NHS National Services Scotland

Water Safety Guidance

Scottish Health Technical Memorandum

Part C - Microbiological testing

SHTM 04-01 part C

Draft 2.09 - March 2026.

Contents

Executive Summary

Scottish Health Technical Memorandum (SHTM) 04-01 “Water safety guidance” is published in seven parts:

- part A: Design, installation, and commissioning
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- part D: Disinfection of domestic water systems
- part E: Alternative materials and filtration
- part F: Chloramination of water supplies
- part G: Operational procedures and Exemplar Water Safety Plan

The documents give comprehensive advice and guidance on the legal requirements, design implications, maintenance, and operation of safe water systems in healthcare premises. The use of these premises is very intense, the occupancy level high and the patients may be particularly susceptible to waterborne infection risks. Their condition may also require close control of the clinical and built environment.

This 2026 SHTM suite draws together developments and updates from the previous guidance, including recommendations for the safe management of water systems, via the integration of the principle of Water Safety Groups (WSGs) and Water Safety Plans (WSPs) and how to manage and minimise the risks to health from various aspects, ranging from clinical risks, microbial and chemical contamination, changes to the water system, resilience of the water supply and so on. It also introduces a stronger emphasis on staff competencies and the implementation of water hygiene awareness training.

There has been increasing evidence that the interaction of water supply and above ground drainage can each give rise to problems where the design and/ or operation is poorly configured. Therefore, a brief section on above ground drainage design has been included in this version.

Information regarding the mechanisms for compliance with the Scottish Water Byelaws are also discussed.

This 2026 version of SHTM 04-01 supersedes all previous versions of SHTM 04-01 “Water Safety for Healthcare Premises”.

Guidance in this SHTM applies to all healthcare facilities containing domestic water and above ground drainage systems.

Language used in technical guidance

In SHTMs verbs such as “must”, “should” and “may” are used to convey notions of obligation, recommendation or permission. The choice of modal verb will reflect the level of obligation needed to be compliant.

The following describes the implications and use of these modal verbs in SHTMs (readers should note that these meanings may differ from those of industry standards and legal documents):

A. “Must” is used when indicating compliance with the law

B. “Should” is used to indicate a recommendation (not mandatory/ obligatory), for example among several possibilities or methods, one is recommended as being particularly suitable - without excluding other possibilities or methods

C. “May” is used for permission, for example to indicate a course of action permissible within the limits of the SHTM

D. “Shall”, in the obligatory sense of the word, is never used in current SHTMs

Typical usage examples

A. “All water fittings used in the construction of systems referred to in this SHTM must comply with the requirements of the Water Supply (Water Fittings) (Scotland) Byelaws 2014.” [obligation]

B. “Waterborne bacteria should be considered during the design, construction, installation, commissioning and maintenance of the hot and cold water systems and above ground drainage system in the healthcare-built environment,” [recommendation]

C. “There are also other waterborne bacteria acknowledged to be in the water systems that may require further supplementary management practices to control)” [permission]

Project derogations from the Technical Guidance

Healthcare facilities built for the NHS are expected to support the provision of high-quality healthcare and ensure the NHS Constitution right to a clean, safe and secure environment. It is therefore critical that they are designed and constructed in accordance with appropriate technical standards and guidance. This applies to all new and refurbishment projects, regardless of procurement model.

Note 1: The healthcare organisation, and their project teams, should ensure that they have a fully documented list of technical standards and guidance that are applicable to the specific project

It is recommended that the starting point for all projects should be one of full adherence to the SHTM guidance or better if that can be demonstrated. While it is recognised that derogations may be required in some cases, these must all be risk-assessed and documented in order that they may be considered within a structured derogation review and approval process. In all instances derogations must not compromise the health and safety or operational resilience of the healthcare facility. Healthcare organisations should ensure that any derogations do not impact on their legal or statutory obligations.

Derogations must be properly authorised by the project's senior responsible officer and informed and supported by appropriate technical advice including that of the WSG, irrespective of a project's internal or external approval processes.

A schedule of derogations should be created for any project, including details of approvals, risk assessment and identified mitigations.

Note 2: This guidance does not alter the healthcare organisations legal or statutory obligations.

NHS Scotland Sustainable Development Policy Drivers

Responding to the global climate emergency is one of the Scottish Government's highest priorities. Sustainable development, the concept that the needs of the present must be met "without compromising the ability of future generations to meet their own needs" is integral to the Scottish Government's overall purpose. The Scottish Government's National Performance Framework (NPF) shares the same aims as the United Nations' Sustainable Development Goals. It highlights the need for a 'whole system approach' to successfully deliver the NPF's national outcomes for Health and recognises the important role that NHS Scotland has in helping to achieve this.

Over recent years the current and future impact of climate change has been well documented, with risks to human health and to health and social care delivery highlighted within Scotland's summary report of the UK Climate Risk Independent Assessment*. NHS Scotland is committed to the delivery of a high quality, environmentally and socially sustainable health service that is resilient to the locked-in impacts of climate change. Director Letter (DL) (2021) 38 'A Policy for NHS Scotland on the Climate Emergency and Sustainable Development' provides the framework for this aim to become a reality, and to maximise NHS Scotland's contribution to mitigating and limiting the effect of the global climate emergency.

* NHS Scotland Climate Change Risk Assessments and Adaptation Plans: A Summary Report on the National Services Scotland (NSS) website.

Who should read this guidance?

This document is aimed at specifiers, designers, suppliers, installers, commissioners, WSGs, estates and facilities managers and operations, and Infection Prevention and Control Teams (IPCTs). Elements of the document will also be relevant to managers concerned with the day-to-day management of healthcare facilities and senior healthcare management. Infection prevention specialists who are involved with monitoring water quality and managing infections and outbreaks potentially linked to water supplies will also find it helpful to be familiar with this guidance.

Main changes since the 2014 suite

- This 2026 edition of SHTM 04-01 provides comprehensive guidance on measures to control waterborne pathogens.
- This edition has been updated to align with the Health and Safety Executive's (HSE's) revised Approved Code of Practice (ACOP) for Legionella (L8) and its associated Health and Safety Guidance (HSG) 274 guidance documents.
- A new chapter on above ground drainage has been added to SHTM 04-01 Part A.
- New guidance has been included in SHTM 04-01 Part A on the hygienic storing and installation of fittings and components and on the competency of installers/ plumbers working on healthcare water systems. The guidance also outlines that any person working on water distribution systems or cleaning water outlets needs to have completed a water hygiene awareness training course.
- Information is discussed in relation to compliance with the Scottish Water Byelaws in SHTM 04-01 Part A.
- SHTM 04-01 Part A and Part E now outlines requests for pipework manufacturers data sheets regarding the product limitations.
- Part B of the SHTM 04-01 now includes updated guidance on the remit and aims of the WSG.
- SHTM 04-01 Part B now includes information on Nontuberculous mycobacteria (NTM).
- Guidance on sampling techniques for, testing for, and the microbiological examination of *Pseudomonas aeruginosa* samples - originally in the Health Technical Memorandum (HTM) 04- 01 Addendum - is now included in SHTM Part C to complement the Total Viable Count (TVC) guidance.
- Whilst SHTM 04-01 Part G provides updated guidance on the WSP and in addition to the 2014 sample templates includes several more.

While some guidance on other water- service applications is included, it is not intended to cover them fully. For example:

- process waters used for laundries, see HTM 01-04 - ‘Decontamination of linen in health and social care’
- endoscopy units, see HTM 01-06 - ‘Decontamination of flexible endoscopes’
- primary care dental premises, see HTM 01-05 Decontamination in primary care dental facilities
- renal units, see Health Building Note (HBN) 07-01 and HBN 07-02, the Renal Association's guidelines and ISO 13959 and 11663
- sterile services departments (SSDs), see Scottish Health Planning Note (SHPN) 13 - Part 1 Decontamination Facilities: Central Decontamination Unit
- hydrotherapy pools, see the Pool Water Treatment Advisory Group’s (PWTAG's) ‘Swimming pool water: treatment and quality standards for pools and spas’
- spa pools, the control of legionella and other infectious agents in spa-pool systems HSG282
- birthing pools, see HBN 21 - ‘Maternity’ and PWTAG’s ‘Swimming pool water: treatment and quality standards for pools and spas’

Acknowledgements

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NHS Scotland Assure would like to thank the National Water Services Advisory Group (NWSAG), Scottish Engineering and Technology Advisory Group (SETAG) and colleagues from Antimicrobial Resistance and Healthcare Associated Infection Scotland (ARHAI) for their contributions and efforts to the production of the SHTM suite revision.

NHS Scotland Assure would also like to thank those who took the time to comment and send feedback during the scoping and technical engagement phases of this document.

NHS Scotland Assure acknowledge contributions from those individuals and organisations involved in the development and publication of previous versions of the SHTM 04-01 suite.

Key personnel involved in the production of this updated document:

- **Thomas Rodger**, Head of Engineering, NHS Scotland Assure
- **Richard Beattie**, Principal Engineering Manager, NHS Scotland Assure
- **Craig Morning**, Senior Engineer, NHS Scotland Assure
- **Jim Wishart**, Senior Engineer, NHS Scotland Assure
- **David Lowe**, Senior Engineer, NHS Scotland Assure
- **Simon Picking**, Head of Hard FM/Engineering, NHS England
- **Fiona Hammond**, Infection Prevention and Control Nurse Consultant, NHS England
- **John Scott**, Infection Prevention and Control Lead Healthcare Scientist, NHS England
- **Girish Mistry**, Water Scientific
- **Gavin Wood**, Hydrop
- **Harry Evans**, HDEAE
- **Andrew Mould**, NHS Associate Director of Operational Estates University Hospitals Birmingham, NHS Foundation Trust
- **Andrew Hallam**, NHS Deputy Head of Estates Leeds Teaching Hospitals, NHS Trust
- **Robert Baker**, NHS Wales Principal Mechanical Engineer, NHS Wales Shared Services Partnership
- **David Wilson**, Department of Health, Northern Ireland

1. Introduction

General

1.1. The Health and Social Care Act places a duty of care on healthcare providers as well as the Health and Safety at Work Act 1974. Increased health risks to patients, staff and visitors can occur if the water system does not achieve and maintain the required standards. To maintain these standards there are multiple statutory and guidance documents (such as this Scottish Health Technical Memorandum (SHTM) 04 01 suite) available for the design, installation, commissioning and operation of the water system. As a system failure may expose people to unacceptable levels of risk. Breaches of statutory requirements can result in prosecution and may also give rise to a civil suit against the operators.

1.2. As with the other SHTM 04-01 suite of documents the theme of a holistic management approach to the water systems via Water Safety Groups (WSGs), Water Safety Plans (WSPs) and other initiatives are discussed. This current review and update of SHTM 04-01 Part C is split into three distinct sections. The first section covers Total Viable Count (TVC) testing, the second legionella testing, whilst the third section discusses testing for *Pseudomonas aeruginosa* and other waterborne pathogens such as Nontuberculous mycobacteria (NTMs).

1.3. Other waterborne microbial testing may also be considered upon input from the Healthcare Organisations microbiologist and Infection Prevention and Control Teams (IPCTs) but is outside the scope of this document. For healthcare organisations that want to test for less common pathogens without an industry methodology. Antimicrobial Resistance and Healthcare Associated Infection (ARHAI) have developed and published the following: “Development and evaluation of test methods for the detection and enumeration of opportunistic waterborne pathogens from the hospital environment” - Journal of Hospital Infection 149 (2024) 98-103. Healthcare organisations can contact ARHAI for any further assistance. Sampling should be informed by a clinical risk assessment in collaboration with a project team and WSG. This should include, (not an exhaustive list) patient group, patient exposure risk, microbial organisms of concern, microbial growth factors and so on. This risk assessment should be started at the early design stages and kept as a live document within the healthcare facilities WSP.

1.4. Reference should be made to National Infection Prevention and Control Manual (NIPCM) Appendix 13 which provides a minimum alert organisms list, for further advice please refer to ARHAI. The NIPCM Appendix 14 also includes the Healthcare Infection Incident Assessment Tool (HIIAT), this should be used by the IPCT or Health Protection Team (HPT) to assess every healthcare infection incident. For further advice refer to ARHAI.

Aim of this guidance

1.5. The current review and update of SHTM 04-01 is intended to move users of the document towards a holistic management of water systems via WSGs, WSPs and other initiatives. This is especially important when we consider the additional risks of delayed handovers and poor installation techniques.

1.6. It has been written to promote good practice for those responsible for the design, specification, installation, commissioning, operation and maintenance of water services in healthcare premises, by:

- highlighting the need for robust governance and management
- outlining the remit of the WSG and how this relates to the provision of safe water in healthcare premises
- outlining key criteria and system arrangements to help stop the ingress, colonisation and growth of opportunistic microbial waterborne pathogens, emerging human pathogens including NTM, and the ingress of chemical contaminants
- identifying temperature regimes for water systems
- ensuring the safe delivery of hot water
- outlining how the correct selection of system components and correct use by occupants can help preserve the quality and hygiene of water supplies
- providing a point of reference to legislation, standards and other guidance pertaining to water systems
- providing a basic overview of possible potential waterborne pathogens
- giving an overview of some of the different water systems (including components) and their safe installation, commissioning and operation and maintenance
- providing typical system layouts and individual component location
- providing information on thermostatic mixing valve (TMV) configurations, appropriate usage and maintenance requirements
- identifying key commissioning, testing and maintenance requirements for referral by designers, installers, operators and management
- identifying key commissioning, testing and maintenance requirements for referral by designers, installers, commissioners, operators and management

1.7. The SHTM 04-01 guidance gives comprehensive guidance on measures to control waterborne pathogens. While Legionella colonisation and growth is, in the main, associated with poor engineering configuration, operation and maintenance, with limited evidence of patient- to-patient or patient-to-outlet transfer. However, *pseudomonas aeruginosa* can colonise skin of healthy individuals without causing infection. *Pseudomonas aeruginosa* may be transferred from person-to-person, person to and from outlets and from splash contamination of the surrounding environment from both patients and staff. Suspected P*seudomonas aeruginosa* waterborne infections require clinical surveillance and additional investigations to determine the source and interventions from infection control specialists and microbiologists. Whilst temperature control is the traditional strategy to minimise the risk from Legionella, managing the risk from *pseudomonas aeruginosa* requires a multifactorial approach.

1.8. As with all control measures, temperatures should be monitored at regular intervals to verify effective control. Because of the complexity of hot and cold water distribution systems and the difficulty of maintaining a temperature control regime in some healthcare facilities, this guidance suggests that additional chemical, physical and other water control methods that have been shown to be capable of controlling microbial colonisation and growth may also be considered.

2. General microbiological sampling in hot and cold water systems

2.1. Samples should be tested by a United Kingdom Accreditation Service (UKAS) accredited laboratory for the isolation of the intended bacteria from water samples provided. Where there are no defined UKAS standard or circumstances dictate the need to use a laboratory without the necessary accreditation, then this should be agreed by the consultant microbiologist and the Water Safety Group (WSG) in advance of any samples being collected.

2.2. In general, and as directed by the WSG, the circumstances under which samples should be taken could be:

- prior to alterations to an existing water system
- as part of commissioning process, prior to handover of a new building or introduction of a (altered, refurbished or new) water system into use
- one week following handover of a new building or new water system
- as part of the tank cleaning and disinfection process
- as part of a risk assessment programme
- routine quality control testing for total viable counts (TVCs) is only considered to be necessary (where there are taste, odour or sustained discoloured water complaints). However, routine sampling should be considered as an indicator in identifying potential problems, refer to clause 3.5 for further guidance
- as part of a targeted water sampling plan in specific areas following risk assessment (for example in areas where high-risk patient groups receive care)
- where there are hydrotherapy and/ or birthing pools
- in response to an incident/ outbreak

Refer to National Infection Prevention and Control Manual (NIPCM) for further guidance.

2.3. The sampling points should be selected by the WSG on the basis of documented risk assessments relating to system configuration or patient susceptibility to create the water sampling plan for each building. The sampling points should be cross referenced with NIPCM chapter 4.1.7 ‘selection of outlets for sampling’. This sampling plan will define the specific locations within each system where samples will be collected, sampling locations should be marked up on up to date “As Fitted” drawings and allocated a unique reference number (in line with the asset register); along with the suite of testing to be undertaken, the frequency and who is responsible for collecting and processing these samples. The following is a list of potential places where samples could be taken from (list not exhaustive):

- incoming main, close to meter, where facilities exist to do so

- inlet and outlet at cold water storage tanks
- possible stagnant areas within tanks pending rectification of any identified problem
- calorifier outlet or nearest hot water tap to calorifier
- return to calorifier
- most distant hot water tap from calorifier (enough taps to represent all major loops)
- most distant cold water tap from each cold distribution system (such as sentinel outlets)
- beginning and mid-point of hot and cold water distribution systems (representative locations)
- special supplies to kitchens, pharmacies, and so on
- typical samples from closed heating or chilled circulating water
- other areas identified within the Water Safety Plan (WSP)

2.4. For testing samples for Coliforms, Escherichia coli, *pseudomonas aeruginosa*, Aerobic Colony Counts (ACCs) and Environmental Mycobacteria, a sterile 500ml (or other volume as agreed with the laboratory undertaking the tests and with the approval of the WSG) plastic bottle should be used containing a pre-dosed standard volume of neutraliser to neutralise any residual disinfectant in the water. Samples to test for legionella pneumophila should be collected in a sterile 1 litre (or other volume as agreed with the laboratory undertaking the tests and with the approval of the WSG) plastic bottle containing a pre-dosed standard volume of neutraliser to neutralise any residual disinfectant in the water. Each bottle should contain water from one location only and should not be a mix of hot and cold water unless taken from an outlet supplied by a Thermostatic Mixing Valve (TMV)/ Thermostatic Mixing Tap (TMT)/ manual mixer tap or other taps where the hot and cold are supplied through the same spout.

Note 3: The most commonly used neutraliser, which is appropriate for chlorinated water systems and those using ozone or hydrogen peroxide, is sodium thiosulphate. For mains water and hydrotherapy pools, 18 mg/litre sodium thiosulphate should be added. If alternative disinfection methods are used, the laboratory should be contacted to obtain the appropriate neutraliser, if one is available. If biocides are likely to be present in the sample that cannot be neutralised (particularly non-oxidizing biocides), this information should be recorded, and the transport and storage times kept to a minimum. Laboratories should be notified as soon as practicable to ensure that analysis begins as soon as possible on receipt.

2.5. Sampling should be undertaken by staff trained and competent in the appropriate technique for taking water samples including the use of aseptic technique to minimise extraneous contamination. The method used for the collection of water samples will differ depending on the bacteria being tested for and specific method statements should be drawn up and accepted by the WSG before samples are collected.

2.6. British Standard (BS) 7592 notes that “The microbiological characteristics of a sample can change significantly when stored, even for relatively short periods of time” it is therefore important to ensure that samples are delivered to the lab as soon as possible to allow the samples to be processed and the testing to begin. Contact should be made with the processing laboratory to confirm stability times between sample collection and the start of analysis.

2.7. Once the samples have been collected these should be stored in a way to protect from the effects of temperature. This includes storing hot water samples together and away from cold water samples. BS 7592 notes that “Transporting and/ or storing the sample at temperatures below 6°C might reduce subsequent recovery of legionellae by culture since the bacteria might be induced into a non-culturable state, although recovery of bacterial Deoxyribonucleic Acid (DNA) is still possible. Transport of samples above 20°C is likely to result in growth of non-target species that might interfere in the culture tests.” If samples are not stored correctly, or do not reach the lab within the required timeframe, they should be discarded and the sampling repeated.

2.8. For outbreak investigations, formal chain of custody records with temperature measurements for sample storage and transport should be maintained. The WSG should agree in advance what these steps should look like and what records should be created for future review.

2.9. The time taken for test results to be received will vary depending on the bacteria being tested for and the process being followed. On prior agreement with the laboratory an early warning or interim report can be issued advising of a potential failure. This may allow actions to be taken ahead of receipt of the final results. All results from water sampling should be supplied in a timely manner including the analysis reports from the reporting laboratory.

2.10. Interpretation of the results should only be undertaken by those familiar with the water systems and the risks being posed so in most instances will be undertaken by the Authorised Person (AP) (Water) and the Consultant Microbiologist. Recommendations from sampling organisation(s) and reporting laboratories can be considered but the final decision on the next steps will be taken by the AP (Water) and the Consultant Microbiologist with input and acceptance from the wider WSG were required.

3. TVC sampling in hot and cold water systems

3.1. This part discusses testing for total microbiological populations, there are several synonyms for these estimations including total viable counts (TVCs), plate count, aerobic colony count (ACC) and heterotrophic bacterial count. Within the Scottish Health Technical Memorandum (SHTM) we refer to TVCs. These counts are estimated by the viable bacterial count in the water when measured as colony forming units per millilitre (cfu/ml). It is common that the same water is also tested for the presence of E. coli and coliforms, but this should be confirmed in a case-by-case basis by the Water Safety Group (WSG) in its documented sampling plan.

3.2. The Health and Safety Executive (HSE) (L8) states "The routine monitoring of general bacterial numbers (total viable count) is also appropriate as an indication of whether microbiological control is being achieved. This is generally only carried out for cooling tower systems, but it is also recommended for spa pools. The risk assessment will help identify if you need to conduct routine monitoring in the specific system".

3.3. However, The Chartered Institute of Building Services Engineers (CIBSE) TM13 notes 'Unlike cooling towers and spa baths, there is no requirement to carry out routine total viable Count (TVC) testing, although it can be undertaken for other water quality purposes and provides useful information on system performance/ cleanliness as part of more comprehensive system audits. If there is evidence of microbiological growth, however (such as. from the colour, taste or odour of the water), it needs to be investigated as this could include the presence of Legionella'.

3.4. Prior to any tendering for engineering changes to the water system, a sampling plan with appropriate microbiological parameters should be agreed by the WSG. As a minimum it should include testing in all settings for TVCs, coliform bacteria (including E. coli) and Legionella spp. Testing for *pseudomonas aeruginosa* should be carried out in high-risk settings. Local documented risk assessments should determine if there are additional testing requirements

3.5. Although TVCs are in themselves not necessarily pathogenic, the testing procedures are intended to provide an early warning system whereby elevated TVCs should trigger some form of action to determine the identity of the organism and implement the appropriate treatment. However, to allow trends to be identified, enough samples would need to be collected to establish a baseline by which any significant variations can be identified. The WSG should develop a sampling plan which should identify the location and frequency for any potential sampling that may take place.

3.6. When sampling from tap water the following steps should be followed:

- mixer taps should be avoided to allow pure samples to be collected, where sampling from a mixed supply (Mixer Tap/ Thermostatic Mixing Valve (TMV)/ Thermostatic Mixing Tap (TMT)) cannot be avoided the outlet should be set to provide water for normal use such as not adjusted for the purposes of the collection of the sample
- for pre-flush samples being collected the condition of the tap should be noted and the first volume of water collected without allowing any to go to drain first. The tap head should not be disinfected
- the sample bottle should be opened with care being taken to not touch any part of the thread or bottle cap
- the tap should be turned on gently to avoid unnecessary splashing, with the sample container filled almost to the brim. The lid should be replaced and tightened, and the bottle inverted gently to ensure the neutraliser is mixed effectively. Note that the bottle should **NOT** be shaken
- after collection of the water sample the tap should be allowed to run and the water temperature recorded and added to the label or the sample submission sheet along with the date and time of collection, the initials of the person collecting the sample and the unique location reference
- if post flush samples are to be collected, then the outlet should be disinfected (as agreed by the WSG and included in the Water Safety Plans (WSP)) and allowed to flush after disinfection for a minimum of two minutes to ensure all residual disinfectant has been removed
- the sample bottle should be opened with care being taken to not touch any part of the thread or bottle cap
- the tap should be turned on gently to avoid unnecessary splashing, with the sample container filled almost to the brim. The lid should be replaced and tightened, and the bottle inverted gently to ensure the neutraliser is mixed effectively. Note that the bottle should **NOT** be shaken
- after collection of the water sample the tap should be allowed to run and the water temperature recorded and added to the label or the sample submission sheet along with the date and time of collection, the initials of the person collecting the sample and the unique location reference

3.7. When sampling from shower the following steps should be followed:

- before turning on the shower the temperature should be adjusted to the midpoint setting
- a new (unused), food grade, plastic bag should be placed over the showerhead and secured in place. Using disinfected scissors, one corner should be cut off and used to form a funnel
- the sample bottle should be opened with care being taken to not touch any part of the thread or bottle cap

- the shower will then be turned on gently to ensure the bag has been secured correctly and the first volume of water collected without allowing any to go to drain first with the sample container filled almost to the brim. The lid should be replaced and tightened, and the bottle inverted gently to ensure the neutraliser is mixed effectively. Note that the bottle should **NOT** be shaken
- after collection of the water sample the shower should be allowed to run sufficiently and the water temperature(s) recorded and added to the label or the sample submission sheet along with the date and time of collection, the initials of the person collecting the sample and the unique location reference
- if post flush samples are to be collected, then the outlet should be disinfected (as agreed by the WSG and included in the WSP) and allowed to flush after disinfection for a minimum of two minutes to ensure all residual disinfectant has been removed
- a new (unused) food grade, plastic bag should be placed over the showerhead and secured in place. Using disinfected scissors one corner should be cut off and used to form a funnel
- the sample bottle should be opened with care being taken to not touch any part of the thread or bottle cap
- the shower will then be turned on gently to ensure the bag has been secured correctly and the first volume of water collected without allowing any to go to drain first with the sample container filled almost to the brim. The lid should be replaced and tightened, and the bottle inverted gently to ensure the neutraliser is mixed effectively. Note that the bottle should **NOT** be shaken
- after collection of the water sample the shower should be allowed to run sufficiently and the water temperature recorded and added to the label or the sample submission sheet along with the date and time of collection, the initials of the person collecting the sample and the unique location reference

3.8. When sampling from a Cold Water Storage Tank (also referred to as a cistern) the following steps should be followed:

- great care should be taken when opening the lid of a Cold Water Storage Tank to prevent any contamination of the tank. It is therefore important to risk assess whether sampling from the nearest cold water outlet would give an accurate representation of the water within the cold water distribution system without risking the potential contamination
- if it is decided it is necessary to sample from a Cold Water Storage Tank directly then the area around the access hatch lid should be reviewed to ensure precautions are in place to prevent anything from falling into the tank during the sampling works

- the process for the collection of water from inside the tank should be agreed by the WSG. It is not advised (British Standard (BS) 7592) that the sample bottles themselves are inserted into the water due to the risk of the neutralizer being washed out of the bottle (residual biocides within a water sample may kill any bacteria present in transit to the lab resulting in a false negative report). Dip samplers and reusable metal containers could be considered for the collection of the water from within the tank which would then be decanted into the sample bottles provided by the laboratory
- when filling the bottle care should being taken to not touch any part of the thread or bottle cap when removing the lid and a small air gap should be left before the lid is replaced and tightened
- after collection of the sample a temperature probe, which will have been freshly disinfected, will be inserted into the stored water remote from the incoming water to record the temperature. This information will be added to label or the sample submission sheet along with the date and time of collection, the initials of the person collecting the sample and the unique location reference
- the lid will be replaced, and any fastenings reattached as found

3.9. When sampling from swimming or hydrotherapy pool water the following steps should be followed:

- the outside of a sterile bottle will be wiped with an alcohol wipe (or equivalent as agreed by the WSG) before insertion into the pool water
- the sample bottle should be opened with care being taken to not touch any part of the thread or bottle cap
- the bottle will then be inserted into the pool water, keeping the long axis approximately horizontal but with the neck pointing slightly upwards to avoid loss of the neutralising agent
- once the bottle is immersed to about 200-400mm below the surface, tilt the bottle to allow it to fill, leaving a small headspace
- on removal from the water, the lid should be replaced and tightened, and the bottle inverted gently to ensure the neutraliser is mixed effectively. Note that the bottle should **NOT** be shaken
- after collection of the sample a temperature probe will be inserted into the pool water remote to record the temperature. A separate sample should be collected from the same location as the first with pool-side testing carried out to determine the total and combined disinfectant levels and Potential of Hydrogen (pH) value. This information will be added to label or the sample submission sheet along with the date and time of collection, the initials of the person collecting the sample and the unique location reference.

3.10. At present there is no guidance within the UK to define specific results which would indicate the need to complete remedial works. However, it is commonly accepted that a significant variation (as agreed by the WSG) from the incoming supply or previous trend data would indicate a breakdown of the control measures that would require further investigation and potential further sampling. It is therefore important to ensure that incoming supply samples are collected as part of the sampling plan being implemented. Incoming supply samples are taken to verify whether the supply could be the source of the identified problems. Scottish Water could also be contacted for distribution zone water quality data.

3.11. All measures should initially be discussed and documented by the Authorised Person (AP) (Water) and Consultant Microbiologist and agreed and documented by the WSG where required.

4. Legionella sampling in hot and cold water systems

4.1. This part discusses testing for legionella pneumophila populations, these counts are estimated by the viable bacterial count in the water when measured as colony forming units per litre (cfu/l).

4.2. Legionella monitoring should be carried out where there is doubt about the efficacy of the control regime or where the recommended temperatures, disinfectant concentrations or other precautions are not consistently achieved throughout the system. The Water Safety Group (WSG) should use documented risk assessments to determine when and where to test.

4.3. When sampling from tap water the following steps should be followed:

- mixer taps should be avoided, if possible, to allow pure samples to be collected. Where sampling from a mixed supply (Mixer Tap/ Thermostatic Mixing Valve (TMV)/ Thermostatic Mixing Tap (TMT)) cannot be avoided, the outlet should be set to provide water for normal use and not adjusted for the purposes of the collection of the sample
- for pre-flush samples being collected, the condition of the tap should be noted and the first volume of water collected without allowing any to go to drain first. The tap head should not be disinfected
- the sample bottle should be opened with care being taken to not touch any part of the thread or bottle cap. The tap should be turned on gently to avoid unnecessary splashing, with the sample container filled almost to the brim. The lid should be replaced and tightened, and the bottle inverted gently to ensure the neutraliser is mixed effectively. Note that the bottle should **NOT** be shaken
- after collection of the water sample, the tap should be allowed to run and the water temperature recorded and added to the label or the sample submission sheet along with the date and time of collection, the initials of the person collecting the sample and the unique location reference
- if post flush samples are to be collected, then the outlet should be disinfected (as agreed by the WSG and included in the Water Safety Plans (WSP)) and allowed to flush after disinfection for a minimum of two minutes to ensure all residual disinfectant has been removed and until it is likely that the water from the main distribution lines is coming through the outlet
- the sample bottle should be opened with care being taken to not touch any part of the thread or bottle cap. The tap should be turned on gently to avoid unnecessary splashing, with the sample container filled almost to the brim. The lid should be replaced and tightened, and the bottle inverted gently to ensure the neutraliser is mixed effectively. Note that the bottle should **NOT** be shaken

- after collection of the water sample the tap should be allowed to run and the water temperature recorded and added to the label or the sample submission sheet along with the date and time of collection, the initials of the person collecting the sample and the unique location reference

4.4. When sampling from shower the following steps should be followed:

- before turning on the shower the temperature should be adjusted to the midpoint setting
- a sterile, food grade, plastic bag should be placed over the showerhead and secured in place. Using sterile scissors one corner should be cut off and used to form a funnel
- the sample bottle should be opened with care being taken to not touch any part of the thread or bottle cap. The shower will then be turned on gently to ensure the bag has been secured correctly and the first volume of water collected without allowing any to go to drain first with the sample container filled almost to the brim. The lid should be replaced and tightened, and the bottle inverted gently to ensure the neutraliser is mixed effectively. Note that the bottle should **NOT** be shaken
- after collection of the water sample the shower should be allowed to run and the water temperature(s) recorded and added to the label or the sample submission sheet along with the date and time of collection, the initials of the person collecting the sample and the unique location reference
- if post flush samples are to be collected, then the outlet should be disinfected (as agreed by the WSG and included in the WSP) and allowed to flush after disinfection for a minimum of two minutes to ensure all residual disinfectant has been removed and until it is likely that the water from the main distribution lines is coming through the outlet
- a new sterile, food grade, plastic bag should be placed over the showerhead and secured in place. Using sterile scissors one corner should be cut off and used to form a funnel
- the sample bottle should be opened with care being taken to not touch any part of the thread or bottle cap. The shower will then be turned on gently to ensure the bag has been secured correctly and the first volume of water collected without allowing any to go to drain first with the sample container filled almost to the brim. The lid should be replaced and tightened, and the bottle inverted gently to ensure the neutraliser is mixed effectively. Note that the bottle should **NOT** be shaken
- after collection of the water sample the shower should be allowed to run and the water temperature recorded and added to the label or the sample submission sheet along with the date and time of collection, the initials of the person collecting the sample and the unique location reference

4.5. When sampling from a Cold Water Storage Tank (also referred to as a cistern) the following steps should be followed:

- great care should be taken when opening the lid of a Cold Water Storage Tank to prevent any contamination of the tank. It is therefore important to risk assess whether sampling from the nearest cold water outlet would give an accurate representation of the water within the cold water distribution system without risking the potential contamination
- if it is decided it is necessary to sample from a Cold Water Storage Tank directly then the area around the access hatch lid should be reviewed to ensure pre-cautions are in place to prevent anything from falling into the tank during the sampling works
- the process for the collection of water from inside the tank should be agreed by the WSG. It is not advised (British Standard (BS) 7592) that the sample bottles themselves are inserted into the water due to the risk of the neutraliser being washed out of the bottle (residual biocides within a water sample may kill any bacteria present in transit to the lab resulting in a false negative report). Dip samplers and reusable metal containers could be considered for the collection of the water from within the tank which would then be decanted into the sample bottles provided by the laboratory
- when filling the bottle care should being taken to not touch any part of the thread or bottle cap when removing the lid and a small air gap should be left before the lid is replaced and tightened
- after collection of the sample a temperature probe, which will have been freshly disinfected, will be inserted into the stored water remote from the incoming water to record the temperature. This information will be added to label or the sample submission sheet along with the date and time of collection, the initials of the person collecting the sample and the unique location reference
- the lid will be replaced, and any fastenings reattached as found

4.6. When sampling from swimming or hydrotherapy pool water the following steps should be followed:

- the outside of a sterile bottle will be wiped with an alcohol wipe (or equivalent as agreed by the WSG) before insertion into the pool water
- the sample bottle should be opened with care being taken to not touch any part of the thread or bottle cap
- the bottle will then be inserted into the pool water, keeping the long axis approximately horizontal but with the neck pointing slightly upwards to avoid loss of the neutralising agent

- once the bottle is immersed to about 200-400mm below the surface, tilt the bottle to allow it to fill, leaving a small headspace
- on removal from the water, the lid should be replaced and tightened, and the bottle inverted gently to ensure the neutraliser is mixed effectively. Note that the bottle should **NOT** be shaken
- after collection of the sample a temperature probe will be inserted into the pool water remote to record the temperature. A separate sample should be collected from the same location as the first with pool-side testing carried out to determine the total and combined disinfectant levels and Potential of Hydrogen (pH) value. This information will be added to label or the sample submission sheet along with the date and time of collection, the initials of the person collecting the sample and the unique location reference

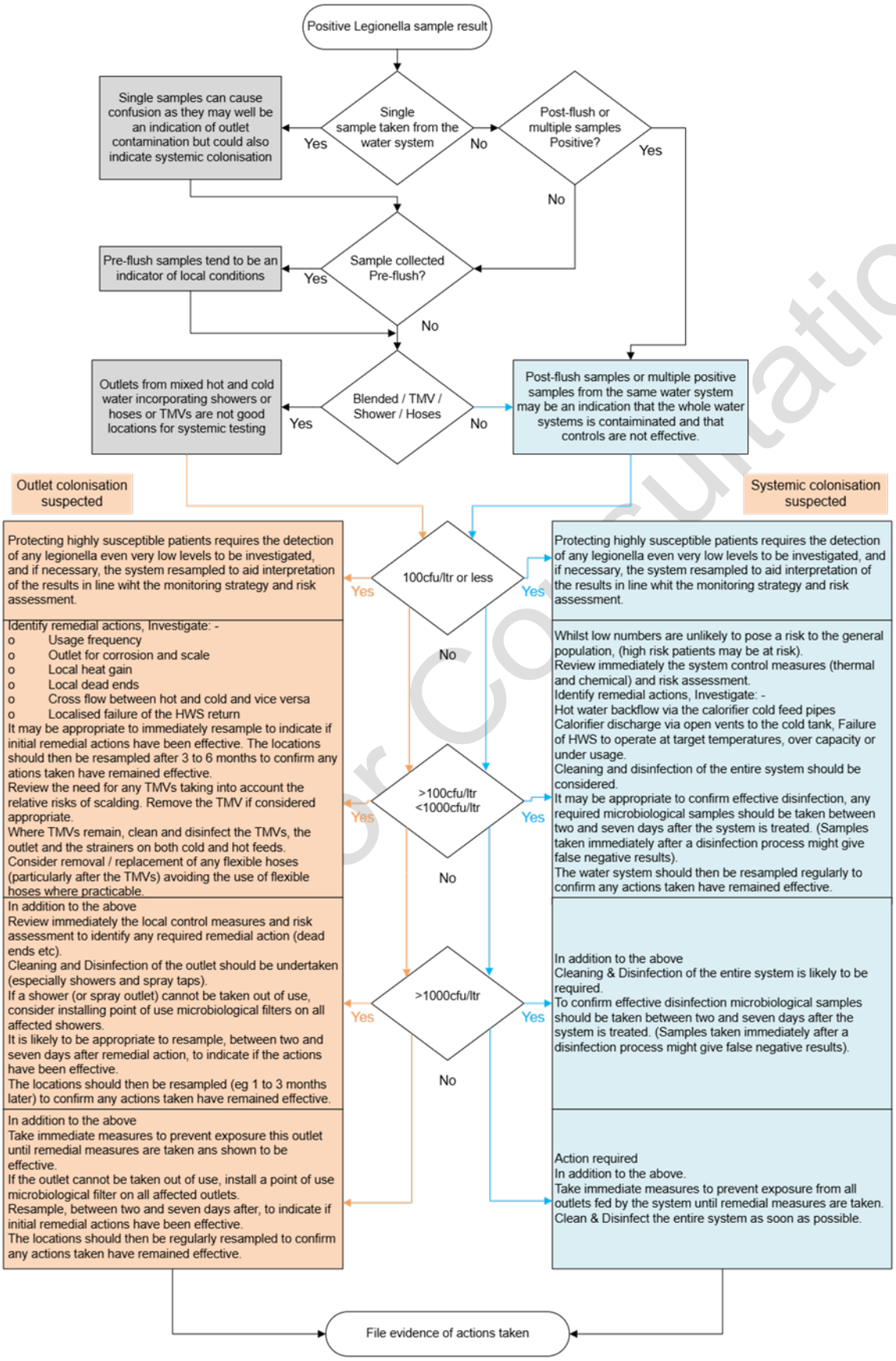
4.7. Action following Legionella sampling in hot and cold water systems is given in the following flowcharts.

Note 4: Figure 4.1 and Figure 4.2 are given as examples of a range of various methods that may be used. Individual conditions will dictate which procedure is appropriate and therefore the charts can be adapted accordingly.

Figure 4.1 - Actions following pre-flush and post-flush legionella counts

Legionella Bacteria (cfu/1)	Results from Pre-flush samples	System results (Post-Flush samples)
	Pre-flush samples tend to be an indicator of local conditions and if detected will often require post-flush samples in order to determine that the contamination is local and not systemic.	Post-flush samples (or multiple positive samples) may be an indication that the whole water systems a contaminated and that controls are not effective.
Legionella not detected	Continue with current control scheme	
Less than 1000	Action required Identify remedial actions, investigate: - o Usage frequency o Outlet for corrosion and scale o Local heat gain o Local dead ends o Cross flow between hot and cold and vice versa o Localised failure of the HWS return It may be appropriate to immediately resample to indicate if initial remedial actions have been effective. The locations should then be resampled after 3 to 6 months to confirm any actions taken have remained effective. In addition to the above, and if the outlet is served by a TMV: Review the need for the TMV taking into account the relative risks of scalding. Remove the TMV if considered appropriate. If the TMV is to remain, clear and disinfect the TMV, the outlet and the strainers on both cold and hot feeds. Identify any flexible hoses particularly after the TMV and consider replacement, avoiding the use of flexible hoses where practicable.	Action required Whilst low numbers are unlikely to pose a risk to the general population Review immediately the system control measures and risk assessment. Identify remedial actions, investigate: - o Check for any hot water backflow via the calorifier cold feed pipes o Calorifier discharge via open vents to the cold tank o Failure of HWS to operate at target temperatures o Over capacity or under usage Cleaning & Disinfection of the entire system should be considered. It may be appropriate to confirm effective disinfection, any required microbiological samples should be taken between two and seven days after the system is treated. The water system should then be resampled regularly to confirm any actions taken have remained effective.
1000-10,000	Action required In addition to the above Review immediately the local control measures and risk assessment to identify any required remedial action (dead ends etc). Cleaning and Disinfection of the outlet should be undertaken If a shower (or spray outlet) cannot be taken out of use, consider installing point of use microbiological filters on all affected showers. It is likely to be appropriate to resample, between two and seven days after, to indicate if initial remedial actions have been effective. The locations should then be resampled (eg 1 to 3 months later) to confirm any actions taken have remained effective.	Action required In addition to the above Cleaning & Disinfection of the entire system is likely to be required. To confirm effective disinfection microbiological samples should be taken between two and seven days after the system is treated.
>10,000	Action required In addition to the above Take immediate measures to prevent exposure from this outlet until remedial measures are taken and shown to be effective. If the outlet cannot be taken out of use, install a point of use microbiological filter on all affected outlets. Resample between two and seven days after, to indicate if intial remedial actions have been effective. The locations should then be resampled to confirm any actions taken have remained effective.	Action required In addition to the above Take immediate measures to prevent exposure from all outlets fed by the system until remedial measures are taken. Clean & Disinfect the entire system as soon as possible.

Figure 4.2 - Action levels following positive results (the figure identifies the processes when detecting a positive Legionella sample result)



5. Pseudomonas aeruginosa and other bacteria sampling in hot and cold water systems

5.1. Although the main focus of this section is on *Pseudomonas aeruginosa*, the section may also have relevance to other waterborne pathogens such as Stenotrophomonas maltophilia, Burkholderia cepacia and atypical mycobacteria, these counts are estimated by the viable bacterial count in the water when measured as colony forming units per 100 millilitres (cfu/100ml). Reference should be to the alert organisms identified in the National Infection Prevention and Control Manual (NIPCM) Appendix 13.

5.2. Currently there is no standardised method available which is aimed at detection of both slow-growing and rapid-growing forms of Nontuberculous mycobacteria (NTM) by culture or molecular methods. At time of publication of this guidance document, an interim detection method for NTM has been provided by the UK Health Security Agency mycobacteria while a standard method is developed. Those commissioning testing should ensure the laboratory is United Kingdom Accreditation Service (UKAS)-accredited to ISO 17025 For these high-risk patients (discussed in Scottish Health Technical Memorandum (SHTM 04-01) Part B); there should be no NTM detected.

5.3. *Pseudomonas aeruginosa* sampling should be carried out where “High-risk” patients have been identified by the clinical and Infection Prevention and Control Teams (IPCTs) and where the Water Safety Group (WSG) determines sampling is appropriate.

5.4. The water outlets to be sampled should be those that supply water which:

- have direct contact with patients
- is used to wash staff hands
- is used to fill or clean equipment that will have contact with patients as determined by risk assessment
- in areas such as prep and treatment rooms where there may be a splash risk onto products for patients

5.5. To maximise the recovery of *Pseudomonas aeruginosa* sampling should take place during a period of, preferably:

- no use (at least two hours or preferably longer)

or if that is not possible

- during a time of lowest usage. This will normally mean sampling in the early morning, though a variety of usage patterns may need to be considered

5.6. When sampling from tap water the following steps should be followed:

- mixer taps should be avoided, if possible, to allow pure samples to be collected, where sampling from a mixed supply (Mixer Tap/ Thermostatic Mixing Valve (TMV)/ Thermostatic Mixing Tap (TMT) cannot be avoided the outlet should be set to provide water for normal use such as not adjusted for the purposes of the collection of the sample
- for pre-flush samples being collected the condition of the tap should be noted and the first volume of water collected without allowing any to go to drain first. The tap head should not be disinfected
- the sample bottle should be opened with care being taken to not touch any part of the thread or bottle cap. The tap should be turned on gently to avoid unnecessary splashing, with the sample container filled almost to the brim. The lid should be replaced and tightened, and the bottle inverted gently to ensure the neutraliser is mixed effectively. Note that the bottle should **NOT** be shaken
- after collection of the water sample the tap should be allowed to run and the water temperature recorded and added to the label or the sample submission sheet along with the date and time of collection, the initials of the person collecting the sample and the unique location reference
- if post flush samples are to be collected, then the outlet should be disinfected (as agreed by the WSG and included in the Water Safety Plans (WSP)) and allowed to flush after disinfection for a minimum of two minutes to ensure all residual disinfectant has been removed and until it is likely that the water from the main distribution lines is coming through the outlet
- the sample bottle should be opened with care being taken to not touch any part of the thread or bottle cap. The tap should be turned on gently to avoid unnecessary splashing, with the sample container filled almost to the brim. The lid should be replaced and tightened, and the bottle inverted gently to ensure the neutraliser is mixed effectively. Note that the bottle should **NOT** be shaken
- after collection of the water sample the tap should be allowed to run and the water temperature recorded and added to the label or the sample submission sheet along with the date and time of collection, the initials of the person collecting the sample and the unique location reference

5.7. To take a swab sample, remove a sterile swab from its container and insert the tip into the nozzle of the tap or other designated area. Care should be taken to ensure no other surfaces come into contact with the tip of the swab. Rub the swab around - that is, move it backwards and forwards and up and down, as much as possible, on the inside surface of the tap outlet or flow straightener (see Figure 5.1). Replace the swab carefully in its container, again ensuring no other surfaces come into contact with the tip of the swab. Place the swab in a transport medium or maximum recovery diluent (MRD) and send to the laboratory.

Figure 5.1 - A sterile swab collecting a sample from inside a tap (A sterile swab should be rubbed on the inside surface of the tap outlet or flow straightener)

5.8. When sampling from shower the following steps should be followed:

- before turning on the shower the temperature should be adjusted to the midpoint setting
- a sterile, food grade, plastic bag should be placed over the showerhead and secured in place. Using sterile scissors one corner should be cut off and used to form a funnel
- the sample bottle should be opened with care being taken to not touch any part of the thread or bottle cap
- the shower will then be turned on gently to ensure the bag has been secured correctly and the first volume of water collected without allowing any to go to drain first with the sample container filled almost to the brim. The lid should be replaced and tightened, and the bottle inverted gently to ensure the neutraliser is mixed effectively. Note that the bottle should **NOT** be shaken
- after collection of the water sample the shower should be allowed to run and the water temperature(s) recorded and added to the label or the sample submission sheet along with the date and time of collection, the initials of the person collecting the sample and the unique location reference
- if post flush samples are to be collected, then the outlet should be disinfected (as agreed by the WSG and included in the WSP) and allowed to flush after disinfection for a minimum of two minutes to ensure all residual disinfectant has been removed and until it is likely that the water from the main distribution lines is coming through the outlet
- the showerhead should be removed (note it should not be placed on the floor) with the water to be collected from the flow of water without the showerhead in place
- the sample bottle should be opened with care being taken to not touch any part of the thread or bottle cap

- the shower will then be turned on gently to ensure the bag has been secured correctly and the first volume of water collected without allowing any to go to drain first with the sample container filled almost to the brim. The lid should be replaced and tightened, and the bottle inverted gently to ensure the neutraliser is mixed effectively. Note that the bottle should **NOT** be shaken
- after collection of the water sample the shower should be allowed to sufficiently run and the water temperature recorded and added to the label or the sample submission sheet along with the date and time of collection, the initials of the person collecting the sample and the unique location reference

5.9. If test results are satisfactory (not detected), there is no need to repeat sampling for a period of a maximum time period of six months unless the WSG has risk assessed the need for more frequent testing or there are changes in the water distribution and delivery systems components or system configuration (for example, refurbishments that could lead to the creation of dead-legs) or occupancy. See NIPCM for guidance.

5.10. However, the WSG could indicate that water sampling is required within six months if there are clinical suspicions that the water may be a source of patient colonisation or infection (that is, with *pseudomonas aeruginosa* or another potentially waterborne pathogen).

5.11. As set out in the NIPCM chapter 4, the microbiological limit is 0 cfu/100 mL. If tests show counts of 1 to 10 cfu/100 mL, the WSG should risk-assess the use of water while simultaneously retesting the water outlet (see Figure 5.2 and Note 5 below).

5.12. If test results are not satisfactory (>10 cfu/100 mL), further sampling along with an engineering survey of the water system could be used to identify problem areas and modifications that may be implemented to improve water quality.

5.13. After such interventions, the water should be resampled (see Figure 5.2 for suggested frequencies).

Note 5: Figure 3 gives an example of sampling frequencies. Sampling may be undertaken more frequently according to the risk assessment. It is important that samples are taken as described in Appendix E to avoid false negative results.

Figure 5.2 - Summary of suggested water sampling and testing frequencies (the figure identifies the processes when detecting a positive *pseudomonas aeruginosa* sample result.

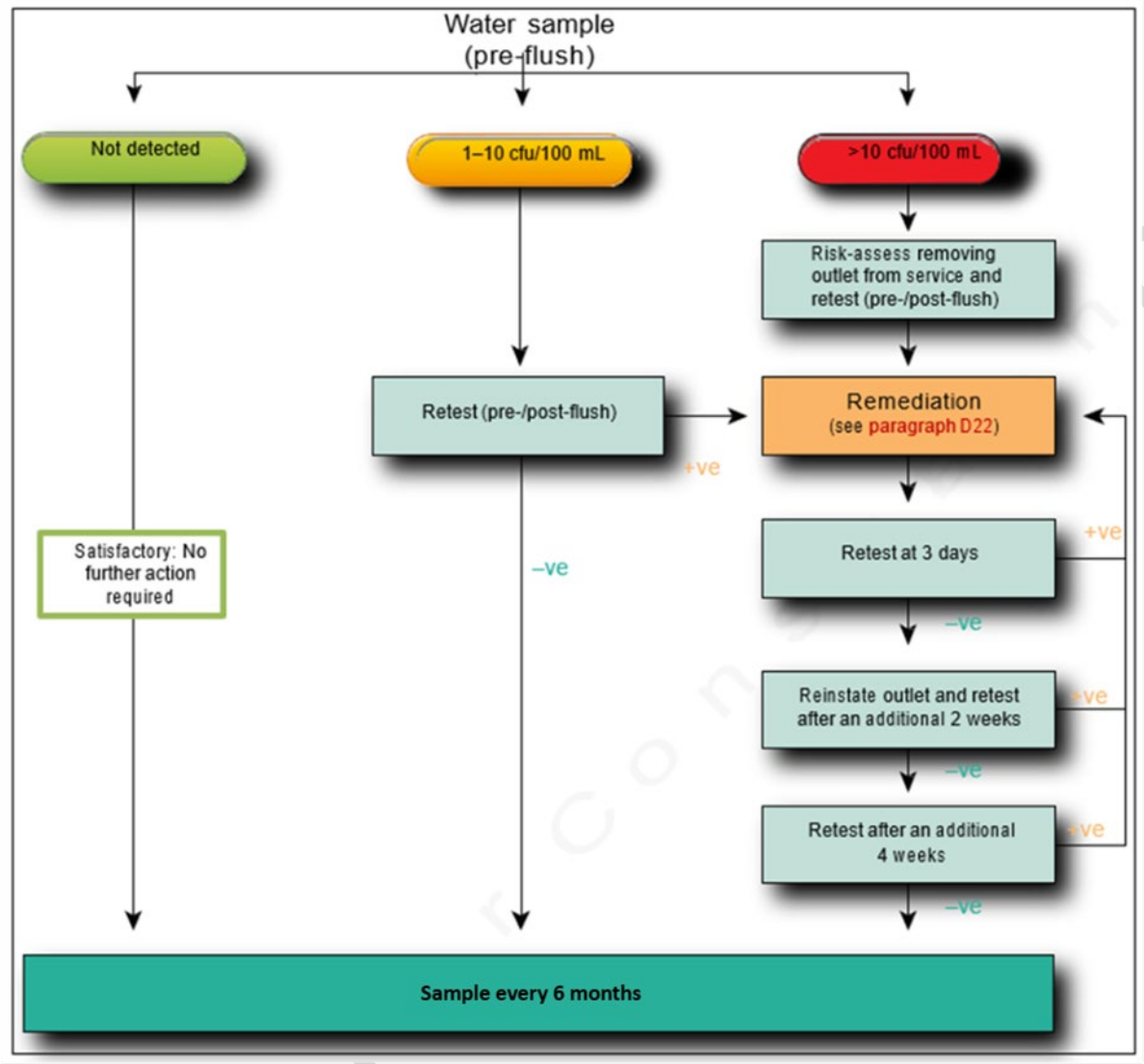


Table 5.1 - Interpretation of pre- and post-flush counts

Result reported	Interpretation
High *pseudomonas aeruginosa* pre-flush count (>10 cfu/100 mL) and low post-flush count (<10 cfu/100 mL)	Suggestive of a local water outlet problem
High *pseudomonas aeruginosa* pre-flush count (>10 cfu/100 mL) and high post-flush count (>10 cfu/100 mL)	Suggestive of a problem not related to a local water outlet but to a wider problem within the water supply

Note 6: Overlaying sample results onto schematic drawings of the system may help to identify the source of contamination and locations for additional sampling.

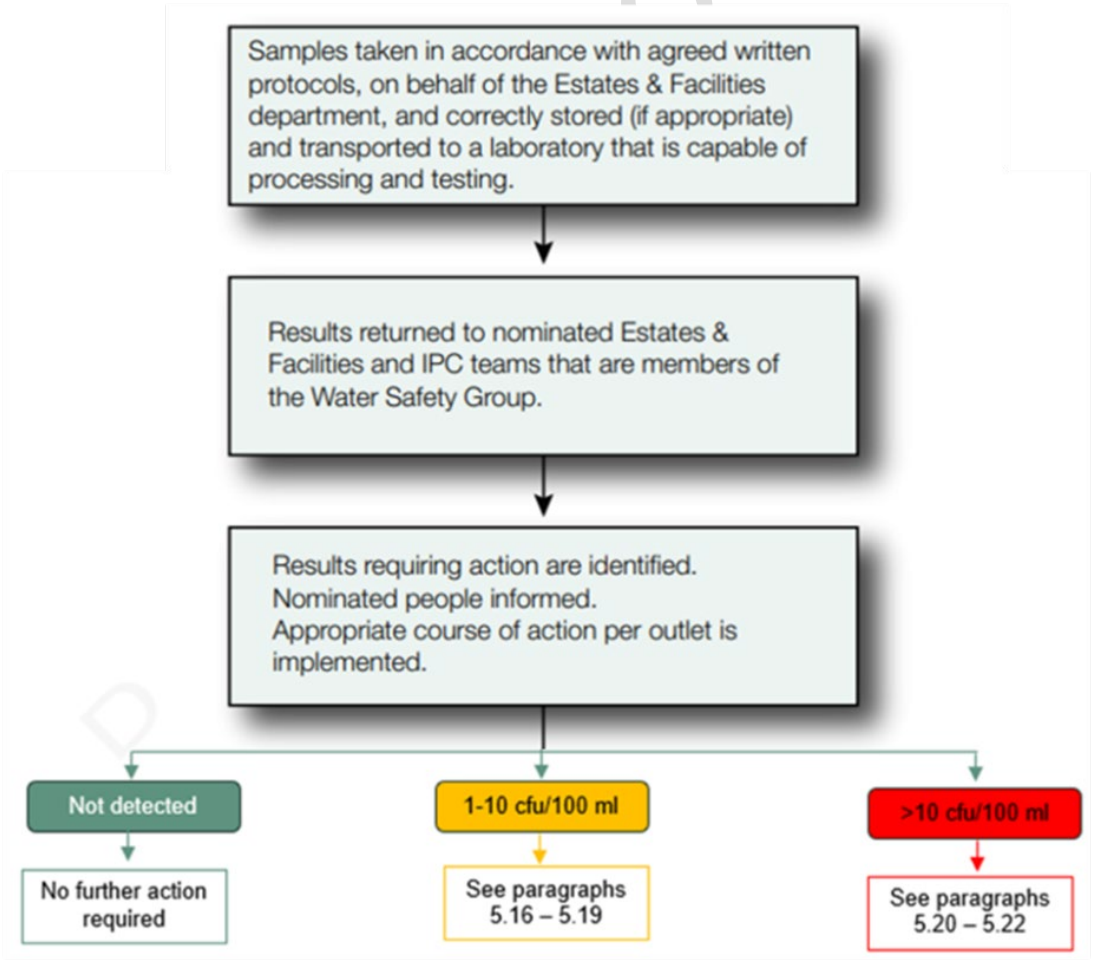
5.14. High counts in pre-flush samples but low counts or none detected at post-flush could indicate that areas/ fittings at or near the outlets are the source of contamination:

- if both pre- and post-flush samples from a particular outlet are >100 cfu/100 mL and other nearby outlets have no or low counts, this shows that the single outlet is heavily contaminated, despite the high post-flush count. This could be explored by testing dilutions of pre- and post- flush water samples from this outlet or by using an extended flush such as for five minutes prior to post-flush sampling or by taking a post-flush sample after disinfection of the outlet as occurs with Legionella post-flush sampling
- a few positive outlets, where the majority of outlets are negative, would also indicate that the source of contamination is at or close to the outlet

5.15. If the sampling indicates that the water services are the problem, then most outlets would possibly be positive and other points in the water system could then be sampled to assess the extent of the problem (see Table 5.1).

5.16. Figure 5.3 provides a summary of the sampling procedure and interpretation of results for *pseudomonas aeruginosa*.

Figure 5.3 - Summary of sampling procedure and interpretation of results for *pseudomonas aeruginosa* (the figure identifies a summary of sampling procedures and interpretation of the results for *pseudomonas aeruginosa* in three scenarios).



5.17. Check connections to mixing taps to ensure that the supply to the hot connection is not supplied from an upstream TMV. A dead leg may exist when an inline TMV is installed upstream of a mixing tap thereby the cold-water pipe feeding the tap is not used. Caution in the design between specifiers of the tap and consultants stating the pipework configuration needs to be considered. Depending on the activities of the room in which the tap is located, cold water may never be drawn through the pipe between the cold-water connections of the mixing valve and mixing tap.

5.18. Risk-assess the water systems for redundant pipework and dead-legs (for example, where water is supplied to both the cold-water outlet and a TMV supplying an adjacent blended water outlet, as such cold-water outlets may be infrequently used). When removing outlets, the branch hot and cold water pipes should also be cut back to the main distribution pipework in order to eliminate redundant pipework.

5.19. Assess the water distribution system for non-metallic materials that may be used in items such as inline valves, test points and flexible hoses. They should be replaced according to the guidance in safety alert Safety Action Notice (SAN)(SC)09/03 ‘Flexible water supply hoses’ risk of harmful micro-organisms.’

5.20. All materials in contact with water should have been assessed and shown they are appropriate for the intended purpose (see SHTM 04-01 Part A) and should not leach chemicals that provide nutrients that support microbiological growth. Materials should also be compatible with the physical and chemical characteristics of water supplied to the building. Flexible pipes should only be used in exceptional circumstances (for example, where height adjustment is necessary as in installations such as rise-and-fall baths and hand-held showers).

5.21. Point of Use (POU) filters, where they can be fitted, may be used to provide water free of *pseudomonas aeruginosa*, NTM and other waterborne pathogens. Where fitted, regard filters primarily as a temporary control measure until a permanent solution is developed, although long-term use of such filters may be required in some healthcare applications. Where POU filters are fitted to taps, follow the manufacturer’s recommendations for renewal and replacement and note that the outer casing of a POU filter and the inner surface can become contaminated.

5.22. There should be sufficient activity space within the wash-hand basin or sink to effectively utilise the wash-hand basin or sink for the intended purpose and the type AUK3 air gap (from the outlet of the POU to the spillover level) must still be achieved, once a POU filter has been fitted.

5.23. In certain circumstances, the WSG may decide it is necessary to carry out a disinfection of the hot and cold water distribution systems that supply the unit to ensure that contaminated outlets are treated. Consider replacing contaminated taps with new taps; however, there is currently a lack of scientific evidence to suggest that this will provide a long- term solution. When replacing taps, consider fitting:

- removable taps
- taps that are easy to use
- taps that can be readily dismantled for cleaning and disinfection
- taps to which a filter can be attached to the spout outlet. Note: Such taps can be used for supplying water for cleaning incubators and other clinical equipment

Abbreviations

ACC:	Aerobic Colony Count
AOCP:	Approved Code of Practice
AP:	Authorised Person
ARHAI:	Antimicrobial Resistance and Healthcare Associated Infection
BS:	British Standard
Cfu/l:	colony forming units per litre
cfu/ml:	colony forming units per millilitre
CIBSE:	Chartered Institute of Building Services Engineers
DL:	Director Letter
DNA:	Deoxyribonucleic Acid
HBN:	Health Building Note
HIIAT:	Healthcare Infection Incident Assessment Tool
HPT:	Health Protection Team
HSE:	Health and Safety Executive
HSG:	Health and Safety Guidance
HTM:	Health Technical Memorandum
IPCT:	Infection Prevention and Control Team
MRD:	Maximum Recovery Diluent
NIPCM:	National Infection Prevention and Control Manual
NPF:	National Performance Framework
NSS:	National Services Scotland
NTM:	Non-Tuberculous Mycobacteria
NWSAG:	National Water Services Advisory Group
pH:	Potential of Hydrogen
POU:	Point of Use
PWTAG:	Pool Water Treatment Advisory Group

SAN:	Safety Action Notice
SETAG:	Scottish Engineering and Technology Advisory Group
SHPN:	Scottish Health Planning Note
SHTM:	Scottish Health Technical Memorandum
SSD:	Sterile Services Department
TMT:	Thermostatic Mixing Tap
TMV:	Thermostatic Mixing Valve
TVC:	Total Viable Count
UKAS:	United Kingdom Accreditation Service
WSG:	Water Safety Group
WSP:	Water Safety Plan

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