



Private Water Supplies Sampling Procedures Manual Version 1.4

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Document control

This manual forms part of the ISO17024 scheme ISO/IEC 17024:2012 Certification of Persons Scheme for sampling private water supplies in accordance with The Private Supply Regulations 2016 as amended and and The Private Supply Regulations 2017 (Wales). It sets out a common standard of sampling practice for the purposes of monitoring private water supplies in England and Wales by local authorities (or their contracted representatives).

These procedures draw on the guidance on sampling best practise from The Standing Committee of Analyst (SCA) Blue Book “*The Microbiology of Drinking Water (2010) – Part 2 - Practices and procedures for sampling*”, available at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/316769/MoDW-2-232.pdf. This document forms part of a series of publications detailing methods for the Examination of Waters and Associated materials.

The administration of this document and the methods and procedures contained therein are maintained using a quality managed system. This is to ensure that the standard of sampling and on site testing of private water supplies complies with the Drinking Water Test Specification (DWTS).

Each holder of the manual shall complete the Version control record (Table 1).

Table 1: Version control record (internal use only)

Manual holder's name	Version number of manual	Date version issued	Date manual implemented	Date version revoked by

Changes and anomalies

Users of this manual are encouraged to submit any suggested changes, or query any aspect of the manual by the submission of a “Change request form” (See Appendix A8), by email to the scheme owner for consideration of its inclusion, at each annual review of the procedures.

Legislative background

Regulation 7 of The Private Water Supplies Regulations 2016 (as amended) and The Private Water Supplies Regulations 2017 (Wales) requires that all local authorities in England and Wales must monitor (sample and analyse) all private water supplies in accordance with this part when carrying out its duties under Section 77 (1) of the Water industry Act 1991. These regulations implement the 1998

Drinking Water Directive in England and Wales (98/83/EC). Regulatory monitoring is carried out to satisfy the requirements of the Water Act 1989.

Schedule 3 of The Private Water Supplies Regulations 2016 (as amended) and The Private Water Supplies Regulations 2017 (Wales) requires that local authorities must ensure that each sample it takes is:

- a) Taken by a competent person
- b) Representative of the water at the sampling point at the time of sampling
- c) Not contaminated in the course of being taken, stored or transported

Following the procedures to the manner prescribed in this manual ensures that regulatory monitoring requirements are met by way of compliance with the Drinking Water Test Specification (DWTS).

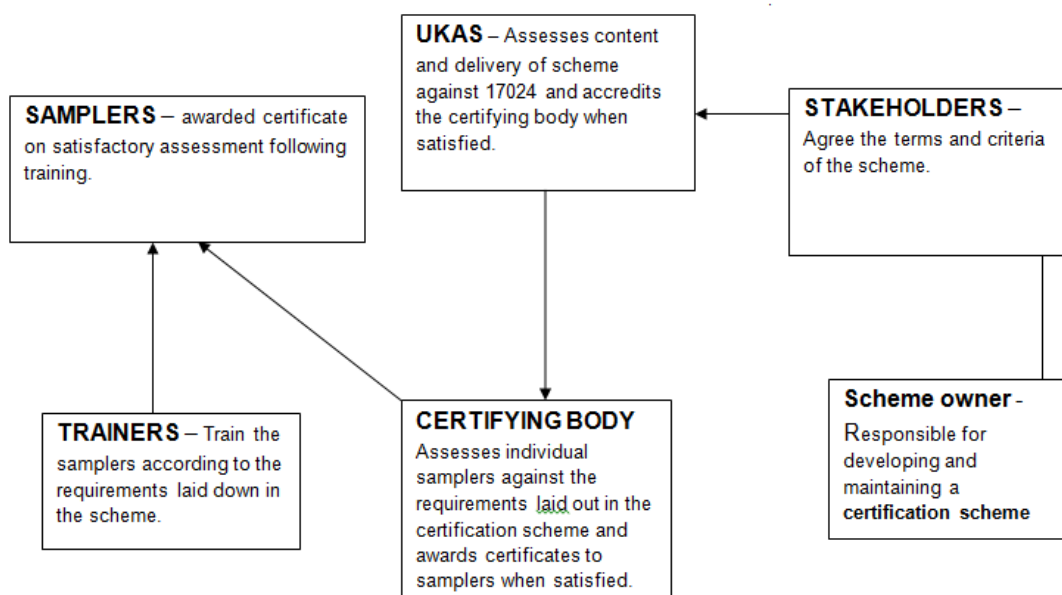
UKAS Accreditation of certified sampling by ISO 17024

A sampler shall only be deemed competent when certified to do by a designated certification body. The body shall be appointed by the scheme owner, namely DWI. The sampling manual shall form the basis of the scheme, and shall be agreed by a committee of stakeholders.

The certification body shall be accredited by The United Kingdom Accreditation service (UKAS) to demonstrate that it is compliant with the ISO17024 standard. The model for this arrangement is shown in Figure 1.

Figure 1: ISO 17024 model

Refer to ISO/IEC 17024:2012 Certification of Persons Scheme for sampling private water supplies in accordance with the Private Water Supply Regulations 2016 (as amended) and Private Supply Regulations 2017 (Wales) for more details.



The procedures contained within this manual prescribe the standard sampling arrangements and methods which local authorities and their contracted representatives must follow for the purposes of regulatory and investigational monitoring of private water supplies. Sampling forms part of the wider risk based requirements of The Private Water Supplies Regulations 2016 (as amended) and The Private Water Supplies Regulations 2017 (Wales).

These procedures form the minimum requirements to which local authority samplers of private water supplies in England and Wales must adhere. It should be noted that whilst procedures for the application of field-site testing equipment are covered in this manual for the purpose of guidance, demonstration of competency in these areas is not a requirement of the ISO/IEC 17024 scheme. This information is included in the appendix for guidance only.

The word “sampler” is used in this manual as a generic term, which applies to any person employed by a local authority or their contractor, and trained under the 17024 scheme, to collect water samples for the purpose of fulfilling regulatory duties under The Private Water Supplies Regulations 2016 (as amended) and The Private Water Supplies Regulations 2017 (Wales). This includes for example Environmental Health Officers, Technical Officers and persons contracted exclusively for sampling.

To differentiate between local manual adaptations, the standard manual within the scheme shall be known as the “scheme manual”.

The appendices of each local manual must contain the following with any local adaptations, where stated:

1. Sample bottles

It is recognised that bottle types may vary according to suppliers. Accordingly each local authority shall include within their version of the manual a comprehensive photographic list of all bottle types used by the authority, which must be appended to the manual.

2. Sampling methods

Each sampler shall amend/replace any methods for the taking of samples in Section 8 of this manual, in accordance with its laboratory/supplier instructions. All amendments and adaptations to a manual as per the above requirements, and as defined in the scope of this document shall be incorporated into the manual.

3. Equipment

A list of all local sampling equipment, including all test equipment shall be appended to the manual.

4. Authorisation to sample

A copy of, or a localised version of, the “Authorisation to carry out sampling” proforma, which must provide the same information as that shown in the scheme manual shall be appended to the manual

5. Sample chain of custody

A copy of, or a localised version, of the “Chain of Custody record” proforma which must provide the same information as that shown in the scheme manual shall be appended to the manual.

6. Sample storage

A copy of, or a localised version of, the “Sample storage temperature record and cleaning” proforma which must provide the same information as that shown in the scheme manual shall be appended to the manual.

The procedures for the taking of on-site test measurements and their calibration are not within the scope of the certification scheme, but procedures, information and suggested proformas are appended within this manual for information and use.

All amendments and adaptations to a sampler’s manual as per the above requirements, and as defined in the scope of this document shall be incorporated into the manual prior to each prospective sampler’s application for assessment and certification. This amended version of the manual shall be presented to the certification body and assessed as part of the applicant’s assessment. This shall be accompanied by a written statement from the laboratory confirming that this complies with the analytical method accredited under ISO 17025.

Health and safety

Only the minimum health and safety requirements that are specific to certain procedures have been included in the scheme manual. Samplers **may** incorporate any additional local health and safety requirements according to local policies and procedures, as they see fit.

Section 1 – Training and competency

1.1 Competency

A sampler shall be deemed competent to take samples of private water supplies when he/she has demonstrated competency in the procedures laid down in this manual, to the satisfaction of the certification body named and designated in the scheme. Those deemed competent to sample by the certification body, as assessed by completion of a written and practical examination with a 90 % pass mark in accordance with the criteria laid down in the scheme shall be awarded an authorised certificate to demonstrate competency by the certification body.

The certification body shall be accredited by The United Kingdom Accreditation Service (UKAS) by demonstration of its compliance with ISO/IEC 17024. UKAS will assess the certification body on an annual basis to determine ongoing competency and compliance with the ISO 17024 standard.

Ongoing local competency of samplers shall be demonstrated by the audit process prescribed in the 17024 scheme at the frequency specified.

Where ongoing competency of a sampler is not evident, the certification body must suspend that individual from sampling duties until competency can be further demonstrated to their satisfaction.

1.2 Training

1.1.1 Introduction

The training of samplers to meet the competency requirements of the scheme may be carried out by the certification body, as described in ISO 17024 scheme requirements or by an independent training provider. If training is delivered by a certification body, then it must be demonstrably independent as specified in the scheme.

1.1.2 Induction

As part of local induction line managers shall provide all certified samplers with the tools, equipment and personal protective equipment (PPE) required for sampling in accordance with the procedures in this manual, prior to undertaking any sampling of private water supplies. A list of this equipment, including the make, model and serial numbers of all test equipment shall be appended to this manual. This kit shall include a current and numbered copy of the sampling procedures manual that has been amended in accordance with the instructions 1-6 within the Scope of this manual. The line manager must complete an "Authorisation to carry out sampling record" (See Appendix A8) once he/she is satisfied that the sampler is competent to sample by virtue of being certified.

Section 2 – Maintaining sample integrity

Cross contamination between samples must be avoided at all times during sample collection, transportation and storage through the strict adherence to the procedures.

Ensure any liquid chlorine and other chemicals are kept isolated to prevent cross contamination when being stored, carried in holders or in transit. Ensure that all chemical containers are at all times labelled with the content name and concentration (where relevant) and the date after which it should no longer be used (expiry date).

Samples, sampling equipment and on site kit shall be stored on vehicles in a hygienic, safe and tidy manner to avoid accidents and sample contamination of any kind. Each local authority shall append to its local version of the scheme manual a list of its sampling equipment. This shall include the make and model of all on site testing and calibration equipment.

Samplers must remain vigilant at all times to conditions that pose a risk to the water quality integrity of a sample by inadvertent contamination, particularly when exposed to adverse weather or other unfavourable external environmental influences (e.g. unhygienic food preparation areas). Issues that impact on sample integrity shall be noted, and recorded in local records, and later considered in the interpretation of any sample failure where relevant.

Personal hygiene must be observed, including hand washing prior to the sampling visit, and washing / cleaning of hands during the visit as necessary, especially following raw water sampling where further treated samples are to be taken at another property.

When sampling raw and treated water in a single site visit, always take the treated water sample first to minimise the risk of cross contamination. Raw and treated water samples shall be segregated in separate containers and holders during transportation and when stored awaiting collection to the laboratory.

Whilst being manually transported, samples (before and after filling) shall be carried in a suitably robust and hygienic holder, in a way that ensures the bottles are maintained permanently in an upright position and that all sampling equipment and on-site test kit is securely stowed in the vehicle at all times.

Containers shall be cleaned in between use, and containers/holders for raw or untreated samples must not be used for treated water samples. They should store in separate boxes or separate areas of a samplers vehicle.

Cool boxes and/or vehicle refrigerated units shall be maintained in a clean and hygienic manner at all times and cleaned no less than the day before sampling, using an appropriate disinfectant spray. Surfaces should be wiped dry with paper tissues afterwards.

N.B. Some samples require refrigeration at all times, including when in transit and storage. These include all microbiological samples and some chemistry samples where it is a requirement to ensure the sample remains representative whilst in transit and storage – as directed by the analytical service provider. These shall be transported in an upright position in a container within a temperature range of 2-8°C in either a cool box or refrigerated unit on the vehicle. See Section 9 for further details. Samples should be protected from direct sunlight at all times as much as possible.

Samplers shall always wear appropriate PPE to meet the relevant health and safety risks at the time of sampling. Furthermore, each sampling activity shall be subject to the application of all health and safety requirements laid down by the local authority.

Do not eat, smoke or drink whilst sampling. Hands should be washed between each set of samples that are taken.

Section 3 – Sample types

Samples from private water supplies are taken for one of two reasons shown below, and they are normally coded as such (these are generally known as “reason codes” or “purpose codes”).

- (a) **Samples taken for regulatory purposes** – These samples are taken to comply with the monitoring requirements, as set out in the Private Water Supplies Regulations 2016 (as amended) and the Private Water Supplies Regulations 2017 (Wales) and must be taken at a tap that is representative of the supply. This should be from the point of consumption, typically at the

kitchen tap. The sample parameters, collection frequencies and points of collection are prescribed by the Regulations.

- (b) **Samples taken for investigational purposes** – These samples are taken where Regulation 16 of The Regulations apply and can be taken from the tap where the water is consumed for domestic purposes and/or from other points in a supply system. Investigational samples are taken to establish the cause if it is suspected that a supply is unwholesome (which in some cases may present a risk to human health) or that an indicator parameter does not comply with the concentrations or values prescribed in the Regulations. They are also taken to verify that any remedial action that has been undertaken has been effective. For the purposes of this scheme, investigational samples fall outside of the scope of the scheme. However, sample procedures described in the scheme should still be followed as an example of good practice.

In addition to their purpose/ reason, sample types are designated according to where in a prescribed sequence they are collected (pre-flush, post flush etc.). This sequence, “the order of sampling”, is an essential element of sampling procedures. There are four sample types in this respect:

- (a) **Overnight stagnation samples** – This is a measure of the worst possible conditions for the dissolution of metals or microbiological growth within plumbing systems, after an overnight period in which the water has remained static in pipework. This sample type may be taken prior to any consumer use on any given day, and before any preparative flushing, cleansing or disinfection of the tap as part of an investigation. The sample bottle must not be rinsed out before filling.
- (b) **Pre-flush samples** – This sample type is taken prior to any flushing, cleansing or disinfection of the tap at a random point in any 24 hour period. Samples of this type may be accompanied by a swab if the sample is being taken for investigative purposes to determine biofilm, growth within fittings. In these instances the swab must be taken before cleaning/cleansing the tap and the taking of any other samples.

N.B. swabs need to be moistened to effectively pick up material and to maintain viability of organisms. Usually the tap has some residual water from its last use, if not, it can be opened just enough to wet the end of the tap.

Samples for chemical analysis must be taken next followed by microbiological samples during which water loss must be kept to an absolute minimum. Pre-flush samples would include those taken for plumbing metals, such as lead, copper and zinc. The results of which can be compared with post flush samples for the same parameters. Samples for chemical analysis must be taken next followed by microbiological samples.

- (c) **Post flush, and post flush/tap disinfection samples** – Samples of this type are taken after a tap has been prepared in the manner described in Section 7.2 of this manual. Most chemical and microbiological samples for regulatory purposes are of this sample type.

- (d) **Lead stagnation samples** – samples of this type are collected for investigative purposes to measure the lead content in water after it has been static in lead pipework for a defined period. (See Section 8.5 for procedure).

Section 4 – Sample vessels (bottle types)

The analytical test requirements for any given sample will determine the sample bottle type/s that the sample shall be collected in. Sample vessels (usually termed generically as bottles) vary in shape, size, volume and the material they are made from, the level of their transparency, how they are pre-prepared (in some cases additives/preservatives are added), whether or not they are reusable, and in their cap type and colour. The vessel used must be of the appropriate type for the intended tests. It is important to recognise that the bottle type required for a particular test or set of tests influences the method and sampling technique to be applied.

N.B. Bottles used for the sampling and analysis of private water supplies must, under the ISO/IEC 17024 scheme, be strictly only those supplied by the laboratory service provider. Analysis of samples must be carried out in accordance with the Drinking Water Testing Specification and accredited to BS17025 by UKAS.

A photographic list and its description of all bottle types used by a local authority for the sampling of private water supplies must be appended to this manual and referenced where relevant in relation to its use.

Where relevant, each bottle shall be labelled with an expiry date (use-by) and if necessary with appropriate hazard labels, where it contains preservatives, **(N.B. this is added by the bottle provider before it is issued for use)**. Technical managers must assign individuals to the responsibility of the management of sampling equipment, including sample bottles and their hygienic and secure storage, ensuring relevant health and safety measures are applied. Bottles must be stored in a clean dry environment and locally stored stocks must be managed such that out of date bottles are not inadvertently used. Any out of date sample bottles must be returned to the appropriate bottle provider. No sample bottle must be used if that date has been exceeded.

Where vessels have tamper-proof seals on the lids, these must be checked prior to use to ensure they are undamaged. If they are damaged they should be discarded and returned to the provider.

Section 5 - Preparation of chlorine solutions for tap disinfection

5.1 Introduction

Hypochlorite or chlorine (sodium or calcium) solutions are commonly used as an effective method of disinfecting sample taps, as well as for equipment, clothing, water mains/pipes and fittings. Appropriate health and safety procedures need to be employed when using hypochlorite (or chlorine) solutions. It is recommended that local authorities undertake a risk assessment for using these chemicals and reference the manufacturer's hazard and data sheets or COSHH sheets as part of the risk assessment. Even at low concentrations chlorinated water can kill fish and cause environmental pollution, if discharged to watercourses. It is therefore essential to plan how best to dispose of chlorinated solutions to the environment. See below. (E.g. diluted and discharged to the foul sewer via a sink or toilet).

- a) Commercial hypochlorite (sodium) solution is a caustic solution containing between 10% and 15% available chlorine when new.
- b) "Rapid release" chlorine tablets are rapidly dissolving and when used in a known volume of water, provide a simple and effective means of preparing chlorine solutions of known strength, for disinfection purposes approved for use with wholesome water. They are best used for making up small quantities of solution.

When using 'rapid release' chlorine tablets it is necessary to consider the different types/sizes of tablet available on the market, and the strength of solution that will be produced. Refer to the manufacturer's instructions/guidance notes.

The chlorine solution must be prepared to the concentration of 10,000 mg/L at the start of the sampling day. All solutions made from tablets need to be used on the day of preparation. The date, description and concentration of the solution must be clearly displayed on the container together with any hazard labels. [Instruction for preparation of this solution must be included in the sampling procedures, including the make/type/size/concentration of product used]

Disposal of small amounts of excess hypochlorite solution must be to a public foul sewer via a sink and flushed with copious amounts of clean water.

N.B. This method of disposal is not suitable for use with septic tanks or cess pits. In this situation, septic tank manufacturer's instructions should be followed.

These solutions cannot be allowed to enter watercourses or surface water drains. All local and manufacturers' health and safety precautions must be applied during the preparation of the solution.

5.2 Personal protective equipment (PPE)

Goggles, nitrile gloves, and appropriate work-wear i.e. coveralls, work trousers and long sleeved top need to be worn at all times when mixing and applying the chlorine

disinfectant solution. At NO time is bare skin to be exposed to the chlorine disinfectant solution/spray.

This PPE is in addition to any other PPE specified in local arrangements. All other applicable local health and safety measures must be observed.

Section 6 – Order of sampling

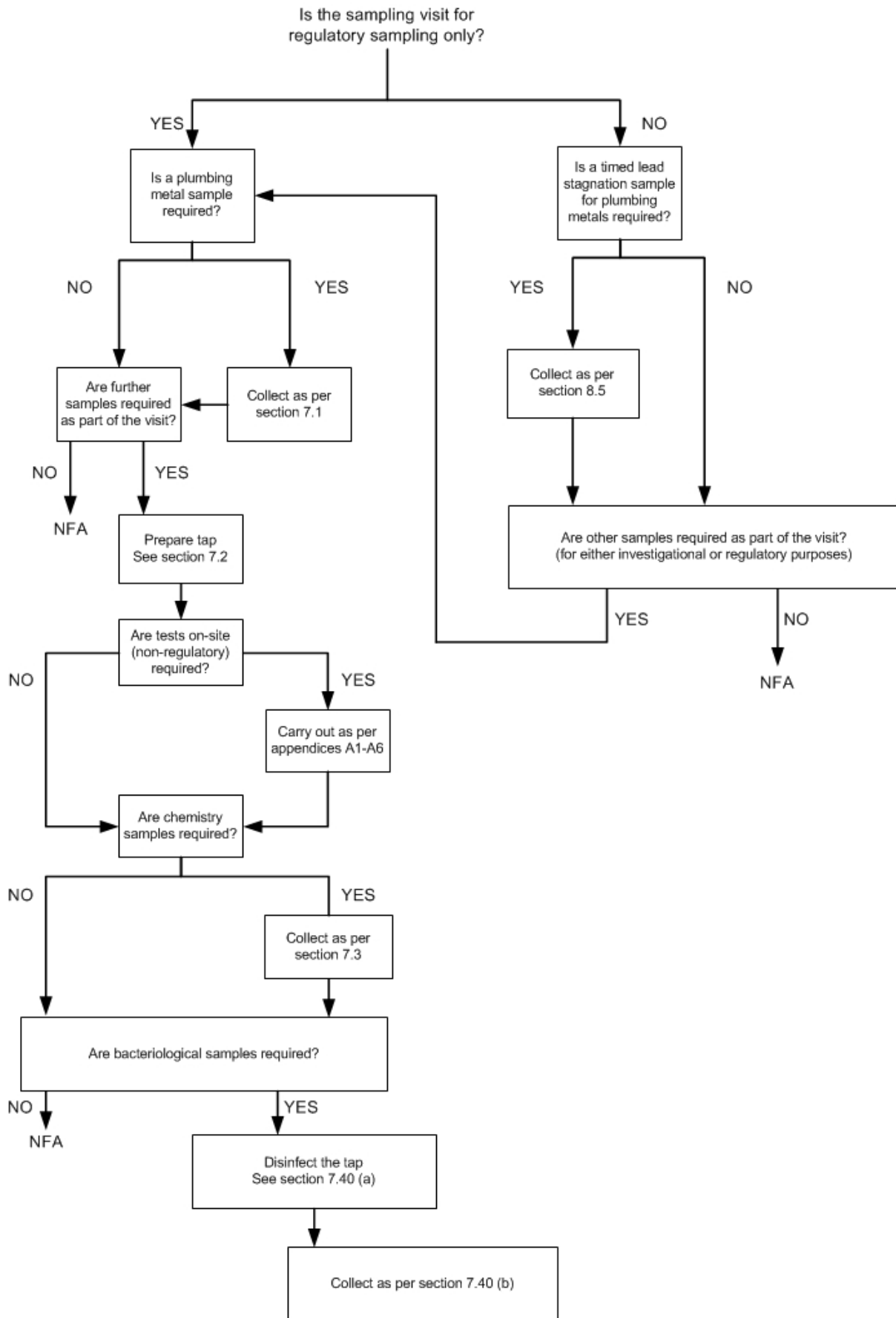
Sampling in the correct order is an essential and integral part of sampling methodology and ensures that samples are representative of their source. The first bottle to be filled within this sequence shall be determined by the analytical requirements of the sample (which can comprise a collection of different sample bottle types for a range of analysis) and shall be collected in accordance with the methods shown in Section 7. In most cases the procedure would commence at point 3 in the sequence. The correct order of sampling is shown in Figure 2.

All sample vessels shall be labelled in advance of the following steps to avoid inadvertent mislabelling and sample mix ups prior to analysis. Labels should be clear, unambiguous and durable. Only those bottles for one sample event should be labelled at any time to avoid filling the bottle for the wrong site.

1. Plumbing metals, or other pre-flush samples or stagnation samples, including swabs for investigational purposes as required
2. Plumbing metals (regulatory)
3. Preparation of the tap, including flushing
4. [On site tests*]
5. After flush chemistry samples
6. Disinfection of the tap
7. Microbiological samples

*On-site testing should be applied at this point in the sequence of sampling. Chlorine residual readings should be taken at this point, only where the water is chlorinated. On site tests include temperature, taste, odour and appearance. It should be noted however that it is not a requirement for samplers to demonstrate competency in on-site testing as part of the ISO/IEC 17024 scheme.

Figure 2: Flow diagram showing order of sampling



Section 7 – Sampling methods

The sampling methods in this section are described in the order sample types are required to be taken. Failure to adhere to these methods could result in sample results being inaccurate, requiring further sampling and investigation at unnecessary expense to the consumer.

N.B. where timed actions are required, time should be measured using a suitable digital instrument e.g. a stopwatch. Time durations must not be estimated.

All procedures must be carried out by trained and certified personnel only (See Scope).

7.1 Plumbing metals (lead, copper, zinc, nickel)

The method of collection of a sample for plumbing metals shall be determined in the first instance by its *purpose (i.e. whether for regulatory monitoring or investigational purposes)*. This in turn will determine where in the order of sampling it is taken.

If a timed investigational stagnation sample for plumbing metals is required, it must be taken prior to any other sample type with the exception of an unflushed metals sample. This shall be collected in the manner shown in Section 8.5.

Regulatory samples shall be collected first and as follows. The sample bottle must be plastic and sufficient in volume to contain the first 1 L of water taken from the tap.

- Fill the bottle *before any cleaning or flushing of the tap*.
- Do not rinse the bottle first.
- Collect the first litre of water from the tap.

7.2 Tap preparation and checks

- Ensure that correct property is being sampled, as well as correct location within the property.
- Ensure that the tap type and condition is likely to provide a sample that is representative of the supply. If the tap has a leaky spindle consider using another tap, if available. Avoid outside taps. Record any observations where representativeness might be compromised, e.g. unhygienic surroundings, attachments/anti-splash devices in use. Record if the tap sampled has a leaky spindle and this should be taken into account when investigating microbiological failures.
- Check for, and record any in-line filters, point of use devices or softeners
- Remove anti-splash devices or rubber hoses etc.

- Clean the outside of the tap with 70% isopropyl alcohol wipe to remove any debris, grease or other potential sample contaminants.
- Turn the tap on and if any unflushed sample is required, adjust the flow to a steady stream, ensuring that the water flows directly into the bottle, without it over-spilling the rim of the vessel. Run for a minimum of two minutes.
- Run further if necessary until the temperature stabilizes.
- Where the supply is chlorinated, take an on-site test measurement at the start and at the end of sampling to verify that the concentration has not changed (See Appendix A3).
- When collecting samples place the required various bottles under the tap without closing and reopening the tap.
- Once the sample has been collected undertake a visual check and record anything unusual about the sample such as colour or the presence of particulate matter.

7.3 Chemistry

Note that this section may need to be amended by a sampler in conjunction with the accredited laboratory performing the analysis to ensure that sample collection and transport is consistent with the accredited analytical method. Chemistry sampling methods can be variable, and while the methods described in this section are the most common, the sampler should check with the laboratory and amend in accordance with the accredited method.

The method for taking a sample for a particular chemistry parameter or group of parameters selected for that supply will largely be determined by the sample bottle type used (for the reasons shown in Section 4). Container cap colours and types will also vary according to the laboratory supplier. The scope of vessels used by a sampler for taking private water supply samples must be appended locally to its version of this manual.

N.B. The following procedures prescribe the methods for using a stated sample bottle type for a particular parameter or set of parameters. Where an alternative bottle type and/or method are used locally by a sampler the procedure shall be amended and the bottle type list appended accordingly.

7.31 Metals other than mercury and plumbing metals¹

- Rinse out the bottle and the cap twice and fill the bottle of the container to the level specified by the test laboratory.
- Replace the lid
- Place the sample in the bottle carrier and transport to vehicle.

7.32 Pesticide samples

If using a 1 L amber glass PTFE lined screw cap bottle fill the bottle to the bottom of the thread and replace the cap. Do not rinse first. These are usually used for organics GCMS analysis.

If using a 2 L glass bottle, rinse the bottle and cap twice with water from the tap, then fill the bottle to the bottom of the thread and replace the cap.

If using a 1 L plastic bottle with additive, fill the bottle to the bottom of the thread and replace the cap WITHOUT RINSING the bottle first.

Place the sample in the bottle carrier and transport to vehicle.

7.33 Trihalomethanes (THMS) samples

DO NOT RINSE THE BOTTLE PRIOR TO USE

- Set the tap to a gentle flow
- Using bottle type X (which contains thiosulphate), run the water from the tap down the inside of it, avoiding any entrapment of air bubbles.
- Fill the bottle completely so that there is no air gap when the bottle stopper is replaced, also avoiding any overflow that could lead to loss of preservative. Top the bottle up if necessary.
- Replace the stopper.
- Place the sample in the bottle carrier and transport to vehicle

Transport the bottle in a refrigerated unit to ensure the sample is kept chilled and not exposed to sunlight.

7.34 Polyaromatic hydrocarbons (PAH) samples

If using a 500 ml amber glass container DO NOT RINSE THE BOTTLE PRIOR TO USE **[N.B. it may contain isopropanol or another preservative]**

- Fill the bottle until it is about a third full and replace the cap
- Invert the bottle gently twice to mix in the additive.
- Loosen the cap and leave the bottle to stand until bubbles of gas stop rising.

¹ These will include lead, copper, nickel and zinc

- Completely fill the bottle and leave it to stand until bubbles of gas stop rising.
- Ensure there is no air space (top up the bottle if necessary) at the top of the sample, replace the cap.
- Place the sample in the bottle carrier and transport to vehicle.

7.35 Mercury and alpha and beta samples

If using a 1 L clear plastic bottle **DO NOT RINSE THE BOTTLE PRIOR TO USE**

- Fill the bottle to the bottom of the thread and replace the cap.
- Place the sample in the bottle carrier and transport to vehicle.

7.36 Sulphide samples

If using a 25 ml clear glass bottle **DO NOT RINSE THE BOTTLE PRIOR TO USE**

- Using bottle, fill from the tap to the brim of the bottle.
- Replace the cap.
- Shake the bottle to mix
- Place the sample in the bottle carrier and transport to vehicle.

7.37 General chemistry samples

These samples include those for **pH, colour, conductivity, and turbidity**

- If using a 1L clear plastic bottle type, fill the bottle in accordance with laboratory instructions.
- Replace the cap
- Place the sample in the bottle carrier and transport it to the vehicle.

N.B. For Laboratory taste and odour (see Section 7.39), total organic carbon (TOC), cyanide, phenol and hydrocarbons the bottle should be filled completely.

7.38 Radon sampling

Radon occurs in water as a dissolved gas and any agitation of the sample may cause losses to atmosphere. It is therefore important that samples are taken directly into the aluminium bottle supplied. The Drinking Water Directive requires that a hose is attached to the tap that reaches the bottom of the sample container. The water should be allowed to flow slowly into the sampling container through the hose, to allow the bottle to fill from the bottom up, expelling any air bubbles as it fills. For specific methodology please consult your laboratory provider.

If attaching a hose to the tap is not practical, the following procedure should be followed to obtain a radon sample:

- Open the tap to obtain a slow, continuous flow. Allow the tap to run for a minute before taking the sample but avoid turbulence at the outlet of the tap and on the bottle walls.
- Take and note the temperature of the flowing water.
- Take the sample carefully, allowing the stream of water to flow gently down the wall of sample bottle. Allow the bottle to overfill for approximately two volumes of the bottle.
- Fill the bottle completely (leaving no air gap) in order to avoid the presence of air in the sample but do not allow the container to overflow with turbulence.
- Close the container ensuring the bottle cap is fixed tightly.
- Transfer the samples to a cool box or fridge and ensure the temperature during transit and storage is below the water temperature at the time of sampling until analysed. This is because the solubility of radon varies greatly with temperature.
- Ensure that the sample container is sealed to prevent it being opened during transport and dispatch to the testing laboratory immediately. Analysis must commence within 48 hours of sampling.

7.39 Taste and odour sampling

Collect the sample in a taste and odour bottle as provided by the laboratory for this use (usually a 1 L bottle). Fill the bottle completely so as to avoid headspace or exclude air and avoid exposure to sunlight during transportation to the laboratory.

7.40 Microbiological sampling

Following tap preparation and all relevant chemistry samples, turn off the tap and carry out the following procedures:

(a) Disinfection of tap

N.B. For purposes of best practise this method employs a double disinfection procedure:

- Following flush and completion of any chemical sampling turn tap off.
- Inject or spray a pre-prepared chlorine solution (see Section 5) over and into the tap nozzle using a suitable container product (e.g. spray bottle or wash bottle). Leave the solution for a contact time of two minutes. **(N.B. the make and model of the vessel or container used must be listed in the appended equipment list).**
- Turn on the tap fully for 5-10 seconds prior to adjusting the flow to a steady stream.
- Run for one minute, then turn off the tap.
- Re-apply the disinfectant and leave for a minimum of two minutes.

- Turn on the tap and adjust flow to steady stream.
- Run the tap for a minimum of two minutes.

(b) Bacteriological sampling procedure

(Usually a pre-prepared 500 ml sterilised clear plastic bottle with added sodium thiosulphate):

- Clean hands with antibacterial hand gel / hand wipes. Consider wearing gloves.
- Using the bacterial bottle type shown in the appendix of this manual, hold it near its base and unscrew cap.
- Do not put the cap down. Hold it open end downwards.
- Do NOT rinse the bottle.
- Fill the bottle by holding it under the water stream a slight angle.
- Avoid splashing and fill to the line where the cap meets the bottle so as to leave an air space to allow for expansion during transportation.
- Replace the cap taking care not to touch the inside of the cap or it to come into contact with anything.
- Tighten the cap and invert.
- Transfer to and transport in a refrigerated unit or cool box.

Section 8 – Investigational sampling

This section includes the methods for the collection of samples to comply with Regulation 16 of the Regulations.

8.1 Procedure for sampling from hydrants

- Observing the requirements of relevant local health and safety arrangements, lift the hydrant cover with a suitable levering tool.
- If the pit is flooded such that the outlet is immersed, then bail out the pit using a suitable container e.g. a plastic jug or bucket until the water level is below the outlet by 2.5 cm or more and all debris removed.
- Carefully, and very slowly to avoid hydrostatic shock open the hydrant valve using a key and crow-bar and allow water to enter the pit, but not flood it.
- Shut the valve very slowly to avoid hydrostatic shock and bail out or pump out the pit if necessary to ensure the water level is below the outlet.
- Attach a swan neck to the hydrant outlet and turn on the valve very slowly.

- Flush the water until it runs visually clear, then for a further two minutes, avoiding the risk this might present to bystanders or property. A bucket or pipe can be used to prevent flooding the pit.
- Check for clarity and odour using a clear plastic sample bottle.
- When the water is clear reduce the flow to facilitate sampling.
- Measure the residual free chlorine to determine the base line reading.
- Take any chemistry samples from the swan neck.
- Turn off valve and safely remove swan neck.

If microbiological samples are required, continue as follows:

- If the hydrant pit has become flooded, bail out or pump out the water to at least 2.5 cm below the hydrant outlet.
- Pour approximately 250 ml of a 10,000 mg/L chlorine solution into the hydrant outlet and 250ml of the same solution into the standpipe by holding up in an inverted position. Chlorine tablets may be used to achieve an equivalent concentration.
- Swiftly connect the standpipe to the hydrant outlet.
- Open the hydrant valve slightly to pressurise the standpipe, and then open the tap on the standpipe to ensure the standpipe is fully charged with water. Turn the tap off as soon as water starts to discharge from the tap. Do not flush. Wipe the outside of the tap with an alcohol wipe. Allow the water to stand in the standpipe for at least five minutes under positive pressure.
- Open the tap fully and run the water to waste for at least four minutes, avoiding filling the pit with the discharged water. A four minute flush should be sufficient in most cases, but it would be a sensible precaution to measure the free chlorine before and after disinfection to ensure that it agrees within a certain tolerance (e.g. within 0.1 mg/L).
- Take microbiological sample using procedure described in Section 7.40.
- Take any on site readings, such as temperature, and appearance.
- Remove the standpipe and replace the hydrant lid.

N.B. if the hydrant pit cannot be bailed out or pumped out for any reason, it is therefore not possible to disinfect the outlet by pouring in a chlorine solution. However, the same procedure can be used except that 500 ml of the 10,000 mg/L chlorine solution should be poured into the inverted standpipe prior to the collection of any required microbiological samples using the procedure described in Section 7.40.

8.2 Procedure for sampling raw water from an open water source

This procedure is applicable for taking investigational samples from any open water facility. This includes from rivers and streams, chambers, channels and storage reservoirs (and tanks) where sampling can only be achieved by standing over open water from a height. Samplers should be aware when undertaking microbiological sampling this method poses contamination risks and health and safety hazards.

When sampling at height, all appropriate local health and safety procedures must be adhered to. Disposable gloves must be worn when taking microbiological samples (e.g. large volume samples). Where a risk of falling into open water is a risk always wear a life jacket.

- When working from height, direct filling of sample bottles, other than samples for pathogens and viruses is not to be used. It requires the use of a dipping jug on a pole.
- First find a suitably safe place to take the sample without causing risk of injury. This may be a bridge, platform or jetty.
- Check that the jug is clean, dry and not grossly contaminated.
- Lower the jug and allow it to sink well below the surface. Do not allow the jug to hit the bottom of the tank, channel etc. to avoid disturbance of any sediment or biofilm, etc.
- Draw the jug back. Rinse water around the inner surfaces of the jug and discard the water away from or downstream from the sample point.
- Lower jug as before and draw jug back.
- Fill sample bottles without delay by pouring from the jug, observing any specific requirements of the bottle type. (Any rinsing to be disposed away from or downstream of the sample point).

8.3 Procedure for pathogens and viruses by direct dipping of raw water

Samples shall be collected in the appropriate bottle shown in the local appended bottle list of the sampler's manual. The volume required for pathogen and virus samples will usually be 5 L or 10 L. Either way samples should be collected in the relevant container.

N.B. disposable gloves should be worn for the collection of these samples.

- Lower the container carefully into the water, observing all health and safety precautions and procedures. If the water is flowing then ensure that the opening of the container faces downstream.
- Allow the container to fill.

- Retrieve the container and replace the cap.
- Dry the container and avoid exposure to sunlight as much as possible.
- Dispose of gloves in a suitable receptacle in the vehicle or back at base and wash hands.
- Transfer to and transport in a refrigerated unit or cool box ensuring the samples are separated from all clean and treated water samples.

8.4 Procedure for large volume sampling procedure for treated water (e.g. regulatory sample points)

Samples should be taken by directly filling the container from the tap. If this is not feasible due to the size of the container, then water should be transferred from the tap to the container using a disinfected jug, e.g. one that has been immersed in a chlorine solution of 1000 mg/L chlorine and then rinsed, or other suitable procedure to be documented in the sampling procedure from the laboratory.

8.5 Procedure for lead stagnation sampling

Lead stagnation samples represent the concentration of lead in the sample after the water has been left in contact with pipes for a specified duration (e.g. 30 minutes). This is to assist with determining the level of risk posed by plumbing and any lead pipes and/or fittings.

These samples must be collected at point 2 in the order of sampling shown in Section 6 using a plastic bottle that is at least 1 L in volume.

- Explain to consumer that they will be unable to use the tap for a specified period due to stagnation method.
- The tap must be first flushed for a minimum of two minutes and the temperature checked throughout flushing.
- When the temperature has stabilised turn off the tap.
- Do not turn on the tap for 30 minutes.
- Collect the first litre of water without first rinsing the bottle and then screw on the cap.
- Transfer to and transport in a refrigerated unit or cool box.

Section 9 – Storage and transportation of samples

Samples for microbiological analysis (bacti) and some chemistry samples must be

transferred to a fridge or cool box, which must be maintained at 2-8 °C after being taken, until delivery to the laboratory. The analytical laboratory can advise on any other bottles requiring refrigeration. Where cool boxes are used, a sufficient number of frozen ice packs must be placed within the cool box during the transportation of samples to ensure the temperature remains within the required temperature range.

Complete the “Chain of custody record” using the sampler’s local proforma, a copy of which should be appended to the sampler’s, for each crate of sample bottles to be transferred to the laboratory and place it into the crate.

Crates should then be sealed, to prevent any tampering of samples during transit. (E.g. using cable ties).

The samples must be transferred to the laboratory as soon as practicable on the day of collection, for analysis to commence promptly on arrival, whilst taking into account parameter stability times – ideally within 24 hours. In exceptional circumstances, if there is a delay, store the samples at 2-8 °C in the dark for analysis within eight hours the next day. Samples that do not meet these requirements **may not be processed**. Samples must remain upright at all times whilst in transit. Raw (untreated) waters and samples from the tap taken for regulatory purposes should be segregated to prevent contamination.

All other unrefrigerated samples should be transferred to the laboratory as soon as practicable on the day of collection, for analysis to commence promptly or appropriate preservation. If samples are unable to be received by the laboratory on the day of sampling, they must be stored securely and transported to the laboratory the following morning.

Fridges and cool boxes used for transporting samples must have the temperature checked with a suitable thermometer that is appropriately calibrated (See Appendix A2). The thermometer should be placed into the cool box and the temperature recorded once a stabilised reading is displayed. Where available a data logger is preferred and data should be downloaded on a daily basis and checked to ensure the temperature has been maintained between 2 °C and 8 °C. Cool boxes should be cleaned using a suitable commercial disinfectant product prior to the sampling visit, either on the day or evening before.

Short-lived exceedances of the temperature band below 2 °C and above 8 °C are to be expected as the fridge/cool box is opened. Exceedances lasting over one hour should be noted. These exceedances can be minimised by buffering the thermometer/probe in a small container of liquid to avoid spurious readings such as when the coolbox or fridge is opened to add samples.

When using a fridge thermometer, the temperature must be recorded using a thermometer that records the maximum and minimum temperatures for the period that the samples are stored and transported by the sampler. The temperature must be noted on the sampler’s daily record sheet. Any recordings outside of the range 2-8 °C should be notified to the laboratory quality control manager, so that corrective action can be taken.

Where the samples are transported to the laboratory by a courier, the temperature of the courier fridge and depot fridge must be recorded on a record sheet. An example of a record sheet can be found in Appendix A8. Arrangements must be made for the courier to deliver the samples to the laboratory, as soon as is practicable.

It should be noted that it is a requirement under ISO 5667 Part 3 that accredited laboratories inform samplers about the storage and transportation requirements of samples.

Further details can be found in Section 2 – Maintaining sample integrity.

Appendices

A1. On site testing

It is not a requirement to demonstrate competency in the following procedures. These are provided for guidance only. Note, it is recommended that all instrumentation used for on- site testing is regularly calibrated (see Appendices A2 and A7).

A2. Procedure for temperature readings

Water temperature readings should be taken using a suitable thermometer, according to the manufacturer's instructions. These may vary according to the make and model. The thermometer should have a range between 0 °C and 100 °C and be capable of reading to within 0.1 °C over the range of use.

All digital thermometers should be calibrated as per manufacturer's instructions before they are used. Thereafter they shall be calibrated according to manufacturer's instructions every 12 months. Calibration shall consist of measuring temperature in an ice bath, and in boiling water. Thermometers that do not read 0 °C and 100°C respectively shall be replaced with a new thermometer.

- Take any pre-flush temperature readings for any investigational sampling required.
- Flush the tap for a minimum of three minutes.
- Place a beaker under the tap and run water into it until it overflows
- Turn on the thermometer and immerse the probe into the water in the beaker. Do not immerse above the probe.
- Allow the temperature to stabilise then record the thermometer reading as shown on the unit.
- If the temperature recorded appears abnormally high or low, then repeat the check and record the temperature once it has stabilised.
- Where the temperature remains abnormally high, an investigation should be carried out to determine the cause and extent. Following this the local authority will need to ensure that the relevant persons (as defined in Section 80 of The Water Industry Act 1991) carries out the necessary remedial action to prevent a recurrence and subsequently verifies completion in a timely manner.

A3. Chlorine residual measurements

The measurement of chlorine residual is only applicable where the supply is known or suspected to be disinfected or pre-treated with a chlorine disinfectant, such as sodium hypochlorite.

Methods will vary according to the instructions of the device and manufacturer's model. The manufacturer's instructions must be followed in all cases. The sampler should insert the procedures for the instrument used in accordance with the manufacturer's instructions into this document.

A3.1 NN-Diethyl-p-phenylenediamine (DPD) reagents (DPD)

DPD measures chlorine that is not bound chemically to other compounds ("free" chlorine). The addition of DPD to chlorinated water forms a pink/red colour, which is measurable.

To measure "total" chlorine (i.e. free chlorine and chlorine which has become chemically bound to other components, known as "combined" chlorine), the DPD is used with iodide, which reacts with DPD to give a measurable pink/red colour, proportional to the total chlorine concentration.

N.B. If stored in a clean dry environment liquid DPD has a shelf life of twelve months whilst unopened and one month when opened. The reagent container should be refrigerated once opened. The expiry date of one month from the date of opening must be written on every bottle where it is used, once it has been opened. Discard any liquid DPD bottles which are outside this date. Check that the DPD reagents in use have a legible batch number and expiry date by the manufacturer. Discard any bottles where the batch number or expiry date is illegible.

After flushing the tap for three minutes, carry out the following procedures as required.

A4. Visual appearance

N.B. vessel types for this test may vary and the method should be checked by the laboratory supplier. The procedure should be amended locally as required.

- Take an untreated 1 L taste and odour bottle and rinse the bottle and stopper under the tap twice.
- By holding under a running tap half fill the taste and odour bottle and replace the stopper
- Invert the bottle and shake vigorously
- Hold the bottle up to the light and inspect the contents for any particulates, turbidity/cloudiness or colour.
- Note the appearance of the water.
- Record the results of your observations.

A5. Procedure for field odour test

- After completing the visual test remove the stopper and immediately smell the sample.
- Note and record any abnormal odour or absence of odour.
- Discard the sample unless carrying out a taste test

N.B. If an unusual odour is detected; caution should be applied when proceeding to tasting the water.

A6. Procedure for taste test (optional)

- Pour a small portion of the original odour sample into a beaker and rinse.
- Discard the water in the beaker
- Pour approximately 125 ml of the original odour sample into the beaker. Taste the sample.
- Note and record any abnormal taste, or absence of taste.

A7. Test equipment checks

Test equipment must be checked and calibrated in accordance with manufacturer's instructions in order to ensure equipment remains fit for purpose at all times.

A8. Proformas

The following proformas must be appended to the local authority version of the scheme manual. Those marked * may be adapted locally but must contain the same information as those in the example proformas embed below.

- Manual change request form
- Chain of custody form
- Authorisation to carry out sampling*
- Daily check for vehicle and refrigerated storage
- Sample storage fridge temperature and cleaning record*
- Sample bottle image list and their descriptions (sampler to add their own list)
- Sampler's local equipment list (sampler to add their own list)

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Change request form

Sampler contact name:

Sampler contact email and phone number:

Section of manual that the change refers to (including page number):

Reason for the requested change:

Further details of the requested change to be described below:

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Sample Chain of Custody record

Each crate must be accompanied by only one of these sheets. It must be completed at 2 stages to form a record of the sample handling process from the time at which the crate is sealed at the courier point to when it is unsealed and the samples received at the laboratory.

Crate identity number:

TO BE COMPLETED ON FILLING THE CRATE

Courier point location.....

Name of person loading crate.....

Local authority/organisation name.....

Contact phone number of above.....

Signature of person loading the crate.....

Time crate sealed.....

Date crate sealed.....

No of microbiology samples in crate

No. Chemistry bottle in crate.....

No. of other bottles in crate.....

TOTAL No. BOTTLES.....

On the reverse of this sheet write the identification numbers of the samples placed in the crate accompanied by this sheet (or stick on labels with the identification numbers)

2. TO BE COMPLETED ON ARRIVAL AT LABORATORY

Date samples arrived at sample reception.....

Time samples arrived at sample reception.....

Name of laboratory.....

Samples registered by (insert name).....

I confirm that [] bottles (insert total no.) have been received, and that the sample identification numbers correspond to those on the reverse of this sheet.

No. bottles broken or missing.....

Signature of the above named

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AUTHORISATION TO CARRY OUT SAMPLING	
Name of sampler	
Post	
Date of Appointment	
Present location and date	
Date of training	
Date of assessment by Certification Body	
Sample procedures manual number and issue date	
<p>Technical Manager Declaration</p> <p>I confirm this person has undergone a full training/ review/ audit (delete as appropriate) and I authorise this person to carry out the statutory and or operational/commercial sampling on behalf of the local authority. I also confirm that I have provided the tools, equipment and PPE required for sampling in accordance with the procedures in this manual</p> <p>Technical Manager signature and date</p>	

17 th						
18 th						
19 th						
20 th						
21 st						
22 nd						
23 rd						
24 th						
25 th						
26 th						
27 th						
28 th						
29 th						
30 th						
31 st						

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Sample storage fridge temperature and cleaning record									
Site									
Month		Year							
Thermometer Type/No.		Fridge type/ no.							
Thermometer working range		2-8 °C							
Date	Start Time	Start Temp °C	Fridge/storage (cleaned/not cleaned)	Initial	End Time	Maximum and minimum temp °C	Temp in range 2 to 8 °C? (Y/N)	Initial	
1st									
2nd									
3rd									
4th									
5th									
6th									
7th									
8th									
9th									
10th									
11th									
12th									
13th									

14th									
15th									
16th									
17th									
18th									
19th									
20th									
21st									
22nd									
23rd									
24th									
25th									
26th									
27th									
28th									
29th									
30th									
31st									

On days where fridge/storage is not used start/end times should be recorded as "n/a"

<u>Comments</u>

The following proformas are provided as examples only. It is not a requirement of the BS 17024 scheme that these are appended to the local authority version of the scheme manual.

- Calibration record for hand held Chlorometer
- Daily check for hand held Chlorometer
- Calibration record for field thermometer
- Calibration record for reference thermometer
- Daily check for hand held instrumentation
- Calibration record for primary thermometer

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Calibration record for hand held Chlorometer			
Instrument name (in full):			
Meter Serial/Equipment No.			
Date of Calibration:			
Reason for Calibration			
Calibration Standard type and batch no.			
1 st standard value (low)			
2 nd standard value (medium)		Recorded value on instrument	
3 rd standard value (high)		Recorded value on instrument	
Calibration successful? Y/N		Recorded value on instrument	
Checked against standard			
Comments:		Within acceptable range? Y/N	
Date of Calibration:			
Reason for Calibration			
Calibration Standard type and batch no.			
1 st standard value (low)			
2 nd standard value (medium)			
3 rd standard value (high)		Recorded value on instrument	
Calibration successful? Y/N		Recorded value on instrument	
Checked against standard		Recorded value on instrument	
Comments:			
		Within acceptable range? Y/N	
Date of Calibration:			

Reason for Calibration			
Calibration Standard type and batch no.			
1 st standard value (low)			
2 nd standard value (medium)		Recorded value on instrument	
3 rd standard value (high)		Recorded value on instrument	
Calibration successful? Y/N		Recorded value on instrument	
Checked against standard			
Comments:		Within acceptable range? Y/N	
Note: Instruments should be calibrated according to manufacturer's instructions			

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Daily check for hand held Chlorometer

Instrument name (in full):	
Meter Serial/Equipment No.	
Standard used	
Batch number	
Target value, limits and units	
Date of last calibration	
Date of next calibration	

Date	Instrument reading	Within Acceptable Range? (Yes/No)	Initial	Comments	Date	Instrument reading	Within Acceptable Range? (Yes/No)	Initial	Comments
1 st					17 th				
2 nd					18 th				
3 rd					19 th				
4 th					20 th				
5 th					21 st				
6 th					22 nd				
7 th					23 rd				
8 th					24 th				
9 th					25 th				
10 th					26 th				
11 th					27 th				
12 th					28 th				
13 th					29 th				
14 th					30 th				
15 th					31 st				
16 th									

Note: This is only to be filled in on days when instrument is used. On days when not being used record "n/a" against date. Manufacturer's instructions for calibration must be followed.

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Calibration record for reference thermometer		
Reference Thermometer		
Type and serial No.		
Frequency of calibration		
Required tolerance		
Date of calibration	Calibrated by	Comments (including whether the required tolerance was met)
<p>Note: It is expected that the reference thermometer will be sent for external calibration by an accredited calibration laboratory and used as a reference to calibrate thermometers used in the field.</p>		

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Daily check for hand held instrumentation

Instrument name (in full):	
Meter Serial/Equipment No.	
Standard used	
Batch number	
Standard measurement and unit	
Date of last calibration	
Date of next calibration	

Date	Instrument reading	Within acceptable range? (Yes/No)	Initial	Comments	Date	Instrument reading	Within acceptable range? (Yes/No)	Initial	Comments
1 st					17 th				
2 nd					18 th				
3 rd					19 th				
4 th					20 th				
5 th					21 st				
6 th					22 nd				
7 th					23 rd				
8 th					24 th				
9 th					25 th				
10 th					26 th				
11 th					27 th				
12 th					28 th				
13 th					29 th				
14 th					30 th				
15 th					31 st				
16 th									

Note: This is only to be filled in on days when instrument is used. On days when not being used record "n/a" against date. Manufacturer's instructions for calibration must be followed.

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Calibration record for primary thermometer		
Primary Thermometer		
Type and serial No.		
Frequency of calibration		
Date of calibration	Calibrated by	Comments
<p>Note: It is expected that the primary thermometer will be sent for external calibration annually and used as a reference to calibrate thermometers used in the field.</p>		