then regulation 23 gives Scottish Ministers discretional power to direct a local authority for the area in which the premises is located in relation to the exercise of its functions under sections 76FB and 76FC of the 1980 Act.

A direction under paragraph (2) may, in particular, specify:

- any advice which the local authority must require to be given to consumers in relation to the failure by notice under section 76FB(3)(d) of that Act;
- any steps which the local authority must require to be taken under section 76FB(3)(b) and (e) of that Act; and
- the period which the local authority must require under section 76FB(3)(c) of that Act.

A local authority must comply with a direction given.

PART 7 – AUTHORISATION OF TEMPORARY DEPARTURES

Regulation 24 – Authorisation of a temporary supply of water that is not wholesome

Regulation 24 allows Scottish Ministers to authorise a departure from the provisions of Part 3 of the Regulations upon written request from Scottish Water. Authorised departures are only applicable for parameters in Table B, in practice this means authorised departures may not be granted for microbiological parameters or indicator parameters.

Authorised departures can only be granted subject to the criteria set out in regulation 25. One criterion is that Scottish Ministers must be satisfied that the departure does not constitute a potential danger to human health. Scottish Ministers will consider applications on a case-by-case basis. Scottish Water are reminded of the guidance provided by DWQR on authorised departures in Information Letter 02/2013 – Authorisation of Different standards. http://dwqr.scot/media/11437/information-letter-2_2013-authorisation-of-different-standards-5_7_13.pdf

The information that shall be provided with an application for an authorised departure is detailed in regulation 24(3). DWQR expects Scottish Water to be actively engaged with Health Protection Scotland, the appropriate health board and CPHM. They should discuss any potential applications with them in advance to enable any risk to the health of the communities in their care to be assessed and appropriate advice to be formulated. Equally DWQR is happy to discuss draft applications with Scottish Water before the formal application is made.

The formal application must be copied to every appropriate local authority, the relevant Health Board, Consumer Scotland and The Water Industry Commission for Scotland. They have 30 days to make any representations on the application. In its covering letter to these bodies Scottish Water should remind them that they have 30 days to make representation.

Regulation 25 – Authorisations: terms and conditions

An authorised departure may be granted for a maximum of three years and in each case will specify the extent to which any parameter may depart from the PCV specified in Schedule 1. In line with the Directive, the Scottish Minister's approach will be to issue departures for as short a period as is reasonably required to complete the associated programme of work. DWQR's general view is that in all cases it will be possible to restore a wholesome water supply within three years.

Where Scottish Ministers consider that the failure to meet the prescribed concentration is trivial and that the PCV will be met within 30 days a shortened application as specified in Regulation 25(4) is required.

Regulation 25(5) allows Scottish Ministers to authorise a further departure again for up to a maximum period of three years. It is only envisaged that this provision will be used in exceptional circumstances.

Regulation 26 – Authorisations: other limitations

Regulation 26 can limit an authorisation to water supplied from particular sources or classes of source or to particular water supply zones or to zones of particular descriptions.

Regulation 27 – Authorisations: publicity

Regulation 27 places an onus on Scottish Water to ensure the consumers affected by the authorisation are notified. Scottish Ministers may determine how this notice is given.

Regulation 28 – Revocation and modification of authorisations

Regulation 28 allows for Scottish Ministers to revoke an Authorisation at any time. Unless it is in the interest of public health, Scottish Ministers must give six months' notice of any revocation or modification of an authorisation.

Regulation 28 also states that Scottish Water must notify Scottish Ministers as soon as the circumstances for the authorisation cease to exist.

PART 8 – TREATMENT, RISK ASSESSMENT AND CONTAMINATION FROM PIPES

Regulation 29 – Disinfection and other treatment arrangements

Regulation 29 requires all water supplied for regulation 4(1) purposes to be disinfected. Disinfection is defined in the Regulations as a process of water treatment to remove or render harmless to human health every pathogenic micro-organism and pathogenic parasite that would otherwise be present in the water. Where necessary the water also has to be subject to sufficient preliminary treatment – it is anticipated that almost all water supplies in Scotland will require some form of treatment to prepare the water for disinfection. The point at which water is considered to be supplied for regulation 4(1) purposes is when it leaves the treatment works (regulation 29(7)(c)).

Disinfection, as defined, relates to the arrangements that Scottish Water has in place to treat raw water before it is supplied. These disinfection arrangements may be a single process of inactivation (such as chlorination, ultraviolet radiation, ozonation) or a single process of removal such as membrane filtration technology, or it may be achieved through a combination of two or more removal and inactivation processes such as filtration and chlorination. It is important that the technical performance characteristics of the disinfection arrangements used by Scottish water at each water treatment works is known in relation to the ability of the process or combined processes to remove or inactivate pathogens. The technical performance of disinfection arrangements should target the widest possible range of pathogens – viruses, bacteria, parasites and toxic algae – that are likely to occur in the source(s) of water being used. DWQR expects Scottish Water to have in place a disinfection policy which is informed by sound science and by knowledge of the occurrence of pathogens in water sources in Scotland.

In addition to the disinfection policy, Scottish Water is expected to have in place a site-specific disinfection strategy covering all of the requirements of regulation 29 (2). Both design and operation must be covered by this strategy which should be kept under regular review and be informed by appropriate studies and technical performance data. Each strategy should specify how disinfection by-products are minimised at each site. DWQR also expects there to be documentation and procedures in place which ensure that at every treatment works it is unambiguous how regulation 29 is being met both in principle and in practice. Scottish Water must be able to demonstrate that the disinfection process is not only designed for the challenge present in the raw water, but also that it is operating within these design criteria – i.e. company disinfection procedures must identify all the critical control points. Scottish Water must ensure that there is current and archived validation data for each critical control for disinfection. DWQR Information Letter 2013/3 **Requirement and expectations for supply specific disinfection strategies** sets out in more detail the expectations for Disinfection Strategies.

http://dwqr.scot/media/12769/dwqr-information-letter-2013-3-requirement-and-expectations-for-supply-specific-disinfection-strategies_2.pdf
The choice of treatment and disinfection processes is not specified in the regulation; this means that Scottish Water is free to decide on the most appropriate technology to apply at each treatment works. Regulation 29(7) defines the preliminary treatment that Scottish Water must have in place to prepare water for disinfection. This means that the water must be treated to modify its quality in respect of any properties (e.g. pH) and substances (e.g. ammonia, natural organic matter) known to adversely affect the performance of the disinfection process (or processes). Where no preliminary treatment takes place DWQR expects Scottish Water to be able to demonstrate from robust data why no preliminary treatment is required.

The regulation makes it clear that the preliminary treatment must secure that turbidity in the raw water is reduced to below 1 NTU before water enters the disinfection stages of treatment. It is anticipated that in most cases, Scottish Water should strive to achieve turbidities significantly lower than the 1NTU value. DWQR considers that, as a minimum, Scottish Water should have a turbidity monitor installed at a point before water enters any inactivation process such as UV or chlorine. Regardless of the location of the designated turbidity monitor(s), Scottish Water is expected to have alarms in place so that appropriate corrective action can be taken well before the measured value reaches 1 NTU.

Minimisation of disinfection by-products

Scottish Water is required by Regulation 29(2) to ensure that disinfection by-products (DBPs) are kept as low as possible without compromising the effectiveness of the disinfection process.

DWQR considers that Scottish Water should focus its activities on minimising the formation of disinfection by-products by identifying and removing DBP pre-cursers and avoiding conditions that encourage the formation of DBPs (whilst ensuring disinfection itself is not compromised).

The regulations set a parametric value of 100 µg/l for trihalomethanes (i.e. a group of four disinfection by-products, namely chloroform, bromoform, dibromochloromethane and bromodichloromethane) and 10 µg/l for bromate. Furthermore, regulation 4(2) states that for water to be considered wholesome it must not contain any substance which alone or in conjunction with any other substance constitutes a potential danger to human health. Thus, while there may not be specific parametric values for DBP's other than THMs or bromate, these must not be present in concentrations that constitute a potential danger to human health. Scottish Water must take care not to inadvertently increase the concentration of one DBP in its efforts to reduce concentrations of another.

Factors affecting the formation of disinfection by-products

Disinfection by-products are formed by the reaction of disinfectants with precursor substances. Natural organic matter (usually measured as Total Organic Carbon) and inorganic matter (bromide) are the most significant disinfection by-product precursors. All commonly used chemical disinfectants (e.g. chlorine, chlorine dioxide, chloramines and ozone) react with organic matter and/or bromide to varying degrees to form different disinfection by-products. Other types of disinfection by-products which may form include haloacetic acids, haloaldehydes, haloketones, chloral hydrate, haloacetonitriles, halogenated hydroxyfuranone derivatives, nitrosamines, chlorite, chlorate and bromate. The factors which influence DBP formation include:

- Type of disinfectant used;
- Concentration of disinfectant used;
- Concentrations of organic matter and other DBP precursors present in water presented for chemical disinfection;
- Temperature;
- pH;
- Contact time;
- Length of the distribution network.

The most commonly used disinfectants and their associated disinfection by-products are outlined in the table below. While a wide range of disinfectant by-products may be formed, the most commonly encountered disinfection by-products are trihalomethanes. However, the levels of bromate where ozone is used and chlorite/chlorate where chlorine dioxide is used as a disinfectant will need to be closely monitored to ensure that the levels do not exceed the regulatory standards or the World Health Organisation provisional guidelines values.

Further factors that can contribute to elevated levels of disinfection by-products include:

- A lack of, or poorly operated or maintained treatment process capable of removing organic matter (such as coagulation or filtration);
- Operation of treatment processes outside of their design criteria (e.g. excessive filtrations);
- Accumulation of sediments in service reservoirs or the distribution network;
- Ingress into reservoirs or distribution network.

Disinfectant	Associated disinfection by-product(s)
Chlorine (e.g. gas, sodium hypochlorite, tablets, OSEC)	Trihalomethanes, Chloramines[(a)], Chlorinated Acetic Acids, Halogentated Acetonitriles, Chloral Hydrate, Chlorophenols, MX[(b)], bromate[(c)], chloropicrin, halofurans, bromohydrins
Chlorine Dioxide	Chlorite, Chlorate and Chloride
Ozone	Bromate, Formaldehyde, Aldehydes, Hydrogen Peroxides, Bromomethanes
Chloramines	Dichloramines, Trichloramines, Cyanogen Chloride, Chloral Hydrate

Notes:

(a) If ammonium present in disinfected water
(b) 3-chloro-dichlormethyl-5-hydroxy-2(5H)-furanone
(c) Bromate is not formed where gas is used

Measures to Reduce Disinfection By-Products in Drinking Water

Actions that Scottish Water can take to minimise the formation of DBPs are listed below. This list is not exhaustive and a significant body of scientific knowledge is available on the reduction of disinfection by-product pre-cursors. Many of the activities below will also have beneficial impacts or should already be underway to ensure the safety and integrity of the water supply:

- Ensure the adequacy of the treatment process to remove organic material;
- Review of raw water intake management;
- Assessment and optimisation of the coagulation and clarification stage (if present);
- Assessment and optimisation of the filtration stage including assessment of media quantity and quality as well as optimisation of filter operations;
- Optimisation of the disinfection process to ensure that the optimum disinfectant dose is used. However, care must be taken that the disinfection process is never compromised;
- Assessment and review of disinfection chemicals used (e.g. ozone, chloramination, chlorine dioxide, UV etc);
- Implementation of a regular programme of flushing and scouring of distribution mains;
- Implementation of a regular programme of cleaning out of any clear water tanks and/or service reservoirs.

Scottish Water must ensure at all times that actions taken to minimise disinfection by-product formation do not compromise the effectiveness of the disinfection process.

Supply of water not complying with 29(1)

Regulation 29(3), 29(4) and 29(5) are designed for emergency situations only and aim to allow a balanced view to be taken between the risk to public health of supplying undisinfected or untreated water and the immediate health risk from there being no public water supply at all. DWQR expects that any decision to supply water which has not been subjected to the normal disinfection process will have been taken in consultation with health professionals.

Regulation 29(3) requires Scottish Water to obtain confirmation from Scottish Ministers, by notice, that they are satisfied that such a step is necessary. Scottish Water must provide Scottish Ministers with details of:

- The severity of the incident
- Reasons why Scottish Water is unable to comply with Regulations 29(1) and (2)
- The risk to health likely to occur if a piped supply of water is not available
- Steps they have taken to protect public health
- Information provided to consumers

Regulation 29(3)(a) can apply retrospectively so as to not impede actions that must be implemented during an emergency, however, a retrospective notice must be sought from Scottish Ministers within 72 hours.

Regulation 29(4) ensures that Regulation 29(3) does not remove the duty on Scottish Water to provide wholesome water and comply with the other requirements of the Regulations nor prevent an investigation by DWQR and potential enforcement action up to and including prosecution for supplying water unfit for human consumption.

Regulation 29(5) requires Scottish Water to inform consumers that their supply has not been subjected to an appropriate level of treatment and inform consumers of actions that Scottish Water has taken and any action that consumers need to take to protect their health such as boiling their water before consumption.

Disinfection of Groundwaters and Definitions of Treatment

Regulation 29(6) allows Scottish Ministers to remove the requirement in 29(1) that all water supplies shall be disinfected for certain groundwaters. In practice, such consistently high quality groundwaters are unlikely to exist in Scotland, and it is not envisaged that this exemption will be requested by Scottish Water.

Regulation 29(7) clarifies some of the terms used in Regulation 29, in particular what constitutes an “adequate treatment process” and “sufficient preliminary treatment”.

It is largely a matter for Scottish Water to determine the appropriate treatment processes which are required to meet the challenge presented by specific raw waters and ensure the water is adequately prepared for disinfection. In selecting and designing a treatment process, Scottish Water is expected to gather sufficient data to adequately characterise the source water as part of the risk assessment process and to ensure that any design is capable of delivering effective treatment both under normal conditions and any extreme situations that may occur. Clearly there is a need for Scottish Water to make a decision on the level of risk it is appropriate to accommodate, however there is an expectation that the resilience of treatment assets will form a key component of any process selection and design.

Management of Risk from *Cryptosporidium*

The *Cryptosporidium* (Scottish Water) Directions 2003 set out Scottish Ministers' expectations for the management of the risk from *Cryptosporidium*. These in turn are based on the reports on "*Cryptosporidium* in Water Supplies" by the first , second and third group of experts under the chair of John Badenoch and Ian Bouchier.

Scottish Water are expected to manage the risk from *Cryptosporidium* at all of its sites, closely following the principles of the three reports by the group of experts. Although the *Cryptosporidium* (Scottish Water) Directions 2003 have been revoked, many elements continue to be highly relevant and Scottish Water is expected to retain certain key requirements as part of its management approach in relation to the following Directions:

- Direction 12: Continuous individual monitoring of turbidity after every filter plus continuous monitoring of the final water
- Direction 18: Develop and implement a robust strategy for membrane integrity testing, in agreement with Scottish Ministers
- Direction 20: Maintenance of filter logbooks
- Direction 37: Management of recycled water return streams

All detections of *Cryptosporidium* in final waters, or circumstances which could lead to breakthrough of oocysts through the treatment process, must be thoroughly investigated. Final water oocyst detections at any plant must not be considered to be a "routine" event and operational staff must be trained to recognise the circumstances under which breakthrough can occur and the appropriate operational responses. Similarly, the absence of oocysts in a sample does not provide a guarantee that oocyst breakthrough could not, or has not, occurred.

***Cryptosporidium* monitoring**

Sampling and Analysis for *Cryptosporidium* shall take place using a fully validated method documented by the Standing Committee of Analysts and acceptable to Scottish Ministers.

Sampling shall take place using the method that maximises oocyst recovery within the constraints of the quality of water being sampled. It is expected that a continuous flow rate of 40 litres per hour through the collection filter will be maintained wherever possible. Where this is not possible, or a low volume sample is collected, (low volume shall be taken to mean 250l), Scottish Water shall annotate the sample result and ensure that operational responses to the sample appropriately reflect the low volume.

Raw Water Cryptosporidium monitoring

Raw water monitoring provides useful data that validates catchment risk assessments and provides an indication of the challenge presented to the treatment process. Raw water monitoring under the *Cryptosporidium* Directions was skewed heavily towards sampling from larger works. Smaller low and medium risk works were not sampled.

It is proposed that raw water sample frequencies for *Cryptosporidium* should become a matter for Scottish Water to determine according to risk. There shall be the following expectations:

- All WTWs shall retain the capability to have a representative raw *Cryptosporidium* sample taken where there is a barrier treatment process;
- Raw *Cryptosporidium* sampling shall be instigated in response to relevant operational events or perceived changes in catchment risk;
- Scottish Water should aim to build up a database of raw water *Cryptosporidium* data from all sites

Final Water *Cryptosporidium* monitoring

Although sample frequencies for *Cryptosporidium* are not defined in the Regulations, it is expected that Scottish Water will continue to sample final waters for oocysts. The significance of *Cryptosporidium* for public health makes it appropriate for Scottish Ministers to define a minimum sampling frequency in final waters. It is acknowledged that the *Cryptosporidium* Directions (2003) have ensured that a comprehensive database of final water data exists, which may prove to be a better indicator of site-specific oocyst breakthrough risk than the risk assessment process defined in the Directions.

It is proposed that the following minimum sample frequency matrix will be used by Scottish Water. This is based on the number of positive *Cryptosporidium* samples taken during the previous 3 years (irrespective of the oocyst count in each sample) and the volume of water supplied by the treatment works. The matrix greatly reduces the sampling frequency for sites where there is minimal history of *Cryptosporidium*.

Where there is less than three full years of data, including where a new treatment works is constructed at the site, the middle (2-6 positive sample) frequency shall be used initially. Where an existing works is changed by the addition of a new treatment process it is not necessary to increase the frequency, provided the new process presents an enhanced barrier against *Cryptosporidium* when compared with the old process. Where a specific case is not clear, Scottish Water may wish to consult with DWQR.

Number of Samples Required per Year

		WTW Maximum Design Flow (Ml/day)			
		≤ 1	> 1 ≤ 10	>10 ≤ 50	>50
Previous 3yrs sample data (min 36 samples)	≥ 7 positive samples	52	104	365	365
	2 – 6 positive samples	12	52	52	104
	≤ 1 positive sample	4	4	12	26

It is expected that Scottish Water will continue to monitor and assess the risk of *Cryptosporidium* in its supplies and will undertake additional sampling in response to this.

The Use of UV for Inactivation of *Cryptosporidium*

Usage and Design Requirements

Ultraviolet irradiation is not acceptable as a standalone treatment process in Scotland – it may only be used as an additional safeguard where an effective barrier process already exists at the site.

Where it is deemed necessary to install UV treatment in order to manage a risk, it shall treat the whole process stream and will operate continuously when the treatment plant is in supply.

Selection & design of equipment must follow existing UK guidance available on the below link: Guidance and codes of practice - Drinking Water Inspectorate (dwi.gov.uk)

Scottish Water must bear in mind that design requirements for a UV system to inactivate *Cryptosporidium* may be different to one designed for disinfection purposes.

Monitoring for any parameter known to impair the performance of UV inactivation of *Cryptosporidium* shall be undertaken prior to the installation of UV treatment for this purpose at a site. The extent of such monitoring shall be sufficient to define the expected range of relevant water quality parameters. The selected parameters should include iron and manganese. These results shall be discussed with any supplier of UV equipment and used to inform a risk assessment for the design and operation of the UV unit, including any mitigation measures. This risk assessment shall be regularly updated to take account of additional sample data.

Validation

Prior to use, any UV plant must be validated to demonstrate that plant performance is satisfactory for the specific conditions of that plant and establish any operating constraints.

- Validation must be in accordance with the DWI guidance document, using a test organism appropriate to the intended usage of the system;
- Operating conditions and constraints under which the system has been validated must be documented in on-site in works manuals.

Monitoring

Water entering the UV unit shall have continuous on-line monitoring for flow rate, turbidity and UV transmissance (UVT) as a minimum. Within each UV reactor chamber, UV fluence shall be measured continuously.

Data from online monitoring and sample data which confirms the effective performance of the UV system shall be retained by Scottish Water for at least 6 months.

Operation

The UV equipment shall be operated in accordance with manufacturers' guidance and the conditions under which validation testing took place. If these conditions change, for whatever reason, the validation shall be repeated under the new conditions.

Upon start-up, UV lamps shall be allowed to reach working intensity, prior to the introduction of any water intended for supply.

The UV process shall not be bypassed under any circumstances.

Minimum quality standards for water entering the UV unit shall be defined and documented on site. These standards shall include turbidity and UVT as a minimum. UV fluence shall not fall below a validated 40mJ/cm2. UVT of water to be treated should not fall below a value predetermined by Scottish Water, typically greater than 80%.

Should the quality of water in the reactor, or the UV fluence, deviate from these specifications for any reason, the plant must shut down automatically and remain offline until the problem is resolved.

Safeguards

Failsafe mechanisms shall be in place to ensure that water entering distribution has been sufficiently irradiated. These shall be linked to Scottish Water's telemetry system and trigger an automatic shutdown of the treatment process.

The control philosophy for the plant should automatically prevent water passing forward from the UV unit in the following circumstances:

- On start-up, before the UV lamp has achieved the correct operating temperature.
- During power dips or interruptions to power supply
- should on-line measurements for turbidity, UVT and UV fluence be outside pre-determined limits

Most UV lamps contain small amounts of mercury and lamp breakages could present a risk to both plant workers and those drinking the supplied water. Breakages can be minimised through good plant design and careful handling of lamps. Scottish Water must have in place an action-plan for minimising and detecting such breakages and dealing with any that do occur.

Maintenance

Maintenance of the UV system and associated equipment must be documented and in line with industry best-practice and manufacturer's guidance.

Regulation 30 – Risk assessment of treatment works and connected supply system

Regulation 30 requires a comprehensive risk assessment for each treatment works and connected supply system which covers all hazards and hazardous events. These risk assessments shall be undertaken using the water safety plan approach published by WHO in the Drinking Water Guidelines 2004, taking into account subsequent updates and associated guidance manuals published by WHO. Water Safety Plans provide a means of recording the hazards and hazardous events that potentially could arise in the catchment area for the source, during treatment, within the distribution system and within building plumbing systems (up to the consumer's cold-water tap). The methodology requires risk to be characterised for each hazard/hazardous event using a scoring system based on likelihood and consequence criteria. Risks should be characterised before and then after taking account of the existing permanent control measures in place. The scoring method should be capable of identifying "residual risks" which require further steps of mitigation (control measures) to be put in place.

A risk assessment carried out under regulation 30 should take into consideration all substances, micro-organisms including parasites, algae and viruses and all variants which may indicate a risk exists. Companies should take into consideration all available information when assessing the likelihood of a hazard being present. For example, when considering *Cryptosporidium* in treated water the analysing laboratory should report the presence of all oocysts confirmed as *Cryptosporidium* spp. irrespective of size and details of any *Cryptosporidium* like bodies present. Taking information on the number of oocysts in the 4-6µm range, together with information on other size ranges and *Cryptosporidium* like bodies Scottish Water can then assess the results to determine the risk this may indicate for a particular supply system. Appropriate mitigation measures to address the change in risk would also be expected to put in place.

Regulation 30(6) requires each risk assessment to be kept under review, with reviews being completed at a minimum of every 5 years. However, a review should also be triggered if Scottish Water becomes aware of a significant change to any part of the supply system, such as catchment, treatment process or distribution network. Additionally, a review should occur following any serious water quality incident.

Regulation 31 – Procedure following risk assessment and prohibition of supply

Regulation 31(2) places an obligation on Scottish Water to report on the nature of any significant risks identified and actions it plans to take in order to mitigate those risks, both planned and already in place. It is not intended that this should introduce a new reporting burden on Scottish Water as such analysis already forms part of the Improvement Plan component of the Drinking Water Safety Plan. Some minor modification may be required to ensure the plan contains the correct level of detail, especially where operational measures to mitigate risk are concerned, and to provide specific dates for completion of actions. Following receipt of such notification, DWQR may request additional details from Scottish Water prior to considering whether actions under regulation 31 (3) are necessary.

Regulation 32 – Copper and Lead Contamination from pipes

Regulation 32 deals with contamination of the water supply by copper or lead as a result of the supply and domestic pipework. Regulation 32(4) requires Scottish Water to modify or replace their part of any lead service pipe when it has reason to believe that the concentration of lead at the consumer's tap exceeds 10 µg/l. Also, Scottish Water is required to replace their part of the pipe when the owner intends to replace his own part of the service pipe and the owner has made a written request to Scottish Water to replace its part.

This Regulation is substantially unchanged from Regulation 26 of the 2001 Regulations, however it is important that Scottish Water is able to demonstrate that it is fully discharging its responsibilities relating to lead pipework.

Where a relevant sample is taken which triggers a potential obligation under regulation 32, Scottish Water must carry out a review of results from the zone (and related zones where treatment control measures are in place at the supplying works) to determine if the failure is an isolated one.

If it is an isolated failure, Scottish Water must take the following action:

> i. if treatment has not been consistent and is not optimised then the company must make improvements to ensure treatment is consistent and optimised. Additionally, if there is lead present in the company's pipe then it must be replaced as required under Regulation 32(5);
>
> ii. if treatment is consistent and optimised (or it has been determined from previous reviews that treatment was not necessary), then the isolated failure must be investigated further, as follows;

When the failure is in a sample from a tap in domestic premises or other premises which is not a public building, no further samples are required but a comprehensive investigation should be undertaken to establish if lead is present in the pipe work belonging to the company and the premises owner. If there is lead present in the Scottish Water's pipe then it must be replaced as required under regulation 32(5). There should be auditable evidence for the conclusion reached by the company's investigation. For example, if preliminary investigations are inconclusive then excavation/exposure of the Scottish Water's pipework may be necessary. If the investigation concludes that there is lead in the supply pipe or the internal plumbing belonging to the owner, the consumers occupying the premises must be notified and given advice about how to protect their health.

When the failure occurs in a sample taken from a tap in a public building the company must carry out a similar investigation to that described above, and replace the company owned communication pipe where this is lead. When there is lead pipe within the pipework belonging to the public building, remedial action must be taken to ensure there is no potential danger to the health of the public consuming the water. Companies should inform the owner of the building and remind them of their obligations under the Water Supply (Water Fittings) Regulations.

DWQR should be notified as soon as possible after each investigation is concluded of the results of the investigation and the action taken together with copies of notification of building owner and consumers (this will normally be as part of Scottish Water's event reporting process). The company should have a standard form for notifying DWQR.

If the failure is not an isolated one in the zone or related zones then Scottish Water must review the plumbosolvency control treatment in place and check that it has been consistent and optimised. If treatment is not consistent or optimised then action must be taken by Scottish Water to improve the treatment and continue to monitor it and lead concentrations to ensure it is consistent and optimised. However, if plumbosolvency treatment is not practised because previous reviews have determined it is not necessary then Scottish Water will need to review all results and consider whether plumbosolvency treatment is likely to reduce the lead concentration at consumer's taps. If it is concluded that treatment is necessary then the company should install treatment, obtain a consistent dose and optimise the dose as soon as practical. No further action is required, following optimisation, unless there is a subsequent failure in the zone or related zones.

If Scottish Water concludes that treatment is consistent and has been optimised then it should carry out the investigations and actions as set out above for an isolated failure and review their findings as part of their regulatory risk assessment. Where Scottish Water's regulatory risk assessment identifies a residual risk relating to lead then the company is expected to identify an integrated package of measures to mitigate this risk.

Part 9 - Controls on substances, products and processes

Regulation 33 – Application and introduction of substances and products

Regulation 33(1) prohibits, with certain exceptions, the introduction by Scottish Water of any substance or product to water that is intended for domestic purposes as defined in regulation 4(1). The exceptions are that the product or substance, at the time of its introduction, satisfies one of the conditions in Regulation 33(3) or conforms with the conditions set out in Regulation 33(2).

The List of Approved Products for Use in Public Water Supply in the United Kingdom (the List) is published and updated regularly on the DWI's web site which represents the definitive List of all substances and products for which approval has been granted (and thus may be introduced into a water supply system, by a water company), refused, modified, revoked or prohibited. The List also makes clear any restrictions on the use of such products that must be observed. The List additionally identifies those products (currently some treatment chemicals and filter media) which may be introduced by water companies through regulation 33(2) where the product or substance conforms to a European Standard (BS:EN), subject to any national conditions of use to protect public health.

It is the responsibility of the end user, i.e. Scottish Water or their appointed agents, to ensure that products used by them in the production, supply and distribution of drinking water are appropriately approved, under Regulation 33(3)(a), or meet the requirements of Regulation 33(3)(b) or (c) before introducing them to the water supply.

For those products conforming to a BS:EN, which may be used under Regulation 33(2), the end user, should ensure that the product they are using conforms to the requirements of the relevant BS:EN standard. The existence of a relevant BS:EN standard does not necessarily mean that all supplies of a specific treatment chemical or product will have been tested and shown to meet the appropriate requirements of the BS:EN. Thus, it is the responsibility of the end user of these products to ensure that the treatment chemicals or products provided by a specific supplier fully meet the requirements of the relevant BS: EN standard. This can be done by obtaining, for example, a statement of conformity for the batch of chemical supplied, or by internally checking through their laboratories. Scottish Water should be aware BS:EN standards for drinking water treatment chemicals and products, do not contain mandatory requirements for attestation of conformity.

Regulation 33(4) authorises applications for approval to be made by any person. Regulation 33(5) provides for variation or revocation of an approval, subject to the requirements of Regulation 33(9) and (10) in respect of the giving of notice to those affected by the variation or revocation. Regulation 33(9) provides for the Scottish Ministers to prohibit the use of any substance or product which Scottish Water would otherwise be authorised to use, subject to the requirements to give notice as set out in regulation 33(9) and (10). Regulation 33(12) permits the Scottish Ministers to make an administrative charge on the person making an application for approval of a product under regulation 33(3)(a).

Regulation 34 – Use of processes

Regulation 34 provides for the Scottish Ministers to give notice to Scottish Water, requiring them to make an application for approval of any process. The notice may also prohibit use of the process for a specified period. Regulation 34 also provides for attaching conditions to an approval and for revocation of approval and modification of conditions of approval and publication of a list of approved processes. Provisions equivalent to those prescribed in Regulation 33 in respect of giving notice apply to Regulation 34.

PART 10 – OFFENCES: PARTS 8 & 9

Regulation 35 – Offences

Under Regulation 35 it is an offence for Scottish Water to contravene Regulations:

- 29(1), relating to disinfection and treatment arrangements;
- the terms of a notice under regulation 31(3)(d);
- regulation 33(7) the use of unapproved products;
- regulation 33(7)the contravention of a prohibition notice;
- regulation 34(1)(b) the use of a process in contravention of a prohibition notice; and
- Regulation 34(2)(b) failure to observe conditions of approval of a process

Scottish Water has a statutory defence if it is able to show that it took all reasonable steps and exercised all due diligence to avoid committing the offence.

Regulation 35(3) allows for the prosecution of anyone providing false information in support of an application under regulation 33 (application and introduction of substances and products) or 34(Use of processes).

Any person guilty of an offence under Regulation 35 is liable on summary conviction, to a fine not exceeding the statutory maximum: or on conviction on indictment, to a fine.

Regulation 36 – Offences by bodies corporate

Where an offence under regulation 35 has been committed by a body corporate or a Scottish partnership or other unincorporated association is liable to be proceeded against and punished accordingly.

If the offence was committed on behalf of, with the consent or connivance of, attributable to neglect of the relevant individual or by someone acting in the capacity of the relevant individual or body corporate is liable to be proceeded against and punished.

Relevant individual in relation to a **body corporate** can be a director, manager, secretary or other similar officer of the body. Where the affairs of the body are managed by its members, the members.

Relevant individual in relation to a **Scottish partnership** means a partner.

Relevant individual in relation to an **unincorporated association** means a person who is concerned in the management or control of the association.

PART 11 RECORDS AND INFORMATION

Regulation 37 – Maintenance of records

Regulation 37 details the information that Scottish water must record. The Regulation does not stipulate the format of the record and this is a matter for Scottish Water to determine whether hard copy or electronic format is the most suitable means. The entries of the results of compliance analysis should be reported in the units of the regulations.

Regulation 38 – Notification of health risk events

Regulation 38 requires Scottish Water to notify DWQR, Public Health Scotland, Scottish Ministers, the relevant local authority and the relevant local health board of a health risk event. This Regulation does not apply if the event has already been notified under the provisions of Part 6. A health risk event is described as an event which, by reason of its effect or likely effect on the water supplied by Scottish Water, gives rise or is likely to give rise to a **significant** risk to health.

DWQR expects that the majority of events will be notified under Part 6 provisions but this Regulation is particularly pertinent in the circumstances when the event is of such significance that the local health board convenes an Incident Management Team.

Regulation 38(3) makes provision for local authorities and health boards to require the provision of information relating to the event and its consequences. This is likely to take effect should the local health board convene an in response to notification of health risks.

Regulation 39 – Publication of information

Scottish Water are no longer required to publish an annual report, but Regulation 39 requires Scottish Water to ensure that water quality data at water supply zone level is placed on its website and therefore publicly available.

PART 12 – SCOTTISH WATER: INCIDENTAL POWERS

Regulation 40 – Power to enter

Scottish Water may where necessary to comply with its duties or requirements in Parts 4 – 9 (see below) enter any premises to which it supplies water for the purposes set out in Regulation 40(1) which are: assessing or monitoring the quality of the water, investigating or isolating anything that appears to be affecting, or may affect, the quality of the water; and take any steps at the premises which are reasonably required for those purposes.

Unless it is an emergency Scottish Water can only enter a premises if they have been given consent for those purposes or have provided at least 24 hours' notice of entry.

Scottish Water have the power of reasonable force if required.

In an emergency means a case which appears to Scottish Water that water supplied by it to premises for human consumption purposes constitutes an imminent danger to human health; and it must exercise immediately the powers conferred by Regulation 40(1) in order to protect human health from that danger.

Regulation 41 – Entry warrants

Under Regulation 41, Scottish Water may apply to the sheriff for a warrant authorising it to enter particular premises for the purposes mentioned in Regulation 40(1); and take any steps at the premises which are reasonably required for those purposes.

The sheriff may grant the warrant sought if satisfied that –

- there are reasonable grounds for entering the premises for those purposes
- admission to the premises has been refused
- the taking of steps at the premises has been obstructed
- or such refusal or obstruction may reasonably be expected
- notice of the intention to seek a warrant has been given to the occupier of the premises

A warrant under paragraph remains valid until the purposes mentioned in regulation 40(1) are fulfilled; and allows the use of reasonable force (if required).

Regulation 42 – Approved persons

An approved person is any person approved (in writing) by Scottish Water for the purposes mentioned in regulation 40(1).

Regulation 43 – Taking steps

Regulation 43 sets out the criteria by which an approved person may enter premises. An approved person must, if required by the occupier of the premises produce:

- evidence of the approved person's identity (and approval)
- explain the nature of the authority by (as the case may be) reference to regulation 40(1) showing a copy of the warrant.

An approved person may take onto the premises other persons acting under the approved person's direction; such equipment as is necessary in connection with the steps that may be taken there.

The steps that may be taken by an approved person (or other persons acting under that person's direction) at the premises include inspecting or measuring any water found there; carrying out tests on or taking samples from any soil, water or other substance found there; and installing or maintaining any measuring, testing or sampling equipment for use there.

Unless an emergency, an approved person may only enter the premises at a reasonable time. If the premises are unoccupied (or the occupier is temporarily absent), an approved person must leave the premises as effectively secured as they were when they entered them.

Schedule 1A – Monitoring Minimum Requirements

Schedule 1A provides further requirements to fulfil regulation 5 and regulation 6 in relation to monitoring of the water supply to ensure that the water meets the water quality standards and that this is representative of quality of the water consumed throughout the year.

Part A – Monitoring Programmes

Scottish Water must implement a monitoring programme for each water supply zone to verify that control measures throughout the public supply system are working effectively and that water at the point of compliance meets the water quality standards. Monitoring programmes should also take into consideration inspection records of equipment and catchment area, water abstraction, treatment, storage and distribution infrastructure.

Part B – Standard parameters and frequencies

Part B requires Scottish Water to take the standard number of samples for analysis for the parameters listed in Tables 2 and 3 of schedule 3. Where Scottish Water has reason to suspect that the water contains a substance that is not listed in Table A, Table B or Table C and poses a potential danger to human health, monitoring should be carried out to establish whether a substance does pose a danger at the point of compliance.

Samples should be taken at regular intervals. Regular sampling means that there is a suitable spread of samples to detect possible variation in water quality. Variation could occur on long term (seasonal) or more short-term basis (within a week or day due to operational changes). The requirement for regular sampling does not mean that the sampling occasions have to be spread at exactly equal intervals. Ideally the day within each week that the sample is taken should be randomised. However, it is recognised that it may not be practicable to fully randomise the day of sampling. Where the sources of supply or operation of a works, service reservoir or zone are known to vary significantly over the period of a week, the sampling programme should be managed to ensure some variation in the day of the week in which the sample is taken.

If Scottish Water fails to take or analyse a sample, through no fault of its own, e.g. a broken sample bottle, it will be expected to reschedule a further sample as soon as possible. The resample should be taken well in advance of the next programmed sample. DWQR considers that only in exceptional circumstances will it not be possible to resample in advance of the next programmed sample. Each case will be reviewed on its merits. Since the regulations require the frequencies to be met on an annual basis rescheduling does not constitute a

shortfall. Provided the resampling is prompt, occasional occurrences of this type will not be regarded as a failure to meet the regularity requirement.

Part C – Deviation from standard parameters and frequencies

Part C indicates the circumstances in which Scottish Water can deviate from the requirements of Part B, whether that be increasing or decreasing the minimum sampling frequencies.

The 2014 regulations did not allow sampling frequencies of *E. coli* to be reduced below the minimum sampling frequency required by Part B, and this is now extended to include Enterococci as well as *E. coli*. All parameters listed in Tables A, B and C must be monitored at least every six years, regardless of any reduction or removal of parameters through the application of risk assessments. Additionally, where a new source of water is integrated into a water supply system, or any changes are made to that system which are expected to potentially have an adverse effect on water quality, sampling must be carried out at least once every six years.

Sampling frequencies in Part B may be reduced or parameters may be removed following confirmation from a risk assessment that it cannot be reasonably anticipated that there will be a deterioration of water quality. Consent must be given by the DWQR. Consent is dependent on the Regulator being satisfied that water quality would not be compromised, and that the presence of the parameter can only occur through a treatment or disinfection method that is not used by Scottish Water.

There are a number of parameters which the DWQR cannot give consent for removal from sampling schedules, namely enterococci, *E. coli*, Coliform bacteria, colony count 22^{o}C, colour, turbidity, pH, iron, lead or manganese. Neither can consent be given to cease monitoring for nitrate where water is supplied within a nitrate vulnerable zone. If Scottish Water has reason to suspect that there are any micro-organisms, parasites or substances not in Table A, B or C which can pose a danger to human health, consent from the DWQR cannot be given.

Part D – Sampling methods and sampling points

Scottish Water should determine sampling point as to ensure that the analysis of samples taken from those points will establish whether the water meets the water quality standards. This also needs to take into consideration the point of compliance for each parameter as listed in Table A, B and C of schedule 1.

Samples should be taken at regular intervals. Regular sampling means that there is a suitable spread of samples to detect possible variation in water quality. Variation could occur on long term (seasonal) or more short-term basis (within a week or day due to operational changes). The requirement for regular sampling does not mean that the sampling occasions have to be spread at exactly equal intervals. Ideally the day within each week that the sample is taken should be randomised. However, it is recognised that it may not be practicable to fully

randomise the day of sampling. Where the sources of supply or operation of a works, service reservoir or zone are known to vary significantly over the period of a week, the sampling programme should be managed to ensure some variation in the day of the week in which the sample is taken.

Part D also highlights that samples must be taken and handled in accordance with the relevant ISO procedures.

Part E – Radioactive Substances

Further guidance on radioactive substances can be found in Appendix 2

Part F – Indicative Dose

Further guidance on radioactive substances can be found in Appendix 2

Schedule 3 – Methods of Analysis

Uncertainty of Measurement

The values for uncertainty of measurement given in the regulations should be applied by Scottish Water and any subcontracted services, other than the exceptions given below:

Lead - 25%

Polycyclic Aromatic Hydrocarbons (PAHs) - 30%

These are minimum performance characteristics and Scottish Water should endeavour to tighten these where applicable to increase the confidence of their analysis results.

DWQR is aware that Scottish Water are struggling to comply with the 30% uncertainty of measurement for Microcystin-LR. DWQR understands the limitations of the method and analysis that has led to this but require Scottish Water to strive for this limit.

APPENDIX A

Document control

Version number	Date	Summary of changes
1.0	22/12/2015	Original
2.0	25/02/2016	Addition of guidance for monitoring radon in drinking water supplies
2.1	28/10/2022	DRAFT changes of 2023 Amendments

APPENDIX B - GUIDANCE IN RELATION TO CERTAIN PARAMETERS

Taste and Odour

The required standards for taste and odour are set out in Table C of schedule 1 and for both parameters has changed from the quantitative standard in the previous regulations to a descriptive qualitative one. DWQR expects Scottish Water to utilise methods A2 and A3 in the Standing Committee of Analysts Method for the Determination of Taste and Odour in Drinking Water 2014. A positive detection by panellists should be treated as a breach of the descriptive standard and Scottish Water should act accordingly. Consequently, when detected either qualitatively or quantitatively, any detection of taste or odour must be investigated to establish whether the finding is abnormal, relative to previous results from the zone, taking into account seasonal variations.

Colour

Standards for colour have been included in Table B and Table C of Schedule 1. The standard in Table B is a quantitative one of 20 mg/l Pt/Co. A qualitative standard has been included in Table C – "no abnormal change and acceptable to consumers" to ensure that the intent of the Drinking Water Directive is transposed into Scots law. Scottish Water must report compliance with both standards in its compliance data return, though for the purposes of calculation of overall water quality, the results against the standard set in Table C will be excluded. DWQR expects that water which meets the quantitative standard will also meet the qualitative one without the need for additional measurement unless a specific consumer complaint has been received.

If Scottish Water has reason to believe that the water supplied does not meet the colour specification in Table C, it must investigate why the specification was not met and determine whether this represents a risk to health in accordance with the requirements of regulation 17 (1).

Radon

Radon is an odourless, colourless, radioactive gas that occurs naturally. It is released from certain rocks and the risk of occurrence varies according to geology. Although direct ingestion of radon in water is harmless, prolonged exposure to radon in air by inhalation has been linked to an increased risk of lung cancer. It is likely that any radon dissolved in water will readily gas off upon exposure to atmospheric pressure, adding to the total radon contact of the air. The

purpose of the inclusion of an indicator parameter for radon in drinking water is to limit the contribution that radon in drinking water makes to the total concentration of airborne radon. Monitoring for radon is required unless:

a) previous results show that the concentration of radon is stable; and
b) Scottish Ministers are satisfied that concentrations of radon, tritium and calculated indicative dose will remain below the PCV for each parameter.

Scottish Ministers will issue notices indicating those supplies that meet these criteria and need not be sampled. In practice, this will be for the following circumstances, where:

1) The supply is a surface water, or
2) The supply is not in an area with a known high risk for radon in air, and previous sampling has shown the radon concentration to be less than half the PCV of 100 Bq/l, or
3) The supply is a groundwater in a high-risk area but the previous three radon samples, taken over a period in excess of 1 year, have all shown the radon concentration to be less than half the PCV of 100 Bq/l.

Where the water is treated with the specific purpose of removing radon, monitoring at the frequency specified in Table 2 of schedule 2 must be undertaken, regardless of the above criteria.

Monitoring for radon is at consumers' taps although a supply point authorisation may be granted by prior arrangement with Scottish Ministers.

<u>Action to be taken in response to an exceedance of the PCV</u>

Where a sample exceeds the radon PCV of 100 Bq/l on a public water supply, and a resample confirms this to be a representative result, Scottish Water must undertake further investigation to identify the source of the high radon value.

It is not considered appropriate for public water supplies to exceed 100 Bq/l as they supply many properties with potentially varying characteristics as far as radon risk is concerned. Where it is identified that a public water supply consistently exceeds 100 Bq/l, action to reduce radon concentrations will be taken. Such action may include treatment, or the abandonment of the source and substitution of an alternative source of water.

All exceedances of the PCV must be reported to health boards, local authorities and DWQR by the existing reporting mechanisms. Exceedances of the standard may not trigger an immediate restriction on use of the supply but might require the introduction of radon in air monitoring.

<u>Radon Treatment</u>

Treatment of water to remove radon is unlikely to be required on the vast majority of public water supplies, but if required is relatively simple. There are three main methods of treatment:

Aeration

As radon is a gas, it can be stripped from the water by cascading the water or bubbling air through it;

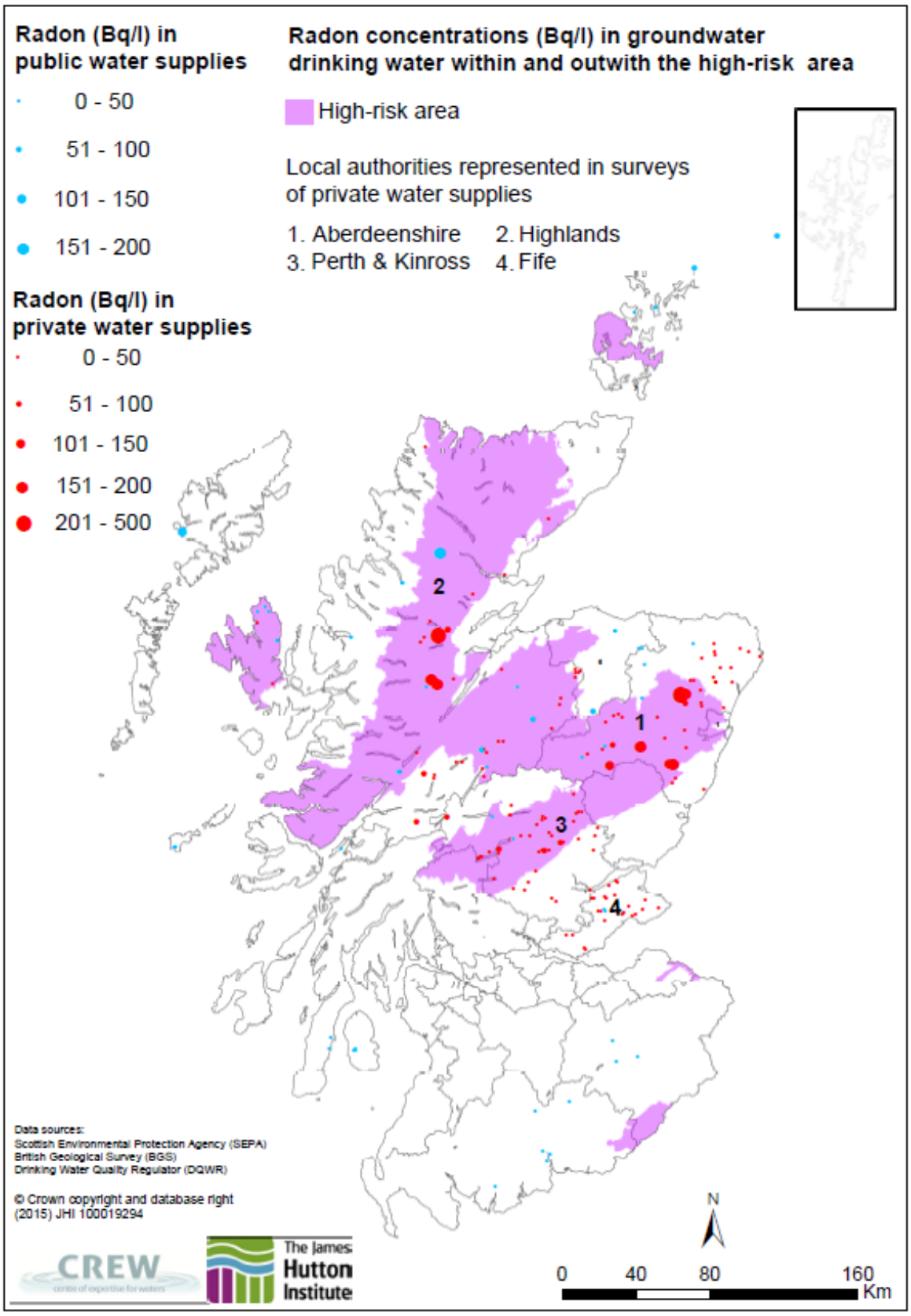
Adsorption

Radon can be adsorbed onto GAC filters. The GAC will need to be periodically replaced, with the replacement interval depending upon the flow rate and concentration of radon in the water. Care may be needed in disposal of spent GAC as they will have accumulated radon;

Decay Storage

Radon has a half-life of 3.8 days, consequently concentrations in water may be significantly reduced if water is allowed to stand. Radon reduction will be further enhanced if the storage chamber is well ventilated. The benefits of decay storage need to be balanced against other risks to water quality due to increased residence times. Consequently, this method is less likely to be appropriate than aeration or adsorption.

Annex 1: Radon in Groundwater Risk Map



Annex 2: Radon Amending Regulations Summary Flowchart